Georgia State University
ScholarWorks @ Georgia State University

Public Health Theses | School of Public Health

Summer 8-7-2018

Examining Variations of Patient Visit Characteristics on Lifestyle Counseling Among Diabetic Patients

Ashley McCook

ABSTRACT

Examining Variations of Patient Visit Characteristics on Lifestyle Counseling Among Diabetic Patients

By

Ashley Alesia McCook

August 7th, 2018

INTRODUCTION: Hyperglycemia is associated with increased risk of diabetic complications; however, this can be reduced by the maintenance of healthy blood glucose levels. Substantial evidence suggests that glycemic control can improve health outcomes in diabetic patients; however, a lack of translation to practice of interventions' effectiveness. Several barriers to providing counseling may exist. The likelihood of counseling has been hypothesized to be associated with patient, physician and system characteristics.
AIM: Explore variations in lifestyle counseling for US adult diabetic patients along with patient, physician, and system characteristics during clinical visit using the NAMCS dataset.
METHODS: Clinical patient visit data was obtained from the National Ambulatory Medical Care Survey [NAMCS] 2012-2015 for analysis. Multivariate logistic regression was utilized to calculate estimates and adjusted odds ratios for characteristics associated with the likelihood of intervention for diabetic patients.
RESULTS: Among the characteristics included in the statistical models for counseling, were found to be significantly associated with the likelihood of being offered diet and exercise counseling in the logistic model. These include HbA1c testing [OR=1.615]; Shift, hourly physicians [OR=5.370]; EMR meeting DHHS criteria [OR=6.529]; patient race [Hispanic OR=2.074, Black OR=1.337]; physician specialty [cardiology OR=1.402]; patient's history of chronic conditions [obesity OR=2.524, OR=4.264].
DISCUSSION: More than patient level characteristics are associated with the likelihood of counseling. Physician and system-level characteristics are also significantly associated with the likelihood intervention. Identifying the sources of variations could not only better understand barriers to executing counseling but also effectively reducing the burden of diabetes and other co-morbidities.

Examining Variations of Patient Visit Characteristics on Lifestyle Counseling among Diabetic Patients

By

Ashley Alesia McCook

B.A., Agnes Scott College

A Thesis Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the
Requirements for the Degree

MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA
30303

APPROVAL PAGE

Examining Variations of Patient Visit Characteristics on Lifestyle Counseling among Diabetic Patients

By

Ashley Alesia McCook

Approved:

____
Committee Chair [Dr. Lee Rivers Mobley]

____
2nd Chair/Committee Member [Dr. Ruiyan Luo]

____
Committee Member [Dr. Megha Kumudchandra Shah]

Date
August 7th, 2018

Acknowledgments

I would like to thank my thesis committee Dr. Mobley, Dr. Luo, and Dr. Shah for their patience, assistance, and generosity throughout my journey of developing and successfully completing my thesis. Without the help of the three of you, I wouldn't have the opportunity that awaits me this coming September. Also, I would like to thank my coworker Alcides Fernandes Filho who had it not been for I would have never figured out a thesis topic. My family, friends, and significant other; I appreciate the love and support you guys have given me the past 6 months. Dealing with a family illness, full-time job, graduate school, and planning a departure all at once took a toll on my mental health. Thanks for being there in ways that I can't describe in those dark moments. To the professors and peers that I've encountered throughout my graduate experience at GSU, it has been a pleasure to learn from you and consider my friends throughout these past 3 years. Lastly, I'd like to acknowledge the podcasts that provided wisdom, encouragement, and comic relief in the arduous process to complete my thesis and degree: Black Girl Podcasts, Gettin' Grown, Therapy for Black Girls, The Friendzone, The Joe Budden Podcast, Small Doses with Amanda Seales, and The Brilliant Idiots. Psalms 23:5 the scripture says: You prepare a table before me in the presence of my enemies. You anoint my head with oil; my cup overflows. With that said, I will feast. Stanford here I come!!!!!!!

Author’s Statement Page

In presenting this thesis as a partial fulfillment of the requirements for an advanced degree from Georgia State University, I agree that the Library of the University shall make it available for inspection and circulation in accordance with its regulations governing materials of this type. I agree that permission to quote from, to copy from, or to publish this thesis may be granted by the author or, in his/her absence, by the professor under whose direction it was written, or in his/her absence, by the Associate Dean, School of Public Health. Such quoting, copying or publishing must be solely for scholarly purposes and will not involve potential financial gain. It is understood that any copying from or publication of this dissertation which involves potential financial gain will not be allowed without written permission of the author.

TABLE OF CONTENTS

List of Tables & Figures

CHAPTER I: INTRODUCTION

Background

Diabetes mellitus, Type 2 [DM II] is a chronic metabolic disease whose prevalence has been rapidly increasing across the population. Due to this trend, diabetes quickly has become an epidemic in both developed and underdeveloped countries worldwide. The increased prevalence of DM II coupled with an influx of an aging population has only exacerbated the burden for healthcare providers to combat the negative impact on the population's health (Alim, 2017). Diabetes accounts for significant part of healthcare expenditures, health related disabilities, and negatively impacts the workforce. According to the Center of Disease Control, medical costs and loss of work wages for people with a diagnosis of diabetes total to 327 billion dollars yearly in the United States of America (Prevention, 2017). Currently, in the U.S. population, 30.3 million people have diabetes [23.1 million officially diagnosed but 7.2 million people are undiagnosed] however 84.1 million adults [18 years or older] are pre-diabetic (Prevention, 2017).

People living with this disease are more susceptible to other complications that can hinder their quality of life and lead to premature death. Patients with hyperglycemia are approximately two times more likely to be diagnosed with some form of cardiovascular disease or suffer from a cerebrovascular event [i.e., stroke] than their counterparts without hyperglycemia (Prevention, 2017). Diabetes is the leading cause of renal failure, limb amputations, and retinal complications [adult onset-blindness] (Prevention, 2017). Apart from obesity, diabetes is one of the gateways to other severe and potentially fatal chronic diseases, adding to the trend of patients living with comorbidities.

For example, according to a New York Times article there is an association between pancreatic cancer and Type II diabetes. Although diagnosis of pancreatic cancer is rare, it's predicted that pancreatic cancer will be the second most deadly form of cancer in 2030 (Brody, 2018). Due to delay of symptoms and early detection biomarker test, survival rates for patients with this diagnosis is very poor. People who are more likely to develop pancreatic cancer have one of the following risk factors:

- Older age
- African-American or Ashkenazi Jew
- Two or more first-degree relatives who have cancer

Tobacco smoking, originally known risk factor, accounts for 20-25% of pancreatic cancer despite the decline over the past few decades (Brody, 2018). However, it's discovered that the main risks of pancreatic cancer and deaths are obesity, Type II diabetes, and metabolic syndrome. The severity of obesity and Type II diabetes is attributable to the rise of pancreatic cancer. When the body resists insulin, the pancreas produces excess insulin promoting cell growth including cancer cells. It's stated that 50-80% of pancreatic cancer patients have diabetes or impaired glucose tolerance (Brody, 2018). However, research has discovered that patients who have better glycemic control through metformin reduce the risk of pancreatic cancer and better rates of survival.

Although currently no cure for this chronic disease, there are different methods of hyperglycemia control such as oral hypoglycemic agents, insulin sensitizers [metformin], biguanide, and more innovative medications. However, there are other treatment modalities such as lifestyle modification that focus on nutrition and physical activity that are not cost effective over time but are useful in controlling blood sugar level in patients who have diabetes.

Type II Diabetes versus Other Diabetes

Diabetes is a chronic condition that disrupts the way a person's body metabolizes glucose. This dysfunction occurs in the body resisting a hormone created by the pancreas called insulin to regulate blood sugar or doesn't produce an adequate amount of insulin to control a consistent glucose level (Knowler, Barrett-Connor, Fowler, & Hamman, 2002). Untreated hyperglycemia over time can cause health complications such as failure of vital organs including the eyes [retinopathy], kidneys [nephropathy], heart, etc. (Ali MK, 2013). There are three types of diabetes: Type I, Type II, and gestational diabetes.

Type I diabetes, also known as juvenile diabetes, is caused by an autoimmune response that destroys pancreatic cells preventing the body from producing insulin. Approximately five percent of people diagnosed with diabetes have Type I. Although the exact cause of Type I diabetes is unknown, potential attributable factors causing Type I diabetes include genetics, exposure to viruses, and other environmental factors.

Gestational diabetes is an ephemeral condition of diabetes-induced during pregnancy. An infant that is born to a mother diagnosed with gestational diabetes has an increased risk of having health complications. Although gestational diabetes majority of the time is temporary, gestational diabetes predisposes women to an increased likelihood of being diagnosed with Type II diabetes. Also, the offspring born to women with gestational diabetes have increased odds to become obese during adolescence and developing Type II diabetes later in life.

