

DISSERTATION

MEDICAL STUDENT HEALTH BEHAVIORS
AND THE INFLUENCE ON PATIENT OUTCOMES

Submitted by

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ABSTRACT

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Purpose: Lifestyle habits are important risk factors for the development of cardiovascular disease, the leading cause of death in industrialized nations. The American Heart Association (AHA) and the National Cholesterol Education Program Adult Treatment Panel III (ATP III) recommend lifestyle changes as the primary and most cost-effective means of reducing the risk of coronary heart disease (CHD). Yet few physicians advise their patients about lifestyle modification. The main objective of this study was to determine if the nutrition and physical activity habits of medical students affect their patients' health behaviors on several important aspects of lifestyle modification: increased fruit, vegetable, and soy intake, and physical activity.

Methods: Third-year medical students at the University of Colorado School of Medicine were recruited to complete a pre- *Healthy Doc-Healthy Patient* survey upon entry into the required Rural and Community Care (RCC) and Adult Ambulatory Care (AAC) eight-week rotation. Medical students received training on administering the *Healthy Doc-Healthy Patient* surveys to patients, and training on CHD risk assessment and behavioral contracting. Students were required to give surveys to a total of eight patients during both RCC and AAC rotations. Patients in the AAC rotation received the CHD risk assessment and behavioral contracting. Post-surveys were given to patients,

with instructions to return in four weeks. No CHD intervention was given to patients in the RCC rotation. To determine if participation affected medical students' behaviors, students with pre-survey data completed a post-survey at the end of the eight-week rotation.

Results: Both pre- and post- surveys were completed by 66 medical students and 133 patients. No significant changes were seen in the medical students or patients between the pre- and post-surveys. Baseline moderate and mild exercise time for medical students significantly correlated with an increase in soy intake for their patients ($r=.52$, $p=0.02$; $r=.58$, $p=0.01$), and medical students' soy intake significantly correlated with an increase in patients' strenuous exercise time ($r=.52$, $p=0.01$). Other significant correlations were seen when stratifying by gender and specialty choice.

Conclusions: Although health behaviors of medical students and patients did not change, several significant correlations were seen between baseline dietary and physical activity habits of medical students and changes in their patients' dietary and physical activity habits. These results indicate that health behaviors of medical students may have an association with health behavior outcomes of patients whom they counsel. Future research is needed to examine the impact of medical students' health behaviors and how these behaviors impact patient outcomes.

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CHAPTER 1

INTRODUCTION

Project Rationale

Lifestyle habits are important risk factors for the development of cardiovascular disease (CVD), the leading cause of death in industrialized nations (Kimmons et al, 2009). The American Heart Association (AHA) and the National Cholesterol Education Program Adult Treatment Panel III (ATP III) recommend lifestyle changes as the primary and most cost-effective means of reducing the risk of coronary heart disease (CHD). The U.S. Preventive Services Task Force (USPSTF) found good evidence that medium- to high-intensity dietary counseling for patients with hyperlipidemia and other risk factors for CVD can produce medium to large changes in the intake of core components of a healthful diet (U.S. Preventive Services Task Force, 2002). The 2009 American Heart Association Pediatric and Adult Nutrition Guidelines (Gidding et al, 2009) recognize nutrition as the cornerstone of the effort to prevent the development of CVD.

Nutrition counseling is a supportive process that helps patients set priorities, establish goals, and create individualized action plans that foster responsibility for self-care (Spahn et al, 2010). Behavior change theories and models that have been validated within the health care field are integral to the nutrition care process. Use of these frameworks helps provide a rationale for helping providers understand external and internal issues, as well as the dynamics that lead to behavior changes. Cognitive behavioral therapy combined with motivational interviewing has been shown to lower

CVD risk and to improve diabetes outcomes in patients with type 2 diabetes (Spahn et al, 2010; West et al, 2007).

The USPSTF report concludes that nutrition counseling is likely to improve health outcomes if it is delivered by a team that includes dietitians and specially trained primary health care professionals. Several studies have demonstrated that medical nutrition therapy (MNT) delivered by a registered dietitian led to beneficial clinical and financial outcomes in patients with hyperlipidemia (Sikand et al, 2000; Rhodes et al. 1996; Hebert et al, 1999).

Primary care physicians have contact with 60% to 70% of the U.S. adult population each year, and physicians are a respected source of lifestyle modification information (Olendzki, 2006). Although 70% of patients seen by primary care physicians have one or more chronic diseases that could be prevented or treated with lifestyle counseling (Rothman et al, 2003), only 38% of physicians report providing any nutrition counseling for their patients (Frank et al, 2000). Physicians report lack of time, patient noncompliance, inadequate teaching materials, lack of counseling training, lack of nutrition knowledge, inadequate reimbursement, and low physician confidence as reasons why they do not conduct nutrition counseling with their patients (Kushner, 1995). An insufficient amount of nutrition education provided during medical school has been reported by medical students. In the 2003 American Association of Medical Colleges' (AAMC, 2003) medical student exit survey, only 46% of students nationally felt that appropriate time was devoted to disease prevention or nutrition education during their four years of medical school.

Health behaviors of medical students and physicians have been shown to affect their nutrition counseling frequency and confidence with their patients (Frank et al, 2000; Howe et al, 2009; Abramson et al, 2000; Spencer et al, 2006). Implementing a focused nutrition and behavior change curriculum into medical school curricula also has been shown to improve medical students' fat intake and to improve their overall health behaviors (Conroy et al, 2004; Kushner et al, 2011). No studies have been published on the topic of medical student and/or physician health behaviors and the impact on patient health behavior outcomes.

The purpose of this study was to determine if the dietary and physical activity habits of medical students would have an association with the dietary and physical activity habits of the patients whom they counseled during their eight-week Rural and Community Care (RCC) and Adult Ambulatory Care (AAC) rotation. The RCC and AAC rotation is a requirement for all third-year medical students at the University of Colorado School of Medicine (CU-SOM).

Definition of Terms

Adult Ambulatory Care Rotation. A required four-week outpatient rotation for medical students at an internal medicine specialty clinic in the Metro Denver area. The Adult Ambulatory Care rotation is part of the primary care rotation.

Primary Care Rotation. The combined eight-week rotation for Rural and Community Care and Adult Ambulatory Care.

Rural and Community Care Rotation. A required four-week outpatient rotation for medical students at a family medicine specialty clinic in rural Colorado. The Rural and Community Care rotation is part of the primary care rotation.

Delimitations

This study was delimited to the following:

1. Medical students consisting of the 108 students enrolled in the eight-week required Primary Care Rotation at the University of Colorado School of Medicine between August 2010 and April 2011.
2. 765 patients seen by the 108 medical students during their eight-week Primary Care Rotation.
3. The timeline for this investigation was August 2010 to April 2011.

Limitations

This study was subject to the following potential limitations:

1. The participants represented a convenience sample.
2. Self-report measures were used.

Assumptions

The following assumptions were made for this study:

1. The participants answered questions honestly and to the best of their ability.
2. All instruments and measures were generally understandable.

CHAPTER 2

REVIEW OF LITERATURE

This chapter reviews the literature relevant to the issues of nutrition counseling and the role of medical students and physicians in the provision of nutrition and health behavior change counseling to their patients. The chapter is organized into the following sections: a review of the guidelines for nutrition counseling for prevention and treatment of coronary heart disease and benefits for patients; sources of patient nutrition education for coronary heart disease prevention and treatment; physician adherence to nutrition and physical activity guidelines; physician and medical student current patient nutrition education practices; behavior change theories and strategies for coronary heart disease prevention and treatment for nutrition counseling; and a summary; and study hypothesis and study objectives.

Guidelines for Nutrition Counseling for Prevention and Treatment of Coronary Heart Disease and Benefits for Patients

Nutrition research over 30 years has resulted in international consensus regarding the role of diet and lifestyle modification for the prevention of coronary heart disease (CHD) (Wood, 1998; Department of Health, 1994). Evidence demonstrates that on a population level, small reductions in blood cholesterol, achieved through a change in diet, can contribute a significant reduction in the level of morbidity and mortality from CHD (Law et al, 1994). The most current nutrition guidelines from the American Heart Association (AHA) for pediatric and adult populations (Gidding et al, 2009) emphasize

the benefit of adopting a heart-healthy nutrition pattern at a young age. The AHA guidelines for diet for both children and adults include these goals: aim for a healthy body weight and recommended levels of blood lipids and lipoprotein, blood pressure, and glucose; and consume diets rich in vegetables and fruits, whole grains, low-fat and nonfat dairy products, legumes, fish, preferably oily fish (at least two times per week), and lean meat, coupled with food choices that minimize intakes of excess energy, saturated fat, *trans* fat, and salt ingestion. Specific guidelines for fat intake are to limit: saturated fat to <7% of energy, *trans* fat intake to <1% of energy, and cholesterol to <200 mg/day. In addition, the AHA diet guidelines emphasize the importance of focusing on the overall diet quality (dietary pattern) rather than individual foods or nutrients, balancing energy intake and expenditure, engaging in regular physical activity, and the increasing importance of following the ADA diet recommendations when eating outside the home.

The National Cholesterol Education Program Adult Treatment Panel III (ATP III) (Expert Panel, 2001) recommends lifestyle change as the primary and most cost-effective means of reducing the risk of CHD. The ATP III approach to reduce risk for CHD is designated *therapeutic lifestyle changes* (TLC). Essential features of the TLC guidelines includes: reduced intakes of saturated fats (<7% of total calories) and cholesterol (<200 mg/day); polyunsaturated fat intake up to 10% of calories; monounsaturated fat intake of up to 20% of total calories; total fat 25% to 35% of total calories; carbohydrate intake of 50% to 60% of calories; fiber intake of 20 to 30 grams/day; protein intake of approximately 15% of total calories; and total calories (energy) to balance intake and expenditure to maintain a desirable body weight and to prevent weight gain.

In addition to the recommendations from the AHA and the TLC guidelines, evidence indicates that persons who consume more fruits and vegetables often have lower prevalence of important risk factors for CHD, including hypertension, obesity, and type 2 diabetes (Ignarro et al, 2007). Some large, prospective studies have shown a direct inverse association between fruit and vegetable intake and the development of CHD incidents and stroke (Bazzano et al, 2003; Houston, 2005). However, the biological mechanisms by which fruits and vegetables may exert their effects are not completely clear, and likely act through multiple mechanisms. Many nutrients and phytochemicals in fruits and vegetables, including fiber, potassium, and folate, could be independently or jointly responsible for the reduction in CHD risk (Bazzano et al, 2003; Houston, 2005). There also are functional aspects of fruits and vegetables, such as their low dietary glycemic load and energy density which may play a role in the reduction of CHD risk factors.

The U.S. Preventive Services Task Force (USPSTF) also concurs with the AHA and The National Cholesterol Education Program findings that the majority of studies show people consuming diets low in fat, saturated fat, trans-fatty acids, and cholesterol, and high in fruits and vegetables, and whole grain products containing fiber have lower rates of morbidity and mortality from CHD, and possibly from several forms of cancer. Despite well-established benefits of consuming a healthful diet, more than 80% of Americans of all ages eat fewer than the recommended daily servings of fruits, vegetables, and whole grain products (Kimmons et al, 2009). There is evidence to support behavioral counseling in primary care to promote a healthful diet (U.S. Preventive Services Task Force, 2002). Additionally, the dietary counseling practices of

primary care clinicians indicate limited attention to diet modification. In a 1999-2000 survey of U.S. adults, 33% of respondents reported past year physician advice to eat more fruits and vegetables, and 29% reported similar advice to reduce dietary fat (Glasgow et al, 2001; Kreuter et al, 2000).

Based on the benefits of consuming a healthful diet for reduction of CHD risk factors, the USPSTF issued a “B Recommendation,” stating “...intensive behavioral dietary counseling for adult patients with hyperlipidemia and other known risk factors for cardiovascular and diet-related chronic diseases. Intensive counseling can be delivered by primary care clinicians or by referral to other specialists, such as nutritionists or dietitians.” The USPSTF concludes that such counseling is likely to improve important health outcomes and that benefits outweigh potential harms (U.S. Preventive Services Task Force, 2002).

Sources of Patient Nutrition Education for Coronary Heart Disease

Prevention and Treatment

Registered dietitians (RDs) are specifically trained to deliver medical nutrition therapy (MNT) to reduce CHD risk factors. MNT is defined as “nutritional diagnostic, therapy, and counseling services for the purpose of disease management, which is furnished by an RD or nutrition professional (Denke, 1994). The components of MNT provided by an RD, according to the Nutrition Care Process (Denke, 1994), include: 1) a comprehensive nutrition assessment using the best available current knowledge and evidence, client data, medical record data, and other resources; 2) nutrition diagnosis; 3) nutrition intervention which includes counseling, and with the client, determining interventions using the cognitive behavioral model, including problem solving,

motivational interviewing, goal setting, and self-monitoring; 4) nutrition monitoring and evaluation including monitoring relevant lab values, and goals for food plan/intake, activity, and other behavior changes; 5) nutrition documentation which includes all steps of the Nutrition Care Process; and 6) outcome management systems, based on the RD analysis, critical thinking and review of data from the patient's medical history and other health professionals. The RD aggregates individual and population outcomes data, analyzes and shares with quality improvement department/group as indicated, and implements improvements to MNT services based on results (Bae et al, 1993).

Several studies have demonstrated the efficacy of MNT for the reduction of CHD risk factors (Rhodes et al, 1996; Hebert et al, 1999; Sikand et al, 2000). Sikand et al found that MNT administered by RDs lowered levels of total cholesterol by 11%, low-density lipoprotein cholesterol by 9%, and triglycerides by 22%, and body mass index by 2%; and MNT raised high-density lipoprotein cholesterol by 4%. After the RD-led intervention, 15 of 30 eligible patients no longer required antihyperlipidemic medications, which led to an annual cost savings of \$27,449.10, or \$638.35 per patient.

Two studies compared nutrition counseling for CHD risk factor reduction delivered by either an RD or a physician. Rhodes et al (1996) compared the effect of the addition of MNT administered by RDs with usual physician counseling on nutrition knowledge, attitudes regarding dietary change, body mass index, dietary intake, and lipid and lipoprotein concentrations during initial management of persons at risk for CVD. Results from this study demonstrated that: the group receiving MNT from an RD gained significantly more nutrition knowledge; had significantly greater perceptions of the benefits and efficacy of following a cholesterol-lowering diet; consumed a significantly

lower percentage of fat, higher percentage of carbohydrate, and less dietary cholesterol than did subjects counseled only by a physician. They also had significantly greater improvements in body mass index, although both groups achieved statistically significant reductions in serum lipid levels.

Hebert et al (1999) examined the effectiveness of a dietitian-based nutrition counseling and education program for patients with hyperlipidemia compared to a physician-delivered intervention. The dietitian-led group saw significant additional reductions in saturated fat intake, total fat intake, a 4% decrease in low-density lipoprotein cholesterol, and body weight over the physician-delivered intervention.

Although RDs are recognized as nutrition experts, and studies have demonstrated their efficacy in providing MNT to reduce CHD risk factors, not all patients have the ability to consult with nutrition professionals because of limited availability and lack of reimbursement for services in some cases. Primary care physicians, on the other hand, have contact with 60% to 70% of the U.S. adult population each year (USDA Dietary Guidelines for Americans, 2000). The public also view physicians as a respected source of lifestyle modification information (Olendski, 2006). Several organizations have recognized the need for physicians to counsel patients on lifestyle factors for CHD risk reduction. One of the objectives of the U.S. Department of Health and Human Services *Healthy People 2020* (objectiveNWS-6; HP2020) is to increase the proportion of physician office visits that include counseling or education related to nutrition or weight (Department of Health and Human Services *Healthy People 2020*). The Healthy People 2020 objectives also include an emphasis on physician education on prevention. Healthy People 2020 objective ECBP-11 states “increase the inclusion of core clinical prevention

and population health content in M.D. granting medical schools” (Department of Health and Human Services *Healthy People 2020*). The Institute of Medicine also emphasized physician well-being and the need to teach medical students how to care for themselves, in its 2004 report on “Improving Medical Education: Enhancing the Behavioral and Social Science Content of Medical School Curricula” (Institute of Medicine, Board of Neuroscience and Behavioral Health, 2004).

However, physicians face several barriers to counseling their patients about nutrition, including limited training and understanding of nutrition. Kushner et al (1996) identified several physician-perceived barriers to delivery of dietary counseling, including: lack of time; patient noncompliance; inadequate teaching materials; lack of counseling training; lack of nutrition knowledge; inadequate reimbursement; and low physician confidence.

