Improving Referral Management After Biometric Health Screening

Gene Farrug

East Carolina University

Abstract

Referral management after biometric health screening is an integral component in the employee health model of care. Early detection and identification of health problems, counseling, follow-up, and referral to a health care provider can improve patient outcomes. PURPOSE: The purpose of this project was to improve the referral management process after biometric screening at a central North Carolina employee health center. Biometric screening referrals for 2015 were reviewed. A sample of 420 screens revealed 84% of patients with abnormal biometric screens did not follow-up with the health center, therefore no further referral was completed. Using an updated biometric screening process and intervention tool, 2015 and 2016 data were then compared to assess for an improvement between the two years. METHODS: Random retrospective chart review and comparison was limited to selected months between January through June 2015 and 2016. Evaluation measures included the following: initial patient referral using intervention tool after biometric screening, contact with the employee after completion of the screening, documentation of the referral completion, and employee's return to the health center. RESULTS: 2016 abnormal biometric screens were consistently referred for follow-up counseling using intervention tool. Evaluation of the data revealed process improvement in screening and referral consistency and documentation. Health center utilization improved between 2015 and 2016. A revised policy on referral management at the health center improved consistency between screeners, tracking of referrals, patient follow-up, and patient volume at the health center. CONCLUSIONS: Using a standardized referral process and intervention tool improved the biometric screening program in this central NC employee health center.

Dedication

To Aimee

Acknowledgments

Thank you to my partner and spouse Aimee Roy Farrug. You have been a wonderful support during this academic and professional journey. Your intelligence, compassion, love, strength, and attention to detail have always inspired me to keep working for the greater good. To my family and friends, especially, my parents Joseph and Virginia, and children Owen and Maisy, who have paved the way and kept me moving over these last few years. Writing the proposal for this project at my father's bedside, with my mother trying to diagnose and treat his sodium imbalance, was a classic moment for my family. To Ralph, Nancy, and the entire Roy side of our family, you all are a true blessing to this world. A big thank you to Dr. Heath Sledge for your wonderful editorial work. I thank and acknowledge all the ECU doctor of nursing practice faculty. Thank you to Dr. Skipper your wonderful assistance, inspiration, and support started way back in Asheville when we could not find our meeting. Dr. King was deployed and still managed to assist me at the beginning and the end of this endeavor. Dr. Corbett and Dr. Tillman both helped me when I needed it most: thank you. Thanks to Dr. Kosko for being on my committee. Kathleen Franklin for being on my committee, your work on the project, and putting up with my work frustrations. Diana Wilson for your work on the project and referral tool. Dr. Trocki and Dr. Trogdon for their statistics prowess and professional input: thank you. Finally, I thank all my professional colleagues and patients who helped make this work an important part of our clinic and our lives. I truly believe we did a great job!

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Chapter I: Introduction

Biometric health screening in an employee health center is an essential component in promoting health and wellness in an employee heath population. The purpose of this quality improvement project (QIP) was to further develop the referral management process after biometric screening at an employee health center in North Carolina. Several studies have cited using biometric screening in employee-based health and wellness programs (Henke, Goetzel, McHugh, & Isaac, 2011; Goetzel and Ozminkowski, 2008, Goetzel et al., 2002). These studies have shown significant promise in improving employee health and reducing health expenditures for their companies. The process of biometric screening, counseling on results, and referral management after biometric screening is a topic of tremendous value to both employees and employers that has not been extensively studied in the literature.

This project reviewed data from a large employee health center in North Carolina. Over 5,000 employees were eligible to participate in biometric screening. Initial sample data was collected as part of the quality assurance process in 2015. This process (Table 1) revealed 84% of patients with abnormal screening results (elevated BMI, cholesterol, blood pressure, or glucose) did not follow-up with the health center, therefore no further health referral was completed for the employee with the abnormal screen. The intention of the biometric screening process for the company and its employees was to assist employees improve their health, and the overall health of the company. This project reviewed the biometric screening process including: screening documentation, following up on abnormal screens, and making appropriate referrals after their abnormal screens.