Type II diabetes or adult-onset diabetes is slightly different from Type I diabetes. Although under the condition of DM II insulin is produced, the body is not producing an adequate amount of insulin or is resistant to the insulin produced. Because of this malfunction, the body is unable to maintain a consistent and normal glucose level [hyperglycemia]. Most patients diagnosed with diabetes have DM II. Unlike Type I diabetes where it is not known how to prevent this disease, DM II can be prevented or delayed with lifestyle changes such as maintaining a healthy weight, eating a balanced, healthy diet, and getting an adequate amount of physical activity consistently (Balas, 1998).

Risk Factors & Prevention

Although the different types of diabetes possess the same consequences when it comes to the longevity and complications of the patient's health, Type II diabetes is a bit more preventable based on specific risk factors and method of prevention. Some of the known risk factors that increase the likelihood of developing diabetes are classified as clinically overweight or obese, 45 years of age or older, having a family history of diabetes, race/ethnicity [people of African, Hispanic/ Latino, American Indian or Alaska Native descent have a higher incidence of diabetes] , diagnosis of pre-diabetes [hyperglycemia- abnormal glucose level but not high enough for diabetes diagnosis], physical active less than 3 days per week, and medical history of hypertension; hyperlipidemia; and history of gestational diabetes during pregnancy (Kreuter, Scharff, Brennan, & Lukwago, 1997). However, there are many methods of prevention to decrease the likelihood of developing DM II and mitigate the effects of diabetes such as consuming a healthy balanced diet and getting an adequate amount of physical activity to consistently control glycemic level in diabetic patients (Knowler, Barrett-Connor, Fowler, & Hamman, 2002). Even though the strong empirical evidence of lifestyle interventions are more effective at improving glycemic control in patients diagnosed with diabetes, other studies that reflect a lack of effectiveness of translation from clinical research into practice. It is estimated that it would take approximately take 17 years for a small percentage of research to integrate into medical practice (Balas, 1998).

Aims of the study

Our data analysis for this research study aims to explore the variations in counseling offered based on patient, provider, and system characteristics for patients diagnosed with Type II diabetes to discover the potential characteristics that influence the likelihood of receiving an intervention. Using the National Ambulatory Medical Care Survey (NAMCS), the study's analysis will address the following research questions:

Question 1: Are patient characteristic variations associated with the likelihood of adult diabetic patients being offered lifestyle counseling in the US?

Question 2: Are provider and system characteristic variations associated with the likelihood of adult diabetic patients being offered lifestyle counseling in the US?

Despite the trends of lifestyle counseling offered to diabetic patients in the ambulatory setting not being well known and other studies' attempts to conduct analysis that lacked statistical power and quality of complete data for study analysis, our goal is to provide more information for community feedback to better identify and understand the barriers from these selected levels of characteristics when it comes to receiving lifestyle counseling.

CHAPTER II: REVIEW OF THE LITERATURE

Statistics showed a population increase of diagnosis of diabetes from 3.5% in 1990 to 7.9% in 2008. A study whose objective was to update the national trends of diabetes [undiagnosed or diagnosed] discovered the mean BMI of the adult U.S. population increased significantly [$p<0.001$] (Menke A, 2015). The prevalence of obesity changed significantly from 21.1% in 1988-1994 to 32.4% among people diagnosed with diabetes in 2005-2010 (Menke A, 2015). Simultaneously, the prevalence of total diabetes [diagnosis plus hemoglobin A1c ≥ 6.5] went from approximately 6.2% [5.6%-6.8%] in 1988-1994, 8.8% [8.1-9.6%] in 1999-2004, and

9.9% [9.2%-10.7%] 2005-2010 (Menke A, 2015). A similar trend increase was observed when diagnosed with diabetes and fasting glucose count [≥ 126 mg/dL] (Menke A, 2015). However, more alarming is the prevalence of undiagnosed diabetes that reflects a similar increasing trend.

Unfortunately, for ethnic minorities and geriatric population the prevalence of diabetes is substantially greater including undiagnosed diabetes, treatment type, and blood sugar control in comparison to their white counterparts. Non-Hispanic Black prevalence for diabetes is 15.4% versus their white counterparts at 8.6%. Mexican-American prevalence fair no better when it comes to diabetes 11.6% versus 8.6% whites (Selvin, Parrinello, Sacks, & Coresh, 2014). When focusing on medication usage among diagnosed patients, prevalence still varies among different ethnic groups. For example, reports on diabetic patients utilizing medication-only shows that only 52% [46.2%- 56.7%] of Non-blacks and 43% [38.1%-49.0%] of Mexican-American had a HbA1c level were less than 7.0% in comparison to 57% of Non-Hispanic White (Selvin, Parrinello, Sacks, & Coresh, 2014). Once adjustments were made in the model to include demographic and adiposity factors, it strongly attenuated and explains the total diabetes prevalence in the U.S. Other studies have discovered an association between diabetes functional status, mobility, cognition, fracture risk and life expectancy which explains the high burden of diabetes in the older adult U.S. population. The high burden of diabetes, prediabetes, poor rates of glycemic control [even patients treated with medications] has only increased the burden of diabetic patients having a greater risk for diabetic complication and developing multiple comorbidities (Morrison, Shubina, & Turchin, 2012). Despite the study's findings revealing that the prevalence of undiagnosed diabetes was relatively stable and increase of glycemic control among diabetic patients, which may be attributable to improvements in initiatives for screening and diagnosis the chronic illness, there is still an issue of a significant portion of the population that isn't achieving the normal hemoglobin A1c levels especially among blacks and Mexican-Americans (Albright AL & EW, 2013). Because of these additive burdens, the health of the population has an increased likelihood of declining at an alarming rate. However, these trends influence the population health but also a significant increase in the healthcare expenditure to compensate for the medical crisis.

A study conducted by the Institute for Health Metrics examined the estimates of national spending on personal health care and public health when stratifying by disease, age, sex, and type of care in the U.S. population. The study utilized government budgets, insurance claims, surveys from medical facilities, household surveys, and other U.S. records from 1996 to 2013 to estimate spending based on 155 medical conditions and 38 age and sex groups. Although the study found ischemic heart disease and cerebrovascular to be the most significant condition of spending at approximately 231.1 billion dollars in 2013, diabetes along with a few other health conditions trailed slightly behind as the second largest condition with spending of 224.5 billion dollars (Dieleman, Baral, Birger, Bui, & al., 2016). Regarding resource and retail pharmaceutical expenditure, total diabetes takes the lead with approximately 101.4 billion on resources, and 57.6% accounted for pharmaceutical spending (Dieleman, Baral, Birger, Bui, & al., 2016). The spending on diabetes was incurred by the 45 years and older population which further aligns with the high burden of diabetes in the aging population from previous studies. With these current trends, it explains Diabetes' significant attribution of morbidity and mortality with an estimated cost of 245 billion dollars in health resources and lost productivity with no slowing down if appropriate measures are not taken in the future (Dieleman, Baral, Birger, Bui, & al., 2016). Despite these alarming statistics that are affecting the U.S. population's health and economy, there is extensive research conducted to discover a solution to the medical and financial crisis of diabetes.

A double-blind clinical trial study examined the effectiveness of different treatment methods that would delay or prevent the development of diabetes. During the study, 3234 pre-diabetic patients from 27 centers were randomly allocated to three treatment groups: placebo, metformin [hyperglycemic medication], and intensive lifestyle intervention [focus on weight loss and physical activity]. Participants were of the age of 25 years or older, BMI of 24 or higher, and plasma glucose concentration of 5.3 to 6.9 mmol per liter in a fasting state and 7.8 to 11.0 mmol per liter two hour after a 75-g oral glucose load, and that weren't taking altering glucose tolerance medication or other illness that compromise the patients' life expectancy.

At the end of the follow-up period, the cumulative incidence of diabetes was lower in the lifestyle intervention group and metformin. The incidence of diabetes in the lifestyle intervention group was approximately 58% lower and 31% of the metformin group in comparison to the placebo group (Morrison, Shubina, & Turchin, 2012). These results were found to be statistically significant even with the adjustment of baseline characteristics. The projected incidence of diabetes at three-years of follow-up is estimated to be 28.9%-placebo, 21.7%-metformin, and 14.4%-lifestyle intervention groups.

Similar trends were seen when applied to the effectiveness of restoring normal fasting glucose levels among the metformin and lifestyle intervention groups (Morrison, Shubina, & Turchin, 2012). However, the lifestyle interventions were more effective in restoring normal post-load glucose levels and among older participants who is the most vulnerable to diabetes. Similar studies conducted by the Diabetes Prevention Program in the U.S. and Finland show similar cumulative incidence in both research studies. The studies showed a greater than 50%

reduction in diabetes incidence among study participants in the intensive lifestyle intervention group compared to those in the placebo group (Lindstrom, Louheranta, Mannelin, Rastas, & al., 2003).

There is extensive research that reveals an association between electronic health record adoption and maturation over time to patient health outcomes coupled with hospital characteristics, i.e., hospital size and teaching status (Lin, Jha, & Adler-Milstein, 2018). There is a growing trend in thought that integrating patient outcomes with electronic health records promotes patient-centered care, research, and overall population health. A U.K. study attempted to quantify and stratify diabetic patients' electronic records with the intent to create a severity score and ability to predict the risk of future health outcome due to diabetes. The purpose of the study conducted in the U.K. was to find a tool for primary care physicians to take preventive measures according to patients' severity of risk for chronic conditions. High performing and quality electronic health records systems and configuration can be influential to the patient health outcomes of medical practices (Zghebi, Rutter, Ashcroft, Ashcroft, & al., 2018). Characteristics of the dataset that proxy EEMR capabilities of every medical practice sampled will also be included in the studies analysis to see if variations of EEMR capabilities are associated with the likelihood of diet and physical activity counseling.

