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Use of the Health Belief Model to Explain Participation in Lifestyle Medical Appointments

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Abstract

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By Rachel Kornrich, MD

Background: Lifestyle Medicine is a growing discipline that uses non-drug modalities to treat chronic conditions in the medical setting. Yet little research exists on the utilization of lifestyle medical appointments by patients. In a primary care setting, two physicians embedded a lifestyle practice into their regular clinic schedule. After an initial lifestyle intake visit, patients were offered follow-up lifestyle appointments as individual medical appointments (IMAs) or shared medical appointments (SMAs). The Health Belief Model states that modifying factors and cues to action impact an individual's health behavior to counter a disease threat, and this paper investigates their role on participation in follow-up lifestyle appointments.

Methods: Using a medical record review, data from n = 100 patients who had been seen in the lifestyle clinic between September 2013 and November 2014 was abstracted. Descriptive analyses, bivariate analyses, and binomial and multinomial logistic regression were employed to investigate predictors of participation in lifestyle appointments by level and type of participation.

Results: Patients attending the intake appointment were middle-aged (M = 48.0 years), primarily female (81%) and Black (76%), and, on average, had a low Charlson Comorbidity Index (M = 2.0). 46% of patients attended only the intake visit, 36% attended only SMAs in follow-up, 7% attended only IMAs in follow-up, and 11% attended a combination of SMAs and IMAs in follow-up. Common predictors between the multinomial (No Follow-up, Low Follow-up (1 or 2 appointments), High Follow-up (3 or more appointments)) and binomial models (No Follow-up vs. Any Follow-up) were Charlson Comorbidity Index, family history, anxiety and depression. Important predictors for participation in IMAs were BMI, Charlson Comorbidity Index, and depression. For participation in SMAs, important predictors were race/ethnicity, family history, and anxiety.

Discussion: Among patients attending a lifestyle clinic set within a primary care clinic, participation in follow-up lifestyle appointments was found to be related to degree of illness, family history, anxiety, and depression. For type of participation, additional factors, such as race/ethnicity and BMI were important. Investigating real-world lifestyle practices with the application of theory is important to understanding expected future appointment utilization.

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Chapter I. Introduction

Problem Definition

Costs, Prevalence, and Lifestyle Treatment of Chronic Conditions

Healthcare expenditures in the U.S. grew to $2.8 trillion in 2012 ($8,915 per person) (Centers for Medicare & Medicaid Services, 2013b). To put that into perspective, 84% of healthcare dollars in 2009 was spent on the nearly 145 million Americans who have at least one chronic condition (Robert Wood Johnson Foundation, 2010). The leading chronic conditions among individuals 65 and older include hypertension (60%), cholesterol disorders (41%), and heart disease (25%) (Robert Wood Johnson Foundation, 2010). For those aged 18 to 64, the leading chronic conditions include hypertension (30%), cholesterol disorders (20%), and diabetes (12%) (Robert Wood Johnson Foundation, 2010). These figures do not include those individuals who are considered to be on the way to developing a chronic condition, an important consideration as another one in three Americans has prehypertension (Chobanian et al., 2003; Fields et al., 2004; Lloyd-Jones et al., 2008) and another one in three has pre-diabetes (Cowie et al., 2008). Additionally, it is important to note that overweight and obesity are not factored into the healthcare expenditures on chronic conditions, despite their impact on other chronic conditions. It is estimated that among adult Americans, 33% are overweight, 35.7% are obese and 6.3% are extremely obese (Fryar, Carroll, & Ogden, 2012). One unifying issue for these and many other chronic conditions is that they are preventable and that management can reverse or control disease processes, therefore preventing more serious and costly outcomes. All individuals impacted by chronic conditions stand to benefit by adopting new lifestyle behaviors.

Adoption of healthy lifestyle behaviors related to nutrition, physical activity, tobacco, and alcohol use are important treatments for chronic disease. National medical societies and

organizations recommend modification of lifestyle behaviors as first-line therapy with or without medication for many chronic diseases, as adoption of healthy lifestyle behaviors can improve disease outcomes (American Diabetes Association, 2009; Fletcher et al., 2005; Go et al., 2014; National Institutes of Health, 2000). For example, individuals who adopt a diet rich in fruits and vegetables can improve the state of a variety of chronic diseases. For individuals with hypertension, this change in dietary pattern can lower blood pressure to the same degree as single drug therapy (Appel et al., 2003; Chobanian et al., 2003). Weight loss as little as 10% among obese patients is associated with a decrease in the severity of co-morbidities (National Institutes of Health, 2000). For overweight people, weight loss of only 10 pounds can significantly reduce elevated blood pressure or prevent hypertension (Chobanian et al., 2003). Physical activity benefits those who are dealing with weight management, elevated blood pressure, cholesterol abnormalities, diabetes and pre-diabetes (American Diabetes Association, 2014; Fryar et al., 2012; Grundy, 2005; Hyre, Muntner, Menke, Raggi, & He, 2007; Whelton, Chin, Xin, & He, 2002). Those who reduce alcohol intake can lower blood pressure (Xin et al., 2001). Additionally, those who stop using tobacco will improve their overall cardiovascular health (Chobanian et al., 2003). With the adoption of two or more lifestyle modifications, effects can be even greater. For example, when an individual adopts two or more healthy lifestyle behaviors, they can prove more effective than single drug therapy on reducing blood pressure (Appel et al., 2003).

Recommendations for Providing Lifestyle Interventions

Despite these impressive benefits related to lifestyle modification, a major issue with recommending lifestyle modification to individuals who suffer from chronic disease is that individuals often need support in a variety of ways in order to be successful in adopting new behaviors (Wadden, Webb, Moran, & Bailer, 2012). Considering the staggering costs and

prevalence chronic disease in the United States, it is no surprise that public health and governmental organizations devote resources to developing and implementing strategies and policies to support environmental and community changes that assist individuals in adopting healthy lifestyle behaviors (Centers for Disease Control and Prevention, 2014; Department of Health and Human Services, 2014; Division of Nutrition, 2014). Governmental influence on how healthcare organizations support individuals in adopting healthy lifestyles is important and changing. The Affordable Care Act (ACA) provides mandates that new insurance policies cover any Grade A or B preventive services as recommended by the United States Preventive Services Task Force (USPSTF) (U.S. Department of Health & Human Services, 2012). Such preventive services include not only screening for high blood pressure, tobacco use, obesity and type 2 diabetes but also services such as diet counseling for adults at higher risk for chronic diseases and obesity counseling for anyone with an obese body mass index (BMI) (U.S. Department of Health & Human Services, 2012). Additionally, the creation of new care models, such as Accountable Care Organizations that utilize shared savings programs to provide financial incentives to healthcare organizations that spend healthcare dollars more wisely on chronically ill patients by improving coordination and quality of care, is driving interest in the adoption of programs and services that focus on prevention and management of chronic disease (Centers for Medicare & Medicaid Services, 2013a). As most chronic conditions share common lifestyle influences, it is in the interest of healthcare organizations to consider ways to assist individuals in adopting healthy lifestyle behaviors. Research exists on the types of interventions and the frequency of such interventions that healthcare organizations and healthcare providers can use to help patients adopt healthy lifestyle behaviors (Centers for Medicare & Medicaid Services, 2012a; Eckel et al., 2014; Moyer & U.S. Preventive Services Task Force, 2012).

Models for Lifestyle Interventions

The USPSTF recommends that all adult patients be screened for obesity, and that clinicians should either offer or refer obese patients to "intensive, multicomponent behavior interventions" (Grade B recommendation) (Moyer & U.S. Preventive Services Task Force, 2012, p. 373). These interventions should be delivered over 12 to 26 sessions in a year and should utilize a variety of components, including "group sessions, individual sessions, setting weight-loss goals, improving diet or nutrition, physical activity sessions, addressing barriers to change, active use of self-monitoring, and strategizing how to maintain lifestyle changes" (Moyer & U.S. Preventive Services Task Force, 2012, pp. 374-375). Such interventions have been shown to lead to an average weight loss of 8.8 to 15.4 lbs. (4 to 7 kg) and improve glucose tolerance and other physiologic factors related to cardiovascular disease (Moyer & U.S. Preventive Services Task Force, 2012). With this recommendation, the USPSTF acknowledges that a specialized behavioral approach for managing obesity and lifestyle can be taken within the clinical setting and also be led by healthcare providers. Utilizing these recommendations as a foundation, the Centers for Medicare & Medicaid Services (2012b) has reinforced the role of the primary care provider in delivering obesity management by providing reimbursement for up to 22 intensive behavioral therapy sessions for obesity each year per Medicare member. This represents acknowledgement of the role of the primary care provider plays in effecting change in individuals with chronic conditions. These recommendations from the USPSTF and Medicare also emphasize the reality of how much time and effort an individual and providers must put into making lasting behavior change for chronic condition management.

Similar, yet less specific recommendations from the USPSTF state that individuals who are overweight or obese and who have additional cardiovascular risk factors should

undergo intensive behavioral counseling for diet and physical activity for cardiovascular disease prevention (LeFevre & U.S. Preventive Services Task Force, 2014). Despite the lack of trials for how to deliver this type of counseling in the primary care setting (LeFevre & U.S. Preventive Services Task Force, 2014), the importance of the primary care provider in delivering this counseling is again recognized, as Medicare will cover a single annual intensive behavioral therapy visit for cardiovascular risk reduction when delivered by a primary care provider (Centers for Medicare & Medicaid Services, 2012a). Finally, the USPSTF recognizes the needs of the individual organization and community as important, and it states that local opinion leaders and healthcare providers must strategize to support the incorporation of its recommendations into clinical practice (Moyer & U.S. Preventive Services Task Force, 2012). This gives providers and organizations flexibility in developing lifestyle programs and clinical services that will meet the needs of all.

Realities of Providing Lifestyle Interventions in Clinical Settings

Physician Barriers

Despite the many known benefits of lifestyle treatments on chronic disease, physicians feel overwhelmed and, at times, incompetent to make lifestyle treatment plans and implement lifestyle intervention programs. Major barriers to physicians providing counseling to patients regarding weight loss include pessimism about effectiveness of counseling, lack of skills in providing counseling, insufficient knowledge, insufficient time, and lack of a comprehensive resource, such as a weight loss clinic (Huang et al., 2004). Physicians need specific skills and training to address the unique difficulties and barriers that they face in recommending and assisting patients in lifestyle treatments. Lifestyle Medicine is a new area that attempts to address those needed skills.