Physician Adherence to Nutrition and Physical Activity Recommendations

Studies have shown that as a group, physicians have healthier lifestyles and lower mortality rates than the general public (Frank, 2004; Williams, 1971). Williams et al conducted a study examining three Harvard Medical School classes, and found that, at all points assessed, physicians had lower cumulative mortality than did other U.S. white men. Frank et al examined the health habits of women physicians in the Women Physicians’ Health Study (WPHS) and found that physicians have very good health habits compared with the general public, even when compared with other individuals of high socioeconomic status (SES). Women physicians had significantly lower rates for smoking and reported less alcohol per episode than other women. Female physicians

reported a similar score for mean fruit and vegetable intake as those women from high SES (3.5 and 3.8, respectively).

Howe et al (2010) studied lifestyle characteristics for attending physicians and medical trainees (residents and fellows). Both groups reported intake for average daily fruit and vegetable servings below the national recommendation of 5 servings per day (3.8 for trainees and 4.8 for physicians). In addition, only 7.8% of trainees and 25.9% of physicians reported engaging in ≥ 150 minutes of aerobic exercise per week (the Surgeon General guideline).

Physician and Medical Student Current Patient Nutrition Education Practices

Recent studies have demonstrated that a physicians' or medical students' health habits have an association with patient lifestyle counseling (Frank et al, 2006; Abramson et al, 2000; Howe et al, 2009). The U.S. Women Physicians' Health Study (WPHS) found that women physicians complying with the Centers for Disease Control/ American College of Sports Medicine (CDC/ACSM) physical activity recommendations were more likely to counsel their patients on exercise (Frank et al, 2000). In another study, Howe et al found for medical trainees (residents and fellows) and attending physicians, predictors of confidence in counseling patients for exercise included the provider's own exercise time of >150 minutes per week (Howe et al, 2010). Abramson et al (2000) also found that physicians who exercised more were more likely to counsel their patients to exercise.

In addition, patients care about their physicians' health habits. In a study conducted by Frank (2004), patients who saw a video of a physician giving advice about diet and exercise reported that the physician was more believable and motivating if she or he disclosed her or his own healthful personal behaviors (Frank, 2004). This study also

found that physicians who reported healthful personal behaviors were more likely to discuss preventive behaviors with their patients.

Potential reasons for the lack of nutrition counseling by physicians have emerged through several studies. In a national study looking at the personal exercise habits and counseling practices by primary care physicians (Abramson et al, 2000), inadequate time was noted by 61% of the respondents, and inadequate knowledge or experience by 16% of the respondents, as the major barriers to counseling regarding aerobic exercise. Lack of adequate training in nutrition education and counseling is demonstrated by data obtained from medical students. In the 2003 American Association of Medical Colleges' (AAMC) medical student exit survey, only 46% of students nationally felt that appropriate time was devoted to disease prevention or nutrition education during their four years of medical school (AAMC Graduation Survey, 2003). The University of Colorado School of Medicine (UC-SOM) graduates' responses to this same exit survey mirrored this opinion by reporting, as recently as 2005, that only 42.6% felt that adequate time was spent on nutrition or disease prevention (UC-SOM Graduation Survey, 2005).

Recent studies have shown that training interventions may improve both medical students' personal dietary behaviors and their prevention counseling attitudes (Spencer et al, 2006; Howe et al, 2010; Conroy et al, 2004). The study by Spencer et al in 2006 examined medical students' perceived relevance of nutrition counseling, reported frequency of nutrition counseling, and frequency of fruit and vegetable intake. This study included 2316 medical students at 16 U.S. medical schools who were surveyed and tracked over their four years of medical school training. Results showed that female medical students were significantly more likely to find nutrition highly relevant,

consumed more fruit and vegetables, believed in primary prevention, and had personal physicians who encouraged disease prevention, or intended to specialize in primary care. Only 19% of students believed that they had been adequately trained in nutrition counseling, and only 17% of seniors reported that they frequently counseled their patients about nutrition. Howe et al found that only 13% of medical trainees, and 24% of attending physicians agreed with the following statement: “I received adequate training in lifestyle counseling patients.”

Conroy et al published a study in 2004 that evaluated the impact of a preventive medicine and nutrition curriculum on medical students’ confidence about addressing patients’ diet and exercise patterns on their own health habits. The students completed a survey before and after the course that assessed diet and exercise habits and confidence in their ability to address diet and exercise with patients and their family members. Results from this study showed that students’ confidence in their ability to assess and counsel patients about diet and exercise significantly improved after the course ($p < 0.001$). The course also was associated with a decrease in the students’ self-reported consumption of saturated fat ($p = 0.002$) and trans fatty acids ($p < 0.001$); 72% of students perceived an improvement in their diet, but only 18% perceived an improvement in exercise habits.

Behavior Change Theories and Strategies for Coronary Heart Disease

Prevention and Treatment for Nutrition Counseling

Nutrition counseling is a supportive process that helps patients and clients set priorities, establish goals, and create individualized action plans that fosters responsibility for self-care (Curry et al, 1998). Behavior change theories and models that have been validated within the health care field are integral to the nutrition care process. Use of

these frameworks helps formulate a rationale for assisting providers to understand external and internal issues, and the dynamics that lead to behavior changes.

The American Dietetic Association Evidence Analysis Library Nutrition Counseling Workgroup conducted a systematic review of peer-reviewed literature related to behavior change theories and strategies used in nutrition counseling (Spahn et al, 2010). Results of this review showed that cognitive behavioral theory (CBT) of greater than 18 months duration facilitated modification of dietary habits and weight to lower cardiovascular risk. Cognitive behavioral theory is one of the oldest and most tested behavior-change theories used in nutrition counseling (Skinner, 1938; Skinner, 1969; Beck, 1993). The National Heart, Lung, and Blood Institute, and the American Diabetes Association, both recommend behavioral therapy for overweight clients (National Heart, Lung, and Blood Institute, Accessed 2011; The American Diabetes Association, 2008). CBT theory is based on the assumption that behavior is learned and can be unlearned by using a variety of cognitive and behavioral strategies (Skinner, 1938; Skinner, 1969; Beck, 1993). CBT focuses on both external factors such as environmental cues, and internal factors such as thoughts and thinking.

Specifically for cardiovascular disease, four large, high-quality randomized clinical trials found that CBT facilitated modifications of body weight to lower cardiovascular disease risk (Stevens et al, 2001; Elmer et al, 2006; Howard et al, 2006; Kuller et al, 2001). The two Trials of Hypertension Prevention (Phase II and the PREMIER trial) demonstrated that, in middle-aged men and women with pre-hypertension or stage 1 hypertension, implementation of CBT produced significant and positive effects for improving dietary habits, weight, and risk for hypertension, when

compared with an advice-only group (Stevens et al, 2001). The implementation of CBT also was examined in the Women's Health Initiative Randomized Controlled Dietary Modification Trial and the Women's Healthy Lifestyle Project (Howard et al, 2006; Kuller et al, 2001). Significant benefits for perimenopausal or postmenopausal women, for dietary intake, weight, waist circumference measures, and lipid levels, were found in the CBT group compared with a control group. For studies of less than 12 months, CBT was found to produce significant reductions in cardiovascular risk factors, including weight, body composition, and lipid levels (Sebregts et al, 2003; Volek et al, 2002).

Motivational interviewing (MI) is a client-centered technique designed to elicit behavior change by assisting clients to explore and resolve ambivalence to change (Miller et al, 2002; Miller et al, 2006). MI was first introduced by Miller and Rollnick as a treatment for alcohol abuse. Dietetic professionals frequently use MI to partner with clients to determine the agenda using empathetic, nonjudgmental, supportive, encouraging, and active listening behaviors (West et al, 2007). Open-ended questions, reflective listening, affirmations, and summarization are used to help clients explore and resolve ambivalence and barriers to behavior change.

MI received a "Grade 1" (good evidence, ADA Evidence Analysis Library, 2011) assignment as an added component to cognitive- behavioral programs or as a self-help intervention (Spahn et al, 2010). Four studies found that MI significantly enhanced adherence to program recommendations and improved targeted diet-related outcomes, including glycemic control, percentage of energy intake from fat, fruit and vegetable intake, and weight loss. MI as a sole style of intervention received a "Grade III" (limited

evidence) (Spahn et al, 2010) as it had little added effect compared to standard therapy. Further research with this counseling strategy is needed to determine efficacy.

Goal setting is collaboration between the client and dietetic professional, by which the client determines from a number of potential courses of action what he or she is willing to do (American Dietetic Association, 2009). Goal setting is an important component of MI, CBT, and social cognitive theory. The AHA also recommends utilization of goal setting as part of implementing nutrition advice for reduction of CHD risk factors (Gidding et al, 2009).

Experiential learning theory (ELT) defines learning as "...the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (Kolb, 1984). ELT is frequently used as an educational method, as it engages the learner through learning by experience (Itin, 1999).

Summary

Research demonstrates the efficacy of nutrition counseling for reduction of CHD risk factors for patients (Adult Treatment III, 2002; U.S. Preventive Services Task Force, 2002; Gidding et al, 2009). Registered dietitians are regarded as nutrition experts, and research conducted with MNT administered by an RD has shown significant reduction in CHD risk factors (Sikand et al, 2000; Rhodes et al, 1996; Hebert et al, 1999). However, physicians see 60% to 70% of the U.S. adult population each year, and physicians are a respected source of lifestyle modification information (Olendzki, 2006). Physicians and medical students report many barriers to providing nutrition counseling to their patients, including lack of adequate training (Kushner, 1996; Howe, 2009). Several studies have

shown that personal health behaviors of medical students and physicians have an effect on their lifestyle counseling practices with their patients (Frank et al, 2000; Howe et al, 2009; Abramson et al, 2000; Spencer et al, 2006). Research is needed to examine the correlation between medical student health behaviors and how these elements affect health behavior outcomes of the patients whom they counsel regarding CHD risk reduction.

Hypothesis and Research Questions

The hypothesis for this study was that medical students with the healthiest baseline lifestyle behaviors (servings/day of fruits, vegetables, and soy, and minutes/day of physical activity) would facilitate a corresponding increase in these behaviors in the patients they counseled during the eight-week primary care rotation. The null hypothesis was that the medical students with the healthiest baseline lifestyle behaviors would have no effect on health behavior change in their patients. Although there have been several studies examining the association of physicians' and medical students' diet and physical activity habits on nutrition and physical activity counseling with their patients, there have not been any published studies correlating these behaviors with actual patient outcomes. This study was based upon experiential learning theory, cognitive behavioral therapy, motivational interviewing, and goal setting. Experiential learning theory was utilized for how the medical students implemented the patient CHD risk assessment; and CBT, motivational interviewing were utilized for the behavioral contracting intervention.

Research Questions

The following research questions were addressed in this study:

1. What are the baseline health behaviors of third-year medical students for fruit, vegetable, and soy intake; and intensity, duration, and frequency for physical activity?
2. What are the baseline health behaviors of patients seen by medical students during the eight-week primary care rotation for fruit, vegetable, and soy intake; and intensity, duration, and frequency for physical activity?
3. Do the baseline health behaviors of third-year medical students for fruit, vegetable, and soy intake, and intensity, duration, and frequency for physical activity, affect these same health behaviors in the patients they counsel during their eight-week primary care rotation?
4. What changes occur in these health behaviors for medical students over an eight-week primary care block which includes two 90-minute lectures on nutrition and preventive health?
5. What changes occur in patient health behaviors after receiving coronary heart disease risk assessment, motivational interviewing, and behavioral contracting and goal setting; or receiving no counseling from medical students?
6. What differences occur between patients living in a rural location in Colorado for changes in health behaviors (fruit, vegetable, and soy intake; and intensity, duration, and frequency for physical activity) compared with patients living in an urban location (Metro Denver)?

7. What differences occur between male and female medical students for fruit, vegetable, and soy intake, and intensity, duration, and frequency for physical activity? And would these changes affect their patients' health behavior outcomes?
8. What differences occur between medical students planning to specialize in primary care or a subspecialty for fruit, vegetable, and soy intake, and intensity, duration, and frequency for physical activity? And would these changes affect their patients' health behavior outcomes?

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CHAPTER 3

PRELIMINARY STUDY

This chapter describes the methods used in the preliminary study, *Implementation of a Coronary Heart Disease Curriculum into a Third Year Medical School Primary Care Rotation*. It is organized into the following sections: Study Design, Participants and Recruitment, Instruments and Procedures, Learning Theories and Validity, Procedures, Data Analysis, and References.

Study Design

In 2006, the University of Colorado School of Medicine (CU-SOM) Department of Family Medicine (DFM) received funding from the Colorado Department of Public Health and Environment to develop and implement a coronary heart disease (CHD) prevention and treatment curriculum to be delivered to third-year medical students during their required primary care (RCC/AAC) eight-week rotation. This study was conducted over a three-year period (August 2006 to June 2009). A pre-post survey design was used to determine changes in medical students' knowledge and counseling practices for CHD risk and smoking cessation with patients, patient satisfaction with the CHD risk assessment and behavioral counseling session, and changes in self-reported total fat, saturated fat, body weight, physical activity, and efforts for smoking cessation. Pre- and post- surveys were administered, via an online survey program ("SurveyMonkey," 2007), to medical students enrolled in the required eight-week Primary Care rotation at the CU-SOM DFM. Surveys were administered to patients by medical students by giving the

patient an initial postcard and a four-week follow-up postcard during the office visit. Patients were asked by the medical student to return the initial postcard by mail within the week after the CHD risk assessment session conducted at the office visit, and to return the follow-up postcard by mail four weeks later. Each postcard was self-addressed and stamped and returned to the study team at the CU-SOM DFM.

Participants and Recruitment

CU-SOM medical students enrolled in the required eight-week Primary Care Rotation, consisting of four weeks in the Rural and Community Care (RCC) rotation and four weeks in the Adult Ambulatory Care (AAC) rotation, and 10 patients for each medical student, participated in this study. Patient participants were recruited by medical students during both the 4-week RCC and the 4-week AAC rotations. Medical students were asked to recruit patients who were at risk of CHD (family history; age ≥ 60 years; body mass index ≥ 30 kg/m²; known hypertension or hyperlipidemia, or coronary artery disease; or current smoker). Students were required, as part of the curriculum, to have five patients during both the RCC and the AAC rotations (a total of 10 patients per medical student) complete the CHD Risk Assessment and the initial postcard, and to provide patients with the follow-up postcard. Medical students were instructed to encourage the patient to complete the follow-up postcard four weeks after the office visit.

Instruments and Procedures

Learning Theories

Several intervention methods were used in this study. These include the Framingham 10-year coronary heart disease risk assessment, *The Coronary Heart Disease Risk Score Card* (nutrition and lifestyle behavioral counseling), The Therapeutic

Lifestyle Change guidelines, step counters, and initial and follow-up surveys administered via postcards. All patient handouts are in Appendix A: Framingham 10-year coronary heart disease risk assessment, *The Coronary Heart Disease Risk Score Card*, and The Therapeutic Lifestyle Change guidelines.

The Framingham 10-year coronary heart disease risk assessment (Wilson et al, 1998) is a validated tool which estimates 10-year risk of developing CHD. This assessment is a coronary disease prediction algorithm that was developed using categorical variables, which allow a physician or other health care provider to predict multivariate CHD risk in patients without overt CHD. This algorithm assesses age, smoking status, blood pressure categories, total cholesterol categories, and LDL cholesterol categories. In 2001, DeAgostino et al validated the use of the Framingham CHD risk algorithm in blacks and whites in different settings, and found that it may be applied to other ethnic groups after recalibration for differing prevalence of risk factors and underlying rates of CHD events. A recent systematic review of studies examining the effect of giving CHD risk information to adults (Sheridan et al, 2010) found that this information seems to improve the accuracy of risk perception and may increase intent to initiate CHD prevention among individuals at moderate to high risk.

The Therapeutic Lifestyle Change (TLC) guidelines are evidence-based guidelines to reduce CHD risk factors (Expert Panel, 2001). The National Cholesterol Education Program Adult Treatment Panel III (ATP III) (Expert Panel, 2001) recommends lifestyle changes as the primary and most cost-effective means of reducing the risk of CHD. The ATP III approach to reduce risk for CHD is designated *therapeutic lifestyle changes* (TLC). Essential features of the TLC guidelines includes: reduced

intakes of saturated fats (<7% of total calories) and cholesterol (<200 mg/day); polyunsaturated fat intake up to 10% of calories; monounsaturated fat intake of up to 20% of total calories; total fat 25% to 35% of total calories; carbohydrate intake of 50% to 60% of calories; fiber intake of 20 to 30 grams/day; protein intake of approximately 15% of total calories; and total calories (energy) to balance intake and expenditure in order to maintain a desirable body weight and to prevent weight gain.

Development of The *Coronary Heart Disease Risk Score Card* involved implementation of several evidence-based strategies for nutrition and behavioral counseling. There is evidence to support behavioral counseling in primary care to promote a healthful diet for adult patients with hyperlipidemia and other known risk factors for cardiovascular disease and diet-related chronic disease (U.S. Preventive Services Task Force, 2002). The U.S. Preventive Services Task Force (USPSTF) also concurs with the American Heart Association (AHA) and The National Cholesterol Education Program findings that the majority of studies show people consuming diets low in fat, saturated fat, trans-fatty acids, and cholesterol, and high in fruits and vegetables, and whole grain products containing fiber have lower rates of morbidity and mortality from CHD, and possibly from several forms of cancer.