Although these studies show promise of effectiveness and applicative to different demographics ethnically; culturally; economically diverse population, these studies lack the statistical power to assess the effects for subgroup analysis to detect a difference in the effect of treatments. Several studies have shown a lack of translation from clinical trials to clinical practice. It is predicted that it would take approximately 17 years for a small percentage of research to be integrated into the medical field (Morrison, Shubina, & Turchin, 2012). Latent barriers and variation in the patient, provider, and system characteristics could explain the lack of counseling offered in the ambulatory setting to improve glycemic control across the population.

CHAPTER III: METHODS AND PROCEDURES

Conceptual Framework

Selected predictors in our analysis were based on the common factors that attribute to the observed burden of Type II Diabetes and variations in counseling from previous studies mentioned in the literature. Studies conducted that examined the prevalence and trends of U.S. adults observed that race/ethnicity, age, BMI were significant factors in analysis. Unadjusted prevalence of total diabetes where higher in age group 65 years and older when compared to younger counterparts (Menke A, 2015). Similar prevalence observations were seen among men and women. Non-Hispanic black, non-Hispanic Asian, and Hispanics when controlling for age had higher prevalence diabetes in comparison to their white counterparts (Menke A, 2015). BMI reflected similar trends in prevalence rates in different race/ethnic groups with the exception that non-Hispanic Asian possessed lowest BMI. However, the diabetes trend in prevalence was significantly increasing over time for all age groups regardless of race/ethnicity, education level, and income.

Another study observed similar trends for Type II diabetes prevalence in the population. Despite the prevalence of glycemic control improving and stability of undiagnosed in the study analysis, there was a significantly greater prevalence of diabetes, undiagnosed diabetes, glycemic control in different ethnic groups. A difference in diabetic treatment types among ethnic minority groups i.e. non-Hispanic blacks and Mexican Americans was reflected in the result of analysis (Selvin, Parrinello, Sacks, & Coresh, 2014). A study in Nova Scotia patient examined patient characteristics documented in the Primary Care Practice Survey to identify predictors of whether patients are provided with diet or exercise advice. Out of the 38 % [diet] and 42% [exercise] of patients who received advice for diet, patient who identified as a male, older than 35 years age, more than one chronic condition, and good professional relationship with provider were more likely to receive advice on diet and exercise (Sincliar, Lawson, & Burge, 2008). In terms of the number of chronic illness, studies have shown that there is a positive association between the number of chronic conditions of the patient and the likelihood of counseling (Sincliar, Lawson, & Burge, 2008). This means physician are inclined to provide lifestyle counseling to patients already sick. There is substantial evidence that patient characteristics are associated with the likelihood of counseling; however, evidence supports that physician characteristic play a vital role as well.

A study evaluating cholesterol management practices of physicians in the United states. Like previous studies patient-level variables that were observed to be associated with the likelihood of counseling of previous studies; however, physician characteristics added to the missing explanation of variations of method of counseling offered to patients. Analysis of the study revealed that physician specialty [cardiologist] were significantly more likely to offer counseling when adjusting for other patient variables. Another study that observed at risk cardiovascular disease in ambulatory settings rate of receiving, observed similar trends as previous studies mentioned. These studies provide further evidence to support the association of physician-level variables and lifestyle counseling offered by physicians. Patient visits with physician approximately 20 minutes or longer, providers seen during the visit [physician, physician assistants, and nurse practitioner], internists and cardiologists, insurance status, geographic region, and metropolitan status area of site of care were significantly associated with the likelihood of counseling.

We hypothesize that these characteristics examined in the literature will be significant predictors for the analysis of the study. Patients who are severely sick or more susceptible to illness due age, race/ethnicity, insurance status, total number of chronic illnesses are more likely to receive diet and physical activity counseling. As the prevalence of BMI over 30 increases, more of the population are at risk for having multiple coexisting chronic illnesses (Alim, 2017). The prevalence of BMI has a strong association with other chronic disease such as diabetes, hypertension, and hyperlipidemia. Because of this significant relationship obesity could explain the variations in the analysis. Insurance status/type for the patients potentially explain the variations in odds of counseling, patients who lack access to healthcare may be less likely to be offered counseling.

Physician-level characteristics such as physician specialty, medical degree possessed [MD vs D.O], provider seen during visit, geographic region of physician sampled, Metropolitan status area, ownership status of physicians, and basic compensation will be utilized in the study. These variables variations can reflect a difference of medical training, comfort level, and strategical plan of reducing the risk of disease of their patients. The severity of patient illness seen may be influential to how often physician recommend counseling especially with specialties such cardiology. The location of the physicians selected for the data could be associated with the outcome of interest for the study. The physician selected could treat patients that live in communities that lack access to appropriate healthcare, live in food desserts, severity of diseases burden, and sociodemographic of communities in the regions observed.

Although EMR capabilities has mixed reviews on its association of patient health outcomes. We believe that EMR capabilities would be a great reflection of system-level characteristics of the data sampled for the study. We hypothesize that the efficiency of EMR capabilities, for example ability to access and sharing patient health information from another facility's EMR system or meeting the Department of Health and Human Services criteria, would be associated with the variations of lifestyle counseling for diabetic patients. Efficient EMR capabilities and sharing PHI could give provider thorough information about the patient's health to take the appropriate measures to improve patient health. This could also be associated with the amount of time spent with patients as well. All the variables that will be utilized in our analysis will encompass more characteristics that can explain the variations in proportions of counseling in comparison to previous studies of this nature.

Data Sources

NAMCS

The National Ambulatory Medical Care Survey [NAMCS] is a national survey collected by the Center of Disease Control's National Center for Health Statistics annually since 1973. NAMCS was designed with the intent to meet the need for objective, reliable information about the provision and use of ambulatory medical services in the U.S. Physicians who are nonfederal employed office-based and primarily concentrated in direct patient care [including community health center-CHCs] were included during data collection. Specialties including anesthesiology, pathology, and radiology were excluded from the survey data collection.

Each physician that participates in the data collection is randomly assigned to a 1-week reporting period of patient visit information. The unit of analysis in the NAMCS survey is the patient visit. The data for the systematic random sample of patient visits are recorded by official census interviewers using patient record forms. The survey data capture patient characteristics such as age, sex, race/ethnicity and visit characteristics such as patient's reason for visit, official diagnosis, services ordered or provided after patient discharge, medical treatments.

Along with the patient and visit characteristics collected, data about physician and practice characteristics are documented during the survey induction interview. NAMCS data is collected from physicians instead of patients with the intent to provide an analytic base that expands the information on ambulatory care through other National Center for Health Statistics surveys. Survey data collected from 2012 through 2015 utilized a new sampling design allowing national estimates for all four census regions and 34 of the United States most populous states.

For the NAMCS survey data collection process, the physician sample is composed of MDs and DOs from various specialties in the medical field. Physicians based on information from the American Medical Association and American Osteopathic Association are randomly selected to provide patient clinical data of 30 patients visit during their 1-week of the reporting period. Due to NAMCS larger sample size; the ability of national representativeness in the data; and the information obtained have patient, provider, and visit characteristics, NAMCS survey data is the most reliable for the data analysis of our research question to attempt fill in the gap of knowledge from prior existing studies.

Institutional Review Board Approval

For the data analysis of our thesis, secondary public use data was utilized to answer the research questions and didn't require IRB approval. The NAMCS survey data is a preapproved data source with exempt status determined by the Georgia State University IRB based on Institutional Review Board Policies.

Inclusion/Exclusion Criteria

For the statistical analysis of this thesis, patient visits were sampled from the merged survey cross-sectional dataset from 2012 through 2015 consisting of 42,215 visit observations. The target population for this study's analysis is U.S. adults diagnosed with Type II Diabetes.

The survey question that prompted the determinant of the patient's diabetes status is "Does the patient now have: Diabetes mellitus (DM), Type 2" which is categorized into responses of yes or no.

The following exclusion criteria are:

- Patients that were not 18 years of age or older at the time of visit
- Not diagnosed with Type II diabetes before being discharged from patient visit [excluding patients with Type I or unspecified].
- Patient is pregnant during observation period.
- Any patient with missing information of lifestyle counseling was offered [defined as diet/nutrition counseling and physical activity counseling].

These observations were excluded from analysis to produce the least biased estimates for appropriate inferences. Once inclusion and exclusion criteria were applied to produce the sample of interest [U.S. adults patients diagnosed with Type II diabetes], only 3,463 resulted in the final sample size for the statistical data analysis of the research study.