Table 1

Sample of follow-up data of NC health center patients after biometric screening 2015

	N	BMI	Glucose	Lipids	BP	Tobacco
Total number of patients	437	309	114	175	78	15
Total follow-up	420					
Total contacted & follow-up	59					
Total contacted & no follow-up	361					
Total reported PCP follow-up	9					
Total not eligible	17					
Total contacted	382					
Total not contacted	55					

Note. Total number of patients = total number of patients counseled in sample. Total follow-up = total number of patients who were counseled and needed follow-up in health center. Total contacted & follow-up = total number who were counseled and did follow-up in health center. Contacted & no follow-up = total number who were counseled and who did not follow-up in health center. Total reported primary care provider (PCP) follow-up = total who reported follow-up with primary care provider. Total not eligible = total not eligible for follow-up by health center. Total contacted = total contacted by health center. Total no contacted = total not contacted by health center. Lab values = 1 or more elevated values. BMI = BMI over 28. Glucose = >100. Fasting Lipids = at least 1 value elevated in lipid panel. BP = Blood pressure >. Tobacco = Tobacco user.

Problem Statement

The United States and state of North Carolina spends billions of dollars on clinical testing, documentation, and health related complications related to obesity, diabetes, and hypertension (CDC, 2015f). The North Carolina employee health center being studied serves patients in multiple states and spends a significant percentage of its employee health care dollars on heart disease, diabetes, and obesity related health problems (BCBS NC, 2015; Stroke, 2012). Furthermore, the cost to this company and the company's employees appears to be rising yearly (Alexander, Garloch, & Neff, 2012; BCBS NC, 2015; Stroke 2012).

Accordingly, programs focusing on improving employee health screening and managing abnormal values through appropriate follow-up and referral are beneficial to both employees and corporations (Goetzel et al., 2014; Volpp, Asch, Galvin, & Loewenstein, 2012). Employer-based biometric screening and wellness programs have the potential to improve patient health outcomes and decrease health care spending. The average American spends a third of their day at work, thus incorporating screening, tracking, and managing referrals on these health issues can serve the multiple roles of increased employee health, wellness, and lower health care costs (CDC, 2014b).

Purpose

The purpose of this project is to improve the documentation, follow-up, and referral management process at an employee health center. The change in practice occurred between 2015 and 2016. A retrospective chart review was completed between June 2016 and August 2016. This data was collected to measure the improvement of this QIP. The health center evaluated our current referral policy/practice which varied between screener (Table 5) and

standardize it between screeners (Table 6). This included evaluation, education, documentation, and patient follow-up.

Background

The initial biometric screening occurred at the health center between January and June of 2015. Prior to this time, biometric screening was performed outside of the health center by a corporate partner. The health center proposed completing the biometric screening process using available clinical staff in the employee health center and provide point of care testing. This proposal included potential cost savings (reduced labor cost) and potential improvement in quality of care (e.g. same day results). The plan for transition started in 2014 and was completed in 2015. The biometric screening process was repeated in 2016 and scheduled again for 2017.

As part of our organization's quality assurance and improvement process for screening at the health center, a sample of referral management and biometric data (Table 1) was collected on employees whose 2015 screenings showed abnormal results. The aforementioned 2015 screening included body mass index, lipids, fasting glucose, blood pressure, and nicotine/cotinine levels. Cotinine levels were not checked in 2016. The sample of 420 screens revealed that 84% of patients with abnormal biometric screens did not follow-up with the health center, therefore no further referral was completed. This projects goal was to improve the biometric screening and referral process for employees in the NC employee health in 2016, and improve the process for future screening years.

After review of the screening process in 2015 (Table 5), several health management team issues were identified. First, a lack of clear referral guidelines between screeners was identified and a new referral tool was created and agreed upon (Table 6). Second, clinical roles in the health center were not clearly defined, resistance to the work flow was encountered, and

skepticism of the results was reported. For example, medical assistants questioned roles, and 2014 data was not available to benchmark our 2015 results. Bi-monthly meetings were held with providers (nurse practitioners), registered dietitian, health center manager, nurses, and medical assistants. Quarterly meetings were held with aforementioned clinical personnel, medical director (physician) and employer representative. The new tool was implemented (Table 6), clinical roles were reviewed, and employee work flow was discussed (Appendix B). The primary investigator applied Rogers' work on the diffusion of innovation to the process (Rogers, 2010). This provided greater understanding of the relationship between the employer, screener, and employee participant during a biometric screening process. Furthermore, it supported tolerance of a wide range of behavior experienced by the primary investigator, clinical staff, and company leadership during the project (Figure 2).