(<http://www.ahrq.gov/clinic/3rduspstf/diet/diettr.htm>).

Based on the benefits of consuming a healthful diet for reduction of CHD risk factors, the USPSTF issued a “B Recommendation,” which means that “intensive behavioral dietary counseling is warranted for adult patients with hyperlipidemia and other known risk factors for cardiovascular and diet-related chronic diseases. Intensive counseling can be delivered by primary care clinicians or by referral to other specialists,

such as nutritionists or dietitians.” The USPSTF concludes that such counseling is likely to improve important health outcomes and that benefits outweigh potential harms (U.S. Preventive Services Task Force, 2002).

Several counseling theories and strategies have been shown to enhance client adherence to a nutrition and physical activity plan and improve CHD risk factors. Cognitive behavioral therapy (CBT), motivational interviewing, and goal setting all have shown efficacy as nutrition counseling strategies to decrease patient CHD risk factors (Spahn et al, 2010; West et al, 2007). Each of these strategies was used in the development of *The Coronary Heart Disease Risk Score Card*.

Increased physical activity is associated with improvements in CHD risk factors (Alevizos et al, 2005, Miller et al, 1997). Due to the extensive health benefits of physical activity, the Department of Health and Human Services recommends “physical activity most days of the week for at least 30 minutes for adults” (Surgeon General’s healthy weight advice for consumers, 2005). The U.S. Department of Health and Human Services 2008 Physical Activity Guidelines for Adults recommends two hours and 30 minutes of moderate intensity activity, or 75 minutes of vigorous intensity activity aerobic exercise each week. Step counters (pedometers) are small, relatively inexpensive devices worn at the hip to count the number of steps walked per day. Some physical activity guidelines specifically recommend taking 10,000 steps per day (Tudor-Locke et al, 2004). A recent systematic review of the use of pedometers to increase physical activity and improve health (Bravata et al, 2007) found that the use of pedometers is associated with significant increases in physical activity and significant decreases in body mass index and blood pressure.

The patient initial and follow-up postcards were based on earlier studies examining the impact of medical student education programs and their effect on patient care (Nieman et al, 2005; Sifuentes et al, 2002). Sifuentes et al found that including a smoking cessation counseling module into a family medicine medical school third-year rotation was effective in changing both student and physician-teacher counseling for smoking cessation. The smoking cessation counseling led to a significant decrease in reported tobacco use among patients. The study concluded that preclinical medical students can successfully learn and practice patient-centered screening and smoking cessation counseling skills in a community setting, and that it provides a value added service in a busy office. Another study (Nieman et al, 2005) implemented a diabetes foot care program into a family medicine medical school third-year rotation, and showed a significant increase in the number of patient foot exams performed. Nieman et al used patient postcards to determine if their patients found value in the care they received from the medical students. The results of the use of patient postcards showed that 90% of patients found value in the care they received from the medical student. The patient initial postcards and the follow-up postcards used in the preliminary study were modeled after the postcards used in the Nieman et al study. The patient initial and follow-up postcards may be found in Appendix B.

Instrument Validity

All study instruments were piloted for six months with the medical students and patients. To receive feedback from the medical students, an online survey was sent out to each student to assess usability of the Framingham 10-year CHD risk assessment, *The Coronary Heart Disease Risk Score Card*, and the TLC guidelines. Based on survey

results, changes were made to each handout, including re-wording the initial patient postcard to lower the reading level to an eighth-grade level, and adding a “priority” column on *The Coronary Heart Disease Risk Score Card*, “My Personalized Treatment Goals” section.

Patient initial and follow-up postcards were piloted for a period of six months. Approximately 100 postcards were distributed, and 40 initial postcards and 19 follow-up postcards were returned. Data from the postcards was overwhelmingly (98%) positive that the information from the medical student on their risk for heart disease was helpful, understandable, and taught them something new.

Procedures

Medical students enrolled in the required third-year RCC and AAC rotations were sent an online survey at the beginning and end of the rotations to assess changes in the medical students’ knowledge and counseling practices for CHD risk factors and smoking cessation. This project provided training for the medical students using small-group case study discussions on assessing CHD risk in patients. As part of the small-group discussion, the medical students completed the Framingham 10-year risk assessment and did a mock behavioral contract using a case study as an example. Students practiced utilizing behavioral counseling techniques of motivational interviewing and goal setting during the small-group session. Students were instructed on the use of the Therapeutic Lifestyle Change (TLC) guidelines and the step counters. Students were given 10 patient handout packets that included the CHD risk assessment (Framingham 10-year Coronary Heart Disease Risk Assessment), *My Coronary Heart Disease Risk Score Card* (behavioral contract), the TLC guidelines, a step counter, and

two anonymous self-addressed and stamped postcards for each patient to return immediately after the initial office visit and four weeks post-office visit. No patient identifiers were collected as part of this study.

When medical students were at their clinic sites during the RCC and AAC rotations, they counseled the patient, and utilizing motivational interviewing techniques, developed a behavioral contract on lifestyle changes to decrease CHD risk. Students were required to make copies of each patient's de-identified CHD risk assessment and to turn in these assessments at the end of the eight-week rotation.

The initial postcard asked the patient demographic information (age, gender, ethnicity), and about the educational session. Questions included: "Did you learn anything new about your risk of heart disease from my teaching session?"; "Was the information I gave you about your risk of heart disease helpful?"; "Was the information I gave you about your risk of heart disease understandable?"; "Did you set a weight loss goal?"; "Are you planning on wearing your step counter on most days?"; "If you smoke, were you advised to quit by the medical student?"; and other comments related to the medical student's teaching session. The medical student's name was included on the postcard. (See Appendix B for postcards).

The four-week follow-up postcard also asked patient demographic information (age, gender, and ethnicity) and self-reported information on decreased fat intake, weight loss, average daily steps, and smoking cessation. Specific questions on the follow-up postcard included: "Did my teaching session teach you anything about the risk of CHD?"; "Did you decrease your total fat and saturated fat intake?"; "Have you lost any weight?"; "If yes, how much weight have you lost?"; "Did you wear your step counter on

most days?"; "If yes, what was your average daily steps?"; "If you smoke, did you contact QuitLine or QuitNet?"; and any other comments the patient wanted to make regarding the medical student's teaching session. The medical student's name was included on the follow-up postcard.

Patient initial and follow-up postcards returned to the DFM were entered into SPSS ("SPSS 16.0 Graduate Student Version," 2008) for data analysis. Copies of the CHD patient behavioral contract were used for grading purposes for the RCC and AAC rotations.

Questions for the pre-and-post surveys for medical students enrolled in the RCC and AAC rotations from 2006-2008 asked questions related to knowledge of CHD risk factors and smoking cessation patient counseling practices, and satisfaction with *The Coronary Heart Disease Risk Score Card*. Responses to the questions were either "Yes," "No," or "Sometimes." During this time period, the medical students' pre- and post-survey data were not paired. Specific survey questions and responses are in Table 2. In 2009, the survey questions were changed so that medical students rated their levels of preparedness, confidence, and ability to counsel their patients (using a scale of 1 = Not at All, to 10 = Completely) on nutrition-related issues pertaining to preventive health, patient's CVD risk, and smoking cessation. To pair individual medical student responses, pre- and post- surveys were coded with an anonymous study code. Survey questions and responses may be found in Tables 2 and 3.

During the AAC rotation students also received one 90-minute lecture on nutrition and lifestyle management. Content of the lecture included: review of literature on nutrition and lifestyle factors associated with coronary heart disease prevention and

treatment; review of the AHA and ATP III nutrition guidelines for coronary heart disease prevention and treatment; and patient counseling techniques recommended by the AHA and the USPTFS, including cognitive behavior therapy, motivational interviewing, and goal setting.

Data Analysis

Descriptive statistics (mean, standard deviation, percentages) were used to characterize the demographic data and responses from patients from the initial and follow-up postcards and medical student pre- and post- surveys. Medical student responses on the pre- and post- surveys were de-identified prior to analysis. Medical student pre- and post- surveys in 2009 were linked using the students' anonymous study codes to identify them with their patients. Paired *t* tests assessed the statistical significance of the pre-post rotation differences. All analyses were performed using SAS version 9.2 (Cary, NC). *P* values of <0.05 were considered significant.

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CHAPTER 4
IMPLEMENTATION OF A CARDIOVASCULAR DISEASE
CURRICULUM INTO A THIRD YEAR PRIMARY CARE
MEDICAL SCHOOL ROTATION
In Preparation for *Family Medicine*

Study Summary

Background: Heart disease is the number one cause of death in the U.S., and improving dietary and physical activity habits have been shown to decrease risk factors for developing heart disease. Few physicians report providing any nutrition counseling for their patients, and medical school curricula have been found deficient in content relating to nutrition, physical activity, and behavior change counseling. The main objective of this study was to determine if medical students' preparedness, knowledge, and confidence improved with a targeted coronary heart disease (CHD) risk assessment and health behavior change counseling curricula integrated into a Primary Care required third year rotation.

Method: Medical students, who were enrolled in the required eight-week Primary Care Rotation, and 10 patients for each medical student, participated in this study. Medical students learned to screen for CHD risk and to perform behavioral counseling for CHD risk reduction in their patients. To assess changes in medical student knowledge and counseling practices for CHD risk factors and smoking cessation, an online survey was sent to each medical student at the beginning and end of rotation.

To assess patient satisfaction with the medical student's CHD risk assessment and behavioral counseling session and changes in self-reported diet and exercise habits, patients were asked to complete two surveys administered via postcards.

Results: Three hundred and two medical students participated in this study, and 879 initial postcards and 381 follow-up patient postcards were returned from 2006-2009. Significant changes were seen from baseline to post-rotation on medical students' abilities for preparedness to counsel patients on nutrition and preventive health issues, and confidence in their abilities to impact their patients' risks for CHD and weight status. Patients self-reported their improvements in total fat and saturated fat intake and weight loss.

Conclusion: Utilization of a CHD risk reduction and behavioral counseling curriculum with third-year medical students can improve medical students' confidence in their ability to impact their patients' CHD risk factors and engage their patients in a successful partnership to improve the health of their patients.

Introduction

Cardiovascular disease (CVD) is the number one cause of death in the U.S., and improving dietary and physical activity habits have been shown to decrease CVD risk factors (Kimmons et al, 2009). Several national organizations recognize the importance of diet and physical activity counseling for patients with hyperlipidemia and other risk factors for CVD (U.S. Preventive Task Force, 2002; Adult Treatment Panel III, 2002; Giddings et al, 2009). Primary care physicians have contact with 60% to 70% of the U.S. adult population each year (Olendzki, 2006), yet only 38% of physicians report providing any nutrition counseling for their patients (Frank et al, 2000).

Medical school curricula are deficient in content relating to nutrition, physical activity, and behavior change counseling (American Medical Student Association, 1996; Winick, 1993; Garry et al, 2002). Medical students are not prepared to counsel patients about diet and exercise, and lack the confidence in their abilities to learn these skills (Scott, et al, 1985; Rubin et al, 1990). Including a preventive medicine and nutrition curriculum with experiential learning opportunities for health behavior change can increase medical students' knowledge, confidence, and reported incidence of counseling their patients (Conroy et al, 2004; Nieman et al, 2005; Sifuentes et al, 2002). Conroy et al exposed medical students to a preventive medicine and nutrition curriculum that was delivered through problem-based learning tutorials, simulated cases to teach counseling skills, student-led debates, and self-assessment exercises. Results of this study showed the implementation of a preventive medicine and nutrition curriculum to be effective in improving students' confidence in diet and exercise counseling and perceived dietary habits.

Nieman et al (2005), and Sifuentes et al (2002) both found the Family Medicine required third-year rotation as an opportunity for medical students to learn and implement behavior change counseling skills. Nieman et al examined a focused training on using motivational interviewing skills with third-year medical students during their Family Medicine rotation with patients who smoked. Results indicated that medical students provided appropriate smoking cessation intervention for 91% of their patients, and there was more than a 50% increase in their knowledge and confidence in conducting smoking cessation patient counseling.

Another study (Sifuentes et al, 2002) implemented a supervised diabetes foot screening and education program into the Family Medicine clerkship at the University of Texas Medical School at Houston. During orientation to the Family Medicine clerkship, medical students were instructed on performing a diabetes foot examination. Medical students then conducted foot exams on patients with diabetes at their preceptors' practices during the Family Medicine clerkship. Patients receiving the diabetes foot check examination from the medical student were asked to complete an evaluation of the medical student's foot examination and the education session. Patients were asked questions about whether the education session taught them anything new, if they were using any information the medical student taught them, and if the session was valuable to them. The evaluation was delivered via a self-addressed, stamped postcard, and patients were asked to return the postcard by mail approximately two weeks after the foot examination. Results from the returned postcards showed that the majority of the patients found the session to be of value (90.35%). No studies have examined changes in medical students' knowledge and counseling practices for CHD risk factors, or if this behavioral counseling impacts patients' CHD risk factors.

The goal of our study was to determine if medical students' preparedness, knowledge, and confidence improved with a targeted CHD risk assessment and health behavior change counseling curricula integrated into a Primary Care required third-year rotation. Secondly, we wanted to see if implementation of the CHD risk assessment and behavioral counseling curricula would impact patient CHD risk factors for fat and saturated fat intake, body weight, and physical activity. Additionally, we sought to determine if patients found the CHD risk assessment and behavioral counseling

understandable, useful, and if they learned anything new. We hypothesized that medical students would report improvement in preparedness, knowledge, and confidence after participating in a targeted CHD risk assessment and health behavior change counseling curriculum; patients receiving the CHD risk assessment and behavioral counseling would self-report improvements in total fat and saturated fat intake, weight loss, efforts toward smoking cessation; and patients would find the session useful and understandable.

Methods

Study Design

A pre-post survey design was used to determine changes in medical students' knowledge and counseling practices for coronary heart disease (CHD) risk and smoking cessation with patients, patient satisfaction with the CHD risk assessment and behavioral counseling session, and changes in self-reported total fat, saturated fat, body weight, physical activity and efforts for smoking cessation. Pre- and post- surveys were administered to medical students enrolled in the required eight-week Primary Care block at the University of Colorado School of Medicine (CU-SOM), via an online survey program ("SurveyMonkey," 2007). Surveys were administered to patients by medical students by giving the patients an initial postcard and a four week follow-up postcard during the office visit. Patients were asked by the medical students to return the initial postcard by mail within the week after the CHD risk assessment session conducted at the office visit, and to return the follow-up postcard four weeks later. Each postcard was self-addressed and stamped, and was returned by mail to the study team at the CU-SOM Department of Family Medicine (DFM).

Participants and Recruitment

Medical students at the CU-SOM enrolled in the required eight-week Primary Care Rotation (clerkship), which was comprised of four weeks of Rural and Community Care (RCC) and four weeks of Adult Ambulatory Care (AAC), and 10 patients for each medical student, participated in this study. This study was conducted over a three-year period (August 2006 to June 2009).

Patient participants were recruited by medical students during the four-week RCC and the four-week AAC rotations. Medical students were asked to recruit patients who were at risk of CHD (family history; age ≥ 60 years; body mass index ≥ 30 kg/m²; known hypertension or hyperlipidemia, or coronary artery disease; or current smoker). Students were required, as part of the curriculum, to have five patients during both the RCC and the AAC rotations (a total of 10 patients per medical student) complete *The Coronary Heart Disease Risk Score Card* and the initial postcard, and provide the follow-up postcard. Medical students were instructed to encourage the patients to complete the follow-up postcard four weeks after the office visit.

Instruments and Procedures

Instruments

Several instruments were used in this study. These include the Framingham 10-year coronary heart disease risk assessment, *The Coronary Heart Disease Risk Score Card* (nutrition and lifestyle behavioral counseling), The Therapeutic Lifestyle Change guidelines, step counters, and initial and follow-up surveys administered via an online survey and postcards. The Framingham 10-year coronary heart disease risk assessment (Wilson et al, 1998) is a validated tool that determines estimated 10-year risk of

developing CHD. The Therapeutic Lifestyle Change (TLC) guidelines are evidence-based guidelines to reduce CHD risk factors (Expert Panel, 2001). The use of step counters is associated with significant increases in physical activity, decreases in BMI, and blood pressure (Bravata et al, 2007).