Predictor Variables

The predictor variables used for analysis were recorded by census interviewers based on randomly select physicians during their 1- week reporting period for the NAMCS survey from 2012-2015. The target population for our analysis was operationalized with the diagnosis of Type II diabetes during the patient visit. The patient visit variables used in our analysis consisted of race/ethnicity, insurance type, age, sex, geographic region, metropolitan area status, patient visit type, tobacco use, total number chronic disease [comorbidities], time spent with physician during patient visit, and other diagnosed disease during patient visit [each disease documented on encounter forms where determined by the International Classification of Disease, Ninth

Revision, Clinical Modification- ICD-9-CM code]. The NAMCS forms also report provider and system variables such as the type of health provider seen at the visit, physician specialty, type of doctor, ownership status of medical practice, type of practice, basic compensation for the physician, owner of the facility, and electronic medical record capabilities.

All predictors in our analysis are categorical/dichotomous due to the distribution of the variables were re-coded into a categorical variable because of lack of normality to be a continuous variable, i.e., total number of chronic disease, time spent with the provider, and patient's age during the visit via statistical testing. All predictors for statistical analysis have no more than 10% of missing observation in the dataset to prevent any bias in the analysis.[Refer to Figure 3.1 for full list of variables in analysis].

Dependent Variables

The two dependent variables of interest are the documented provision of diet and exercise counseling on the NAMCS survey forms collected. The outcome variables of interest from previous studies are the same in this analysis which is the offering of diet or exercise counseling. Like the independent variables selected for analysis, the outcome variables are categorized as yes or no response of whether physician sampled in the survey data offered counseling.

Statistical Data Analysis

All statistical analyses for the research study were conducted using SAS 9.4 for Windows software [Statistical Analysis Software System 9.4]. Each visit to the NAMCS is assigned appropriate patient and physician weights for each visit data collected. The patient [PATWT] and physician-level [PHYSWT] weights take into account the unequal selection probabilities from the sample design and nonresponse. Omitting the sample weights from the survey data would produce biased and incorrect inference. Findings in analysis wouldn’t be generalizable to the larger target population, only to the sample used for analysis. All analyses take into account survey weights from patient weights which were available in the NAMCS datasets selected for the research study from 2012-2015. The patient weights were utilized in the analysis for national and regional estimates to represent the physicians and patients from the US observed in all four regions of the United States [Northeast, South, Midwest, West] and different metropolitan statistical area.

Descriptive statistics were conducted through PROC SURVEYFREQ to illustrate the frequency distribution of the visit, patient, provider, and system characteristics among diabetic patients offered both diet and exercise counseling from 2012-2015. Rao Chi-square tests were used on all the categorical variables from the survey data to detect any associations between the different characteristics and offered counseling among diabetic patients.

Using the PROC SURVEY LOGISTICS procedure in SAS 9.4, multivariate logistics regression analysis was utilized to produce two models [diet and exercise counseling offerings] beta estimates, standard errors, p-values, and adjusted odds ratios and respective 95% confidence intervals of all the patient, physician, and system level characteristics examined in the analysis. Both constructed models of intervention counseling included physician specialty, medical insurance, different chronic disease conditions [hypertension, hyperlipidemia, CKD, and etc.], HbA1 testing offered to patient, method of basic compensation for physicians, patient's sex, metropolitan statistical area, computerized capabilities: reminders for intervention/screening; practice share of PHI electronically, EMR meet Department of Health and Human Service criteria, provider type seen during patient visit, patient race/ethnicity, regions where physicians were randomly sampled, obesity, total chronic disease, and substance/alcohol dependence. The predictor variables included in the multivariate logistic regression models for analysis were selected based on the previous literature of frequent contributors (Stafford, Blumenthal, & Pasternak, 1997) to variations and stepwise model selection procedure with an entry probability of $p<0.01$ and removal probability of $p<0.05$. The models for each lifestyle counseling were chosen based on the conceptual framework, and the best statistical model fits according to Akaike Information, i.e., AIC.

Statistical analyses were performed at an alpha level of 0.05 level and 95% confidence intervals to determine if univariate and logistic regression analysis were statistically significant.

CHAPTER IV: RESULTS

Non-Clinical and Clinical Characteristics

In the NAMCS dataset utilized in the study's analysis, we identified 42,215 patients from 2012-2015. After excluding patients who were younger than 18 years of age; diagnosis of a type of diabetes other than type II [Diabetes Mellitus type I or unspecified], pregnant during patient visit recorded; and missing information of diet and exercise counseling offered during patient visit, the final dataset was composed of 3,463 observation that fit the criteria of the study.

Tables 4.1 and 4.2 display the descriptive statistics of non-clinical and clinical characteristics of the study population by diet/nutrition counseling and physical activity counseling offers by randomly selected physicians. All non-clinical variables in the univariate analysis considered in the study reflected the patient, physician, and some medical practice (system) characteristics from the dataset. When comparing the weighted percentages/proportions of the non-clinical characteristics, proportions of intensive lifestyle counseling seem to be similar among diabetic patients who were offered counseling or not offered during the visit. However, when the Rao-Scott Chi-Square test results are examined some characteristics have statistically significant association with the outcome variable of interest. Patient sex [$p= 0.0212$], Metropolitan Statistical Area status of physician location [p=0.0147], physician specialty [p=0.0112], and patient's tobacco consumption status [p=0.0005], patient's time spent with provider during visit [p=0.0161] were the only non-clinical characteristics statistically associated with the diet/nutrition offering groups. However, Metropolitan Statistical Area status of physician location [p=0.0374], physician specialty [p=0.0195], health provider seen [p=0.0271], and basic compensation of the physician randomly selected [p=0.0461] are statistically associated with the physical activity offering groups.

Table 4.2 analyzes the association between clinical characteristics, i.e., chronic comorbidities other than Type II diabetes and the outcome of interest in our study. Based on the univariate analysis of patient chronic illness, cancer[p=0.006]; history of pulmonary embolism [p=<0.0001]; and hyperlipidemia [p=0.0168] are statistically associated with dietary counseling. However, arthritis[p=0.0386] was the only clinical characteristic statistically associated with physical activity counseling. Obesity [p=<0.0001] is statistically associated regarding the offering of diet and exercise counseling. Obesity was the only clinical characteristics statistically significant among both intervention groups among diabetic patients. All variables with less than 10% missing observations are included in the analysis to reduce the likelihood of inducing bias in the statistical models.

Multivariate Logistic Models

Multivariate logistics models were fit for diet/nutrition counseling and exercise counseling respectively. All characteristics in the models are based on the conceptual framework and univariate analysis. Tables 4.3 and 4.4 display the beta estimates, standard error, adjusted odds ratios and 95% confidence interval for all the non-clinical and clinical variable chosen for the best fitting logistics models. Although majority of the variables in the logistic model exhibited differences in adjusted odds ratio, only a select group of characteristics were deemed statistically significant in the models.

In model 1, the response variable for analysis was diet and nutrition counseling offered by a physician and predictors were selected based on univariate analysis. For the patient level characteristics, patients who identify as having Non-Hispanic black or Hispanic racial-ethnic backgrounds, have an increased likelihood of being offered dietary counseling than their Non-Hispanic White counterparts [Non-Hispanic black OR=1.337 (0.686, 2.606) Hispanic OR=2.074 (1.189,3.618)]. Patients who identified as Hispanic in the survey have a statistically significant adjusted odds ratio of counseling than their Non-Hispanic White counterparts in the analysis results. However, patients who identified as Non-Hispanic other had a smaller likelihood of counseling relative to Non-Hispanic white participants [Non-Hispanic Other OR=0.890 (0.205, 3.868)]. Although some of the chronic conditions reveal variance in the odds of nutrition counseling, obesity [OR=2.524 (1.551,4.109)] and cancer [OR=0.499(0.291,0.855)] were the only statistically significant adjusted odds ratio. Patients who were clinically obese were 2.524 times the odds to be offered diet counseling in comparison to patients who are not clinically obese. However, the opposite occurred in patients diagnosed with cancer. Cancer patients were 0.499 times the odds to be offered counseling than patients who were not diagnosed with any form of cancer.

For the physician characteristics, there were also variations in the likelihood of diet counseling. When controlling for other covariates, patients who are offered HbA1c testing is 1.615 times the odds to be offered diet counseling than patients who are not offered to test for HbA1c. Surprisingly, physician’s compensation seems to be associated with diet counseling when adjusted for other covariates [Shift, hourly OR=5.370 (1.788, 16.128), Mix salary and share billings OR=1.519 (0.811, 2.846), and Share of practice billings OR=1.344 (0.599, 3.017) in comparison to Fixed salary]. Physicians compensated through an hourly rate had a statistically significant adjusted odds ratio. Interesting, in the analysis, it was observed that physician's whose specialty is Neurology/Ophthalmology had 0.195 odds of offering nutrition counseling than physicians in General/Family practice specialties. Also, medical practices' electronic medical records have an association on counseling outcomes. For example, patients who attend a visit in a medical practice whose EHR meet the Department of Health and Human Services 6.529 times the odds to be offered nutrition counseling than those who visit medical practices with EHR that don't meet DHHS criteria.