Lifestyle Medicine is the "evidence-based practice of helping individuals and families adopt and sustain healthy behaviors that affect health and quality of life" (Lianov, 2010, p. 202). Suggested core competencies for physicians who practice Lifestyle Medicine state that physicians must be leaders in promoting lifestyle behaviors (Lianov, 2010). Additionally, they must be knowledgeable in guidelines, skilled in behavioral techniques to assess and manage patients, and able to engage the patient's community (*e.g.*, family and/or community resources) to promote healing. Although useful to any specialty, achieving competency in Lifestyle Medicine requires motivation to pursue additional education, training, and practice, as well as systems-support for implementing the practice of Lifestyle Medicine within an organization.

Incorporating Individual Lifestyle Sessions

Although Medicare provides beneficiaries with up to 22 individual counseling sessions with a physician for treating obesity, the counseling time covered is minimal (15 minutes) and reimbursement is extremely low in comparison to that for a typical problem-based visit (Centers for Medicare & Medicaid Services, 2012b). In addition, by focusing on obesity alone, these sessions may easily miss the point of promoting overall comprehensive health in the context of someone with other serious chronic diseases. Therefore, physicians and healthcare organizations must find ways to incorporate what is known about lifestyle interventions for managing and treating chronic diseases in a way that will yield competitive reimbursement.

Incorporating Group Lifestyle Sessions

For even those physicians who achieve competence in Lifestyle Medicine, the traditional one-on-one model for office visits is likely inadequate to deliver intensive, multicomponent lifestyle interventions for chronic conditions. Behavioral science research

demonstrates that peer support and group influence are important ways to modify an individual's behavior. Many effective behavioral interventions and programs for the management of diverse chronic disease through lifestyle modification rely on group counseling and/or group activity sessions (Appel et al., 2003; Knowler et al., 2002; Laws & Counterweight Project, 2004; Miller et al., 2002; Ornish et al., 1990; Pi-Sunyer et al., 2007). Additionally, Moyer and U.S. Preventive Services Task Force (2012) recommend group sessions as a component of the intensive, multicomponent behavior intervention for obesity management.

Yet, group sessions have not been adopted as standard practice in primary or specialty care, likely because physicians are unfamiliar with them and because they have to be adapted to meet the rules and regulations of billing in the medical office setting. Even though Medicare recently decided to cover intensive behavioral therapy for certain conditions, this has not translated to rapid implementation or use of this service in primary care. Despite the mandate from the ACA that payers cover counseling for obesity as a preventive service, there is no requirement that coverage include physician services; instead, payers could opt to reimburse community-based organizations for managing obese patients, completely excluding the healthcare provider from the management of this condition. Additionally, it is likely that group session are uncommon because billing regulations state that non-individualized group counseling services cannot impact the level of service for which a healthcare provider bills (American Academy of Family Physicians, n.d.-a; Hughes, 2007; Noffsinger, 2009). From this, it is interpreted that if a healthcare provider leads a group counseling session in which he/she does not address the unique medical needs of each patient, then those services are not billable. Combined with the lack of guarantee that obesity counseling will be reimbursed and the extra care needed to lead group counseling

sessions in a way that will lead to reimbursement, these are major hindrances to getting a physician to engage in either activity.

The challenge for healthcare organizations, then, is to find alternative, yet reimbursable, ways to get patients to engage in healthy lifestyle behaviors. Additionally they must ensure that their healthcare providers are competent in delivering lifestyle modification treatment plans. Finally, they should consider the unifying approach to managing chronic disease that Lifestyle Medicine provides.

A Realistic Practice Model for Lifestyle Interventions in Clinical Settings

Any lifestyle intervention based out of a clinical setting will start, if not continue, with individual medical appointments (IMAs) with a physician. Although traditional office visits are reimbursed based on a physician's documented history, examination, medical decision-making, and treatment plan, there is an alternative method for billing with similar reimbursement rates. This alternative method relies on how much time a physician spends counseling a patient on management of a disease state (Henley, 2003; Hill, 2008; Sophocles, 2003). Coding based on counseling time, provides physicians with an ideal opportunity to assess and motivate patients about adopting lifestyle behaviors that will manage and treat chronic diseases and conditions, such as hypertension and diabetes. This method, counseling in the IMA, is a financially viable way for healthcare organizations and physicians to promote lifestyle interventions among patients who need them.

Additionally, group medical appointments, distinct from group counseling sessions, are also provide a financially viable method for healthcare organizations and physicians to promote lifestyle interventions among patients, but they must follow a specific model in order to be billable (Noffsinger, 2009). Medicare billing regulations state that physicians are allowed to bill for services provided to an individual that are observed by others,

remembering that no payment will be provided for observation of any services, subsequent group counseling/education, or discussion of observed services (American Academy of Family Physicians, n.d.-a; Hughes, 2007; Noffsinger, 2009). The model for group medical appointments, also known as Shared Medical Appointments (SMAs), is one in which groups of patients are seen by a physician on a basis of medical necessity and patients are serially addressed (Noffsinger, 2009). SMAs can accommodate 6 to 12 patients at a time, last for 60 to 120 minutes with some time reserved for socializing and/or educational sessions, and typically require only a physician and a nurse to be run (Edelman et al., 2012; Noffsinger, 2009; Theobald & Masley, n.d.). The simplest way to think about an SMA is that it is a traditional one-on-one doctor's visit that is observed by other patients while each patient takes turns. Fortunately, SMAs provide a very different environment in comparison to the traditional office visit and, in many ways, more opportunities for assessing and advising for behavior change while providing social support.

SMAs have been utilized in a variety of primary care settings for acute and chronic medical conditions (Cleveland Clinic, n.d.; Dartmount-Hitchcock, n.d.; Edelman et al., 2012; Noffsinger, 2009). Additionally, SMAs can be effective in managing populations with chronic conditions. SMAs for diabetics can lead to reduction in hemoglobin A1c, systolic blood pressure, total and LDL cholesterol, and hospitalizations (Edelman et al., 2012). For older adults, SMAs can improve the patient experience and reduce ER visits (Edelman et al., 2012). More importantly, SMAs offer an ideal opportunity for discussing pertinent lifestyle factors. For example, although the physician only bills for the individual counseling provided to one patient about physical activity, all other patients are still able to benefit through observational learning. Furthermore, SMAs create an environment of peer support and teamwork (Cohen, Hartley, Mavi, Vest, & Wilson, 2012); therefore, likely building self-

efficacy for behavior change. Additionally, they are ideal settings for incorporating behavioral interventions into real medical practice, and recognizing this, the American Academy of Family Physician advocates for and advises on their use in the primary care setting (American Academy of Family Physicians, n.d.-b; Theobald & Masley, n.d.). SMAs provide the opportunity to blend intensive, multicomponent behavior interventions for diverse chronic conditions with legitimately reimbursable physician services.

Exploring ways to effectively incorporate lifestyle treatments within a doctor's visit is important. Physicians who are motivated and competent in Lifestyle Medicine can deliver effective and appropriate lifestyle treatment of chronic disease. Counseling-based IMAs and SMAs that focus on lifestyle interventions are both alternatives to the traditional office visit that might lead to improved outcomes for patients. Additionally, counseling-based IMAs and SMAs provide billable patient encounters for helping a patient adopt and sustain behavior change for treatment of lifestyle-related diseases.

Issues with Implementing Office-based Lifestyle Interventions

Despite the fact that healthcare providers can use counseling-based IMAs and SMAs to deliver intensive, multicomponent behavior interventions for diverse chronic conditions to improve health outcomes in patients, they both face serious issues. For example, patients may not view counseling-based IMAs as real medical appointments, might not be able to return with such frequency as demanded by lifestyle management, or might become frustrated by wait times at physician offices. Yet, counseling-based IMAs likely face fewer challenges than SMAs. For example, even though an SMA is a medical appointment, many patients view it as a "class." Additionally, as SMAs are not common, patients need introductory explanations about how SMAs function, and they often need encouragement to attend. Moreover, as SMAs are intended to provide ongoing and longitudinal care to patients

with chronic conditions, attrition is a continuous issue. Finally, it is unknown which patients are most likely to take advantage of an SMA in real practice settings.

This last issue, knowing which patients will participate in SMAs, is important for multiple reasons. Because SMAs are not common, they require "marketing." Physicians and healthcare providers must be knowledgeable of the services provided at SMAs and actively recruit and invite patients to attend. Additional staff might be needed to call patients or send letters inviting patients to participate. In addition, any educational or activity sessions that are added on to the SMA need to be prepared. All of these tasks could be simplified if healthcare providers and staff could focus their efforts on those patients who are most likely to participate in an SMA. Furthermore, characterizing those patients who are most likely to attend SMAs allows healthcare organizations to estimate the reach that SMAs could have within the patient population. Additionally, knowing which patients would prefer IMAs over SMAs or follow-up frequently would also allow healthcare organizations and physicians to estimate the potential reach when choosing to offer office-based lifestyle interventions for patients.

Problem Justification

Creation of The Lifestyle Clinic

In order to fully address the needs of patients with lifestyle-related chronic diseases and conditions, the physicians at Emory Preventive Medicine have dedicated a portion of their clinical practices to prescribing lifestyle treatments. The physicians named these clinical services The Lifestyle Clinic. The physicians are trained in Lifestyle Medicine and use either counseling-based IMAs or SMAs as the mode of care. The Lifestyle Clinic has been piloting its services from August 2013 to present at the Emory Family and Preventive Medicine Clinic.

The Need for The Lifestyle Clinic

Emory Preventive Medicine began The Lifestyle Clinic at Emory Healthcare because: 1) there is a high prevalence of patients with at least one chronic disease in the primary care clinics (35% at the Emory Family and Preventive Medicine Clinic); 2) there is a high prevalence of established patients with obesity in the primary care clinics (33% at the Emory Family and Preventive Medicine Clinic); 3) community stakeholders who participated in the Emory Healthcare 2013 Community Needs Assessment identified lifestyle-related topics, such as nutrition, exercise, diabetes, obesity, tobacco use, and alcohol use as important patient education needs; and 4) community stakeholders identified the need for Emory Healthcare to increase the focus on preventive and chronic disease/condition management for the community (Emory Healthcare, 2013).

Initial Activities of The Lifestyle Clinic

The Lifestyle Clinic is integrated into the Emory Family and Preventive Medicine Clinic. The Lifestyle Clinic Team has created basic marketing and "internal referral" strategies for patient recruitment and retention. They have created and tested nursing flows for SMAs and have written standard operating procedures for nurses, schedulers, and residents. They developed and had special confidentiality forms approved for patient participation in the SMAs. The Lifestyle Clinic team has identified and is using validated, culturally appropriate tools for providing a baseline assessment of nutrition and general health. Furthermore, to address adult learning needs during SMAs, the team has developed a 13-session curriculum that focuses on skill building and removal and avoidance of barriers in health promotion. The team has also developed binders with introductory and ongoing support materials for patients. These piloted services provided by The Lifestyle Clinic

complement the existing care for patients within the Emory Family and Preventive Medicine practice and is supported by the department's leadership, as well as its clinical support staff.