Development of *My Coronary Heart Disease (CHD) Risk Score Card* involved implementation of several evidence-based strategies for nutrition and behavioral counseling to reduce CH risk factors. These evidence-based guidelines include recommendations from The U.S. Preventive Services Task Force (USPSTF), the American Heart Association (AHA), and The National Cholesterol Education Program. Recommendations from these organizations for reduction of morbidity and mortality from CHD include consuming diets that are low in fat, saturated fat, trans-fatty acids, and cholesterol, and that are high in fruits and vegetables, and whole grain products containing fiber. Several counseling theories and strategies have been shown to enhance client adherence to a nutrition and physical activity plan and improve CHD risk factors. Cognitive behavioral therapy (CBT), motivational interviewing, and goal setting all have shown efficacy as nutrition counseling strategies to decrease patient CHD risk factors (Spahn et al, 2010; West et al, 2007). *My Coronary Heart Disease Risk Score Card* consisted of asking the patient other CHD risk factors not assessed by the Framingham 10-year Coronary Heart Disease risk assessment (BMI ≥ 30 kg/m², physical inactivity, and alcohol consumption); assessing the patient's readiness for change; collaborative goal setting between the patient and medical student in order to set treatment goals for CHD risk reduction; setting one to two achievable goals over the following two weeks; and setting up the patient with community resources, and following up with the provider.

The patient initial and follow-up postcards were based on an earlier study conducted by Sifuentes et al (2002). The initial postcard asked the patient demographic information (age, gender, ethnicity), and about the educational session. Questions included: “Did you learn anything new about your risk of heart disease from my teaching session?”; “Was the information I gave you about your risk of heart disease helpful?”; “Was the information I gave you about your risk of heart disease understandable?”; “Did you set a weight loss goal?”; “Are you planning on wearing your step counter on most days?”; “If you smoke, were you advised to quit by the medical student?”; and other comments. The medical student’s name was included on the postcard.

The four-week follow-up postcard also asked patient demographic information (age, gender, and ethnicity) and self-reported information on decreased fat intake, weight loss, average daily steps, and smoking cessation. Specific questions on the follow-up postcard included: “Did my teaching session teach you anything about the risk of CHD?”; “Did you decrease your total fat and saturated fat intake?”; “Have you lost any weight?”; “If yes, how much weight have you lost?”; “Did you wear your step counter on most days?”; “If yes, what was your average daily steps?”; “If you smoke, did you contact QuitLine or QuitNet?”; and other comments. QuitLine and QuitNet are two free smoking-cessation programs offered in Colorado. The medical student’s name was included on the follow-up postcard.

To assess changes in medical student knowledge and counseling practices for CHD risk factors and smoking cessation, an online survey was sent to each medical student at the beginning and end of the eight-week rotation. Questions for the pre- and post- surveys for medical students enrolled in the RCC and AAC rotations from 2006 to

2008 asked questions related to knowledge of CHD risk factors and smoking cessation patient counseling practices, and satisfaction with *The Coronary Heart Disease Risk Score Card*. Responses to the questions were either “Yes,” “No,” or “Sometimes.” During this time period, the medical students’ pre- and post- survey data were not paired. Specific survey questions are listed in Table 2. In 2009, we changed the survey questions so that medical students rated their levels of preparedness, confidence, and ability to counsel their patients (using a scale of 1 = Not at All → 10 = Completely) on nutrition-related issues pertaining to preventive health, patient’s CVD risk, and smoking cessation. To pair individual medical student responses, pre- and post- surveys were coded with an anonymous study code. Survey questions are listed in Table 4.

Procedures

In 2006, the CU-SOM DFM received funding from the Colorado Department of Public Health and Environment to develop and implement a CHD prevention and treatment curriculum to be delivered to third-year medical students during their required, primary care (RCC/AAC) eight-week rotation. Prior to beginning the rotation, medical students were sent an email invitation to complete an online survey asking questions regarding their knowledge and counseling practices for CHD risk factors and smoking cessation. On the first day of the RCC and AAC rotations, medical students attended a required one-day orientation. A didactic session during orientation included background information on the Framingham study and USPSTF, AHA and ATP III guidelines. Students then were divided into small groups and utilized case studies to assess CHD risk. As part of the small group discussion, medical students completed the Framingham 10-year risk assessment and did a mock behavioral contract using a case study as an

example. Students practiced utilizing behavioral counseling techniques of motivational interviewing and goal setting during the small group session. Students also were instructed on the Therapeutic Lifestyle Change (TLC) guidelines, step counters, and were given resources for smoking cessation (QuitLine and QuitNet). Students were given 10 patient handout packets that included the CHD risk assessment (Framingham 10-year Coronary Heart Disease Risk Assessment), *My Coronary Heart Disease Risk Score Card* (behavioral contract), step counters, the TLC guidelines, and two anonymous, self-addressed and stamped postcards for the patients to return by mail immediately after the initial office visit and four weeks post-office visit. No patient identifiers were collected as part of this study.

When medical students were at their clinic sites during the RCC and AAC rotations, they collaborated with the patient, and utilizing motivational interviewing techniques, developed a behavioral contract on lifestyle changes to decrease CHD risk. Students were required to make copies of each patient's de-identified *My Coronary Heart Disease Risk Score Card* and turn these in at the end of the 8-week rotation. Patients returned the anonymous initial and follow up postcards to the study team at the CU-SOM DFM.

Protection of Human Subjects

The study assessment design, instruments, and procedures were determined by the Colorado Multiple Institutional Review Board as exempt, since the nature of this research was educational, and no patient identifiers were collected.

Data Analysis

Descriptive statistics (mean, standard deviation, percentages) were used to characterize the demographic data and responses from patients from the initial and follow-up postcards and medical student pre- and post- surveys. Medical student pre- and post- surveys in 2009 were linked using the students' anonymous study codes. Paired *t* tests assessed the statistical significance of the pre-post rotation differences. All analyses were performed using SAS version 9.2 (Cary, NC). *P* values of <0.05 were considered significant.

Results

A total of 302 medical students participated in this study from August 2006 to June 2009. During this three-year period, 879 initial postcards and 381 follow-up postcards were returned to the CU-SOM DFM. Table 1 describes the baseline demographic characteristics for patients returning the initial and follow up postcards.

Table 2 displays changes from 2006-2008 in medical students' assessments of: CVD risk in patients; knowledge regarding the primary target of CVD therapy; influence, beliefs, and referral for smoking cessation; and a rating of use of *The Coronary Heart Disease Score Card*. All five measures improved from baseline, particularly for assessment of CVD risk in patients. Table 3 displays changes in 2009 for medical students' preparedness to counsel patients on nutrition and preventive health issues; confidence in their ability to impact their patients' risks for CVD and weight status; their belief that they can influence their patients to quit using tobacco products; and their frequency for identifying, advising, and referring patients for smoking cessation. Six measures improved significantly after students completed the RCC and AAC rotations.

The only measure that did not significantly improve was the medical students' preparedness to counsel their patients on nutrition-related issues as it pertains to preventive health.

For the initial postcard patient responses (see Table 4), the majority (99.2%) of patients reported that the information provided by the medical students regarding risk for CHD was helpful. Approximately 70% of patient responders reported setting a weight loss goal, 88% planned on wearing their step counters, and 90% of smokers reported that they were advised to quit smoking by the medical student.

Follow-up patient postcard responses (see Table 5) indicated the majority (85.6%) of responders decreased their total fat and saturated fat intake, 61.5% reported losing weight, 74% reported wearing their step counters on most days of the week, and 34% of smokers reported contacting the smoking-cessation resources of QuitLine or QuitNet. Follow-up postcard responders also reported losing a mean of 6.5 pounds (± 5.5), and they reported mean daily steps of 6726 (± 3678).

Discussion

We implemented a CHD risk assessment and behavioral counseling curriculum into a required, third-year medical school Primary Care rotation, and evaluated changes in medical students' preparedness, knowledge, and confidence, and patient satisfaction and self-reported changes in diet and physical activity. We demonstrated that medical students could learn and apply a CHD risk assessment and apply behavior counseling techniques in a community-based, ambulatory primary care setting. We evaluated the patient experience, and found the majority of patients thought the information provided to them by the medical student on their CHD risk was helpful, and that they intended to

make some health behavior changes to reduce their CHD risk. Patient responders to the follow-up postcard demonstrated through self-report that they made health behavior changes to decrease their CHD risk by decreasing total fat and saturated fat intake, losing weight, increasing physical activity (through report of average daily steps), and approximately one-third of smokers reporting seeking smoking-cessation assistance.

Our study team implemented earlier curriculum recommendations for smoking cessation (Nieman et al, 2005) by including a focused and interactive training on behavioral counseling including motivational interviewing techniques. Our project team also modeled patient evaluation of the CHD risk assessment and behavioral counseling after Sifuentes and colleagues' (2002) use of a patient postcard to evaluate their diabetes foot exam program. We found similar results to Sifuentes and colleagues, specifically that the majority of our patients found the information the medical students gave them about their risk for CHD to be helpful. In addition, we found improvements in patient outcomes from a focused behavioral counseling intervention conducted by medical students, although these are self-reported data. Further research is needed in this area to determine the true impact on patient outcomes related to CHD risk.

Limitations

Several limitations to this study exist. It is an assessment of a training and intervention conducted by medical students at one institution, and our results may not be directly applicable on a national level. Colorado also is the leanest state and has the lowest rate for coronary heart disease in the country. Potential bias (including selection bias) may exist, given the voluntary nature of this study. Moreover, patient confidentiality issues prevented us from obtaining specific information regarding the

impact of the CHD risk assessment and behavioral counseling. Thus, our follow-up with patients was short-term and limited to anonymous postcards returned by patients.

Additionally, patients with the most healthful behaviors may have been more likely to return the surveys.

Conclusions

Our results suggest that medical students can learn about CHD risk factors and behavioral counseling techniques, and apply these techniques in an ambulatory setting when treating patients who are at risk for coronary heart disease. Initial postcards returned by patients indicated that patients found the CHD risk assessment conducted by the medical student to be helpful and that they intended to make lifestyle changes to decrease their risk. Follow-up patient postcard data showed self-reported changes for CHD risk factors, including diet and body weight, physical activity, and tobacco use. Utilization of a CHD risk reduction and behavioral counseling curriculum with third-year medical students can improve medical students' confidence in their ability to impact their patients' CHD risk factors and engage their patients in a successful partnership to improve the health of their patients.

Table 1: Patient Self-Reported Demographic Characteristics

	Initial Counseling		4 Week Post Counseling	
Age (Mean $\pm$ SEM)	N=868 57.88(15.2)		N=381 59.11(17.3)	
	N	Percent	N	Percent
Gender				
Male	440	49.4	188	47.0
Female	428	48.0	193	48.3
Ethnicity				
Caucasian	635	71.3	216	54.0
African American	48	5.4	17	4.3
Hispanic	74	8.3	21	5.3
Other	29	3.3	9	2.3

Table 2: Medical Students CVD Survey Responses (%) 2006-08

Survey Question	Pre-Rotation N=204	Post-Rotation N=189
Have you ever assessed CVD risk in a patient?	Yes = 47% No = 53%	Yes = 99% No = 1%
Lowering LDL cholesterol should be the primary target of CVD therapy. True or False?	True = 52% False = 48%	True = 65% False = 35%
Do you believe that you can influence patients to stop smoking?	Yes = 45% Sometimes = 55% No= 0%	Yes = 68% Sometimes = 32% No= 0%
Do you advise patients to quit smoking?	Yes = 33% Sometimes = 56% No= 11%	Yes = 71% Sometimes = 29% No= 0%
Have you referred patients to QuitLine or QuitNet?	Yes = 9% Sometimes = 37% No= 54%	Yes = 37% Sometimes = 59% No= 4%
How would you rate the use of the CHD Risk Score Card with patients?	N/A	Excellent = 21% Good = 47% Fair = 26% Poor = 6%

Table 3: Medical Student CVD Survey Responses 2009 (N = 98)

Survey Question	Mean	Std. Dev	<i>p</i> Value Change From Pre-To-Post
Do you feel prepared to counsel patients on nutrition-related issues as it pertains to preventive health? (1 = Completely → 10 = Not at All) Pre-Rotation Post- Rotation	5.81 4.10	1.9 2.3	.20
How confident are you in your ability to impact your patient's risk for CVD through a therapeutic lifestyle intervention? (1 = Not at All → 10 = Completely) Pre- Rotation Post- Rotation	4.40 6.65	1.6 1.9	.02
How confident are you in your ability to impact your patient's weight status through a therapeutic lifestyle intervention? (1 = Not at All → 10 = Completely) Pre- Rotation Post- Rotation	4.60 6.02	1.6 1.9	.03
Do you believe that you can influence patients to quit using tobacco products? (1 = Always → 10 = Not at All) Pre- Rotation Post- Rotation	5.89 5.24	1.9 .8	.004
How frequently have you IDENTIFIED smokers (do you ask patients if they smoke)? (1 = Every visit → 10 = Never) Pre- Rotation Post- Rotation	2.01 1.75	.8 .5	.004
How frequently have you ADVISED smoking patients to quit smoking? (1 = Every visit → 10 = Never) Pre- Rotation Post- Rotation	2.36 1.61	.8 .6	.0001
How frequently have you REFERRED smoking patients to QuitLine or QuitNet? (1 = Every visit → 10 = Never) Pre- Rotation Post- Rotation	2.99 2.30	.7 .9	.004

Table 4: Patient Initial Postcard Results

Preliminary Study: Initial Patient Postcards Responses N = 879		
Patient Responses	Yes (%)	No (%)
Was the information the medical student gave you about your risk of CVD helpful?	99.2	0.8
Set a weight loss goal with medical student	70.5	29.5
Planning on wearing step counter on most days of the week?	87.6	12.4
If you smoke, were you advised to quit by the medical student?	89.9	10.1

Table 5: Patient Follow-Up Postcard Results

Follow-Up Patient Postcards Responses N = 381			
Patient Responses	Yes (%)	No (%)	Pounds weight loss or average daily steps ($\pm$ SD)
Did you decrease your total fat and saturated fat intake?	85.6	14.4	
Have you lost weight?	61.5	38.5	
If yes, how much weight have you lost?			6.5 lbs. ($\pm$ 5.5)
Did you wear your step counter on most days of the week?	74	26	
If yes, what were your average daily steps?			6726 ($\pm$ 3678)
If you smoke, did you contact QuitLine or QuitNet?	34.4	65.6	

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CHAPTER 5

METHODS

MEDICAL STUDENT HEALTH BEHAVIORS AND

THE INFLUENCE ON PATIENT OUTCOMES

This chapter describes the methods used in this study. It is organized into the following sections: Study Design, Participants and Recruitment, Protection of Human Subjects, Instruments and Procedures, and Data Analysis. A preliminary study was conducted at the CU-SOM with third-year medical students from August 2006 to June 2009. A cardiovascular disease curriculum was developed and piloted during this time period. Several behavior change instruments were developed and tested during the preliminary study. These instruments include the Framingham 10-year Coronary Heart Disease Risk Assessment, the *Coronary Heart Disease Risk Score Card* (behavioral contract), and the TLC Guidelines. Behavioral theories of CBT, motivational interviewing, and goal setting were integrated into the *Coronary Heart Disease Risk Score Card*. Medical students entering the required RCC and AAC rotations were instructed on the use of these instruments during small-group discussions and use of case studies to practice the implementation of these tools. Patients receiving the CHD risk assessment and behavioral counseling by the medical students were asked to return an initial postcard evaluating the usefulness of the CHD counseling and a four-week follow-up postcard describing changes in fat intake, body weight, and physical activity. The results from this study are described in Chapter 4. The study design and instruments used

in *Medical Student Health Behaviors and Influence on Patient Outcomes* study were derived from this preliminary study.

Study Design

A pre-post survey design was used to determine fruit, vegetable, and soy intake, and physical activity habits for medical students and their patients. Pre- and post-surveys were administered online for the medical students. The pre-survey was given to the patient by the medical student at the time of the office visit. The post-survey was given to the patient at the time of the office visit, and the medical student instructed the patient to complete and mail this survey in four weeks. A stamped and self-addressed envelope was attached to the post-survey. Correlation analyses were used to explore relationships among fruit, vegetable, and soy intake and physical activity habits for medical students and the patients they counseled during their eight-week primary care rotation.

Participants and Recruitment

Student participants for this study were recruited from the medical students at the University of Colorado School of Medicine (CU-SOM) entering the third-year required, eight-week Rural and Community Care (RCC) and Adult Ambulatory Care (AAC) rotations. Prior to entering the RCC and AAC rotations, medical students were sent an email invitation asking them to participate in this study and were provided a link to the survey. Medical students were informed that this study was part of a PhD research study and were assured that participation in this study was voluntary and would not affect their grades in the RCC or AAC rotations.

Patient participants were recruited by medical students during both the four-week RCC and four-week AAC rotations, and were asked to complete the pre-survey as part of the office visit with the medical student. Students were required, as part of the curriculum, to have four patients during both the RCC and AAC rotations (a total of eight patients per medical student) complete the pre-survey and provide the post-survey. Medical students were instructed to encourage the patients to complete the post-survey four weeks after the office visit. Post-surveys were administered at the end of the eight-week block for medical students, and at four weeks post-appointment for the patients.