Model 2 is in respect to the physical activity counseling among diabetic patients in the data analysis. Like model 1, the predictors in model 1 that were adjusted where selected for the statistical model also there were similar variations in the odds for receiving physical activity counseling. However, unlike model 1 there are other interesting variations at patient and physician-level that wasn't observed in model 1. Cardiologists are 1.402 times the odds to offer diabetic patients exercise counseling than General Practice /Family Practice physicians. Specialties in Internal Medicine and Neurology/Ophthalmology has a statistically significant decrease in the likelihood of offering physical activity counseling [OR=0.443 (0.207,0.946), OR=0.095(0.020, 0.442)]. All racial/ethnic groups have an increased likelihood of offered physical activity in comparison to their white counterparts [Non-Hispanic Black OR= 1.248(0.650, 2.397), Hispanic OR=1.566 (0.800, 3.068), Non-Hispanic Other OR=1.506 (0.401,5.664)] despite not being statistically significant. Physicians sampled from the southern region were 1.340 times the odds to offer exercise counseling than physicians sampled from the Northeast when adjusting for other predictor variables. Obesity, when adjusted for other variables in the model, has attenuated odds ratio in comparison to model 1. Clinically obese patients are 4.264 times the odds of receiving physical activity counseling than patients of a healthy weight. Also, patients diagnosed with COPD have a statistically significant adjusted odds of 2.904 odds of being offered exercise counseling than patients without COPD.

Interestingly, some characteristics decrease the likelihood of being offered exercise counseling. For example, diabetic patients that suffer from chronic kidney disease have 0.200 odds of physical activity counseling in comparison to their counterparts without CKD. As far as the ownership of medical practices sampled for analysis, medical practices owned by an insurance company or other health corporations are 0.412 times the odds to offer diabetic patients physical activity counseling than physician or physician group owned medical practices. The type of entity that owns a medical practice was observed to be statistically significant in our model.

CHAPTER V: DISCUSSION AND CONCLUSION

Conclusion

The main objective of this study was to examine the potential variations in the patient, physician, and system characteristics that are associated with the likelihood of diabetic patients offered diet and physical activity counseling. Due to the burden of Type II Diabetes in every aspect of healthcare, effective uniform counseling is critical to improve population health. At the end of the analysis, we observed that there are definite factors on all three levels that influence the variations of this intervention being offered to diabetic patients. When controlling for other covariates in the model for diet counseling, we observed statistically significant odds ratio for testing of HbA1c for diabetic patients, methods of basic compensation, current EMR meets DHHS criteria, provider seen during the visit, patient race/ethnicity, status of obesity, and diagnosis of cancer. For the exercise counseling model, the statistically significant odd ratios were physician specialty; provider seen during visit; diagnosis of CKD; status of obesity; history of COPD; and ownership of medical practice. These results from our logistic model suggests that patient characteristic aren't the only factors that can explain for the variations of likelihood of counseling. Previous studies that examined the effectiveness of lifestyle counseling of diabetic patients only focused on the variations among patient characteristic. Our results from analysis is very important to address the gap of translation in practice for counseling among diabetic patients. Variation in these characteristics reflect barriers of improving population health among the diabetic population. If there is knowledge of what is contributing to these barriers for diabetic patients, then we can better reduce the burden of diabetic complication overtime.

Discussion

Although patient characteristics have been the primary focus on to improve the DMII burden of the population health, to effectively create an intervention to significantly reduce this burden and improve the cost of healthcare all patient visit characteristics must thoroughly be examined. Previous studies have shown that lifestyle intensive intervention is effective for increasing the likelihood of diabetic patients consistently controlling their glycemic levels and decreasing the likelihood of having diabetic complications. However, the lack of translation from clinical trials to clinical practice may be attributable to the lack of attention to physician and medical practice.

The following characteristics were observed to be statistically significant in our model, including HbA1c testing [OR=1.615]; Shift, hourly physicians [OR=5.370]; EMR meeting DHHS criteria [OR=6.529]; patient race [Hispanic OR=2.074, Black OR=1.337]; physician specialty [cardiology OR=1.402]; patient's history of chronic conditions [obesity OR=2.524, OR=4.264. As stated in previous studies and reiterated in our analysis, patients who identify in certain racial/ethnic groups and possess BMI over 30 [obese] are more likely to be recommended diet or exercise counseling. For physician-level characteristics, physicians who work hourly shifts; offered HbA1c testing to patients and specialize in Cardiology more likely to offer lifestyle counseling. Cardiologist may be more likely to offer diet and physical activity counseling because of the health severity of the patients they encounter during medical patient visit in comparison to other specialties. Logically, patients who receive HbA1c testing are more likely to receive counseling makes sense. HbA1c is the main tool of observing the pattern of blood sugar levels over time. Finally, EMR capabilities meeting DHHS criteria would create variation of offering because physician would have the full scope of patient's medical history and current state of health to make the appropriate and strategic plan to improve the patient's health. Many factors that were observed increased the likelihood of counseling, but other factors decreased the likelihood of counseling for diabetic patients. CKD and Cancer patients were observed to be less likely to be offered counseling in our analysis. These observations may be due to the severity of the chronic disease to which such counseling would be counterproductive to the recovery of patients' health, or the sample of cancer and CKD patient are too small for analysis.

MSA is a variable that represents the Metropolitan status area of the physicians' location in the NAMCS dataset. MSA is census marker to describe the size of a geographic location's population. In the survey, MSA proxy whether physician location is an urban area with a population of 50,000 or more [MSA] or rural area with a population of less than 50,000 [Non-MSA]. The response in the survey for this question is reflected by an answer of MSA or Non-MSA of the randomly selected physicians' location in the patient visit. Although it was observed in the univariate analysis that MSA was statistically significant for diet and exercise counseling, MSA lost statistical significance when included in the logistic regression model when controlling for other non-clinical and clinical variables. A reasonable explanation for these observations is the univariate analysis between MSA and the outcome interest, MSA reflected all the variance in the relationship between the predictor and outcome variable.

Details of geographic regions are very important to explaining variations in health outcomes in public health research. We hypothesize that the physician location where the patient visits may have different levels of certain disease burden accounted for in the MSA variable. For example, it is possible for specific physician location have a larger prevalence of comorbidities, obesity, access to adequate to healthcare, and food desert relative to other locations in the study. When we accounted for all the variables in the model that were attributable to the variations and significance via the MSA variable, the statistical significance disappeared in the logistic regression model for both types of counseling. Diabetic patient's that see physicians located in more urban area potentially have a higher burden of disease and access to healthcare. As previously stated, physicians may offer counseling to sicker patients because of the state of their health due to outside factors that influence the disease.

Unlike many previous studies, the two main strengths of the study are the sample size utilized for analysis and the quality of complete patient data for analysis. Although these factors are essential for appropriate and unbiased analysis, there were many weaknesses in this study's analysis. Some variables were proxy for other variables for analysis due to the amount of "missingness" could have hidden potential additive effects of characteristic variation. For example, obesity was substituted for BMI due to 60% of the observation were missing. Although BMI clinically determines obesity, the added variance could provide further insight into the physician's medical criteria to offer intervention. HbA1c levels were more than 10% missing as well. It is possible exploring the variations among the different BMI [overweight vs. obese], and HbA1c [pre-diabetes vs. diabetes] could provide more insight to providing an effective treatment for people at risk of diabetes and people diagnosed diabetes.

More patient information should be collected to give a clearer picture to account for socioeconomic characteristics [income, marital status, and zip code] for further explanation of variance observed. Other physician and system characteristics that create the variation for outcome variables of interest should take into account for future research. There has been extensive research that physician's race, sex, year of experience, and socioeconomic background is associated with patient health outcomes and health disparities in the population. For example, patients who identify themselves as black women and children tend to have poorer health outcomes and mortality rate when it comes to childbirth.

In our analysis, we examined that the electronic patient records capabilities could influence effective care being provided to patients at risk for poor health outcomes. For system characteristics, patient-centered medical home status was not available for dataset before 2016 for analysis. Patient-centered medical home [PCMH] is a medical care delivery model that focuses on coordination through primary care doctor to effectively give the patient the care they need. This variable would have beneficial for further analysis to gain further insight into the system levels relationship with lifestyle counseling.

Limitations

One major limitation in the analysis is the size of the survey sample to address the aims of the study. After applying inclusion and exclusion criteria to the data observed, 3,463 survey observations were left for data analysis. Although we are focusing specifically on U.S. adult

Type II diabetes, the exclusion of patient who were pregnant during patient visit affected the sample weights in our analysis. Approximately 27.36% of observations of patient who were pregnant, or pregnancy status were unknown where excluded from analysis. The sample weights post exclusions are incorrect due to the observations that were included in the calculation of the sample weight are no longer in the dataset. Despite the intent of resolving the issue of sample size from past research studies with a representative data, there may be issues of generalizability for the type II diabetic populations. This impairs the representativeness of the sample despite utilizing the sample weights.

Sample weights were utilized to produce national estimates for patients and physician from all four regions of the U.S.; however, for the number of predictors are analysis may need more observation in the data for analysis. A survey sample size of 4,000 can't provide implications of the observations that weren't analyzed. To extrapolate and apply results to the overall population, a sufficient statistical power (i.e. adequate sample size) must be attained for appropriate analysis for the population. The inferences and generalizability from this research study can only be implied to the relevant study sample in analysis, not for all people in the population. This could be resolved by extending the timepoint for data analysis for the survey sample size issue.