Detailed Description of The Lifestyle Clinic

The Lifestyle Clinic team seeks to augment traditional chronic disease management at Emory Healthcare by providing an outpatient referral resource that focuses on modification of lifestyle behaviors through intensive, multicomponent behavior interventions delivered through either counseling-based IMAs or SMAs. The Lifestyle Clinic's Team aims to identify and assess patients who are seeking assistance in modifying their behaviors for treatment of chronic disease but who would otherwise be unable to do so without physician support. The Lifestyle Clinic's physicians follow patients for ongoing management of behavioral factors as medical treatment of chronic disease in a unique way that is otherwise not be available to the patient in a primary or specialty care clinic currently available at Emory Healthcare.

The Lifestyle Clinic team asks primary care physicians at Emory Family and Preventive Medicine to identify and refer patients who would benefit from its services. Patients age 18 and above with a chronic medical condition, such as hypertension, coronary artery disease, diabetes, pre-diabetes, dyslipidemia or obstructive sleep apnea, with a co-diagnosis of obesity, and with or without tobacco or alcohol abuse are eligible. Additionally, the team asks that patients be at least contemplating the idea of behavior change (Glanz, Rimer, & Viswanath, 2008; Norcross & Prochaska, 2002).

At the initial medical encounter, called an Intake visit, the Lifestyle Physician first assesses the state of a patient's medical conditions and medication use to ensure they are optimal to helping achieving the patients' potential goals. After reviewing the patient's chart and taking pertinent histories, the physician uses the 5 A's approach for behavior change to

guide the Intake visit (Centers for Medicare & Medicaid Services, 2012b; Whitlock, Orleans, Pender, & Allan, 2002), while developing a personal relationship with the patient. The physician helps the patient identify the most useful behavior changes needed to modify the patient's disease. The patient and physician develop an individualized, achievable goal and plan, which is called a "Lifestyle prescription" while using the 5 A's approach. Each goal set with the physician's help is specific, measurable, realistic, and attainable with a set time for initiating the new behavior. The physician helps the patient identify barriers to success and recommends evidence-based behavioral strategies for overcoming them.

Using the Medicare Intensive Behavioral Therapy for Obesity schedule as a loose guide, the physician and patient decide on a timely follow-up if appropriate. The physician recommends to the rare patient who is not appropriate for The Lifestyle Clinic (*e.g.*, clinically unstable or unmotivated), to return to the care of his primary care physician or referring provider. For the patient who prefers individual follow-up, the physician accommodates that, and follow-up visits involve reassessment of nutrition and physical activity status as appropriate, review of goals, and development of new plans and addressing barriers. Most commonly, the patient joins the SMAs for follow-up.

During the Intake visit, the physician discusses the option of following-up with the patient in the SMAs. To participate in SMAs, patients should desire the opportunity to interact with other patients, understand that attending SMAs is voluntary, and agree to maintain confidentiality. All patients who elect SMAs in their follow-up plan sign an informed consent and confidentiality agreement.

The SMAs follow a set flow to maximize billed time with each patient, while designating a brief amount of non-billable time to adult learning and taste-testing activities. The Lifestyle Clinic team designed the SMAs to accommodate 10-12 patients. Staff ask

patients to arrive 15-20 minutes prior to the start of the SMA to accommodate vitals, nursing duties, and paperwork. Nurses seat the patients at a conference table in a room that is quiet and private from the rest of the clinic's activities. Prior to the SMA, the physician briefly reviews each patient's Lifestyle prescription and goals and medical history. The physician starts the SMA on time, with a warm greeting, and a review of the need that all should maintain confidentiality. The physician leads the "check-in" for each patient, during which the physician takes an updated history and focusing on the successes and challenges for each patient in the intervening time since the patient's last visit. "Check-in" lasts 5-8 minutes for each patient, and physician addresses patients serially. After all "check-ins" are complete, the resident physician delivers a 15-minute presentation or activity that follows a curriculum schedule – it is during this presentation that physical activity is discussed, demonstrated and practiced, that strategizing for behavior change is done, and that general nutrition counseling occurs. Additionally, at every SMA, all patients taste-test a new foods with the intention of promoting healthy eating. The presentation and taste-testing give opportunities for patients to interact with one another and provide peer support.

Finally, the physician leads the "check-out," directing the patient to readjust his/her Lifestyle Prescription with a new goal. Check-out lasts 5-8 minutes for each patient, and each patient is serially addressed so that plans are individually developed. Observing other patients interact with the physician allow a patient to learn from others' experiences and allow patients to serve as role models. While the SMA occurs, nursing staff documents, prepares paperwork, and prepares for patient discharge. Patients are scheduled for follow-up in an upcoming SMA according to their individualized plans. After the SMA, the physician is given time to finalize documentation and billing forms.

For even the counseling-based IMAs, the medical team invests a lot of time and resources. In both the IMAs and the SMAs, patients need educational materials, reminders to follow-up on progress, and close support to ensure short-term outcomes. Substantial work and steps go into establishing a lifestyle service in an office-based setting, and understanding which patients utilize services will help The Lifestyle Clinic Team determine the potential reach of lifestyle services at its first location and reconsider and evaluate its current approach.

Estimating The Lifestyle Clinic's Reach

The Lifestyle Clinic Team would like to understand the characteristics of the patients who take advantage of their lifestyle medical appointments, both individual and shared. They think this will help them estimate the full reach within the Emory Family and Preventive Medicine Clinic and beyond. They imagine that someday The Lifestyle Clinic could be a mobile service, rotating to different primary care or specialty clinics throughout Emory Healthcare. Alternatively, they think other clinical sites at Emory might be interested in providing their own lifestyle appointments. Activities such as these would bring these specialized services to where the patients are currently seeking care, also allowing better integration with primary or specialty care.

In an initial effort to understand the reach of The Lifestyle Clinic Team determined from data from the Emory Family and Preventive Medicine clinic that there was a 33% prevalence of obesity among patients who were seen two or more visits over a two year period (2011 to 2013), but only 3% of those patients had obesity listed as a billing diagnosis code. It is possible that Emory physicians do not make the diagnosis of obesity, even though it is apparent by BMI, because there are other issues related to chronic disease management that take precedence. Potentially, they also don't make the diagnosis of obesity for the same

reasons that physicians avoid providing obesity and lifestyle management, such as lack of competence, training, and referral resources as described earlier. The Lifestyle Clinic could provide referring physicians with a trusted group to refer patients for management of lifestyle related behaviors that directly influence chronic disease. Understanding who utilizes their services is a first step in estimating reach.

Theoretical Framework

The Health Belief Model is a common and classic model used to explain an individual's health behavior (Glanz et al., 2008; National Cancer Institute, 2005). The Health Belief Model was initially developed in the 1950s to explain lack of success in getting individuals to participate in screening programs developed by the U.S. Public Health Service (Glanz et al., 2008). Social psychologists refined the model throughout the 1960s and 1970s to its current state (Christensen, Martin, & Smyth, 2004; Glanz et al., 2008).

This model states that an individual's participation in a health behavior is a result of an individual's beliefs regarding the threat of disease and the effectiveness of engaging in a health behavior to counteract that disease (Christensen et al., 2004; Glanz et al., 2008). Two major assumptions of the model are that individuals value avoiding an illness and expect that adopting a health behavior or taking a health action will prevent or slow illness progression (Glanz et al., 2008). Typically, the Health Belief Model contains six primary constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. The Health Belief Model states that the higher the perceived threat of illness, the higher the probability that the individual will take a specific health action to prevent illness (Glanz et al., 2008). The perceived probability of decreasing the threat results as a combination of perceived susceptibility and perceived severity. Perceived susceptibility refers to an individual's assessment of contracting a disease or condition. Perceived severity

refers to an individual's assessment about the medical consequences of an illness, as well as potential effects on the individual's job, life, and family. Perceived benefits refers to the individual's beliefs about the benefits of engaging in a particular health behavior to which he/she is susceptible. Perceived barriers refers to the costs of engaging in the health behavior and can include inconvenience, unpleasantness, and cost. Cues to action are triggering or potentiating mechanisms. Cues to action is a less formalized construct and can include a variety of concepts, such as physical symptoms, mass media campaigns, illness of family member, and advice from others (Christensen et al., 2004; Glanz et al., 2008). Self-efficacy refers to an individual's belief that he/she can successfully carry out the health behavior, and is the most recently added construct. A seventh construct, general health motivation, refers to an individual's readiness to be concerned about health issues, yet this construct is not always included in the model (Christensen et al., 2004). Reviews of the Health Belief Model's application reveal that perceived barriers are the most powerful single predictor across all studies and behaviors, while perceived severity is the least powerful predictor (Glanz et al., 2008).

Although less commonly discussed, the Health Belief Model allows for other important variables, known as modifying factors. Modifying factors, which include demographic, sociopsychological, and structural variables, are important for their influence on perceptions and, therefore, their indirect influence on health behavior. Demographic factors can include age, gender, ethnicity, socioeconomic status, and education (Glanz et al., 2008), and they are intimately tied to health and wellness. Sociopsychologic factors can include personality, peer pressure, and perceived control over a behavior (Glanz et al., 2008). Structural variables might include access to care, household structure, and peer/reference

group (Glanz et al., 2008). Although typically considered static, at times, there is overlap of modifying factors and cues to action, as some modifying factors can change.

The importance of these modifying factors is intuitive; some individuals with certain characteristics have a propensity to use healthcare services more than others, even though the characteristics are not directly responsible for healthcare service use (Andersen & Newman, 2005). For example, persons of different age groups have different patterns of healthcare utilization just because disease burden varies by age (Andersen & Newman, 2005). Additionally, certain demographic factors, such as socioeconomic status, insurance coverage, and education, enable or permit individuals to receive healthcare services (Andersen & Newman, 2005). For example, Andersen and Newman (2005) demonstrated that reduction in out-of-pocket healthcare costs for the poor due to increased and better insurance coverage corresponded with increased numbers of physician visits; furthermore, they showed that when certain healthcare services are not covered, the poor will not access them. Although modifying factors are not the most studied predictors, they are an obviously important component of the model.