Clearly record redundancy created confusion; this was an ongoing issue and was greatly improved by scanning paper records into the electronic medical record. For example, data was stored in multiple computer programs which did not communicate with each other and a paper copy was filed. This redundancy in clinical records led to duplicate tests, misfiling, lack of referral, and inconsistent follow-up procedures between screeners. Inefficient documentation (e.g. documenting the same information 3 or 4 times) was noted by all screeners. Additionally, clinical roles related to biometric screening and referral needed reiteration and workflow concerns discussed and adjusted. The 2016 project improved clinical documentation and the referral management process, and will be continued in 2017. The creation and implementation of a referral management intervention tool (Table 6) made a difference in clinical documentation and participant follow-up, the results were reviewed and evaluated for quality assurance. The

quality assurance component of this project was completed in summer 2016 and included a chart review.

Quality Improvement Questions:

To date, research has explored the importance of biometric screening yet there is a limited amount of QIPs reviewing the importance of referral management after biometric screen at an employee health center. Based on the literature discussed in the evidence-based practices section, the principal investigator developed four quality improvement questions:

1. Does a consistent referral management process, using intervention tool, including participant tracking, and participant follow-up, make a difference in clinical documentation of the participant screen? Does the EHR have a biometric screen in 2015? In 2016?
2. Is there is a difference in clinical documentation with a consistent referral management process, including tacking and participant follow-up, in clinical documentation at the health center. Does the EHR have a referral? Did the health center contact the participant? Did the participant return to the health center?
3. Does a consistent referral management process, including tracking, and participant follow-up make a difference in observed patient volume at the health center?
4. What is the frequency of referrals for elevated body mass index, elevated glucose, elevated cholesterol, elevated lipids, and elevated blood pressure?

Definition of Terms

The following terms are operationalized as follows in the project:

Attended visit: Employee participant has a visit to the health center.

Biometric Screening: the measurement of objective physical features such as height, weight, body mass index, blood pressure, blood cholesterol, blood glucose, and physical fitness tests that

can be measured at a employee health center and used as part of a health screening to assess and evaluate changes in employee participant health status over time (CDC, 2015c).

Blood Pressure (BP): is the measure is the force of blood pushing against the walls of the arteries that carry blood from your heart to other parts of your body. Blood pressure normally rises and falls throughout the day, but it can damage your heart and cause health problems if it stays high for a long time. High blood pressure is also called hypertension. This is consistent with the CDC (2015a) guidelines for screening asymptomatic adults.

Body Mass Index-BMI: is used as a screening tool for overweight or obesity. BMI is a person's weight in kilograms divided by the square of height in meters. The formula for BMI is weight in pounds (lbs) divided by height in inches (in) squared and multiplied by a conversion factor of 703. A BMI range of >17 and < 28 has been set as an individual goal body mass for the employee population. This is consistent with the CDC (2015d), and NIH guidelines for screening asymptomatic adults.

Cholesterol and Lipid Testing: is the measure of cholesterol and lipids, waxy fat-like substances that travel through the blood. Cholesterol and Lipid testing defined in this project is consistent with the CDC (2015b) guidelines for screening asymptomatic adults.

Diffusion of Innovation with Biometric Screening in Employee Health: process which employees experience when receiving personal health information from employer sponsored program. This process is also experienced by employees facilitating program (Rogers, 2010).

Electronic Health Record/EHR: electronic database at employee health center utilized for chart review.

Follow-Up Visit: a visit documented in the EHR for counseling on abnormal biometric screening results.

Glucose Testing: is the measure of blood sugar in the human body. Normal Glucose is 60–100 mg/dl. Glucose testing defined in this project is consistent with the American Diabetes Association (ADA, 2015) guidelines for screening asymptomatic adults.

Hemoglobin A1c testing: the measure of blood sugar in the human body over 3 months. A normal hemoglobin A1c is < 5.7, this correlates to an average blood sugar of 117. This is consistent with ADA guidelines for screening asymptomatic adults (ADA 2015).

Nonclinical Disease in Employees with Abnormal Biometric Screens: biometric measurements indicate an increased risk of the employee developing a disease, e.g. elevated fasting blood sugar in non-diabetic employee. Clinical symptoms of the disease have not been observed or experienced by the employee.

Office Visit: a regular office visit documented in the EMR after biometric screening.

Patient Deferral: Employee with abnormal screen who deferred further counseling with health provider.

Point of Care Testing: objective health screening/testing employees and counseling on results at the same visit.

Population Health Team: Team responsible for the larger health promotion project. This project group was separate from this team and did collect data and coordinate with this team.

Post-Screening Follow-up message: Additional follow-up message sent to employee with abnormal biometric screen.