Instruments and Procedures

Instruments

The *Healthy Doc-Healthy Patient* survey was completed by both medical students and patients to assess pre- and post- fruit, vegetable, and soy intake, and frequency and duration of physical activity. The *Healthy Doc-Healthy Patient* survey is a validated survey (Spencer et al, 2005). This survey was developed by Spencer et al to assess fruit, vegetable and soy intake, and the physical activity habits of medical students. For medical students, the *Healthy Doc-Healthy Patient* survey was administered online via an online survey program (“SurveyMonkey,” 2007).

The 11-item survey consisted of assessing the frequency of consumption of a medium-sized serving for fruit, vegetables, and soy; and during an average week, the frequency and intensity of physical activity. For fruit, vegetable, and soy intake, the survey asked the number of times (0-6) these foods were consumed per day, per week, or per month. For fruit intake, the survey asked fruit juice and fruit, other than juice, servings. For vegetables, the survey asked servings of vegetable juice, green salad,

vegetable soup or stew, beans (baked, pinto, kidney, lentils, not green beans), and any other vegetable. The soy question asked total soy intake. For physical activity, the survey determined, in an average week, number of times (0-14) subjects participated in mild, moderate, or strenuous activity; and the length of time for each episode (10 minutes - 9+ hours). Mild, minimally exertive exercise was defined as easy walking, golf, bowling, and yoga. Moderate exercise was defined as fast walking, tennis, volleyball, dancing, easy swimming and/or biking. Strenuous exercise was defined as jogging, soccer, aerobics, vigorous swimming, or biking. The survey also included demographic information (age, gender, and ethnicity) for patients. For medical students, demographic information also included planned specialty choice (primary care, subspecialty, or undecided) and an estimate of weight and height. *Healthy Doc-Healthy Patient* survey questions are included in Appendix C, and the survey sent to the medical students may be found in Appendix D.

Procedures (Program Intervention)

All medical students entering the required RCC and AAC rotations between August 2010 and February 2011 were invited to participate in this study. Participation for the medical students involved completing the pre-and-post *Healthy Doc-Healthy Patient* survey (Spencer et al, 2005) prior to beginning the RCC and AAC rotations, and at the end of this eight-week rotation. Medical students who completed the pre-survey were assigned an anonymous study number.

All medical students attended a required one-day orientation on the first day of the eight-week rotation. Each student was given a packet of the same *Healthy Doc-Healthy Patient* survey (pre- and post-) to give out to four patients during each four-week

block (a total of eight patients per medical student). In order to compare survey responses of medical students and their patients, surveys were coded with a study number for each student (not related to their CU-SOM medical student number), and to delineate location (rural or urban) patient surveys were color coded differently for the RCC and AAC rotations. Each patient survey packet included a stamped and self-addressed envelope and instructions to return the post-survey by mail in four weeks. No patient identifiers were collected as part of the study.

Students also received training on CHD risk assessment, motivational interviewing, and behavioral contracting, and were required to conduct this counseling with the same four patients to whom they gave the *Healthy Doc-Healthy Patient* survey during the AAC rotation. The patients in the AAC rotation also received handouts with their Framingham 10-year coronary heart disease risk assessment score, *The Coronary Heart Disease Risk Score Card* (a behavior-change handout with a personalized lifestyle change goal), the Therapeutic Change Lifestyle (TLC) guidelines, and information on increasing physical activity. The Framingham 10-year coronary heart disease risk assessment (Wilson et al, 1998) is a validated tool that determines estimated 10-year risk of developing CHD by assessing age, smoking status, blood pressure categories, total cholesterol categories, and LDL cholesterol categories. The Framingham 10-year coronary heart disease risk assessment, *The Coronary Heart Disease Risk Score Card*, and TLC guidelines handouts can be found in Appendix A. Patients in the RCC rotation were asked to complete the pre- *Healthy Doc-Healthy Patient* at the office visit, and were given instructions to complete and return the post-survey in four weeks. RCC patients did not receive the CHD risk assessment or lifestyle counseling by the medical student.

During the AAC block, students also received two 90-minute lectures on nutrition and lifestyle management. Content of the lectures included: review of literature on nutrition and lifestyle factors associated with coronary heart disease prevention and treatment; review of the AHA and ATP III nutrition guidelines for coronary heart disease prevention and treatment; and patient counseling techniques recommended by the AHA and the USPTFS, including cognitive behavior therapy, motivational interviewing, and goal setting.

Medical students in the RCC and AAC eight-week rotations were assigned to two four-week blocks. During the four-week RCC rotation, students were assigned to a family medicine ambulatory care clinic in a rural location in Colorado. During the four-week AAC rotation, students were assigned to an adult ambulatory care internal medicine clinic in the Denver Metro area (urban location). Students who did the RCC rotation switched to the AAC rotation at the end of the first four-week block, and vice versa.

At the end of the eight-week rotation, students who completed the pre-survey were invited via email to complete the post-survey. All students submitted their eight patient pre-surveys at the end of the eight-week rotation. Patient post-surveys were sent to the study team at the CU-SOM DFM.

Protection of Human Subjects

The study assessment design, instruments, and procedures were approved by the Colorado Multiple Institutional Review Board and by the Colorado State University Research Integrity & Compliance Review Office, and received exempt status as educational research. Approval letters are included in Appendix E.

Data Analysis

From the *Healthy Doc-Healthy Patient* survey, total servings of vegetables was determined by the sum of vegetable juice, green salad, vegetable soup, beans (baked, pinto, kidney, lentils, not green beans) and other vegetables, and were converted to daily servings. Total fruit servings were calculated by the sum of servings of fruit juice and fruit, and were converted to daily servings. Daily soy intake was determined by calculating the number of servings of soy and converting to daily servings. Physical activity total number of minutes of exercise for mild, moderate, and strenuous/day was calculated by the length of time for each exercise episode times the number of times/week divided by seven.

To determine seasonal differences in fruit and vegetable intake and physical activity, medical students and patients who entered the study in the fall (August-October) were compared with those students and patients entering the study in the winter (January-February). To address the low patient post-survey return rate (21%), comparisons were done between patients with only pre-survey data and patients with both pre- and post-survey data. Comparisons between groups for demographic information (age, gender, rural/urban location) and baseline fruit, vegetable, and soy intake, and physical activity habits, were conducted.

Descriptive statistics (mean, standard deviation, percentages) were used to characterize the demographic data for medical students and patients. Paired student *t* tests were used to compare changes within medical students and for their patients. Pearson product moment correlations were used to compare pre-survey scores for the medical students to the changes within their patients for fruit, vegetable, and soy, and

physical activity. All analyses were performed using SAS version 9.2 (Cary, NC).

Significance was set at $p \leq 0.05$.

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CHAPTER 6

MEDICAL STUDENT HEALTH BEHAVIORS AND THE INFLUENCE ON PATIENT OUTCOMES

In Preparation for *Academic Medicine*

Study Summary

Purpose: Lifestyle habits are important risk factors for the development of cardiovascular disease, the leading cause of death in industrialized nations. The American Heart Association (AHA) and the National Cholesterol Education Program Adult Treatment Panel III (ATP III) recommend lifestyle changes as the primary and most cost-effective means of reducing risk of coronary heart disease (CHD). Yet few physicians advise their patients about lifestyle modification. The main objective of this study was to determine if the nutrition and physical activity habits of medical students affect their patients' health behaviors on several important aspects of lifestyle modification: increased fruit, vegetable, and soy intake, and physical activity.

Methods: Third-year medical students at the University of Colorado School of Medicine were recruited to complete a pre- *Healthy Doc-Healthy Patient* survey upon entry into the required Rural and Community Care (RCC) and Adult Ambulatory Care (AAC) eight-week rotation. Medical students received training on administering the *Healthy Doc-Healthy Patient* surveys to patients, and training on CHD risk assessment and behavioral contracting. Students were required to give surveys to a total of eight patients during both RCC and AAC rotations. Patients in the AAC rotation received the

CHD risk assessment and behavioral contracting. Post-surveys were given to patients with instructions to return in four weeks. No CHD intervention was given to patients in the RCC rotation. To determine if participation affected medical students' behaviors, students with pre-survey data completed a post-survey at the end of the 8-week rotation.

Results: Sixty-six medical students and 133 patients completed both pre- and post- surveys. No significant changes were seen in the medical students or patients between the pre- and post- surveys. Baseline moderate and mild exercise time for medical students significantly correlated with an increase in soy intake for their patients ($r=.52$, $p=0.02$; and $r=.58$, $p=0.01$) respectively, and medical students' soy intake significantly correlated with an increase in patients' strenuous exercise time ($r=.52$, $p=0.01$). Other significant correlations were seen when stratifying by gender and specialty choice.

Conclusions: Although health behaviors of medical students and patients did not change, several significant correlations were seen between baseline dietary and physical activity habits of medical students and changes in their patients' dietary and physical activity habits. These results indicate that medical students' health behaviors may have an association with health behavior outcomes of patients whom they counsel. Future research is needed to examine the impact of medical students' health behaviors and how these behaviors impact patient outcomes.

Introduction

Over 70% of patients who present in a primary care office have one or more chronic disease that are preventable or treatable with lifestyle counseling (Rothman et al, 2003). Diet and physical activity are two modifiable health behaviors with the potential to

prevent substantial morbidity and mortality, yet few physicians advise their patients about lifestyle modification. Several studies have shown that <50% of physicians include nutrition or dietary counseling in their patients' visits (Horrocks et al, 1987; Frank, 2004; Frank et al, 2006; Lobelo et al, 2006) . Evidence demonstrates that on a population level, small reductions in blood cholesterol, achieved through a change in diet, can contribute a significant reduction in the level of morbidity and mortality from coronary heart disease (CHD) (Law et al, 1994). The most current nutrition guidelines from the American Heart Association (AHA) for pediatric and adult populations (Gidding et al, 2009) emphasize the benefit of adopting a heart-healthy nutrition pattern at a young age. The National Cholesterol Education Program Adult Treatment Panel III (ATP III) also recommends lifestyle changes as the primary and most cost-effective means of reducing CHD (Expert Panel, 2001).

There is evidence to support behavioral counseling in primary care to promote a healthful diet (U.S. Preventive Services Task Force, 2002). The USPSTF has given a “B Recommendation”, which recommends this service, for behavioral dietary counseling for adult patients with hyperlipidemia and other known risk factors for cardiovascular and diet-related chronic disease. Intensive counseling may be delivered by primary care clinicians or by referral to other specialists, such as nutritionists or dietitians. However, studies have shown that primary care clinicians pay little attention to diet modification for their patients. In a 1999-2000 survey of U.S. adults, 33% of respondents reported past-year physician advice to eat more fruits and vegetables, and 29% reported similar advice to reduce dietary fat (Glasgow et al, 2001; Kreuter et al, 2000).

A lack of nutrition and lifestyle counseling by physicians may be attributable to a lack of training during medical education. Kushner et al (1995) identified several physician-perceived barriers to delivery of dietary counseling, including lack of time, patient noncompliance, inadequate teaching materials, lack of counseling training, lack of nutrition knowledge, inadequate reimbursement, and low physician confidence. In a national study (Abramson et al, 2000) looking at the personal exercise habits and counseling practices by primary care physicians, responders reported major barriers to counseling on aerobic exercise for inadequate time (61% of respondents) and inadequate knowledge or experience (16% of respondents). Lack of adequate training in nutrition education and counseling is demonstrated by data obtained from medical students. In the 2003 American Association of Medical Colleges' (AAMC) medical student exit survey, only 46% of students nationally felt that appropriate time was devoted to disease prevention or nutrition education during their four years of medical school (AAMC Graduation Survey, 2003).

Identifying this gap, the U.S. National Institute of Medicine (IOM) highlighted the need for physician well-being and medical student education on self-care in their 2004 report (Institute of Medicine, 2004). Studies have demonstrated that a physicians' or medical students' health habits can influence lifestyle counseling with their patients (Frank et al, 2006; Lobelo et al, 2008, Frank et al, 2000). Recent studies have shown that training interventions may improve both medical students' personal dietary behaviors and their prevention counseling attitudes (Spencer et al, 2006; Howe et al, 2010; Conroy et al, 2004). However, no studies have examined potential relationships between physician or

medical student health behaviors and the effect of these same health behaviors have on their patients' outcomes.

The goal of this study was to determine if the dietary habits of medical students, characterized by fruit, soy and vegetable intake, and physical activity, would affect these same health behaviors in the patients whom they counseled during their eight-week Rural and Community Care (RCC) and Adult Ambulatory Care (AAC) rotations. We hypothesized that the medical students with the healthiest baseline lifestyle habits (servings/day of fruits, vegetables, and soy, and minutes/week of physical activity) would have a corresponding increase in these behaviors in the patients whom they counseled.

Methods

Study Design

A pre-post survey design was used to determine fruit, vegetable, and soy intake, and physical activity habits, for medical students and their patients. Pre- and post-surveys for medical students were administered via a web-based survey. For patients, pre-surveys were completed at the office visit, and post-surveys were completed and returned via US mail. Correlation analyses were used to explore relationships among fruit, vegetable, and soy intake, and physical activity habits, for medical students and the patients whom they counseled during their eight-week primary care rotation. The study design, procedures, and instruments were approved by the Colorado Multiple Institutional Review Board and by the Colorado State University Research Integrity & Compliance Review Office.

Participants and Recruitment

Student participants for this study were recruited from the medical students at the University of Colorado School of Medicine (CU-SOM) entering the third-year, required eight-week RCC and AAC rotations. Prior to entering the RCC and AAC rotations, medical students were sent an email invitation asking them to participate in this study, and were provided a link to the survey. Medical students were assigned an anonymous study number, and were assured that participation in this study was voluntary and would not affect their grades in the RCC or AAC rotations.

Patient participants were recruited by medical students during both the four-week RCC and the four-week AAC rotations, and were asked to complete the pre-survey as part of the office visit with the medical student. Students were required, as part of the curriculum, to have four patients during both the RCC and AAC rotations (a total of eight patients per medical student) complete the pre-survey, and to provide the post-survey. Medical students were instructed to encourage the patients to complete the post-survey four weeks after the office visit and return it by mail. Post-surveys for the medical students were administered at the end of the eight-week rotation. Patient postcards were returned to the study team at the CU-SOM Department of Family Medicine.

Instruments and Measures

The *Healthy Doc-Healthy Patient* survey was completed by both medical students and patients to assess pre- and post- fruit, vegetable, and soy intake, and the frequency and duration of physical activity. The *Healthy Doc-Healthy Patient* survey is a validated survey (Spencer et al, 2005). This survey was developed by Spencer et al to assess fruit, vegetable and soy intake, and the physical activity habits of medical students. For

medical students, the *Healthy Doc-Healthy Patient* survey was administered online via an online survey program (“SurveyMonkey,” 2007).

The 11-item survey consisted of assessing the frequency of consumption of a medium-sized serving for fruit, vegetables, and soy; and during an average week, the frequency and intensity of physical activity. For fruit, vegetable, and soy intake, the survey asked the number of times (0-6) fruit, vegetables, and soy were consumed per day, week, or month. For fruit intake, the survey asked fruit juice and fruit, other than juice, servings. For vegetables, the survey asked servings of vegetable juice, green salad, vegetable soup or stew, beans (baked, pinto, kidney, lentils, not green beans), and any other vegetable. The soy question asked total soy intake. For physical activity, the survey determined, in an average week, number of times (0-14) subjects participated in mild, moderate, or strenuous activity; and the length of time for each episode (10 minutes to 9+ hours). Mild, minimally exertive exercise was defined as easy walking, golf, bowling, and yoga. Moderate exercise was defined as fast walking, tennis, volleyball, dancing, easy swimming and/or biking. Strenuous exercise was defined as jogging, soccer, aerobics, vigorous swimming, or biking. The survey also included demographic information (age, gender, and ethnicity) for patients. For medical students, demographic information also included planned specialty choice (primary care, subspecialty, or undecided) and self-reported estimate of weight and height.

Program Overview

Medical students in the RCC and AAC eight-week rotations were assigned to two -four-week blocks. During the four-week RCC block, students were assigned to a family medicine ambulatory care clinic in a rural location in Colorado. During the four-week

AAC block, students were assigned to an adult ambulatory care internal medicine clinic in the Denver Metro area. Students who did the RCC rotation switched to the AAC rotation at the end of the first four-week block, and vice versa. All medical students attended a required one-day orientation on the first day of the eight-week rotation. Students were each given a packet of the same *Healthy Doc-Healthy Patient* surveys (pre- and post-) to give out to four patients during each four-week block (a total of eight patients). Surveys were coded with an anonymous study number for each student (not related to their CU-SOM medical student number) and color coded for the RCC and AAC rotations. Each patient survey packet included a stamped and self-addressed envelope and instructions to return by mail the post-survey in four weeks. No patient identifiers were collected as part of the study. Students also received training on CHD risk assessment, motivational interviewing, and behavioral contracting and were required to conduct this counseling with the same four patients they gave the *Healthy Doc-Healthy Patient* survey during the AAC rotation. The patients in the AAC rotation also received handouts with their Framingham 10-year CHD risk assessment score, a behavior change handout with a personalized lifestyle change goal, the Therapeutic Change Lifestyle guidelines, and information on increasing physical activity. During the AAC block, students also received two 90-minute lectures on nutrition and lifestyle management. Patients in the RCC rotation only received the *Healthy Doc-Healthy Patient* surveys. At the end of the eight-week rotation, students who completed the pre-survey were invited by email to complete the post-survey. All students handed in their eight patient pre-surveys at the end of the eight-week rotation. Figure 1 describes the study design.