In the case of The Lifestyle Clinic, the Health Belief Model could be used to determine which modifying factors, and possibly which cues to action, determine participation in lifestyle appointments (both IMAs and SMAs). Although the Health Belief Model is typically applied or evaluated based on constructs, such as perceived barriers and perceived susceptibility, this information is not available in this or most clinical situations. Although not the ideal way to evaluate individual beliefs around participation in a specific health behavior, turning to modifying factors and cues to action, is a realistic approach and will help meet the need in determining the reach of The Lifestyle Clinic within Emory Healthcare, as basic demographic measures will be the basis of any future estimation of

potential reach. Additionally, the Health Belief Model is a cognitive model, focusing on voluntary health behaviors, which aligns well with determining who voluntarily participates in lifestyle appointments. This model will assist The Lifestyle Clinic team in determining the reach of lifestyle appointments within Emory Family and Preventive Medicine and across Emory Healthcare by making the first step of identifying what sorts of patients are most likely to utilize this service.

Formal Statement of Problem

At the moment, little literature exists on the characteristics of patients who attend lifestyle appointments, and The Lifestyle Clinic team would like to determine which characteristics are most associated with attendance at lifestyle appointments, either individual or shared. The purpose of this study is to evaluate the relationship between an individual's modifying factors and cues to action and level and type of participation in specialized lifestyle appointments developed by The Lifestyle Clinic. To that aim, I have developed three main study objectives.

1. To describe the characteristics of patients who attended lifestyle appointments at The Lifestyle Clinic by a) level of participation and b) type of participation in lifestyle medical appointments
2. To determine characteristics of patients who attended lifestyle appointment differ across a) level of participation and b) type of participation in lifestyle medical appointments
3. To evaluate the relationship of characteristics of patients who attended lifestyle appointments to a) level of participation and b) type of participation in lifestyle medical appointments

Chapter II. Literature Review

To date, little research on the application of the Health Belief Model exists on the sole role of modifying factors in predicting participation in a health behavior. In reality, most studies do not explicitly evaluate how perceived barriers, perceived susceptibility, perceived benefits, and perceived severity mediate the effects of modifying factors. Other studies, such as those evaluating the effectiveness of shared medical appointments on a health outcome or qualitative and cross sectional studies on factors that determine weight loss, do not use a theoretical basis, and they may or may not describe modifying factors and their role in a health behavior.

Furthermore, conceptualizing modifying factors and their relationship to engagement in a particular behavior depends on the context. In particular, the needed frequency of the health behavior to reduce the perceived health threat is likely important to understanding how modifying factors might influence participation in the health behavior. Finally, the type of health behavior to be practiced should influence how we perceive the influence of modifying factors on the individual beliefs.

Exploration of Modifying Factors

Wirth, James, Fafard, and Ochipa (2014) conducted 20 semi-structured interviews with Baby Boomer men about their weight management experiences in the context of the Health Belief Model. The researchers found that men are motivated to manage their weight for internal and external reasons, and for some, one cue is enough to motivate weight loss, while for others, multiple cues might be needed. The cues to action that were identified include: having a wife who pushes the man to manage his weight; having a weight goals or a weight limit which they refuse to surpass; being diagnosed with health problems; having work requirements or everyday tasks that demand being fit; and having financial incentives (Wirth et al., 2014). This reiterates the importance of cues to action, such as being diagnosed

with specific health problems, for understanding what distinguishes individuals who will or will not engage in a specific health behavior.

The Effect of Modifying Factors on Single or Annual Event Behaviors

Calnan and Moss (1984) show that among older British women registered to general practitioners in a provincial health district in the United Kingdom, attendance at a class on breast self-examination was determined by socioeconomic status, education level, knowledge of breast self-examination, previous practice of breast self-examination, intention to attend, reported health status, social pressure, and social support. Further analyses determined that, in addition to perceived vulnerability and health motivation, marital status ($p < .05$) and social support ($p < .05$) were important variables in significantly increasing the discrimination between the attendees and non-attendees of the class about breast self-examination (Calnan & Moss, 1984). A study by Orbell, Crombie, and Johnston (1996) showed that the influence of social class on uptake of cervical cancer screening was mediated by Health Belief Model components, yet the Health Belief Model components did not mediate the influence of marital status ($p < .001$) or sexual experience ($p < .05$) on cervical cancer screening. These studies demonstrate how at times individual beliefs do not completely explain participation in a health behavior, and that demographic factors are important to consider at any time we wish to understand health behavior.

To identify variables that explained adherence to annual eye examinations for diabetics, Sheppler, Lambert, Gardiner, Becker, and Mansberger (2014) used logistic regression modeling to identify significant predictors of adherence. In addition to the health belief constructs, modifying factors measured were demographic (sex, age, race/ethnicity, insurance status, education level, marital status, and income) and clinical (hemoglobin A1c level, years diagnosed with diabetes, type of diabetes, and dilated eye examination history).

The authors identified two different models that classified cases with 69% and 72% accuracy and which explained 19% and 24% of the variance respectively. Both models showed that years diagnosed ($p = .01$ and .01), hemoglobin A1c level ($p = .01$ and .01), and insurance ($p = .02$ and .02) were significant predictors. Here, demographic modifying factors (insurance) as well as clinical modifying factors (years diagnosed and hemoglobin A1c level) were important.

The Impact of Modifying Factors on Ongoing Behaviors

The importance of modifying factors, including race, income, living environment, medical supervision, and knowledge, was demonstrated by Reiser (2008) in a study regarding the factors that determine healthy lifestyle behaviors among college women. The author found that perceived diet benefits accounted for over 15% of the variance seen in eating behavior, and perceived exercise barriers accounted for 35% of the variance in physical activity, while exercise benefits explained another 4%. By including the socioeconomic factors, Reiser (2008) increased the variance explained from 15% to 30% in eating behaviors and from 39% to 49% in physical activity behaviors.

Among dialysis patients, Elliott, Ortman, Almaani, Lee, and Jordan (2014) showed with a cross-sectional survey that endorsed adherence to low-phosphorous diets was heavily determined by modifying factors. The authors measured age, gender, race/ethnicity, education, income, marital status, depression, quality of life, chronic kidney disease knowledge, and time on dialysis as modifying factors. Significant modifying factors associated with reported adherence to low-phosphorus diets included white race/ethnicity odds ratio (OR) 8.99 (95% Confidence Interval (CI): 1.08-74.60; $p = .042$), more than high school education OR 18.23 (95% CI: 1.62-205.00; $p = .019$), better quality of life OR 9.28 (95% CI: 1.35-63.71; $p = .023$) and time on dialysis OR 1.04 (95% CI: 1.01-1.07; $p = .006$).

Significant health belief constructs for diet adherence included perceived benefits OR 3.18 (95% CI: 1.47-6.88; p = .003) and self-efficacy OR 1.22 (95% CI: 1.09-1.38; p = .001). This study again supports the idea that modifying factors are important in explaining health behavior.

Modifying factors do not always significantly contribute to explaining ongoing behaviors, yet they are likely still important. Among women age 50 and above without heart disease, Ali (2002) assumed that, in addition to the perception of susceptibility and perception of seriousness of coronary heart disease, knowledge of coronary heart disease risk factors, general health motivation, social support, demographics, and cues to action would be important in a woman's engagement in coronary heart disease preventive behaviors. In this study, regression analysis showed that 76% of the variance in coronary heart disease preventive behaviors was explained by the combination of perceived susceptibility (50.7%, p < .001), perceived seriousness (3.5%, p < .001), knowledge of risk factors (19.5% p < .001), and general health motivation (2.3%, p < .001). Social support did not contribute to the variance observed for coronary heart disease preventive behaviors. Results showed a significant difference in the mean number of coronary heart disease behaviors practiced between women who were receiving medication for hypertension and those who were not (t-value 2.40, df = 176, p = .017); yet there was no significant difference between women who were receiving medications for either diabetes (p = .09) or high cholesterol (p = .274) compared to those were not. There was no significant difference in engaging in coronary heart disease preventive behaviors when comparing women who reported a family history of coronary heart disease and women who did not report a family history (p = .126). This example shows that modifying factors do not always assist researchers in determining what

will predict health behavior action. Here they demonstrated that, perhaps, medication use is an important modifying factor/cue to action, but that family history may not be.

Swaim, Barner, and Brown (2008) explored the use of modifying factors to explain the variance in calcium intake and exercise in a cross-sectional survey that examined postmenopausal women's health beliefs and preventive behaviors regarding osteoporosis. For modifying factors, the authors included demographics (age, race/ethnicity, education, and income) and osteoporosis risk factors (body mass index and family history). They found that the addition of the block of modifying factors to the regression equations did not significantly increase the explained variance in either calcium intake ($p = .922$) or exercise ($p = .770$). The authors, though, did find that modifying factors were significantly related to self-efficacy of calcium intake and self-efficacy of exercise. Additionally, BMI was inversely related to self-efficacy of calcium intake ($p < .001$), and whites had significantly lower levels of calcium intake self-efficacy than Hispanics ($p = .016$). Similarly, BMI ($p = .009$) and age ($p = .043$) were inversely related to self-efficacy of exercise, and whites had significantly lower levels of exercise self-efficacy than Hispanics ($p = .006$). Although, these authors did not find a direct influence of modifying factors on behaviors, there was evidence for their direct influence on mediating health belief constructs.

Non-theory Based Exploration of Modifying Factors

The Diabetes Prevention Program was a multi-site, randomized clinical trial that enrolled over 3,000 participants, with approximately 1,000 in the intensive lifestyle intervention arm. The intensive lifestyle intervention provided case management in individual and 16 group sessions in which they assisted participants in meeting the study's weight loss and physical activity goals (Diabetes Prevention Program Research Group, 2001). It resulted that weight loss barriers affected participants of the lifestyle intervention

arm of the Diabetes Prevention Program differently. In particular, weight loss barriers were more common for women than men, younger compared to older persons, and working compared to retired persons (Venditti et al., 2014). This builds off of other findings from this study that showed that lifestyle participants over the age of 60 had better session attendance, turned in more food records, and had more weight loss, physical activity (Wing et al., 2004), diabetes delay, and other biometric outcomes (Diabetes Prevention Program Research Group et al., 2009). Modifying factors are important in predicting who will participate and succeed in intensive lifestyle programs.

Laz, Rahman, Pohlmeier, and Berenson (2014) studied among low-income reproductive-aged women. Those women who were overweight or obese were more likely to engage in healthy weight loss behaviors and have higher nutrition knowledge scores, reiterating that pre-existing medical conditions are important modifying factors to consider.

Shared Medical Appointment Utilization

The effectiveness of SMAs has been the primary focus of most studies in the literature, as they are exploring them as a randomized or matched intervention. Very few studies have looked at who utilizes SMAs when they are offered as a healthcare service in the real world. One study by Palaniappan, Muzaffar, Wang, Wong, and Orchard (2011) explored which patients engaged in weight loss SMAs delivered by a single physician in a primary care clinic over a two-year period. The authors showed that those patients who attended at least one weight loss SMA ($n = 74$) were more likely to be female (76% vs. 64%, $p < .05$), older (mean age of 52.4 vs. 47.0 years, $p < .01$), and weigh more (mean BMI 35.3 vs. 29.4 kg/m^2, $p < .01$) than those in the comparison group (patients in same physician's practice who had at least one office visit and a BMI ≥ 25, $n = 356$).