Another limitation in the study analysis was the questions that were asked for the NAMCS survey. This limitation is the major factor for the lack of statistical power and sample size issue. The survey question utilized to identify patients that were pregnant wasn't recorded until 2012. Because the uncertainty of the pregnancy status, observation from 2012-2015 were included for statistical analysis of lifestyle counseling. Finally, the last limitation would be the amount of "missingness" observed throughout the predictor variables in the data. The variables detected to be a contributor to the burden of DMII and indicators to explain the variations in likelihood of lifestyle counseling in previous studies had more than 10% of missing observations. This resulted in variables such as BMI and A1c-levels to be proxy for other variables related to the ones of interest. Further variation in the survey that was excluded from the analysis could have explained the difference in likelihood of counseling for diabetic patients.

Future Directions

For future studies, more characteristics on all levels should be examined to develop a thorough and complete framework of potential barriers of the interventions to be effective in diabetic glycemic control. Once these barriers have been explored, figuring out how much of the variations can significantly explain the difference of likelihood of diet and exercise counseling. The patient and visit characteristics are nested within provider characteristics in the NAMCS dataset so a hierarchal model [generalized mixed effect model] would address if provider and system characteristics can explain the difference in the likelihood of diabetic patients offered intensive lifestyle counseling. A hierarchal model with the appropriate statistical software is the best approach when independence is violated due to the clustering in the dataset. If the appropriate measures are taken to analyze specific contributing patient visit characteristics and the ability to quantify how much variations account for the lack of translation in the delivery of effective glycemic control, then health population and cost of healthcare can improve drastically with a noticeable impact shorter than 17 years.

REFERENCES

Albright AL, & EW, G. (2013). Preventing type 2 diabetes in communities across the U.S.: the National Diabetes Prevention Program. *Am J Prev Med*, S346-51.

Ali MK, B. K. (2013). Achievement of goals in U.S. Diabetes Care, 1999-2010. *N Engl J Med*, 287-8.

Alim, J. (2017). The Impact of Race and Diabetes on Mortality among Breast Cancer Patients. *Thesis, Georgia State University*.

Balas, E. A. (1998). From appropriate care to evidence-based medicine. *Pediatr Ann*, 581-4.

Brody, J. E. (2018, July 23). *Nytimes*. Retrieved from The New York Times: https://www.nytimes.com/2018/07/23/well/pancreatic-cancer-risk.html?mabReward=CBMG1&recid=17mYvhlxWwj4Ms9TsaNN5TiODuw&recp=5&action=click&pgtype=Homepage&region=CColumn&module=Recommendation&src=rechp&WT.nav=RecEngine

Dieleman, J. L., Baral, R., Birger, M., Bui, A. L., & al., e. (2016). US Spending on Personal Health Care and Public Health, 1996-2013. *JAMA*, 2627-46.

Knowler, W. C., Barrett-Connor, E., Fowler, S. E., & Hamman, R. F. (2002). Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*, 393-403.

Kreuter, M. W., Scharff, D. P., Brennan, L. K., & Lukwago, S. N. (1997). Physician recommendations for diet and physical activity: which patients get advised to change? *Prev Med*, 825-33.

Lin, S. C., Jha, A. K., & Adler-Milstein, J. (2018). Electronic Health Records Associated With Lower Hospital Mortality After Systems Have Time To Mature. *Health Aff (Millwood)*, 1128-1135.

Lindstrom, J., Louheranta, A., Mannelin, M., Rastas, M., & al., e. (2003). The Finnish Diabetes Prevention Study (DPS): Lifestyle intervention and 3-year results on diet and physical activity. *DIabetes Care*, 3230-6.

Ma, J., Urizar, G. G., & Stafford, R. (2004). Diet and physical activity counseling during ambulatory care visits in the United States. *Preventive Medicine*, 815-822.

Menke A, C. S. (2015). Prevalence of and Trends in Diabetes Among Adults in the United States, 1988-2012. *JAMA*, 1021-9.

Morrison, F., Shubina, M., & Turchin, A. (2012). Lifestyle counseling in routine care and long-term glucose, blood pressure, and cholesterol control in patients with diabetes. *Diabetes Care*, 334-41.

Pi-Sunyer, X. (2014). The Look AHEAD Trial: A Review and Discussion Of Its Outcomes. *Curr Nutr Rep*, 387-391.

Prevention, C. f. (2017). National Diabetes Statistics Report. *Atlanta,GA: Centers for Disease Control and Prevention, US Department of Health and Human Services*.

Selvin, E., Parrinello, C. M., Sacks, D. B., & Coresh, J. (2014). Trends in prevalence and control of diabetes in the United States, 1988-1994 and 1999-2010. *Ann Intern Med*, 517-25.

Sincliar, J., Lawson, B., & Burge, F. (2008). Which patients receive advice on diet and exercise? *Can Fam Physician*, 400-412.

Stafford, R. S., Blumenthal, D., & Pasternak, R. C. (1997). Variations in cholesterol management practices of U.S. physicians. *J Am Coll Cardiol*, 139-46.

Zghebi, S. S., Rutter, M. K., Ashcroft, D. M., Ashcroft, D. M., & al., e. (2018). Using electronic health records to quantify and stratify the severity of type 2 diabetes in primary care in England: rationale and cohort study design. *BMJ Open*, e020926.

Figure 3.1 **List of Patient Visit Characteristics in Analysis**

Patient Variables	Physician Variables	System Variables
Patient Race/Ethnicity	Geographic region	Type of Practice
Medical Insurance	Metropolitan Status Area	Owner of Medical Practice
Patient Age	Physician Specialty	E-Share with other providers
Patient Sex	Health Provider Type	Reminders of interventions/test
Visit Type	Ownership Status of Physician	E-share with different EMRs
Tobacco Use	Physician Compensation	EMR meet criteria of DHHS
Total No. Chronic Conditions	MD vs DO	
List of chronic conditions	HbA1c testing offered to patient	
Time spent with MD		

TABLE 4.1					
Patient Visit Non-Clinical Characteristics Offered Lifestyle Counseling [Diet/Exercise]					
		Diet/Nutrition Counseling		**Exercise Counseling**	
Variable	**Total Freq.**	Frequency [weighted %]	p-value	Frequency [weighted %]	p-value
Race/Ethnicity			0.0942		0.1541
Non-Hispanic White	2517	427 [13.3281]		311 [9.5767]	
Non-Hispanic Black	426	84 [4.4136]		64 [2.9158]	
Hispanic	330	79 [6.0416]		55 [4.7104]	
Non-Hispanic Other	190	19 [1.0110]		14 [0.9154]	
Medical Insurance			0.4550		0.9313
Non-private	1554	265 [9.9834]		180 [7.8612]	
Private	1909	344 [14.8210]		264 [10.2571]	
Age			0.4581		0.4972
18-34	69	13 [0.3529]		8 [0.2304]	
35-49	436	92 [3.8070]		68 [3.0215]	
50-69	1960	366 [14.6715]		266 [10.2613]	
70+	998	138 [5.9729]		102 [4.6051]	
Sex			**0.0212		0.0845
Male	2427	402 [15.4319]		293 [11.3344]	
Female	1036	207 [9.3725]		151 [6.7839]	
Geographic Region			0.5053		0.8474
Northeast	439	92 [5.5661]		57 [3.0279]	
Midwest	1046	173 [3.6263]		123 [2.7680]	
South	1056	210 [10.2019]		158 [7.5923]	
West	922	134 [5.4101]		106 [4.7302]	
Metropolitan Status Area			**0.0147		**0.0374
MSA	3062	556 [23.5889]		410 [17.2255]	
Non-MSA	401	53 [1.2155]		34 [0.8928]	
Visit Type			0.7874		0.5104
New or GME	2264	416 [14.9711]		290 [10.3433]	
Return or Non-GME	1199	193 [9.8332]		154 [7.7751]	
Physician Specialty			**0.0112		**0.0195
General/Family Practice	915	220 [11.0523]		160 [8.4163]	
Internal Medicine	616	130 [6.3567]		94 [3.6326]	
Cardiology	286	64 [2.0905]		57 [1.8415]	