Referral: employee directed to additional health resources after biometric screen.

Referral Management: is a process whereby an employee is introduced and directed to additional health resources within the health center or the community. This process should include documentation in the EHR, documented follow-up, and documented patient response.

Return on Investment in employee health (ROI): Cost of the program subtracted from the benefits the program. Employers want to see their investment pay dividends for the company.

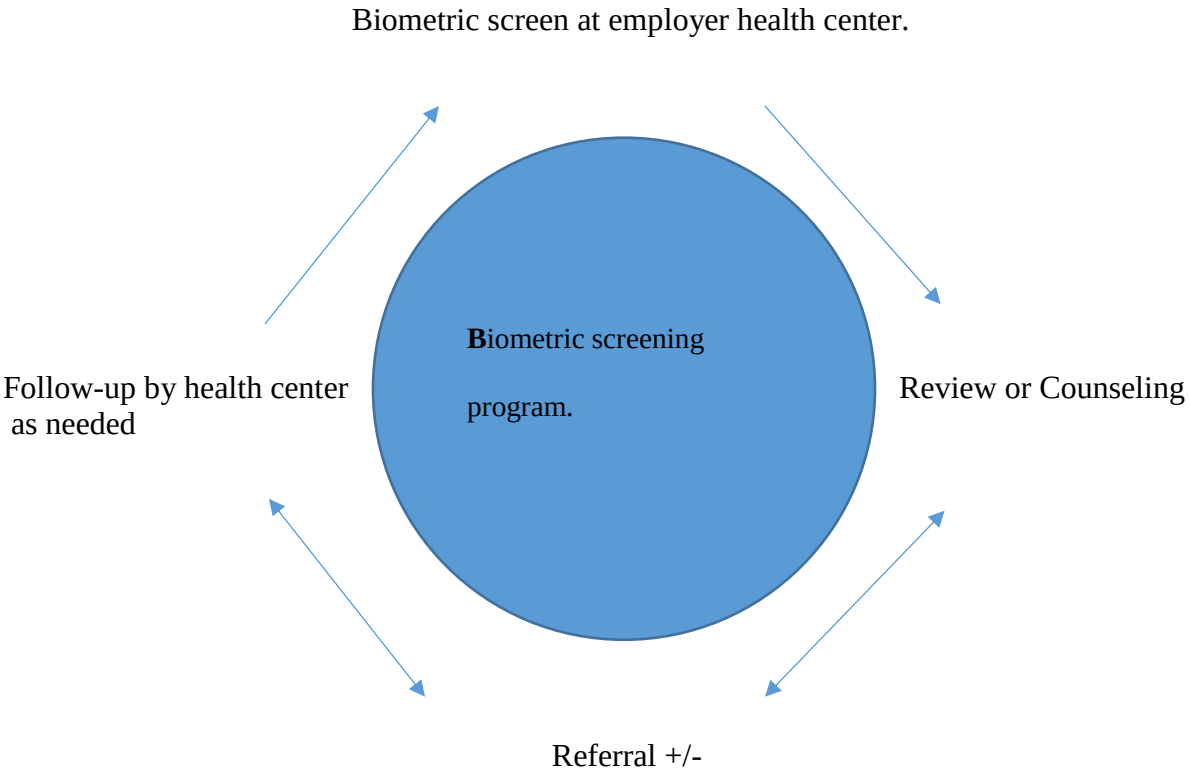

Figure 1. The biometric screening and referral management loop.

Note. Theoretical design of biometric screening program. Arrows imply directionality of employee in biometric screening program. Employee elects to take part in screening. Confidential measurements are taken and coded. Counseling is completed after screen. If the employee receives a referral, the health center manages the referral, and follows-up on the referral. Repeat screen per clinical guidelines. Negative referrals flow back to screening agent, counseling and information on health center provided. The program is then repeated or completed (see Figure 1). As this was a new process for the employee health center, Rogers' work on the diffusion of innovation provided a theoretical framework for understanding resistance to the biometric screening program (Rogers, 2010).