Another study, looking at the effectiveness of diabetes SMAs in a veteran population used post hoc analyses to compare those individuals who attended only one SMA (n = 20) to those who attended more than one (n = 40) (Guirguis et al., 2013). The authors found that those who only attended a single SMA were more likely to be using insulin (85% vs. 57.5%, p = .03), with a trend for a higher hemoglobin A1c (9.63 vs. 8.99%, p = .14), with a non-significantly longer distance to drive (14.5 vs. 9.5 miles, p = .17). These studies demonstrate that modifying factors are likely to be important predictors for determining which patients will use SMAs.

Another study conducted out of a federally qualified health center evaluated the differences in characteristics of patients who attended group visits for diabetes (n = 39), those who refused participation (n = 22), and nonparticipants (those recorded in a local diabetes registry, n = 215) (Culhane-Pera et al., 2005). With the exception of a statistically significant difference between participants and nonparticipants on having previously had formal diabetes education (respectively 79% vs. 49%, p < .001), the authors found no significant differences between participants and refusers and between participants and nonparticipants for age, gender, age at diagnosis of diabetes, years with diabetes, insurance type, mean hemoglobin A1c level, mean systolic blood pressure, mean diastolic pressure, mean LDL, and mean BMI.

Summary of Findings and Restatement of the Problem

The few studies that have compared participants and nonparticipants of shared medical appointments demonstrate conflicting results on the importance of modifying factors in determining who is and is not likely to participate in a shared medical appointment. Additionally, among studies that have examined the relationship between individual beliefs and practicing a health behavior while also taking into account the effect of

modifying factors, there is a lack of consistency to say which modifying factors are most important to practicing the outcome behavior. What is most important likely lies in the choice of what to investigate. Modifying factors and cues to action of importance to a health behavior will depend on the health behavior being investigated and the information available to the researcher.

Taking into account concepts from the Health Belief Model, I restate the objectives of this study to reflect the importance of modifying factors and cues to action as follows:

1. To describe the modifying factors and cues to actions of patients, as determined by the Health Belief Model, that attended lifestyle appointments at The Lifestyle Clinic by a) level of participation and b) type of participation in lifestyle medical appointments
2. To determine if modifying factors and cues to actions, as determined by the Health Belief Model, of patients who attended lifestyle appointment differ across a) level of participation and b) type of participation in lifestyle medical appointments
3. To evaluate the relationship of modifying factors and cues to action, as determined by the Health Belief Model, of patients who attended lifestyle appointments to a) level of participation and b) type of participation in lifestyle medical appointments

Chapter III. Methods

Study Description

I utilized a medical record review to quasi-experimentally evaluate the relationship between patients' modifying factors/cues to action and level of and type of participation in specialized lifestyle appointments. I retrospectively collected pre-recorded, patient-centered data on the target and comparison populations and performed multinomial and binomial logistic regression analyses.

Target Population and Sample

The study population is all patients who have participated in lifestyle appointments at The Lifestyle Clinic, located at Emory Family and Preventive Medicine at Dunwoody. Physicians at the clinic informally began to see patients as early as 2012, but did not use the name of The Lifestyle Clinic until approximately August 1, 2013. For studying the level of participation, I include those patients who attended one or more lifestyle appointments as the study population, and those who do not follow-up as the comparison population. For studying the type of participation, I include those patients who followed up in IMAs and those who followed up in SMAs as the study populations and those who did not return for that type of follow-up as the comparison population. I excluded patients from the study if they were found to be less than 18 years of age at the time of the first lifestyle appointment or had their intake lifestyle appointment prior to September 1, 2013 or after November 30, 2014 to allow sufficient follow-up time for documenting follow-up lifestyle appointments through February 28, 2015. I determined that only n=100 patients met criteria for inclusion in this study, although as of February 28, 2015, lifestyle physicians had seen approximately 115 patients.

Outcome Variables

For evaluating level of participation, the primary outcome variable is participation in any follow-up lifestyle appointment, measured as attendance at least one follow-up lifestyle appointment. To investigate level of participation, I divided those who attended at least one follow-up lifestyle appointment into two types of subcategories:

1. Low follow-up (attendance at one or two follow-up lifestyle appointments) or High follow-up (attendance at three or more follow-up lifestyle appointments)
2. Any follow-up (attendance at any number of follow-up lifestyle appointments).

For evaluating type of participation, the primary outcome variable is participation in follow-up lifestyle appointment by type of appointment. Specifically, I divided those who attended at least one follow-up lifestyle appointment into two subcategories based on the follow-up type:

1. Individual follow-up (attendance at one or more individual follow-up lifestyle appointments)
2. SMA follow-up (attendance at one or more SMA follow-up lifestyle appointments).

Exposure Variables

I chose variables available in the electronic medical record according to the Health Belief Model. These variables can be described as demographic modifying factors, clinical modifying factors/cues to action, or personal/social modifying factors. In Table 1, I describe how these variables relate to the primary outcome of attendance at lifestyle appointments and summarize how the exposure variables were determined.

Demographic Modifying Factors

I include a variety of demographic variables as determined by the Health Belief Model. All of these variables are self-reported by patients but recorded in the electronic medical record by varying members of the healthcare team. These variables are Age (years as calculated from date of birth), Gender (male, female), Race/Ethnicity (white/other, black), and Insurance (government, private). Additionally, I created a socioeconomic status variable, Median Income by Zip (continuous), by linking the patient's zip code to the median household income for that zip code based on 2010 Census data (Michigan Population Studies Center, n.d.).

Clinical Modifying Factors/Cues to Action

I include the following clinical modifying factors or cues to action variables: Number of Medications (continuous), Charlson Comorbidity Index (continuous), Number of Other Conditions (continuous), BMI (continuous), Family History (yes/no), Intake Physician (Trainee/Attending). I assigned the variable Number of Medications to be the number of medications as recorded in the medical record on the date of the intake visit. The Charlson Comorbidity Index is a validated, weighted index, with possible scores ranging from 0 to 33, to assess the severity of advanced or terminal illnesses, which can be used to predict 10-year mortality when accounting for age (Table 2) (Charlson et al., 2008; Charlson, Pompei, Ales, & MacKenzie, 1987; Deyo, Cherkin, & Ciol, 1992). I verified and modified a publicly available code to calculate and weight the Charlson Comorbidity Index based on International Classification of Diseases, 9th Edition, with Clinical Modifications (ICD-9-CM) diagnosis codes as recorded on the problem list at the day of the intake visit (Manitoba Centre for Health Policy, 2014a, 2014b, 2014c). As the Charlson Comorbidity Index does not take into account many types of chronic conditions, I created a non-weighted index based on ICD-9-CM codes to capture a history of hypertension, dyslipidemia, pre-diabetes, anxiety/depression, coronary artery disease, and obesity (based on BMI > 30 kg/m^2) with a possible score of 0 to 6 (Table 3). The variable BMI is calculated from the height and weight as documented at the intake visit. I created the dichotomous variable Family History based on the intake note recording a family history positive for any of the following: hypertension, dyslipidemia, coronary artery disease, myocardial infarction, diabetes, stroke, chronic obstructive pulmonary disease, or chronic kidney disease. Finally, the variable, Intake Physician, was determined by whether the Trainee or Attending physician saw the patient and documented the note at the intake visit.

Personal/Social Modifying Factors

Each patient attending the intake lifestyle appointment should have completed the PROMIS-29, a validated instrument designed to measure self-reported physical health, mental health, and social health on a variety of domains, among those with chronic disease, as well as the general U.S. adult population (Cella et al., 2010; PROMIS, 2013). The PROMIS-29 covers 7 domains, including physical function, anxiety, depression, fatigue, sleep disturbance, satisfaction with social role, and pain interference, as well as pain severity. The single item domain pain severity was excluded from this study due to multicollinearity. Each domain is measured with 4 items measured on a scale of 1 to 5 and the sum of the 4 items is standardized to the general U.S. population, except for satisfaction with social role and sleep disturbance, with a higher T-score representing more of the concept being measured (PROMIS, n.d.). For satisfaction with social role and sleep disturbance, a score of 50 represents the average of the calibration sample, which had participants with more chronic illness, meaning that a score of 50 is likely worse than the general U.S. population (PROMIS, n.d.). PROMIS-29 data were missing for n=11 patients.

Setting, IRB Approval, and Procedures to Reduce Risk

As I collected pre-recorded data from Emory's electronic medical record, this study did not rely on physical interaction with patients at the clinic. My Faculty Advisor and the Emory Institutional Review Board approved this study. As this was a secondary data analysis that involved no interaction or communication with patients, there was minimal risk to the patient, but as I did collect some protected health information, including name, medical record number, date of birth, and zip code, I took precautions to ensure protection of this data. First, data was extracted directly onto a spreadsheet stored on a password- and fire wall-protected server. Second, I created a separate password-protected file that linked

identifiers to subjects and that changed date of birth to age and zip code to a measure of socioeconomic status so that the final dataset was de-identified.

Data Collection Procedures

I initially relied on a previously created partial dataset that manually pulled age, gender, race, ethnicity, insurance plan, and zip code at the time of the intake visit, and I manually entered missing data. Relying on previously created patient lists for The Lifestyle Clinic in the electronic medical record, I identified missing patients. I manually abstracted values for the remaining variables.

Analyses

I performed descriptive analyses on the entire dataset to evaluate for normality and outliers. Across multinomial levels of participation in follow-up lifestyle appointments (None vs. Low vs. High) and binomial levels of participation in follow-up lifestyle appointments (None vs. Any), I used either one-way fixed effects ANOVA or t-tests for continuous variables and either Chi-square tests of homogeneity of proportion or Fisher's exact tests for categorical variables to determine whether each variable differed across outcomes. Similarly for evaluating the type of participation in follow-up lifestyle appointments, I used the same analytic methods to evaluate two follow-up types: No IMA follow-up vs. Any IMA follow-up and No SMA follow-up vs. Any SMA follow-up. I evaluated the relationship between the exposure variables and outcome variables with four logistic regression models. I investigated the level of participation with two models, 1) None vs. Low vs. High follow-up (Multinomial model) and 2) None vs. Any follow-up (Binomial model), and the type of participation with two models, 3) No IMA follow-up vs. Any follow-up (IMA Model) and 4) No SMA follow-up and Any SMA follow-up (SMA Model). As there were n = 11 patients with missing PROMIS-29 variables, I tested the above analyses with

and without the PROMIS-29 variables to check for robustness. All analyses were conducted using SAS v. 9.4 (Cary, NC). All tests were two-tailed and significance was set at $\alpha = .05$.