Neurology/Ophthalmology	369	27 [0.2138]		11 [0.0858]	
Other	1277	168 [5.0910]		122 [4.1422]	
Health provider type			0.2163		**0.0271
Physician	3415	603 [24.7418]		442 [18.1353]	
Mid-level provider	19	2 [0.0864]		1 [0.0432]	
Other	19	3 [0.0351]		1 [0.0081]	
Tobacco Use			**0.0005		0.2837
No	3352	564 [23.0367]		410 [17.1063]	
Yes	111	45 [1.7677]		34 [1.0121]	
Total No. Chronic Condition			0.1466		0.4979
0-1	294	32 [1.5954]		21 [1.4398]	
2 or more	3169	577 [23.2090]		423 [16.6786]	
MD vs DO			0.6653		0.5662
MD	3218	559 [23.0610]		2173 [7.573]	
DO	245	50 [1.7434]		151 [0.4542]	
Ownership Status Physician			0.6639		0.8003
Full-owner	956	157 [8.8496]		117 [6.7291]	
Part-owner	847	156 [7.3596]		101 [4.84]	
Employee	1564	285 [8.3014]		223 [6.5298]	
Contractor	83	7 [0.0623]		2 [0.0250]	
Type of Practice			0.3714		0.2767
Non-Solo	2517	442 [14.4804]		324 [10.1219]	
Solo	945	167 [10.3325]		120 [8.0027]	
Basic Compensation* **			0.1581		**0.0461
Fixed Salary	1030	190 [8.0120]		153 [7.1065]	
Share of Practice billing	633	111 [4.6726]		74 [1.7180]	
Shift, hourly or time based	33	7 [0.2291]		5 [0.1173]	
Mix of salary and share billings	1394	245 [10.8351]		175 [8.4521]	
Other	200	24 [0.5706]		17 [0.4404]	
Time Spent with MD			**0.0161		0.6347
0-30 minutes	2986	513 [19.7909]		385 [15.1338]	
31-60 minutes	436	88 [4.9085]		55 [2.9192]	
≥ 61 minutes	41	8 [0.1050]		4 [0.0654]	
Owner of Medical Practice * **			0.2613		0.1546
Physician/Physician group	521	401 [20.4337]		301 [15.2492]	

Medical/Academic Health Center	550	110 [2.3928]		82 [1.7274]	
Insurance company/Health Corp.	2263	79 [1.8654]		51 [1.1500]	
HbA1c testing offered to patient			0.0638		0.4618
No	2784	407 [16.0098]		310 [12.5622]	
Yes	679	202 [8.7946]		134 [5.5561]	
E-share w/ other providers			0.7697		0.8417
No	1386	208 [11.3032]		143 [8.8436]	
Yes	2077	401 [13.5012]		301 [9.2747]	
Reminders for intervention/test* **			0.5763		0.7116
No	395	54 [1.4535]		32 [1.0967]	
Yes, used routinely	2584	461 [19.4025]		340 [13.5632]	
Yes, not routinely	283	49 [1.9446]		37 [1.3058]	
Yes, not used	98	26 [0.5980]		23 [0.7376]	
E-share [different systems] * **			0.4926		0.1759
No	1562	251 [14.2012]		176 [11.3955]	
Yes	1480	290 [11.4955]		214 [7.3536]	
EMR meet DHHS criteria * **			0.5406		0.1765
No	144	14 [3.0884]		16 [3.0077]	
Yes	3040	563 [22.4450]		410 [15.9524]	
**** p <0.005 is statistically significant *** variable is missing less than 10% of observations**					

TABLE 4.2					
Patient Visit Clinical Characteristics Offered Lifestyle Counseling [Diet/Exercise]					
Variable		**Diet/Nutrition Counseling**		**Exercise Counseling**	
	Total Freq.	Frequency [weighted %]	p-value	Frequency [weighted%]	p-value
Alzheimer			0.4764		0.9726
No	3441	604 [24.6110]		442 [18.0186]	
Yes	22	5 [0.1933]		2 [0.0997]	
Arthritis			0.0690		**0.0386
No	2809	497 [19.3787]		349 [13.6928]	
Yes	654	112 [5.4257]		95 [4.4256]	
Asthma			0.7525		0.8226
No	3205	573 [23.3168]		417 [16.8599]	
Yes	258	36 [1.4875]		27 [1.2584]	
Cancer			**0.0006		0.3333
No	3119	569 [23.7552]		411 [16.877]	
Yes	344	40 [1.0492]		33 [1.2407]	
Cerebrovascular Disease			0.1532		0.3372
No	3306	585 [24.3348]		425 [17.7487]	
Yes	157	24 [0.4696]		19 [0.3696]	
Chronic Kidney			0.7203		0.1722
No	3073	522 [21.4254]		399 [16.7197]	
Yes	390	87 [3.3789]		45 [1.3986]	
COPD			0.5593		0.1068
No	3203	565 [23.3998]		403 [16.4144]	
Yes	260	44 [1.4046]		41 [1.7040]	
Congestive Heart Failure			0.1707		0.1584
No	3295	581 [24.2532]		423 [17.7329]	
Yes	168	28 [0.5512]		21 [0.3855]	
Coronary Artery Disease			0.6378		0.9018
No	2789	478[20.1478]		346 [15.0337]	
Yes	674	131 [4.6565]		98 [3.0847]	
Depression			0.6164		0.3637
No	3019	517 [22.2708]		380 [16.4174]	
Yes	444	92 [2.5336]		64 [1.7009]	
End of Stage Renal Disease			0.8047		0.1459

No	3422	600 [24.5501]		442 [18.0621]	
Yes	41	9 [0.2543]		2 [0.0563]	
Pulmonary Embolism			**<.0001		0.9103
No	3421	604 [24.7559]		441 [17.8934]	
Yes	42	5 [0.0485]		3 [0.2249]	
HIV			0.2205		0.1200
No	3448	606 [24.7786]		443 [18.1089]	
Yes	15	3 [0.0258]		1 [0.0094]	
Hyperlipidemia			**0.0168		0.3819
No	1651	212 [9.1276]		158 [7.6942]	
Yes	1812	397 [15.6768]		286 [10.4242]	
Hypertension			0.9145		0.8766
No	1015	151 [7.3900]		106 [5.3429]	
Yes	2448	458 [17.4143]		338 [2.7755]	
Obesity			**<.0001		**<.0001
No	2663	375 [16.2106]		254 [10.9633]	
Yes	800	234 [8.5938]		190 [7.1551]	
Sleep Apnea			0.7455		0.7255
No	3119	539 [23.1011]		393 [16.9041]	
Yes	344	70 [1.7032]		51 [1.2142]	
Osteoporosis			0.2792		0.3609
No	3407	601 [24.5822]		434 [17.7567]	
Yes	56	8 [0.2222]		10 [0.3616]	
Substance abuse			0.3070		0.5758
No	3368	587 [24.0117]		424 [17.834]	
Yes	95	22 [0.7927]		20 [0.3350]	
Alcohol abuse			0.3385		0.3422
No	3427	601 [24.6677]		440 [18.0299]	
Yes	36	8 [0.1366]		4 [0.0884]	

**** p <0.005 is statistically significant**
***** variable is missing less than 10% of observations**

Table 4.3

Parameter Estimates and Odds Ratio of Patient and Physician Characteristics Diet Counseling

Characteristics	*Estimate*	*SE*	*T-value*	*P-value*	*OR*	*OR 95% CI*	
Intercept	-3.8350	0.9789	-3.92	**<.0001	-----------	-----------	-----------
Physician Specialty				**0.0435			
General/Family Practice	-----------	-----------	-----------		1.00 [REF]	-----------	-----------
Cardiovascular	-0.0947	0.5654	-0.17		0.910	0.300	2.757
Internal Medicine	-0.5127	0.3579	-1.43		0.599	0.297	1.208
***Neurology/Ophthalmology*	-1.6346	0.5435	-3.01		0.195	0.067	0.566
Other	0.1710	0.3779	-0.45		0.843	0.402	1.768
Medical Insurance				0.8382			
Non-Private	-----------	-----------	-----------		1.00 [REF]	-----------	-----------
Private	0.0451	0.2207	0.20		1.046	0.679	1.613
Hypertension				0.6983			
No	-----------	-----------	-----------		1.00 [REF]	-----------	-----------
Yes	-0.0994	0.2565	-0.39		0.905	0.547	1.497
HbA1c testing offered				**0.0459			
No	-----------	-----------	-----------		1.00 [REF]	-----------	-----------
Yes	0.4793	0.2400	2.00		1.615	1.009	2.585
Method of basic compensation				**0.0431			
Fixed Salary	-----------	-----------	-----------		1.00 [REF]	-----------	-----------
Mix salary and share billings	0.4181	0.3201	1.31		1.519	0.811	2.846
Share of Practice billings	0.2955	0.4124	0.72		1.344	0.599	3.017
***Shift, hourly*	1.6808	0.5608	3.00		5.370	1.788	16.128
Other	0.0706	0.5703	-0.12		0.932	0.305	2.851
Sex				0.5359			
Male	-----------	-----------	-----------		1.00 [REF]	-----------	-----------
Female	0.1465	0.2366	0.62		1.158	0.728	1.841
Metropolitan Stat. Area				0.0824			
Non-MSA	-----------	-----------	-----------		1.00 [REF]	-----------	-----------
MSA	0.6521	0.3753	1.74		1.920	0.920	4.007
Reminders for intervention/Screening test				0.9558			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes, but not used	-0.1306	0.9199	-0.14		0.878	0.145	5.329
Yes, but not routinely used	-0.3792	0.7733	-0.49		0.684	0.150	3.118
Yes, used routinely	-0.3254	0.6663	-0.49		0.722	0.196	2.667
Current EMR meet DHHS criteria				**0.0042			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	1.8763	0.6548	2.87		6.529	1.808	23.578
Provider seen during patient visit				0.0270			