Data Analysis

From the *Healthy Doc-Healthy Patient* survey, total servings of vegetables was determined by the sum of vegetable juice, green salad, vegetable soup, beans (baked, pinto, kidney, lentils, not green beans) and other vegetables, and converted to daily servings. Total fruit servings were calculated by the sum of servings of fruit juice and fruit, and converted to daily servings. Daily soy intake was determined by calculating the number of servings of soy, and converting to daily servings. Physical activity total number of minutes of exercise for mild, moderate, and strenuous/day was calculated by the length of time for each exercise episode times number of times/week divided by seven. To determine seasonal differences in fruit and vegetable intake and physical activity, medical students and patients who entered the study in the fall (August-October) were compared with those students and patients entering the study in the winter (January-February). To address the low patient post-survey return rate (21%), comparisons were done between patients with only pre-survey data and patients with both pre- and post-survey data. Comparisons between groups for demographic information (age, gender, rural/urban location) and baseline fruit, vegetable, and soy intake, and physical activity habits, were conducted.

Descriptive statistics (mean, standard deviation, percentages) were used to characterize the demographic data for medical students and patients. Student paired *t* tests were used to compare changes within medical students and for their patients. Pearson product moment correlations were used to compare pre-survey scores for the medical students to the changes within their patients for fruit, vegetable, and soy, and physical activity. All analyses were performed using SAS version 9.2 (Cary, NC).

Results

Sixty-six of 108 medical students (61%) completed the pre- and post- surveys (44% male and 56% female). Table 1 describes baseline characteristics for age, gender, planned specialty choice and mean Body Mass Index (BMI), derived from self-reported weight and height.

A total of 632 patients completed the pre-survey, and 133 patients completed both pre- and post- surveys (21% response rate). Only data from the 133 patients with pre- and post- survey data was used for analysis. Table 2 shows the demographic results for the patient responders.

Results of the pre-survey for the medical students revealed an average fruit intake of 1.81 servings/day; vegetable intake of 2.27servings/day; soy intake of .4 servings/day; approximately 22 minutes/day of mild activity; 13 minutes/day of moderate activity; and 17 minutes/day of strenuous activity. There were no differences between males and female medical students. Post-survey results showed no statistically significant change in fruit, vegetable, or soy intake, or change in physical activity minutes per day (Table 3).

Results of average fruit, vegetable, and soy intake, and average daily physical activity, for the 133 patients who had both pre- and post- survey results are shown in Table 3. No differences were seen between male and female patients or by region (rural or urban). Similar to the medical students, no changes were seen in the patients' post-survey results. No differences were seen for seasonal differences for fruit and vegetable intake and physical activity when comparing medical students and patients who entered the study in the fall to those who entered in the winter.

Intent to treat analysis was performed to compare patients with only pre-survey results to patients with pre- and post- survey results. There were no significant differences for percentage of male and female, or for those living in a rural or urban area of Colorado. However, patients who completed both pre- and post- surveys were significantly older (65.3 years versus 62.0, $p=.001$). There was a significant difference in mean daily minutes of strenuous physical activity between groups (11.6 minutes/day versus 8.4 minutes/day, $p=.04$). No differences were seen between groups for average mean daily servings of fruit, vegetable, and soy; or for mean daily minutes of mild and moderate physical activity. Results are presented in Table 4.

Several characteristics of the medical students' diet and exercise habits significantly correlated with the change scores of their patients. When comparing all medical students, medical students' higher pre-soy intake significantly correlated with an increase in their patients' strenuous exercise time ($r=.52$, $p<.01$). Medical students' with higher pre-mild and moderate exercise time also showed a significant increase in their patients' soy intake ($r=.58$, $p<.001$; $r=.52$, $p=.02$). Results are presented in Table 5.

Several characteristics of medical students' diet and exercise habits significantly correlated with the change scores for their patients when stratifying by gender and specialty choice. Female medical students' pre-survey soy intake significantly correlated with an increase in their patients' strenuous exercise time ($r=.62$, $p=0.003$), and pre-survey higher levels of mild and moderate exercise time significantly correlated with patients' increase in soy intake ($r=.74$, $p=0.003$; $r=.70$, $p=0.003$). Female medical students with lower pre-survey levels of moderate exercise showed a significant decrease in their patients' mild exercise change ($r=-.61$, $p=0.001$) (Table 6). No significant

correlations were seen in male medical students' pre-survey results and changes for any health behaviors for their patients. Medical students planning to go into primary care and had higher pre-survey scores for soy intake resulted in a significant increase in their patients' strenuous exercise time ($r=.70$, $p=0.05$); and medical students planning to go into subspecialty care and had higher pre-survey vegetable intake resulted in an increase in their patients' soy intake ($r=.60$, $p=0.05$).

Discussion

Using a survey to determine pre- and post- fruit, vegetable, and soy intake, and physical activity habits for third-year medical students and patients, we observed health behaviors of these students and patients during an eight-week primary care rotation. The short training in CHD risk reduction did not result in changes in medical students' or patients' reported diet and exercise habits. Several baseline diet and physical activity characteristics of medical students significantly correlated with change scores for diet and physical activity in the patients whom they counseled.

The lack of changes in medical students for fruit and vegetable intake may be due in part to their already healthful habits, as they self-reported on their pre-surveys about four servings per day of fruits and vegetables. However, that figure is still below the recommendation of 5 servings of fruits and vegetables per day, but above the U.S. adult average of 3 servings of fruits and vegetables per day (Kimmons et al, 2009).

Changes in dietary habits of medical students have been studied through implementation of a preventive medicine and nutrition curriculum (Conroy et al, 2004). This study demonstrated a significant improvement in medical students' self-reported saturated fat and trans fatty acid intake ($p=0.002$ and $p<0.001$), but only 18% perceived

an improvement in exercise habits. Kushner et al (2011) studied the effects of implementing a focused behavioral care plan over six weeks with second-year medical students. This study indicated that implementation of a focused behavioral care plan over six weeks resulted in 48% of medical students meeting their goal for behavior change. In our study, the medical students received two 90-minute lectures on nutrition and lifestyle management during the AAC block. However, the focus of these lectures was presenting research on the effectiveness of nutrition and physical activity on chronic disease prevention, not on behavior change for the medical students. The lack of improvement for our medical students' diet and physical activity habits may be a result of the focus of the nutrition curriculum. Unlike the Conroy and Kushner studies, we did not emphasize a change in medical students' health behaviors, and this focus may be needed for behavior change to occur. Additionally, the lack of change between the pre- and post- surveys for the medical students may be attributed to the short time frame of eight weeks.

Medical students also self-reported approximately 56 minutes of total physical activity on both the pre- and post- surveys. However, the majority of daily physical activity was from mild exertion. Although this amount of daily physical activity does meet the Surgeon General's recommendation of 30 minutes of physical activity per day, given the average age of the medical students (28 years), one would expect the minutes of moderate and strenuous activity to be higher. Others have observed low levels of physical activity for medical trainees. A recent study conducted by Howe et al (2010) showed that only 9.8% of medical trainees (residents and fellows) reported exercising four or more days per week. Medical students, similar to residents and fellows, work long and unpredictable hours during their third-year clerkship rotations, often getting

inadequate sleep, and they have little time for family and leisure. All of these factors may contribute to the low levels of moderate and strenuous physical activity reported by the medical students.

Fruit and vegetable intake for patients also did not significantly change over four weeks and remained at three servings per day, which is the national average, but below the recommended five servings per day (Kimmons et al, 2009). A lack of change for patients in their fruit and vegetable intake also may be attributed to the short time frame between the pre- and post- surveys of four weeks. Similar results were seen with self-reported physical activity, with no significant changes between the pre- and post-surveys. Similar to the medical students, patients reported the majority of minutes of physical activity per day from mild physical activity (easy walking). Interestingly, there were no changes between the patients in the RCC and the AAC for change in fruit and vegetable intake and physical activity habits. Since the patients in the AAC block were supposed to receive counseling from the medical students on their CHD risk and to develop a goal setting and a behavioral contract, it was expected that the patients in the AAC block would increase fruit and vegetable intake and physical activity more than patients in the RCC rotation. We believe that the medical students may not have followed through with the CHD risk assessment and behavioral counseling with the AAC patients, thus there were no differences between groups. Additionally, the medical students may have lacked the skills needed to help their patients implement changes to improve their dietary and physical activity habits.

Several significant correlations were seen between the medical students' pre-survey results and the change scores for their patients. For all medical students, and

when stratifying by gender and specialty choice, significant correlations were demonstrated that related to soy intake and exercise time. For all medical students, female medical students, and those planning to specialize in primary care, pre-survey higher soy intake significantly correlated with their patients' increase in soy intake. The only dietary correlation other than soy pertained to those students planning to go into a non-primary care specialty. For these medical students, pre-survey vegetable intake correlated with an increase in their patients' soy intake. Although the focus of the dietary aspect of this study was on fruit and vegetable intake, soy intake was the biggest correlate for dietary change. Plant-based and vegetarian diets have been correlated with some physicians' likelihood to provide patient nutrition counseling (Frank et al, 2002), and Spencer et al (2007) found that medical students self-identifying as vegetarians reported eating more fruits and vegetables than non-vegetarians. Plant-based diets are generally high in soy content, including soy-based foods such as tofu, soy-based milk, soy beans, and soy-based meat substitutes. Consuming a plant-based diet has been associated with decreases in CHD risk factors. A recent study by Jenkins et al (2011) showed that consuming plant-based diets significantly reduced LDL cholesterol. In a longitudinal prospective cohort study of soy intake in middle-aged and elderly Chinese women in Shanghai, China, researchers found that those women with usual higher intakes of soy foods saw an inverse relationship with both systolic and diastolic blood pressure (Yang et al, 2005). Soy intake in Western populations is extremely low and has not been well-studied (Willett, 2003). Although fruit and vegetable consumption did not change in our study, soy intake increased for patients counseled by medical students with higher baseline soy intake. This increase in soy intake may help patients to lower their CHD

risk. Additionally, the amount of soy in the diet may be a predictor of overall healthful dietary habits; however, more research is needed in this area to determine the relationship between soy intake and more healthful lifestyle habits.

Physical activity habits of the medical students also showed some significant correlations with their patients' change scores for physical activity and soy intake. Female medical students' with higher pre-survey mild and moderate exercise time correlated with increases in their patients' soy intake and strenuous exercise time. Female medical students with the lowest pre-survey strenuous exercise time also were correlated with a decrease in their patients' moderate exercise time. Several studies have demonstrated the relationship between a medical students' or physicians' physical activity habits and their likelihood to counsel their patients on physical activity (Lobelo et al, 2008; Frank et al, 2000; Howe et al, 2010). Findings from these studies include provider's physical activity of >150 minutes per week as a predictor of confidence in counseling for exercise; women physicians complying with the CDC/ACSM physical activity guidelines were more likely to counsel their patients on exercise; and physical activity habits of physicians and medical students influenced their patient counseling practices. The results from our study also indicate that physical activity habits of medical students may have an association with counseling practices; however our study is the first one to demonstrate that the physical activity habits of medical students can significantly affect patient outcomes.

Some interesting differences were seen when stratifying medical students by gender and planned specialty choice. Significant changes in patient health behaviors were correlated with female medical students. Spencer et al (2006) also found that

female medical students were significantly more likely to find nutrition highly relevant. These results may indicate that medical school curricula should target male medical students for changes in physical activity and nutrition. Our study found that students planning to specialize in both primary care and non-primary care had significant correlations with health behavior changes for their patients. Spencer et al found that medical students planning to specialize in primary care were more likely to find nutrition relevant. However, our study also found that those medical students planning to go into a non-primary care specialty, and who had higher pre-survey vegetable intake, had a significant increase in their patients' soy change scores. These results may indicate that lifestyle habits of medical students may be a better indicator of counseling on lifestyle behaviors than planned specialty choice.

Several limitations to this study exist. As an assessment of medical students at one institution, our results may not be directly applicable on a national level. Additionally, this study was conducted in Colorado, which nationally is ranked as the leanest state and has the lowest incidence of cardiovascular disease. Potential bias (including selection bias) may exist, given the voluntary nature of the survey for the medical students, and with a response rate of 61% for the medical students and 21% response rate for the post-surveys from patients, may not be directly reflective of our population as a whole. Additionally, the self-reported nature of the surveys may have allowed for recall bias or failure to estimate correctly becoming potential confounders. Patients with the most healthful behaviors may have been more likely to return the surveys. Moreover, the level of CHD risk of patients was not known, nor the patient

selection strategy by the medical students. Our analysis did not evaluate causality, thus there may be unknown factors that accounted for correlations we observed in this study.

The principle strength of our study was that, to our knowledge, it was the first to correlate medical students' lifestyle behaviors to patient outcomes. We examined the key indicators of healthful lifestyle behaviors: fruit, vegetable, and soy intake, and physical activity duration and intensity, for both medical students and for the patients whom they counseled during their eight-week primary care rotation. We saw significant correlations between the lifestyle behaviors of these medical students and their patients for soy intake and physical activity.

Conclusions

Medical students' and patients' fruit, vegetable, and soy intake and physical activity did not significantly change over an eight-week or a four-week period, respectively. Several significant correlations were seen between medical students' pre-survey soy intake and the number of minutes of physical activity, and subsequent increases in their patients' soy intake and the number of minutes of physical activity. These results show that health behaviors of medical students can have a significant impact on improving patient outcomes for vegetable and soy intake, and for increasing physical activity.

Medical schools should consider training interventions targeted at medical students to improve their own health behaviors, particularly for fruit, vegetable, and soy intake, and for physical activity. Future research is needed to further examine the impact of medical students' health behaviors and how these behaviors impact patient outcomes.

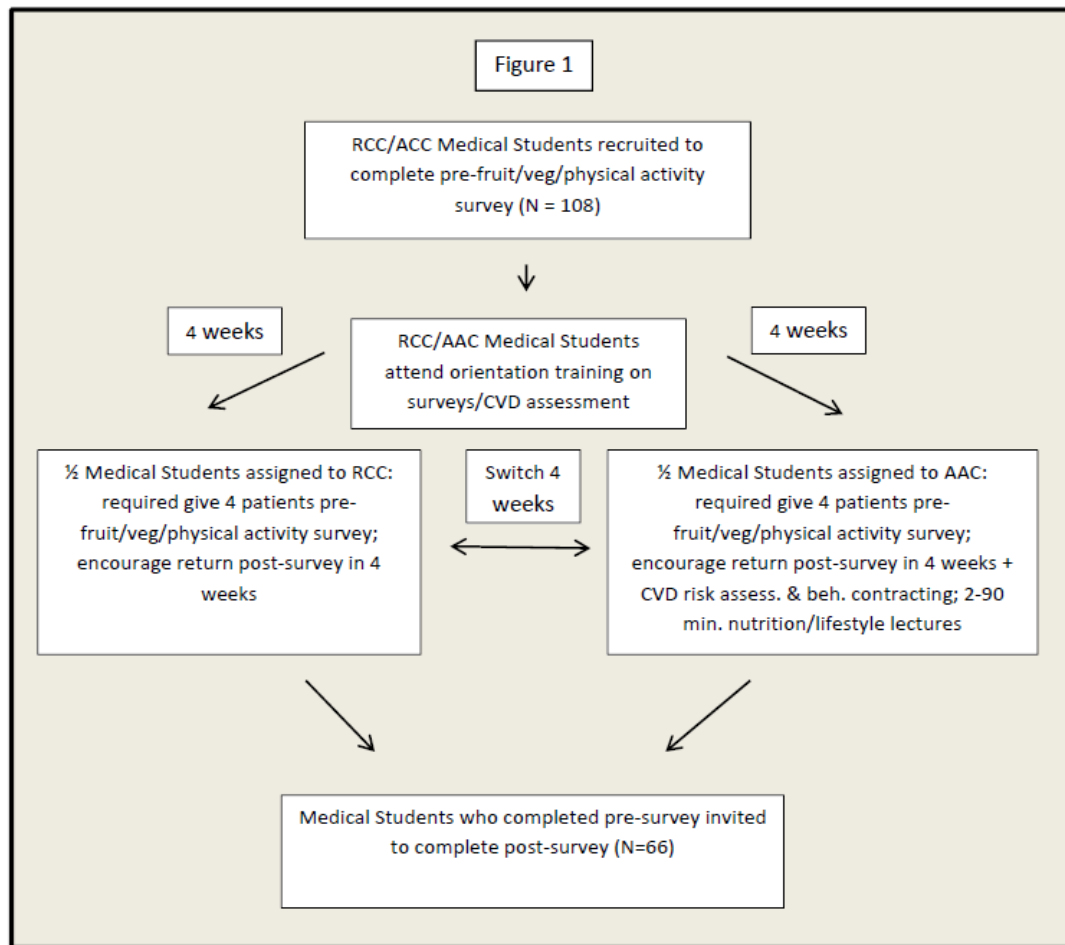


Figure 1: Study Design

Table 1: Self-Reported Characteristics of Medical Students (N= 66)