Chapter IV. Results

Descriptive Statistics

Descriptive statistics are displayed in Table 4. For the patients (n = 100) included in this study, descriptive statistics of the Demographic Modifying Factors variables showed average age was 48.0 years (SD = 12.9), average median income in the zip code lived was $58,210 (SD = $19,182), and 81% were female. For race/ethnicity, 76% were Non-Hispanic Black, 12% were Non-Hispanic White, 4% were Hispanic, and 8% were other. 46% of patients had either private insurance or were self-pay, and the remaining 54% had either Medicare or Medicaid plans. For the Clinical Modifying Factors/Cues to Action variables, the average number of medications on the problem list at intake was 6.5 (SD = 4.5), the median Charlson Comorbidity Index score at intake was 0 (Range 0-5), the average number of other chronic conditions at intake was 2.2 (SD = 0.9), the average intake BMI was 40.0 kg/m^2 (SD = 8.3), and 54% had a family history that documented a chronic disease, and 85% were seen by the Attending physician at the intake visit.

For the study sample's Personal/Social Modifying Factors, the average self-reported physical function (Mean (M) = 46.1, SD = 9.0), anxiety (M = 55.8, SD = 10.6), depression (M = 52.9, SD = 11.1), fatigue (M = 55.5, SD = 10.3) and pain interference (M = 55.5, SD = 11.1) are slightly worse than that of the general U.S. population. Patients reported, on average, sleep (M = 53.4, SD = 9.2) and satisfaction with social role (M = 44.4, SD = 10.9) to be slightly worse than the calibrated sample for the PROMIS-29.

Of the 100 patients, 46% participated in only the intake visit (had no follow-up), 18% participated in follow-up IMAs, 47% participated in follow-up SMAs, and 11%

participated in both types of follow-up (Table 5). Of the 18% that attended follow-up IMAs, 83% attended either one or two follow-up IMAs, and the remaining 17% attended between three and seven IMAs. Of the 47% that attended follow-up SMAs, 72% attended one or two follow-up SMAs, with the remaining 28% attending between three and eight follow-up SMAs.

Among the 100 patients, 90% were obese, 65% had hypertension, 31% had dyslipidemia, 24% had diabetes, 11% had pre-diabetes, and 19% had anxiety/depression according to the Problem List as recorded at the intake visit (See Table 6 for this and other percentages of other chronic conditions).

Bivariate Analyses

Across the multinomial outcome (No Follow-up vs. Low Follow-up vs. High Follow-up) and the binomial outcome (No follow-up vs. Any Follow-up), only positive Family History was found to be significantly different across both of these outcomes (Multinomial Negative Family History: No 30% vs. Low 6% vs. High 11%; Multinomial Positive Family History: No 16% vs. Low 26% vs. High 11% (Chi-square (X^2) = 16.5; $p < 0.001$). Binomial Negative Family History: No 36% vs. Any 17%; Binomial Positive Family History: No 16% vs. Any 37% ($X^2 = 11.3$; $p < 0.001$) (Table 7). Additionally, mean age (No M = 49.3 years (SD = 12.9) vs. Low M = 43.0 years (SD = 11.7) vs. High M = 52.7 years (SD =1 2.6); F-statistic (F) = 4.36; p = 0.02) and Intake Physician (Trainee: No 6% vs. Low 4% vs. High 5%; Attending: No 40% vs. Low 20% vs. High 18%; Fisher's exact test p = 0.04) were found to be significantly different across only the multinomial outcome (Table 7).

Across the outcome No IMA Follow-up vs. Any IMA Follow-up, the variables BMI at intake (No M = 37.8 kg/m^2 (SD = 8.3) vs. Any M = 44.1 kg/m^2 (SD = 6.2); t-statistic (t) = -3.01; p = 0.003), Intake Physician (Trainee: 9% with No IMA Follow-up vs. 6% with Any

IMA Follow-up, Attending: had 73% vs. 12%, respectively; Fisher's exact test p = 0.02), Satisfaction with Social Role (No M = 45.9 (SD = 11.2) vs. Any M = 37.8 (SD = 6.3); t = 2.78; p = 0.007), and Fatigue (No M = 54.7 (SD = 10.9) vs. Any M = 59.3, (SD = 5.8); t = -2.40; p = 0.02) were found to differ significantly (not shown). Across the outcome No SMA Follow-up vs. Any SMA Follow-up, the variables Race/Ethnicity (Non-black: 18% with No SMA Follow-up vs. 6% with Any SMA Follow-up, Black: 35% vs. 41%; X^2 = 6.1; p = 0.01) and Family History (Negative Family History: 32% No SMA Follow-up vs. 15% Any SMA Follow-up, Positive Family History: 21% vs. 32%, respectively; X^2 = 8.1; p = 0.004) were found to differ significantly (not shown).

Logistic Regression Models

The logistic regression models yielded similar results for both the multinomial and binomial models for level of participation, with Charlson Comorbidity Index, Family History, Anxiety, and Depression being significant in both models (Table 8). Median Income by Zip, Race/Ethnicity, and Number of Medications were additionally significant in the multinomial model. Median Income by Zip (odds ratio (OR) 1.03, 95% Confidence Limits (CL): 1.00, 1.07; p=0.04), Race/Ethnicity (OR 4.30, 95% CL: 1.08, 17.19; p=0.04), Number of Medications (OR 1.17, 95% CL: 1.02, 1.33; p = 0.02), Charlson Comorbdity Index (OR 0.58, 95% CL: 0.35, 0.95; p = 0.03), Family History (OR 3.51, 95% CL: 1.22, 10.06; p = 0.02), Anxiety (OR 1.16, 95% CL: 1.06, 1.26; p = 0.001), and Depression (OR 0.87, 95% CL: 0.79, 0.95; p = 0.002) are significant in the multinomial model.

For the models that investigated the type of participation in lifestyle appointments, Race/Ethnicity (OR 8.65, 95% CL: 1.38, 54.40; p = 0.02), Family History (OR 4.36, 95% CL: 1.28, 14.91; p = 0.02), and Anxiety (OR 1.10, 95% CL: 1.01, 1.23; p = 0.03) were significant in the model that looked at SMA follow-ups (Table 8). For the model that

evaluated the relationship to IMA follow-up, Government Insurance (OR 0.03, 95% CL: 0.001, 0.89; p=0.04), Number of Medications (OR 1.65, 95% CL: 1.02, 2.65; p = 0.04), Charlson Comorbidity Index score (OR 0.15, 95% CL: 0.03, 0.75; p = 0.02), BMI (OR 1.23, 95% CL: 1.02, 1.48; p = 0.03), Depression (OR 0.70, 95% CL: 0.50, 0.99; p = 0.04), and Satisfaction in Social Role (OR 0.71, 95% CL: 0.54, 0.96; p = 0.03) were significant (Table 8).

All four models were also run without any of the Personal/Social Modifying Factors considering 11% of patients were missing this data (not shown). For example, in the Multinomial model Race/Ethnicity and Family History stayed significant, Number of Medications and Charlson Comorbidity Index were no longer significant, and Intake Physician (OR 0.26, 95% CL: 0.08, 0.85; p = 0.03) was significant. In the binomial model, only Family History remained significant, and Race/Ethnicity (OR 3.71, 95% CL: 1.07, 12.89; p = .04) became significant. In the IMA model, only BMI remained significant, and Intake Physician (OR 0.07, 95% CL: 0.01, 0.44; p = 0.004) became significant. In the SMA model, findings did not significantly change.

Chapter V. Discussion

Summary of Findings and Conclusions

Descriptive Findings. Considering The Lifestyle Clinic focuses on the management and treatment of chronic conditions through lifestyle behavior change, it isn't surprising that, on average, patients who attended any lifestyle appointment were middle-aged and had more than two chronic conditions. The finding of relatively low Charlson Comorbidity Index scores, on average, demonstrates that those who attended The Lifestyle Clinic did not have extensive morbidity and were likely to have a high 10-year survival rate. These findings, in combination with an average BMI of 40 kg/m^2 suggest that, although those who participate in The Lifestyle Clinic are suffering from chronic conditions, those conditions are earlier in

the disease process and would most likely benefit the greatest from lifestyle changes. Additionally, the high percentage of women attending The Lifestyle Clinic might reflect the fact that the lifestyle services are situated within a primary care clinic and because women utilize primary care services more than men (Bertakis, Azari, Helms, Callahan, & Robbins, 2000; Cleary, Mechanic, & Greenley, 1982). The percent Black and Non-Black and the mixture of insurance coverage among patients of The Lifestyle Clinic likely reflects the population served by the Emory Family and Preventive Medicine Clinic at Dunwoody. These findings show that The Lifestyle Clinic is seeing patients who fit their target population: i.e., those with low or moderate risk chronic conditions who present within the primary care clinic in which The Lifestyle Clinic is situated.

That most patients chose SMAs for follow-up lifestyle appointment likely reflects that The Lifestyle Clinic support staff and physicians have typically promoted SMAs over IMAs. The finding that the majority of patients who participated in follow-up appointments attended between one and two visits might be influenced by the time allowed for data collection in this study, but it might also reflect the small number of support staff hours devoted to this project. Additionally, it could reflect the difficulty inherent in behavior change or other barriers to follow-up, such as co-pays or taking time off work to attend a medical appointment (Kullgren, McLaughlin, Mitra, & Armstrong, 2012; McCormick, Sayah, Lokko, Woolhandler, & Nardin, 2012). Attention to limited staff resources might be an important consideration of The Lifestyle Clinic (Green, Wendland, Carver, Hughes-Rinker, & Mun, 2012), in addition to patient outcomes and service utilization.

Bivariate and Multivariate Results. Although age differed significantly across the multinomial outcome, it is likely by chance, or as a proxy for another variable since the effect is no longer significant in the multivariate model. Furthermore, because there is neither a

trend in the direction of age and the level of participation nor is age significantly different across the binomial outcome, this suggests that age is not meaningful. Although age might be important to consider for the target population of the The Lifestyle Clinic, it does not seem to be an important marker for who will continue to utilize the service.

Median Income by Zip was a significant predictor in the multinomial model, appearing to be different between No Follow-up and Low/High Follow-up. Although the average median income by zip across level of participation did not show a trend in direction and was not significant across the binomial model, this might be due to the cut-off points placed on the outcome of interest. Perhaps socioeconomic status should be considered in future studies that have larger samples.