Chapter II: Research-Based Evidence

Reviewing the literature on biometric screening, referral patterns, and employee follow-up over the last five to ten years using multiple terms (screening, employees, referral, referral management, biometric screening, employee health, occupational health, health promotion, and health care economics) reveals how little is known about referral management after biometric screening in employee health (Table 4). This study used meta-analysis, systematic reviews, original research, policy statements by private and governmental organizations, and expert opinions expressed in printed literature to review existing evidence on improving referral management after biometric screening. For example, Baxter, Sanderson, Venn, Blizzard, & Palmer (2014) completed a meta-analysis on the return on investment in employee health programs using biometric screening and found that the data supported a favorable return for employers. Although they noted that the amount of return depended on the quality of the study; interestingly, the higher the quality of the study, the lower return on investment. Referral for disease management has a favorable return on investment, and controlling costs related to disease management is key for positive investment return. There does not seem to be a consensus in the literature about the best way to manage referrals after a positive biometric screen in employee health centers.

The US Centers for Disease Control and Prevention (CDC, 2015c) defines biometric screening as the measurement of physical characteristics such as BMI, lipids, fasting glucose, blood pressure and aerobic fitness at a worksite. The CDC (2015f) states that elevated BMI, glucose, lipids, and blood pressure have been associated with increased risk for developing heart disease, stroke, diabetes, vascular disease, mobility issues, and reduced longevity. However, the reviewed literature does not specifically define a referral and follow-up procedure after biometric

screening in employee health. The CDC (2015f) loosely defines a referral as a provider, nurse, or other clinical agent advising a patient of their need for further consultation with a provider. Further research is needed into patient noncompliance issues and referral back to an employee health center (Arena et al., 2014).

Calls for further research on clinical coordination between screening, disease management, and wellness programming exist (Goetzel et al. 2014.; Henke, Goetzel, Mchugh, & Issac, 2011; Goetzel and Ozminkowski, 2008; Goetzel et al., 2002). Multiple studies by Goetzel, dating back to 2002, all clearly discuss the importance of screening, disease management, and wellness programming in employee health. Dement, Epling, Joyner, and Cavanaugh (2015). continue reporting literature dating back to the 1980's discussing the benefits of biometric screening and employee health. A systematic review by Soler et al. (2010) reviewed studies from 1980-2005 provides evidence of the value of employee health screening and the need for coordinated interventions after screening over the last 25 years. For example, Soler et al. (2010) note that cholesterol reduction was considered significant while mean blood pressure was not; screening was found to be beneficial, and the authors note that further research on screening and management using more objective measurements (most of the studies relied on self-report) was needed. Bellew, St George, and King, (2012), who report that ample evidence for the value of biometric screening exists, also discuss the importance of linking biometric screenings with wellness programming. Johnson & Johnson, a company that is considered a corporate leader in employee health, reports a significant savings when biometric screening is linked with wellness interventions (Henke et al., 2011). Blue Cross and Blue Shield of Kansas City had success with an online health assessment (Colkesen et al., 2011). Baicker, Cutler, & Song (2010) report

wellness programs can generate savings for employers. Further research is needed to clarify the role of referral management after biometric screening in employee health

The American College of Occupational and Environmental Medicine (Behling et al., 2013) has a consensus statement on employer biometric health screening. It clearly outlines the important role biometric screening can play in a well-coordinated employee health and wellness program. Yet their recommendations on referral management to health providers and follow-up by the health and wellness agency are not clearly defined. They emphasize that screenings are not a replacement for medical examinations or wellness visits with a provider, but they do not specify whether referral and follow-up make any difference. The American Heart Association (Arena et al., 2014) has an excellent policy statement and suggests further research on the predictors of noncompliance in adopting healthier lifestyles after employee screening. Curry, Grossman, Whitlock, and Cantu (2014) discuss the importance of evidence-based behavioral counseling after health screening.

Referral Management

A consistent referral and management process after biometric screening in an employee health setting can assist patients in receiving the highest quality care (Arena et al., 2014). Improving the management of biometric referrals and consistent biometric follow-up can assist in employee health center predictions of patient volume, clinical utilization, and projected costs (Arena et al., 2014; Goetzel et al, 2002). This process reflects a fundamental paradigm shift occurring over the last decade, accelerated by the Affordable Care Act (Blumenthal, Abrams, & Nuzum, 2015). The Affordable Care Act (ACA) has refocused the healthcare industry on early identification and management of risk factors contributing to a higher risk for nonclinical disease: particularly obesity, cardiovascular dx, diabetes, and hypertension (Arena et al, 2014).

Providers hoping to have clinical success with biometric screening and patient follow-up in employee health should consistently review screening methods, results, patient counseling, and reported care for all employees being screened (Arena et al., 2014). For example, many biometric programs claim to provide quality care, yet never define how they track and follow up with employees in their model or program. Bridging the screening, follow-up, and referral gap in an employee health setting is essential.