Characteristic	N (%)
Male	29 (44)
Female	37 (56)
Specialty:	-
Primary Care	19 (29)
Subspecialty	32 (48)
Undecided	15 (23)
Ethnicity:	-
White	59 (89)
Black	1 (1.5)
Hispanic	1 (1.5)
Other	5 (8)
	Mean (+SEM)
Age	27.72 (3.88)
BMI(calculated from weight & height)	23.05 (3.08)

Table 2: Self-Reported Characteristics of Patients with Pre-and-Post Surveys (N=133)

Characteristic	N (%)
Male	57 (43)
Female	76 (57)
Urban Location	57 (43)
Rural Location	76 (57)
	Mean (+SEM)
Age	65.27 (12.62)

Table 3: Self-Reported Health Behaviors for Medical Students and Patients

Health Behavior	Medical Students (N= 66) Mean (+/- SEM)				Patients (N=133) Mean (+/- SEM)			
	Pre	Post	Mean Change	P Value	Pre	Post	Mean Change	P Value
Average Fruit servings/day	1.81 (0.97)	1.88 (0.94)	0.01 (0.85)	0.91	0.85 (1.0)	0.78(0.9)	-0.1 (0.6)	0.19
Average Vegetable servings/day	2.27 (1.14)	2.54 (1.53)	0.11(1.21)	0.51	2.26 (1.50)	2.48 (1.7)	0.46 (1.7)	0.08
Average Soy servings/day	0.39 (0.43)	0.36 (0.37)	-0.05 (0.27)	0.22	0.263 (0.41)	0.29 (.46)	0.06 (.29)	0.24
Average minutes of mild exercise/day	26.26 (67.59)	21.82 (47.56)	-3.18 (32.73)	0.5	19.71 (24.82)	20.39 (43.67)	-0.65 (36.07)	0.94
Average minutes of moderate exercise/day	12.52 (12.9)	15.25 (13.03)	4.39 (19.09)	0.14	15.37 (24.61)	17.13 (24.65)	0.03 (13.67)	0.28
Average minutes of strenuous exercise/day	17.2 (13.96)	18.63 (14.33)	1.26 (10.81)	0.37	11.62 (20.42)	11.8 (17.42)	-0.35 (19.88)	0.94

Table 4: Patients Characteristics of Those with and without Post-Surveys

Baseline Patient Characteristics	Pre-and-Post Survey N=133 % or Mean ($\pm$ SEM)	Pre-Survey Only N=632 % or Mean ($\pm$ SEM)	p-value
Age	65.3 (12.6)	61.95 (5.6)	.001
% Female	57%	51%	.17
% Male	43%	46%	.17
% Rural Location	57%	51%	.13
% Urban Location	43%	49%	.13
Average daily servings fruit	0.85 (1.0)	.81 (.85)	.61
Average daily servings vegetables	2.26 (1.50)	2.21(1.7)	.55
Average daily soy servings	0.26 (0.41)	.34 (.69)	.26
Average daily mild exercise time (minutes)	19.7 (24.8)	23.8 (57.8)	.11
Average daily moderate exercise time (minutes)	15.4 (24.7)	16.4 (55.3)	.88
Average daily strenuous exercise time (minutes)	11.6 (20.4)	8.4 (18.6)	.04

Table 5: Comparison of All Medical Student Pre-Survey Health Behaviors with Patient Health Behavior Change Scores (R values)

Patients N= 133	Medical Students N=66					
	Fruit	Vegetable	Soy	Strenuous Exercise Change	Moderate Exercise Change	Mild Exercise Change
Fruit Change	-0.19	0.13	0.08	0.11	0.2	0.11
Vegetable Change	-0.02	0.16	-0.06	-0.12	-0.07	-0.1
Soy Change	-0.12	0.36	0.25	0.41	.52*	.58*
Strenuous Exercise Change	-0.18	0.05	.52*	-0.13	0.21	0.04
Moderate Exercise Change	-0.13	0.07	0.22	-0.23	-0.08	0.13
Mild Exercise Change	-0.11	0.28	-0.8	0.08	-0.23	-0.1

*P values $\leq .05$

Table 6: Comparison of Female Medical Student Pre-Survey Lifestyle Behaviors With Patient Lifestyle Behavior Change Scores (R values)

Patients N= 76	Female Medical Students Pre-Survey N=37					
	Fruit	Vegetable	Soy	Strenuous Exercise	Moderate Exercise	Mild Exercise
Fruit Change	-0.29	0.16	0.12	0.12	0.26	0.13
Vegetable Change	-0.18	0.26	0.02	-0.08	0.08	-0.15
Soy Change	0.05	0.38	0.21	0.36	0.74*	.70*
Strenuous Exercise Change	0.14	0.12	0.62*	0.1	0.13	-0.05
Moderate Exercise Change	0.05	0.19	0.13	-0.05	-0.12	0.12
Mild Exercise Change	-0.04	0.34	-0.15	0.26	-0.61*	-0.18

*P values $\leq .05$

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CHAPTER 7

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This chapter discusses the results of this investigation and offers conclusions based on these results. This chapter is organized by Major Findings, Limitations, and Recommendations for future studies.

Major Findings

This study found several interesting results:

- 1) The principle strength of this study was that it was the first, to our knowledge, to correlate medical students' lifestyle behaviors to patient outcomes.
- 2) Health behaviors for medical students and patients did not change for fruit, vegetable, and soy intake and physical activity over an eight- and four-week period of time. Although this finding was disappointing, it is useful to show that this time period is not sufficient to produce behavior change. A review of the literature on nutrition counseling to decrease CHD risk factors (Spahn et al, 2010) found that 18 months duration for CBT facilitated modification of dietary habits and weight to lower CHD risk. Future research should consider a longer follow-up period of greater than one year.
- 3) Health behaviors for medical students may not have changed since the curriculum for the nutrition lectures did not emphasize personal behavior change. Other researchers have shown that a targeted nutrition and health behavior change curriculum for medical students can produce significant

changes in fat intake and implementing healthful behaviors (Conroy et al, 2004; Kushner et al, 2011). Compared with the results of the Conroy and Kushner studies, our study demonstrates that in order to produce significant health behavior changes for medical students, a nutrition curriculum needs to include a robust behavior change component.

- 4) Disappointingly, there were no changes between the patients in the RCC and the AAC in fruit and vegetable intake and physical activity habits. The lack of change between the pre- and post- surveys for the RCC patients was expected, as they did not receive any type of lifestyle counseling. However, we did anticipate a change in the AAC patients' fruit, vegetable, and soy intake, and in their physical activity. Since the patients in the AAC block were supposed to receive counseling from the medical students on their CHD risks and develop a shared goal-setting and a behavioral contract, we had expected that the patients in the AAC block would increase fruit and vegetable intake and physical activity more than patients in the RCC rotation who did not receive this type of intervention. However, it was not required for the medical students to document completion of the CHD and behavioral contract with the patients. During the preliminary study, it was found that medical students were not conducting the CHD risk assessment and behavioral contract with patients, since it was not required and was not part of their grade. For the preliminary study, the criteria and grading were changed so that the medical students had to turn in copies of the behavioral contract (*The Coronary Heart Disease Risk Score Card*) for eight patients. After this change was

implemented, there was a concurrent increase in the number of returned initial and four-week, follow-up patient postcards. For this study, since it was required that the medical students had to turn in the patient pre- *Healthy Doc-Healthy Patient* survey, the requirement to turn in a copy of the CHD risk assessment and behavioral contract was dropped. The medical students may not have followed through with the CHD risk assessment and behavioral contracting with the AAC patients, thus there were no differences between groups.

- 5) Medical students may have lacked the skills needed to help their patients change their fruit, vegetable, and soy intake and physical activity habits. The CHD curriculum for this study included several nutrition counseling techniques of CBT, motivational interviewing, and goal setting. However, the medical students received a short training on implementation of these behavior change techniques during the one-day required orientation. The CU-SOM curriculum does not include behavior change counseling in other clinical rotations nor during didactic sessions.
- 6) The small impact of medical student behavior change counseling on changing patient lifestyle habits indicates the work of RDs is very important for decreasing CHD risk factors. Other research has compared the effect of MNT delivered by RDs with usual physician counseling. Results showed greater benefits for reductions in CHD risk factors in the dietitian-led groups (Rhodes et al, 1996; Hebert et al, 1999).

- 7) The *Healthy Doc-Healthy Patient* post-survey response rate for the patients was low (21%). The Institutional Review Boards did not allow collection of any patient identifiers, thus limiting the ability for follow-up. In order to determine change in health behaviors, a better return rate for the post-surveys is needed. Response rates of >60% is the goal for most researchers (Fincham, 2008). In order to achieve this level, future research addressing patient follow up will need to include the ability to contact patients to reinforce goal setting and remind them to complete post-surveys.
- 8) The most interesting results that emerged from this study are the significant correlations between medical students' baseline health behaviors and the corresponding changes in the patients they saw during their RCC and AAC rotations. For all medical students, the significant correlations related to soy intake and exercise time. Although the focus of the dietary aspect of this study was on fruit and vegetable intake, soy intake was the biggest correlate for dietary change. Plant-based and vegetarian diets have been correlated with some physicians' likelihood to provide patient nutrition counseling (Frank et al, 2002), and Spencer et al (2007) found that medical students self-identifying as vegetarians reported eating more fruits and vegetables than non-vegetarians. Soy intake may be a predictor of overall healthful habits, and more research in this area is warranted. In addition, the increased soy content of patients' diets may have an impact of reduction of CHD risk factors. More research should be considered to determine if CHD risk factors in patients

(blood pressure, LDL cholesterol, total cholesterol) changed with the corresponding reported increase in soy intake.

Baseline physical activity habits of medical students also showed significant correlations with their patients' changes in physical activity and soy intake. Several studies have demonstrated the relationship between medical students' or physicians' physical activity habits and their likelihood to counsel their patients on physical activity (Lobelo et al, 2008; Frank et al, 2000; Howe et al, 2010). The results from this study indicate that physical activity habits of medical students have an association with their counseling practices; however, this study is the first to demonstrate that the physical activity habits of medical students can significantly affect patient outcomes.

9) Results from this study showed significant correlations between female medical students' pre-survey mild and moderate exercise time and soy intake, and changes in their patients' soy intake and strenuous exercise time. No correlations were seen for male medical students. Spencer et al (2006) also found that female medical students were significantly more likely to find nutrition highly relevant. These results may indicate that medical school curricula should target male medical students for changes in physical activity and nutrition.

10) Interesting correlations were seen when stratifying medical students by specialty choice. Medical students planning to go into primary care, and who had higher pre-survey scores for soy intake, correlated with significantly higher change scores for strenuous exercise in their patients. Spencer et al

(2006) also found that medical students planning to specialize in primary care were more likely to find nutrition relevant. However, this study also found that those medical students planning to go into a non-primary care specialty, and who had higher pre-survey vegetable intake, had a significant increase in their patients' soy change scores. These results may indicate that lifestyle habits of medical students may be a better indicator of counseling on lifestyle behaviors than planned specialty choice.

Limitations

There were several limitations for this study:

- 1) The self-reported nature of the data;
- 2) Low post-survey response rate;
- 3) Inability of the study personnel to collect patient identifiers' limited ability for follow-up with patients;
- 4) The study sample was a convenience sample and may not reflect medical students across the nation;
- 5) The level of CHD risk for patients was not known, nor the patient selection strategy by the medical students;
- 6) Our analyses did not evaluate causality, thus there may be unknown factors that accounted for correlations we observed in this study.

Recommendations

The results from this study have some very important implications for medical student education:

- 1) Curricula on nutrition and lifestyle change needs to include a robust behavior change component in order to see changes in medical students' own health behaviors.
- 2) This study found that medical students' health behaviors, particularly for soy intake and physical activity, may have an impact on improvement for these same parameters in the patients they counsel. Results from this study emphasize the need to encourage healthful lifestyle behaviors for medical students as these can help to improve CHD risk factors for their patients.
- 3) Previous studies have shown that medical students planning to specialize in primary care report healthier behaviors and disclose that they are more likely to counsel their patients on nutrition and physical activity. This study found significant correlations between both medical students planning to specialize in primary care, and those planning to specialize in a sub-specialty and significant correlations to changes in health behaviors for their patients. These results may indicate that the health behaviors of medical students are a better indicator of patient counseling practices than specialty choice. This result strengthens the argument to include curricula in medical school education on health behavior change.

Recommendations for Medical School Faculty

Results from this study indicate that baseline health behaviors of medical students have a significant effect on change in their patients' soy intake and physical activity habits. However, additional research is needed to determine these correlations.

Recommendations for faculty who are involved with medical school curriculum development:

- 1) Incorporate a curriculum that focuses on health behavior changes for medical students.
- 2) Incorporate a longer follow up period of three to six months.
- 3) Include conducting health behavior change counseling with patients as part of the required curriculum.
- 4) Determine methods for patient follow up that meet criteria of the Colorado Multiple Institutional Review Board.

Recommendations for Future Research:

- 1) A longer follow-up period for both the medical students and the patients are needed to truly detect a change in health behaviors. A period of three to six months is recommended for a future study.
- 2) In order to increase the response rate for the patient follow-up surveys, and to stay in compliance with HIPAA regulations, it is recommended that the medical students follow up with their patients. The study design should include a requirement for the medical students to call their patients within two weeks of completion of the pre-survey and again in six weeks. Study design should include asking patients to return to the clinic in three months to reassess progress on health behavior change. Future study design should also consider chart audits to determine other patient outcomes such as improvements in blood pressure, lipids, and glucose levels.

- 3) Health behavior change curricula implemented as part of a study needs to be required and part of the grade for that particular rotation.

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APPENDIX A

PATIENT HANDOUTS: FRAMINGHAM 10-YEAR CHD RISK ASSESSMENT,
BEHAVIORAL CONTRACTING AND GOAL SETTING, AND TLC GUIDELINES

Framingham 10-year Coronary Heart Disease Risk Assessment

NCEP ATP III Defined Major Risk Factors for Coronary Heart Disease

Risk Factors	Yes	No
• Currently Smoking Cigarettes	☐	☐
• Hypertension (BP $\geq$ 140/90 or antihypertension meds)	☐	☐
• Low HDL cholesterol (<40mg/dL)	☐	☐
• Family HX premature CHD	☐	☐
men 1° relative < 55		
women 1° relative < 65		
• Age	☐	☐
men $\geq$ 45 years old		
women $\geq$ 55 years old		

If 2+ risk factors are present, assess 10-year CHD risk.
If already established CHD, other Atherosclerotic diagnosis or diabetes,
10-year risk will automatically be > 20%.

Framingham 10-year Coronary Heart Disease Risk Assessment

Note: When assessing risk, also consider weight (BMI), metabolic syndrome, heredity, including race/ethnicity and socioeconomic status

Years	Age Male Points	Female Points	Risk Factor	Value	Points
20-34	-9	-7	Age	_____ yrs	_____
35-39	-4	-3	Systolic Blood Pressure	_____ mmHg	_____
40-44	0	0	HDL-C	_____ mg/dL	_____
45-49	3	3	Total Cholesterol	_____ mg/dL	_____
50-54	6	6	Smoker	Yes ☐ No ☐	_____
55-59	8	8			
60-64	10	10			
65-69	11	12			
70-74	12	14			
75-79	13	16			

(mg/dL)	HDL Male Points	Female Points
> 40	2	2
40-49	1	1
50-59	0	0
$\geq$ 60	-1	-1

(mmHG)	Male Points		Female Points	
	Untreated	Treated	Untreated	Treated
< 120	0	0	0	0
120-129	0	1	1	3
130-139	1	2	2	4
140-159	1	2	3	5
$\geq$ 160	2	3	4	6

(mg/dL)	Male Points					Female Points				
	20-39	40-49	50-59	60-69	70-79	20-39	40-49	50-59	60-69	70-79
< 160	0	0	0	0	0	0	0	0	0	0
160-199	4	3	2	1	0	4	3	2	1	1
200-239	7	5	3	1	0	8	6	4	2	1
240-279	9	6	4	2	1	11	8	5	3	2
$\geq$ 280	11	8	5	3	1	13	10	7	4	2

	Male Points					Female Points				
	20-39	40-49	50-59	60-69	70-79	20-39	40-49	50-59	60-69	70-79
Nonsmoker	0	0	0	0	0	0	0	0	0	0
Smoker	8	5	3	1	1	9	7	4	2	1

Total Points
Male $\leq$ 11
Female $\leq$ 19
< 10%

Total Points
Male $\leq$ 12-15
Female $\leq$ 20-22
10% - 20%

Total Points
Male $\leq$ 16
Female $\leq$ 23
> 20%

My Coronary Heart Disease Risk Score Card (Patient Behavior Contract)

~~MY CORONARY HEART DISEASE RISK SCORE CARD~~

Your *Medical Student* has conducted a risk assessment test for **coronary heart disease (CHD)** using the Framingham 10-year Coronary Heart Disease Risk Assessment.