Physician	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Mid-level provider	0.0725	0.7644	0.09		1.075	0.240	4.814
*****Other***	-2.4765	0.9225	-2.68		0.084	0.014	0.513
Race/Ethnicity				0.0694			
Non-Hispanic White	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Non-Hispanic Black	0.2906	0.3402	0.85		1.337	0.686	2.606
*****Hispanic***	0.7296	0.2838	2.57		2.074	1.189	3.618
Non-Hispanic Other	-0.1161	0.7490	-0.16		0.890	0.205	3.868
Physician's Region				0.1763			
Northeast	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Midwest	-0.8567	0.4476	-1.91		0.425	0.176	1.021
South	-0.2690	0.3590	-0.75		0.764	0.378	1.545
West	-0.9565	0.5515	-1.73		0.384	0.130	1.133
Chronic Kidney Disease [CKD]				0.2160			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.4432	0.3582	-1.24		0.642	0.318	1.296
Tobacco Use				0.4698			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.4309	0.5962	0.72		1.539	0.478	4.953
Hyperlipidemia				0.0911			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.3642	0.2155	1.69		1.439	0.943	2.196
Obesity				**0.0002			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.9260	0.2484	3.73		2.524	1.551	4.109
Total Chronic Disease				0.8506			
0-1	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
2 or more	0.1269	0.6737	0.19		1.135	0.303	4.254
Arthritis				0.4045			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.1881	0.2256	0.83		1.207	0.776	1.878
Asthma				0.2825			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.1881	0.2256	0.83		0.631	0.273	1.461
Cancer				**0.0114			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.6949	0.2743	-2.53		0.499	0.291	0.855
Cerebrovascular Disease				0.7239			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.1380	0.3904	-0.35		0.871	0.405	1.873

Chronic Obstructive Pulmonary Disease				0.4377			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.2760	0.3555	0.78		1.318	0.656	2.646
Congestive heart failure				0.2405			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.4913	0.4185	-1.17		0.612	0.269	1.390
Coronary artery disease				0.2397			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.3119	0.2652	1.18		1.366	0.812	2.298
Depression				0.8514			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.0642	0.3426	0.19		1.066	0.545	2.088
End Stage Renal Disease				0.8398			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.1224	0.6056	-0.20		0.885	0.270	2.901
History of pulmonary embolism				0.0763			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-1.4667	0.8271	-1.77		0.231	0.046	1.168
HIV				0.0874			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-2.0024	1.1709	-1.71		0.135	0.014	1.341
Obstructive Sleep apnea				0.4607			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.1802	0.2442	-0.74		0.835	0.517	1.348
Osteoporosis				0.2093			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.8257	0.6574	-1.26		0.438	0.121	1.590
Substance abuse/dependence				0.3222			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.7705	0.7781	0.99		2.161	0.470	9.937
Alcohol Abuse or dependence				0.3309			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.5914	0.6081	-0.97		0.554	0.168	1.824
Practice share PHI electronically				0.1746			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.4704	0.3464	1.36		1.601	0.811	3.157
Ownership of Medical Practice				0.2115			
Physician or Physician Group	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Medical/Academic Health Center	-0.2942	0.3983	-0.74		0.529	0.259	1.080
Insurance company, health plan	-0.6364	0.3636	-1.75		0.745	0.341	1.627

**All variables in the dataset Odds ratios are adjusted to the model constructed for diet/nutrition counseling offer*
*** p-value < 0.05 is statistically significant*
REF= reference group

TABLE 4.4

Parameter Estimates and Odds Ratio of Patient and Physician Characteristics Exercise Counseling

Characteristics	*Estimate*	*SE*	*T-value*	*P-value*	*OR*	*OR 95% CI*	
Intercept	-2.4287	1.1371	-2.14	**0.0328	-----------	-----------	-----------
Physician Specialty				**0.0108			
General/Family Practice	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Cardiovascular	0.3378	0.5890	0.57		1.402	0.442	4.450
***Internal Medicine*	0.8141	0.3869	-2.10		0.443	0.207	0.946
***Neurology/Ophthalmology*	-2.3570	0.7859	-3.00		0.095	0.020	0.442
Other	-0.0390	0.4006	-0.10		0.962	0.438	2.110
Medical Insurance				0.6094			
Non-Private	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Private	-0.1163	0.2275	-0.51		0.890	0.570	1.391
Hypertension				0.7551			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.0805	0.2580	0.31		1.084	0.653	1.798
HbA1c testing offered				0.2110			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.3260	0.2605	1.25		1.385	0.831	2.309
Method of basic compensation				0.1821			
Fixed Salary	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Mix salary and share billings	0.0294	0.3458	0.08		1.030	0.523	2.029
Share of Practice billings	-0.8216	0.4433	-1.85		0.440	0.184	1.049
Shift, hourly	0.1358	0.6305	0.22		1.145	0.333	3.944
Other	-0.6011	0.6851	-0.88		0.548	0.143	2.101
Sex				0.3897			
Male	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Female	-0.1711	0.1989	-0.86		0.843	0.571	1.245
Metropolitan Stat. Area				0.1621			
Non-MSA	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
MSA	0.6468	0.4624	1.40		1.909	0.771	4.728
Reminders for intervention/Screening test				0.3392			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes, but not used	0.6585	0.9447	0.70		1.932	0.303	12.318

Yes, but not routinely used	-0.7251	0.7979	-0.91		0.484	0.101	2.315
Yes, used routinely	-0.4810	0.7283	-0.66		0.618	0.148	2.578
Current EEMR meet DHHS criteria				0.4153			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.5664	0.6952	0.81		1.762	0.451	6.886
Provider seen during patient visit				0.0282			
Physician	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Mid-level provider	-0.7917	0.7215	-1.10		0.453	0.110	1.865
*****Other***	-2.9077	1.1883	-2.45		0.055	0.005	0.561
Race/Ethnicity				0.5496			
Non-Hispanic White	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Non-Hispanic Black	0.2216	0.3329	0.67		1.248	0.650	2.397
Hispanic	0.4487	0.3429	1.31		1.566	0.800	3.068
Non-Hispanic Other	0.4096	0.6754	0.61		1.506	0.401	5.664
Physician's Region				0.4160			
Northeast	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Midwest	-0.2521	0.5008	-0.50		0.777	0.291	2.075
South	0.2925	0.4212	0.69		1.340	0.587	3.060
West	-0.2305	0.5687	-0.41		0.794	0.260	2.422
Chronic Kidney Disease [CKD]				**0.0007			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-1.6083	0.4765	-3.38		0.200	0.079	0.510
Tobacco Use				0.5733			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.2991	0.5309	0.56		1.349	0.476	3.820
Hyperlipidemia				0.0845			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.3795	0.2199	1.73		1.462	0.950	2.250
Obesity				**<.0001			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	1.4501	0.2609	5.56		4.264	2.556	7.112
Total Chronic Disease				0.6076			
0-1	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
2 or more	-0.3429	0.6678	-0.51		0.710	0.192	2.629
Arthritis				0.1153			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.4296	0.2727	1.58		1.537	0.900	2.623
Asthma				0.1946			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.6154	0.4743	-1.30		0.540	0.213	1.370

Cancer				0.6545			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.1294	0.2892	-0.45		0.879	0.498	1.549
Cerebrovascular Disease				0.8302			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.0954	0.4450	-0.21		0.909	0.380	2.175
Chronic Obstructive Pulmonary Disease				**0.0010			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	1.0659	0.3249	3.28		2.904	1.535	5.490
Congestive heart failure				0.5075			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.3994	0.6025	-0.66		0.671	0.206	2.186
Coronary artery disease				0.8668			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.0523	0.3116	-0.17		0.949	0.515	1.749
Depression				0.7354			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.0857	0.2536	-0.34		0.918	0.558	1.509
End Stage Renal Disease				0.4961			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.7513	1.1037	-0.68		0.472	0.054	4.109
History of pulmonary embolism				0.8413			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.1549	0.7734	-0.20		0.856	0.188	3.903
HIV				0.2921			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-1.2340	1.1710	-1.05		0.291	0.029	2.893
Obstructive Sleep apnea				0.3765			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.2724	0.3079	-0.88		0.762	0.416	1.393
Osteoporosis				0.9445			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.0391	0.5615	0.07		1.040	0.346	3.127
Substance abuse/dependence				0.6303			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.2280	0.4737	0.48		1.256	0.496	3.180
Alcohol Abuse or dependence				0.2962			
No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	-0.7900	0.7561	-1.04		0.454	0.103	1.999
Practice share PHI electronically				0.3011			

No	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Yes	0.3764	0.3638	1.03		1.457	0.714	2.974
Ownership of Medical Practice				0.1389			
Physician or Physician Group	-----------	-----------	-----------	-----------	1.00 [REF]	-----------	-----------
Medical/Academic Health Center	-0.4118	0.4620	-0.89		0.662	0.268	1.639
Insurance company, health plan	-0.8872	0.4487	-1.98		0.412	0.171	0.993

All variables in the dataset Odds ratios are adjusted to the model constructed for exercise counseling offer

***** p-value < 0.05 is statistically significant***

REF= reference group