Although Race/Ethnicity did not vary by level of participation or participation in IMAs, it did approach significance across the binomial outcomes ($p = 0.06$) and was significant across participation in SMAs. Additionally, its significance in the multinomial and SMA models and near significance in the binomial model ($p = 0.06$), shows that at The Lifestyle Clinic, utilization of lifestyle appointments can be predicted by a patient's race.

The number of medications recorded at the intake visit was a significant predictor in the multinomial model. Because thee was a non-significant trend in increasing number of medications across the three levels of participation (No Follow-up vs. Low Follow-up vs. High Follow-up), it is logical to consider that those who take more medications might feel more motivated to engage in lifestyle behavior change than those with fewer medications or might be in a later stage of readiness to change, especially as the threat of initiating medication can create a desire to engage in lifestyle behaviors (Hultgren, Jonasson, & Billhult, 2014; Peyrot et al., 2005). Another explanation could be that the physician might stress the importance of returning more for those patients taking more medications.

Anecdotally, patients at The Lifestyle Clinic cite the desire to come off of medications as a reason for participation, and number of medications should be considered an important consideration in determining who will utilize lifestyle appointments.

The Charlson Comorbidity Index was a significant predictor in three of the four logistic regression models, all showing that an increasing score is associated with less participation in lifestyle medical appointments. This might suggest that more ill patients find participation in a voluntary physician-recommended activity, like lifestyle medical appointments, harder to do, or comorbidity with depression might be making it more difficult to participate in any recommended follow-up. So, instead of serving as a cue to action, increasing level of disease might signify a barrier to participation in lifestyle appointments.

The finding that those who chose to participate in lifestyle IMAs for follow-up had a significantly higher BMI than those who had no lifestyle IMA follow-up might reflect that extremely obese individuals prefer privacy over a group environment for dealing with their chronic conditions, perhaps because IMAs might be perceived as a less threatening healthcare environment (Phelan et al., 2015). Another explanation might the strong link between depression and weight gain (Vogelzangs et al., 2008) confounds participation in lifestyle appointments, so that those who are depressed prefer one-on-one attention from the physician or find the group participation more difficult. Alternatively, as obese individuals are known to utilize primary care services more than non-obese individuals (Bertakis & Azari, 2005), it might mean that lifestyle IMAs appear more similar to standard primary care services than do lifestyle SMAs. Being sensitive to an individual's needs or wants in adopting lifestyle behaviors is important. Continuing to offer IMAs might allow

The Lifestyle Clinic to reach more extremely obese individuals in a more private and familiar clinical setting.

Family history was also significant at the bivariate level. This variable remained significant in the multivariate analysis with other variables controlled. More than half of the patients attending The Lifestyle Clinic had a positive family history of chronic conditions, and the presence of a family history differed significantly by level of participation and for participation in SMA follow-up appointments. This, and its significance in determining level of participation in follow-up appointments and participation SMA follow-up appointments in the regression models, might reflect its role as a cue to action (Glanz et al., 2008). Another explanation of the finding that family history is important to participation might be that if your risk is family history and not personal, you might be more willing to talk about it in a group setting. Identifying those patients with a family history might allow The Lifestyle Clinic determine who is more or less likely to participate in lifestyle appointments, and the lifestyle physicians might be able to better understand a patient's motivation for participation if a thorough family history is documented and explored.

The high percentage of patients seen at the intake visit by the Attending Physician over the Trainee Physician is likely a function of the Attending having substantially more clinical sessions than the Trainee, although it is possible that it might reflect experience or familiarity with a physician who is present at the clinic more often. Although it was found that the proportion of patients who participated in follow-up IMAs differed by intake physician, the validity of these results is questionable considering the small number of patients seen by the Trainee Physician at the intake visit. Yet, it might be possible that the Attending Physician was encouraging patients to follow-up in SMAs more than the Trainee, resulting in a smaller than expected number of patients who participated in an IMA follow-

up and in making Intake Physician a significant predictor in the multinomial and IMA models when the Personal/Social Modifying Factors variables are not included. However, the lack of significance within all of the logistic regression models when the Personal/Social Modifying Factors variables are included suggests that distinguishing between intake lifestyle physicians may not be a useful factor for determining participation in follow-up lifestyle services.

It is interesting to note that for those patients for whom data was available, all of the Personal/Social Modifying Factors variables demonstrated that, on average, patients self-reported worse than average for either the U.S. general population or for the calibrated sample of the PROMIS-29. Those who attend The Lifestyle Clinic start with poorer than average outcomes, and it seems that those individuals who report more anxiety and more depression can significantly impact level of participation and participation in SMAs. Although anxiety/depression, embedded within the number of chronic conditions variable, was not a significant predictor of participation in follow-up appointments, it should be noted this measure for anxiety/depression relied on documented ICD-9-CM codes recorded in the patients' problem lists and is unlikely to accurately reflect an individual's mood at the time of the intake visit. Additionally, the significant findings can be logically explained: those who report more anxiety might feel more compelled to do something about their current health status and follow-up with recommended lifestyle medical appointments, while those who report more depression might be less motivated or capable of following through on such recommendations. Considering that patients with diagnosed anxiety disorders tend to use more primary care and emergency services and report more medical illnesses (Deacon, Lickel, & Abramowitz, 2008; Harter, Conway, & Merikangas, 2003) and that even though depression patients tend to be high medical utilizers and have more chronic illness, they also

may delay important medical visits and recommended treatments (Katon, 2011), this logic holds. Similarly, those who reported low satisfaction in their social role were significantly less likely to participate in IMA follow-up appointments perhaps demonstrating that perceived social role can influence self-care behaviors like attending follow-up lifestyle appointments, especially one-on-one follow-up, which puts more attention on the individual (Nilsen, Bakke, Rohde, & Gallefoss, 2014).

Finally, when excluding the Personal/Social Modifying Factors to check for robustness of results, it is interesting to find that the variable, Race/Ethnicity, previously non-significant became significant in an additional model. This suggests that these variables, perhaps especially self-reported anxiety and depression, explain differences across racial and ethnic groups (Williams, Chapman, Wong, & Turkheimer, 2012). The robustness of Family History and BMI are demonstrated, as they stay significant in the models in which they were significant before.

Strengths and Limitations

This study is strong as it is a reflection of a real-world experience providing lifestyle services. Additionally, as it includes every adult patient that was seen in The Lifestyle Clinic during the specified time frame, it is comprehensive and does not suffer from selection bias. Although this study relied heavily on data recorded by a medical assistant or physician, the inclusion of self-reported data, such as the Personal/Social Modifying Factors, is a strong point for a medical record review. The study, though, has some weaknesses. The inclusion of a comparison population that did not participate in The Lifestyle Clinic would have been advantageous, as it would have added the dimension of understanding utilization and non-utilization of the intake visit. In addition, the small number of patients included might have affected the power to detect important differences. Given small sample sizes, this study was

unable to test whether determinants of follow-up were different for men and women or for whites and minorities. Additionally, this study has little external validity. In this setting, patients were largely of minority background and typically low-income. These findings may not hold in samples with higher incomes or different racial/ethnic backgrounds, given different resources and expectations regarding lifestyle change behaviors. Yet, a strength is that it provides specific information for The Lifestyle Clinic staff going forward.

Implications and Recommendations for Research and Practice

Real-world, clinic-based research that incorporates health behavior and health promotion theories is limited. Applying theories to understanding important clinical topics, such as utilization of services, is also important. Future research could extend the findings from this study, particularly by examining other settings, or by collecting larger samples. Future research in a clinic with a different patient population could test whether these findings hold true in other populations, as well. Future studies might also be able to investigate stratified samples. Larger samples would also be helpful for testing whether determinants vary by gender or race, and finding an ideal comparison group, perhaps those referred but who never arrived for a lifestyle appointment, might prove useful in determining other important factors that determine utilization. Additionally, exploring the use of tools in a research setting that specifically test the Health Belief Model in determining utilization of lifestyle appointments could prove valuable.

Tables

Table 1. Variables and their relationship to attendance at lifestyle appointments by modifying factors and cues to action constructs of the Health Belief Model along with variable definition

Construct Exposure Variable	Relationship to Attendance at Lifestyle Appointments and Variable Definition
Demographic	Persons of a certain age, gender, race/ethnicity, insurance status, or socioeconomic status might be more likely to participate in lifestyle appointments. For example, those with government insurance might be more likely to participate due to the lack of co-pays. Age (in years) is determined on day of intake. Median Income by Zip is determined by the median household income of the patient's zip code according to Census Bureau data. Gender and Race/Ethnicity are self-reported. Insurance is documented as in medical record but broken down by private/self-pay or government insurance.
Age	
Median Income by Zip	
Gender	
Race/Ethnicity	
Insurance	
Clinical/Cues to Action	Persons who use more medications, have a family history of an important chronic disease, or who suffer from more chronic disease might be more motivated to attend lifestyle appointments. Alternatively, those who have more disease burden might be less able to participate, or those with a single/new diagnosis might be more motivated to participate to ward off chronic disease. Number of medications is determined by the quantity of medications self-reported by the patient at the time of an intake visit. The Charlson Comorbidity Index is a validated, weighted measure of severe chronic conditions. Number of Other Conditions is an non-weighted index of hypertension, dyslipidemia, pre-diabetes, anxiety/depression, coronary artery disease, and obesity. BMI is calculated from the height and weight as documented at the intake visit. Family History is determined as a family history positive for hypertension, dyslipidemia, coronary artery disease, myocardial infarction, diabetes, stroke, chronic obstructive pulmonary disease, or chronic kidney disease as recorded in the intake note. The Intake Physician is determined by whether the Trainee or Attending Physician saw the patient and documented the intake visit.
Number of Medications	
Charlson Comorbidity Index	
Number Other Conditions	
BMI	
Family History	
Intake Physician	

Personal/Social	Persons with better physical function, satisfaction with social role and with less anxiety, depression, fatigue, sleep disturbance, and pain interference might be more able to participate in lifestyle appointments and the physician recommendations. Additionally, they might be in the "mood" or mental/physical state that will allow them to participate in lifestyle appointments. Alternatively, those with worse self-reported outcomes might be more motivated to engage in lifestyle appointments to help improve outcomes. These scores are determined by the PROMIS-29, a validated measure of these health outcomes in the U.S. population. The higher the score, the more of the concept that is measured for each variable captured with the PROMIS-29.
Physical Function	
Anxiety	
Depression	
Fatigue	
Sleep Disturbance	
Satisfaction with Social Role	
Pain Interference	

Table 2. Charlson Comorbidity Index and Total Possible Score as determined by ICD-9-CM diagnosis codes as recorded in the problem list at the intake visit (Charlson et al., 2008; Charlson et al., 1987; Deyo et al., 1992)