Following are your recommendations for prevention or treatment of CHD:

My risk of having a heart attack or dying from heart disease over the next 10 years is: _____

Other CHD Risk Factors I Can Improve:

Risk Factors	Yes	No
• BMI ≥ 30	☐	☐
My BMI: _____		
• Physical Inactivity:	☐	☐
• Alcohol Consumption	☐	☐
High risk if > 2 drinks per day		

Am I Ready To Make A Change To Decrease My Risk?

On a scale of 1 to 10 (1 = not ready; 10 already making big changes)

- How important to you is it to improve your health?
- How confident are you that you can make changes to improve your health?
- My potential barriers?

My Personalized Treatment Goals:

	Where I am Now	Goal	Doing Great	Priority
• LDL Cholesterol	_____	_____	_____	_____
• Smoking Cessation	_____	_____	_____	_____
• Blood Pressure	_____	_____	_____	_____
• HgA1C (if diabetic)	_____	_____	_____	_____
• Body Weight	_____	_____	_____	_____
• Daily Physical Activity	_____	_____	_____	_____
• Depression Coexisting	_____	_____	_____	_____
• Alcohol Consumption	_____	_____	_____	_____

Achievable goal(s) for me to follow for the next 2 weeks include:

(check all that apply, see handout for *TLC Guidelines*)

- ☐ Reduce my fat and saturated fat intake
- ☐ Increase my physical activity by wearing my step counter
- ☐ Increase my fiber intake and servings of fruits and vegetables to 5 servings a day
- ☐ Weight loss
- ☐ Decrease my alcohol consumption
- ☐ Follow DASH and/or low sodium diet to decrease my blood pressure (see handout for *TLC Guidelines*)
- ☐ Community resources I will utilize: _____
- ☐ I will follow up with my doctor: _____

Therapeutic Lifestyle Change Guidelines:

Therapeutic Lifestyle Change (TLC) & NHLBI High Blood Pressure Recommendations:

Essential features of the TLC and NHLBI High Blood Pressure Treatment plan are:

- Reduce intakes of saturated fats and cholesterol
- LDL lowering with increase in fiber intake
- DASH diet recommendations
- Weight reduction
- Increased physical activity
- Smoking Cessation

Modification	Recommendation	Food or Activity to Increase or Decrease
Reduce intakes of saturated fats and cholesterol	Reduce total fat intake to 25-35% and saturated fat to no more than 7% of total calories; polyunsaturated fat up to 10% of total calories and monounsaturated fat up to 20% of total calories. Reduce cholesterol intake to <200 mg/day.	<i>Avoid foods high in saturated fat, such as:</i> butter, egg yolks, whole milk dairy products, fatty beef and pork products, poultry skin, lard, coconut oil, palm oil, and fried foods. <i>Foods high in monounsaturated fat that should be included in moderation:</i> olive oil, canola oil, flax seed oil, sesame oil, and avocado.
Increase Fiber and Fruit and Vegetable Intake	Include 25-35 grams of fiber/day and at least 5 servings of fruits and vegetables/day.	<i>Foods high in fiber should be included such as:</i> fruits and vegetables, nuts, seeds, whole grains, cereals, oat bran, barley, dried beans and peas, psyllium and flax seed.
DASH Diet Recommendations to Lower Blood Pressure (If applicable)	In addition to following above recommendations for decreasing saturated and total fat, and increasing fiber, adopt a diet rich in fruits, vegetables and low fat dairy products.	<i>Include</i> at least 5 servings of fruits and vegetables each day. <i>Include</i> lowfat dairy sources, such as 1% or skim milk, lowfat yogurt, and cottage cheese.
Dietary Sodium Restriction (If applicable)	Reduce dietary sodium intake to <100 mmol/day (2.4 grams sodium or 6 grams sodium chloride).	<i>Avoid foods high in sodium, such as:</i> canned vegetables, frozen/packaged meals, soups, cured meats, snack foods such as chips, and fast food. <i>Include low sodium foods, such as:</i> fresh or frozen fruits and vegetables, dried beans & lentils, and nuts & seeds.
Weight Reduction	Lose 10% of body weight by decreasing calories by 500/day.	Follow the above recommendations for decreasing total fat and increasing fiber. Decrease portion sizes, sugared drinks and high-sugar foods. Follow recommendations below for physical activity.
Increased Physical Activity	Accumulate at least 30 minutes of physical activity or 10,000 steps on most days of the week.	Wear step counter daily and record steps. Increase steps by 500 each week above baseline to achieve 10,000 steps/day weekly average.
Smoking Cessation (If applicable)	Stop Smoking	<i>Seek smoking cessation assistance,</i> such as Quitline: 1-800-784-8669

APPENDIX B

PATIENT INITIAL AND FOLLOW-UP POSTCARDS

Appendix B: Patient Initial Postcard

Coronary Heart Disease Risk Score Card Evaluation

Thank you for letting me talk to you about your heart disease risk at Dr. _____'s office. So that we can continue to improve our student education, complete the information below and put this self-addressed and stamped postcard in the mail **this week**.

Age: _____

Ethnicity:

☐ Male

☐ Caucasian

☐ Hispanic

☐ Female

☐ African American

☐ Other

	Yes	No
• Did you learn anything new about your risk of heart disease from my teaching session?	☐	☐
• Was the information I gave you about your risk of heart disease helpful?	☐	☐
• Was the information I gave you about your risk of heart disease understandable?	☐	☐
• Did you set a weight loss goal?	☐	☐
• Are you planning on wearing your step counter on most days?	☐	☐
• If you smoke, were you advised to quit?	☐	☐
• Other Comments: _____		
Medical Student Name: _____		

Appendix B: Patient Follow-up Postcard

Coronary Heart Disease Risk Score Card Evaluation

Thank you for letting me talk to you about your heart disease risk at Dr. _____'s office. So that we can continue to improve our student education, complete the information below and put this self-addressed and stamped postcard in the mail **4 weeks after your appointment**.

Age: _____

Ethnicity:

☐ Male

☐ Caucasian

☐ Hispanic

☐ Female

☐ African American

☐ Other

	Yes	No
• Did my teaching session teach you anything about the risk of heart disease?	☐	☐
• Did you decrease your total fat and saturated fat intake?	☐	☐
• Have you lost any weight?	☐	☐
• If yes, how much weight have you lost?		
• Did you wear your step counter on most days?	☐	☐
• If yes, what were your average daily steps?		
• If you smoke, did you contact QuitLine or QuitNet?	☐	☐
• Other Comments: _____		

Thank you!

Medical Student Name: _____

APPENDIX C

***HEALTHY DOC-HEALTHY PATIENT* SURVEY QUESTIONS**

Fruit and Vegetable/Physical Activity Questionnaire

Please complete the following information and return this sheet to your provider.

Age: _____ ☐ Male ☐ Female Ethnicity: ☐ Caucasian ☐ African American ☐ Hispanic ☐ Other

Medical Student Number: _____

1. How many medium-sized servings do you typically consume per day, week, or month?

FOOD	NUMBER OF TIMES	DAILY	WEEKLY	MONTHLY
Fruit juice	① ② ③ ④ ⑤ ⑥	☐	☐	☐
Fruit, other than juice	① ② ③ ④ ⑤ ⑥	☐	☐	☐
Vegetable juice (tomato, V8, carrot)	① ② ③ ④ ⑤ ⑥	☐	☐	☐
Green Salad	① ② ③ ④ ⑤ ⑥	☐	☐	☐
Vegetable soup or stew	① ② ③ ④ ⑤ ⑥	☐	☐	☐
Beans (baked, pinto, kidney, lentils, not green beans)	① ② ③ ④ ⑤ ⑥	☐	☐	☐
Soy	① ② ③ ④ ⑤ ⑥	☐	☐	☐
Any other vegetable	① ② ③ ④ ⑤ ⑥	☐	☐	☐

2. In an average week, how many times do you perform strenuous exercise where your heart beats rapidly (e.g. jogging, soccer, aerobics, vigorous swimming or biking) and how long is each exercises episode?

Number of times weekly (mark one)

- ☐ 1 time ☐ 6 times ☐ 11 times
☐ 2 times ☐ 7 times ☐ 12 times
☐ 3 times ☐ 8 times ☐ 13 times
☐ 4 times ☐ 9 times ☐ 14 times
☐ 5 times ☐ 10 times

Length of time for each exercise episode (mark one)

- ☐ 10 minutes ☐ 60 minutes ☐ 5 hours
☐ 15 minutes ☐ 90 minutes ☐ 6 hours
☐ 20 minutes ☐ 2 hours ☐ 7 hours
☐ 30 minutes ☐ 3 hours ☐ 8 hours
☐ 45 minutes ☐ 4 hours ☐ 9+ hours

3. In an average week, how many times do you perform moderate, non exhausting exercises (e.g., fast walking, tennis, volleyball, dancing, easy swimming and/or biking) and how long is each exercises episode?

Number of times weekly (mark one)

- ☐ 1 time ☐ 6 times ☐ 11 times
☐ 2 times ☐ 7 times ☐ 12 times
☐ 3 times ☐ 8 times ☐ 13 times
☐ 4 times ☐ 9 times ☐ 14 times
☐ 5 times ☐ 10 times

Length of time for each exercise episode (mark one)

- ☐ 10 minutes ☐ 60 minutes ☐ 5 hours
☐ 15 minutes ☐ 90 minutes ☐ 6 hours
☐ 20 minutes ☐ 2 hours ☐ 7 hours
☐ 30 minutes ☐ 3 hours ☐ 8 hours
☐ 45 minutes ☐ 4 hours ☐ 9+ hours

4. In an average week, how many times do you perform mild, minimally exertive exercise (e.g., easy walking, golf, bowling, yoga) and how long is each exercises episode?

Number of times weekly (mark one)

- ☐ 1 time ☐ 6 times ☐ 11 times
☐ 2 times ☐ 7 times ☐ 12 times
☐ 3 times ☐ 8 times ☐ 13 times
☐ 4 times ☐ 9 times ☐ 14 times
☐ 5 times ☐ 10 times

Length of time for each exercise episode (mark one)

- ☐ 10 minutes ☐ 60 minutes ☐ 5 hours
☐ 15 minutes ☐ 90 minutes ☐ 6 hours
☐ 20 minutes ☐ 2 hours ☐ 7 hours
☐ 30 minutes ☐ 3 hours ☐ 8 hours
☐ 45 minutes ☐ 4 hours ☐ 9+ hours

Medical Student Health Behaviors and the Influence on Patient Outcomes, Barton/Jortberg

APPENDIX D

DEMOGRAPHIC QUESTIONS FOR MEDICAL STUDENTS

Medical Student Year III and Year IV Fruit & Vegetable/Physical Activity Su...

*** 1. Please enter your name. Please note that you will automatically be assigned a number so all of your answers will not be related to your name.**

*** 2. Please enter your age.**

*** 3. Please choose your ethnicity:**

- ☐ Caucasian
- ☐ African American
- ☐ Hispanic
- ☐ Other

*** 4. Please select your gender:**

- ☐ Male
- ☐ Female

*** 5. Please enter your current weight and height:**

Weight (lbs):

Height (Inches):

*** 6. Please choose your intended specialty:**

- ☐ Primary Care (family medicine, general internal medicine or pediatrics, obstetrics and GYN, preventive medicine/public health)
- ☐ Subspecialist (dermatology, emergency medicine, medical/pediatric subspecialist, pathology, physical medicine and rehabilitation, psychiatry, radiology, surgery (e.g., general surgery, neurological surgery, ophthalmology, orthopedic surgery, otolaryngology, plastic surgery, urology, etc.))
- ☐ Undecided

*** 7. How do you feel that your nutrition and/or physical activity habits have changed since beginning medical school?**

- ☐ No Change
- ☐ Improved
- ☐ Worsened

8. If you feel that your nutrition and/or physical activity habits have worsened, why do you think this is the case? Please check all that apply:

- ☐ Less free time
- ☐ Increased stress
- ☐ Less sleep
- ☐ Financial restrictions for healthy food choices

Other (please specify)

9. How many medium-sized servings do you typically consume per day, week, or month? Please choose frequency and whether it is Daily, Weekly, or Monthly by selecting "X" in the drop-down box in the appropriate column:

	Number of Times	Daily	Weekly	Monthly
Fruit Juice				
Fruit, other than juice				
Vegetable Juice (tomato, V8, carrot)				
Green Salad				
Vegetable soup or stew				
Beans (baked, pinto, kidney, lentils, not green beans)				
Soy				
Any other vegetable				

10. For the next set of questions, please record how many times and for how long you perform the exercises described.

	Frequency	Duration
In an average week, how many times and for how long do you perform strenuous exercise where your heart beats rapidly (e.g. jogging, soccer, aerobics, vigorous swimming or biking) and how long is each exercise episode?		
In an average week, how many times do you perform moderate, non exhausting exercises (e.g., fast walking, tennis, volleyball, dancing, easy swimming and/or biking) and how long is each exercise episode?		
In an average week, how many times do you perform mild, minimally exertive exercise (e.g., easy walking, golf, bowling, yoga) and how long is each exercise episode?		

11. Additional Comments

APPENDIX E

INSTITUTIONAL REVIEW BOARD APPROVAL LETTERS



Colorado Multiple Institutional Review Board, CB F490
University of Colorado, Anschutz Medical Campus
13001 E. 17th Place, Building 500, Room N3214
Aurora, Colorado 80045

303.724.1055 [Phone]
303.724.0980 [Fax]
uchsc.edu/comirb [Web]
comirb@ucdenver.edu [E-Mail]
FWA00005070 [FWA]

University of Colorado Hospital
Denver Health Medical Center
Veteran's Administration Medical Center
The Children's Hospital
University of Colorado Denver
Colorado Prevention Center

Certificate of Exemption

09-Aug-2010

Investigator: William Barton
Sponsor(s):
Subject: COMIRB Protocol 10-0695 Initial Application
Effective Date: 03-Aug-2010
Anticipated Completion Date: 03-Aug-2013
Exempt Category: 2
Title: Medical Student Health Behaviors and the Influence on Patient Outcomes

This protocol qualifies for exempt status. Periodic continuing review is not required. For the duration of your protocol, any change in the experimental design/content of this study must be approved by the COMIRB before implementation of the changes.

The anticipated completion date of this protocol is 03-Aug-2013. COMIRB will administratively close this project on this date unless otherwise instructed either by correspondence, telephone or e-mail to COMIRB@ucdenver.edu. If the project is closed prior to this date, please notify the COMIRB office in writing or by e-mail once the project has been closed.

You will be contacted every 3 years for a status report on this project.

Any questions regarding the COMIRB action of this study should be referred to the COMIRB staff at 303-724-1055 or UCHSC Box F-490.

Review Comments:

This approval includes:

1. Not Human Subject or Request for Exemption Application
2. Fruit and Vegetable/Physical Activity Questionnaire
3. Fruit and Vegetable/Physical Activity Follow Up Questionnaire
4. Medical Student Fruit and Vegetable/Physical Activity Questionnaire

Sincerely,

UCD Panel B



Research Integrity & Compliance Review Office
Office of Vice President for Research
Fort Collins, CO 80523-2011
(970) 491-1553
FAX (970) 491-2293

DATE: October 13, 2010

TO: Mary Harris, FSHN
Bonnie Jortberg, FSHN

FROM: Janell Barker, IRB Administrator
Research Integrity & Compliance Review Office

TITLE: Medical Student Health Behaviors and the Influence on Patient Outcomes

IRB ID: 026-11H

Review Date: October 13, 2010

The Institutional Review Board (IRB) Administrator has reviewed this project and has declared the study exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b)(2): Research involving the use of educational tests,....survey procedures, interview procedures or observation of public behavior, unless: a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects. The IRB determination of exemption means that:

- You do not need to submit an application for annual continuing review.
- You must carry out the research as proposed in the Exempt application, including obtaining and documenting (signed) informed consent if stated in your application or if required by the IRB.
- Any modification of this research should be submitted to the IRB through an email to the IRB Administrator, prior to implementing any changes, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.
- Please notify the IRB if any problems or complaints of the research occur.

Please note that you must submit all research involving human participants for review by the IRB. **Only the IRB may make the determination of exemption**, even if you conduct a similar study in the future.