Condition/Disease State	**Points**
Myocardial Infarction	1
Congestive Heart Failure	1
Peripheral Vascular Disease	1
Cerebrovascular Disease	1
Dementia	1
Chronic Pulmonary Disease	1
Connective Tissue Disease-Rheumatic Disease	1
Peptic Ulcer Disease	1
Mild Liver Disease	1
Diabetes without complications	1
Diabetes with complications	2
Paraplegia and Hemiplegia	2
Renal Disease	2
Cancer	2
Moderate or Severe Liver Disease	3
Metastatic Carcinoma	6
AIDS/HIV	6
Total Possible Points	**33**

Table 3. Chronic Conditions Index (not defined by the Charlson Comorbidity Index, but important to patients of The Lifestyle Clinic) determined by ICD-9-CM diagnosis codes as recorded in the problem list at the intake visit

Condition/Disease State	**Points**
Hypertension	1
Dyslipidemia	1
Pre-diabetes	1
Anxiety/Depression	1
Coronary Artery Disease	1
Obesity	1
Total Possible Points	**6**

Table 4. Descriptive characteristics of patients attending intake lifestyle appointments as Mean (Standard Deviation) or Percent

	Descriptive Statistic	
Demographic		
Age (in years)	48.0	(12.9)
Median Income by Zip (in $)	58210	(19182)
Gender		
Male (in %)	11	
Female (in%)	81	
Race/Ethnicity		
White (in %)	12	
Black (in %)	76	
Hispanic (in %)	4	
Other (in %)	8	
Insurance		
Private/Self-pay (in %)	46	
Government (in %)	54	
Clinical/Cues to Action		
Number of Medications	6.5	(4.5)
Charlson Comorbidity Index	2.0	(2.6)
Number Other Conditions	2.2	(0.9)
BMI (in $kg/m^{2)}$	40.0	(8.3)
Family History (in %)		
No (in %)	46	
Yes (in %)	54	
Intake Physician		
Trainee (in %)	15	
Attending (in %)	85	
Personal/Social		
Physical Function (T-score)	46.1	(9.0)
Anxiety (T-score)	55.8	(10.6)
Depression (T-score)	52.9	(11.1)
Fatigue (T-score)	55.5	(10.3)
Sleep Disturbance (T-score)	53.4	(9.2)
Satisfaction in Social Role (T-score)	44.4	(10.9)
Pain Interference (T-score)	55.5	(11.1)

Table 5. Type of participation (Individual Medical Appointment (IMA) vs. Shared Medical Appointment (SMA)) in lifestyle medical appointments in percent

		Follow-up in Shared Medical Appointments (SMAs)	
		None	**1 or more**
Follow-up in Individual Medical Appointments (IMAs)	**None**	46	36
	1 or more	7	11

Table 6. Percent with Chronic Condition

Condition/Disease State	**Percent with Condition**
Myocardial Infarction	0
Congestive Heart Failure	1
Peripheral Vascular Disease	0
Cerebrovascular Disease	2
Dementia	0
Chronic Pulmonary Disease	8
Connective Tissue Disease-Rheumatic Disease	3
Peptic Ulcer Disease	0
Mild Liver Disease	1
Diabetes without complications	20
Diabetes with complications	4
Paraplegia and Hemiplegia	0
Renal Disease	6
Cancer	10
Moderate or Severe Liver Disease	1
Metastatic Carcinoma	0
AIDS/HIV	0
Hypertension	65
Dyslipidemia	31
Pre-diabetes	11
Anxiety/Depression	19
Coronary Artery Disease	3
Obesity	90

Table 7. Characteristics of patients as Mean (Standard Deviation) or Percent for Multinomial (Multi.) and Binomial (Bin.) Models

Outcome	No Follow-up		Low Follow-up		High Follow-up		Multi. Test Statistic	Multi. p-value[1]	Bin. Test Statistic	Bin. p-value[2]
Demographic	**(n=46)**		**(n=32)**		**(n=22)**					
Age (in years)	49.3	(12.9)	43.0	(11.7)	52.7	(12.6)	4.36	0.02	0.91	0.37
Median Income by Zip (in $)	58913	(21607)	57540	(16069)	57717	(18738)		0.95		0.74
Gender										
Male (in %)	9		8		2		2.16	0.34	0.02	0.89
Female (in%)	37		24		20					
Race/Ethnicity										
Non-Black (in %)	15		7		2		4.62	0.10	3.46	0.06
Black (in %)	31		25		20					
Insurance										
Private/Self-pay (in %)	23		15		8		1.13	0.57	0.55	0.46
Government (in %)	23		17		14					
Clinical/Cues to Action										
Number of Medications	5.9	(4.1)	6.1	(4.2)	8.0	(5.3)	1.83	0.17	-1.09	0.27
Charlson Comorbidity Index	0.8	(1.1)	0.7	(0.7)	0.9	(1.6)	0.19	0.70	0.36	0.84
Number Other Conditions	2.1	(0.8)	2.1	(1.0)	2.5	(0.9)	1.02	0.19	-0.95	0.41
BMI (in $kg/m^{2)}$	38.5	(8.7)	37.6	6.7	41.8	(9.2)	1.84	0.16	-0.48	0.64
Family History (in %)										
No (in %)	30		6		11		16.46	<0.001	11.35	<0.001
Yes (in %)	16		26		11					
Intake Physician										
Trainee (in %)	6		4		5		Fisher's	0.04	0.26	0.61
Attending (in %)	40		28		17					

Personal/Social	**(n=41)**		**(n=30)**		**(n=19)**					
Physical Function (T-score)	45.1	(8.6)	48.4	(9.1)	45.0	(9.8)	1.38	0.26	-1.04	0.30
Anxiety (T-score)	54.9	(10.8)	54.8	(10.5)	59.7	(10.1)	1.60	0.21	-0.81	0.42
Depression (T-score)	53.3	(11.2)	52.0	(10.9)	53.4	(12.0)	0.15	0.86	0.35	0.72
Fatigue (T-score)	54.5	(10.2)	56.1	(10.0)	57.0	(11.5)	0.45	0.64	-0.90	0.37
Sleep Disturbance (T-score)	52.6	(7.2)	53.4	(9.4)	55.2	(12.5)	0.54	0.58	-0.81	0.42
Satisfaction in Social Role (T-score)	45.5	(11.5)	45.4	(10.2)	40.8	(10.5)	1.35	0.26	0.80	0.43
Pain Interference (T-score)	56.3	(11.5)	53.8	(9.7)	56.3	(12.2)	0.51	0.60	0.67	0.51

[1] = Comparison across 3 subcategories of Attendees (Intake Only, Low Follow-up (1 or 2 follow-up visits), or High Follow-up (3 or more follow-up visits)), using Chi-square test of homogeneity of proportions (or Fisher's exact test) for categorical variables and one-way fixed effects ANOVA for continuous variables

[2] = Comparison across 2 subcategories of Attendees (Intake Only vs. Any Follow-up (1 or more follow-up visits)), using Chi-square test of homogeneity of proportions for categorical variables and t-tests for continuous variables

Table 8. Odds Ratios and corresponding p-values for four different logistic regression models evaluating the relationship of Demographic Modifying Factors, Clinical Modifying Factors/Cues to Action, and Personal/Social Modifying Factors to various outcomes. Two models investigate the number/level of participation in lifestyle follow-up appointments and two models investigate the type of participation in lifestyle follow-up appointments.

	Models based on number/level of follow-up appointments				*Models based on type of follow-up appointment*			
Outcome	**Multinomial: None vs. Low[1] vs. High[2, 3]**	**p**	**Binomial: None vs. Any[3]**	**p**	**No Individual vs. Any Individual[3]**	**p**	**No SMA vs. Any SMA[3]**	**p**
Demographic								
Age	1.00	0.87	0.98	0.40	0.93	0.18	0.98	0.36
Median Income by Zip	1.03	0.04	1.03	0.15	1.08	0.09	1.00	0.74
Gender								
Male	--	--	--	--	--	--	--	--
Female	2.54	0.19	1.22	0.82	51.58	0.08	0.81	0.81
Race/Ethnicity								
Non-Black	--	--	--	--	--	--	--	--
Black	4.30	0.04	5.07	0.06	0.48	0.67	8.65	0.02
Insurance								
Private/Self-pay	--	--	--	--	--	--	--	--
Government	1.01	0.98	0.87	0.83	0.03	0.04	2.28	0.20
Clinical/Cues to Action								
Number of Medications	1.17	0.02	1.18	0.06	1.65	0.04	1.16	0.07
Charlson Comorbidity Index	0.58	0.03	0.50	0.03	0.15	0.02	0.59	0.09
Number Other Conditions	1.49	0.17	1.39	0.34	2.79	0.14	1.57	0.19
BMI	1.03	0.33	1.00	0.64	1.23	0.03	0.98	0.69
Family History								

No	--	--	--	--	--	--	--	--
Yes	3.51	0.02	6.95	0.02	21.53	0.052	4.36	0.02
Intake Physician								
Trainee	--	--	--	--	--	--	--	--
Attending	0.23	0.06	0.28	0.16	0.005	0.02	0.25	0.15
Personal/Social								
Physical Function	1.05	0.23	1.03	0.47	1.15	0.22	1.06	0.23
Anxiety	1.16	0.001	1.21	0.02	1.30	0.07	1.12	0.03
Depression	0.87	0.002	0.87	0.02	0.70	0.04	0.92	0.12
Fatigue	0.99	0.80	1.02	0.61	0.94	0.49	1.02	0.73
Sleep Disturbance	1.02	0.50	1.00	0.98	0.98	0.83	1.03	0.56
Satisfaction in Social Role	0.95	0.13	0.96	0.40	0.72	0.03	1.03	0.54
Pain Interference	0.96	0.17	0.97	0.41	0.98	0.73	0.98	0.50

[1]= Low Follow-up defined as 1 or 2 appointments

[2]= High Follow-up defined as 3 or more appointments

[3]= Due to missingness of the Personal/Social Modifying Factors variables, the models were run without these variables to check for robustness. In the multinomial model, Family History stays significant (OR 2.41, 95% CL: 1.03, 5.63; p = 0.04), but Race/Ethnicity is additionally significant (OR 3.03, 95% CL: 1.02, 9.02; ($p<0.05$), while Number of Medications is no longer significant (p = 0.23). In the SMA model, Family History stays significant (OR 2.78, 95% CL: 1.08, 7.25; p = 0.03), but Race/Ethnicity is additionally significant (OR 4.50, 95% CL: 1.26, 16.10; p = 0.02). No meaningful changes in results for the Binomial or IMA models were found.

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