Elevated BMI/Obesity

Elevated body mass and obesity is a growing epidemic in American companies. According to the CDC (2014a), approximately, one-third, or 34.9%, of American workers can be classified as obese (BMI >30), and another 40% can be classified as overweight or having an elevated BMI (BMI > 25). The cost of treating obesity within the US healthcare system is estimated at $147 billion per year and rising yearly (CDC, 2014d).

Referral management for elevated BMI and obese patients is challenging in any clinical environment. For example, addressing patient and provider BMI, bias, and clinical expectations in an employee health center is difficult. The nature of sedentary work expectations, increased stress, and availability of high calorie food contribute to excess weight (CDC, 2014d). Evaluating employer and employee motives and incentives are crucial for program success (Wing et al., 2006). Employee health centers should develop standard screening and referral programs to address this unhealthy trend in the data (CDC, 2015f).

Furthermore, human behavior regarding eating patterns and weight gain, weight loss, and weight maintenance are complex (CDC, 2014d). The importance of relationships between screeners, providers, and their obese patients in initiating and maintaining biometric screening and referral management is central for program success (Wing et al., 2006). For example,

Watson's (2008) theory of human caring can explain and guide the process (McEwen & Willis, 2011). It can provide a foundational aspect of a caring relationship between screeners, providers, and their biometric/bariatric patient (Butts & Rich, 2015). Caring for a patient is the starting point and basis for initiating and maintaining a therapeutic relationship with an employee in an employee health setting (Table 6). Addressing the intricacies of increasing BMI in an employee health setting is important for referral management.

Cholesterol

The Expert Adult Treatment Panel (ATP III) of the National Cholesterol Education Program (NCEP) has recommended cholesterol testing (2001) for patients requesting cardiovascular risk assessment or a family history of cardiovascular disease. Sample data from the central NC project site (Table 1) revealed that 40% of employees had abnormal cholesterol values (total cholesterol >200 mg/dl, low-density lipoprotein >150 mg/dl, triglycerides >150 mg/dl; see Table 2). Additionally, claims data from a 2015 report cited cardiovascular disease as the third most common diagnostic set of codes for employees (BCBS NC, 2015). The aforementioned ATP III guidelines describe how elevated cholesterol levels can result in increased fatty deposits in human arteries, including those around the heart, which can lead to narrowing of the arteries and to heart disease (Grundy et al., 2004).

In 2010, the economic costs of cardiovascular disease and stroke in the United States were estimated at $444.2 billion, including $272.5 billion in direct medical expenses and $171.7 billion in indirect costs (CDC, 2015f). Elevated cholesterol is one of the major risk factors for heart disease and contributes to health care expenditures in the US and NC. It has been established that the central NC employer has an interest in improving employee health and reducing the impact of elevated cholesterol on cardiovascular disease.

The following guidelines, synthesized from the guidelines produced by ATP III (2004) and Gillespie, Keenan, Miner, Hong, and CDC (2012), outline best practices for cholesterol screening.

According to ATP III and the CDC (2015b):

- Screening should include total cholesterol/lipoprotein, low-density lipoprotein (i.e., LDL cholesterol), high-density lipoprotein (i.e., HDL cholesterol) and triglyceride levels. Screening tests should use blood from a person who has fasted for at least 12 hours. Table (2) outlines the lipoprotein parameters.
- Screeners should note employees with elevated BMI, cholesterol, type 1 or type 2 diabetes, and high blood pressure, as they have an even greater risk of heart attack; these patients should be encouraged to receive further risk evaluation and counseling.

Elevated Glucose and Type 2 Diabetes.

The American Diabetes Association (2015) has recommended glucose screening for groups who have a BMI over 25; are not physically active; have positive family history, hypertension, lipid problems; and are over 45. The data (Table 1) collected for employees suggests (26% had elevated blood glucose, serum glucose >100 mg/dl) that screening for elevated blood sugar and for type 2 diabetes is indicated. Employees with elevated fasting blood sugar or prediabetes have an abnormally high blood glucose level that is not elevated enough to be classified as diabetes. Employees with prediabetes are at high risk for developing type 2 diabetes (CDC, 2015d).

Type 2 diabetes accounts for about 90% to 95% of all diagnosed cases of diabetes (ADA, 2015). Uncontrolled blood sugar and type 2 diabetes affects productivity at work (CDC, 2015f). Screening and management for type 2 diabetes and elevated blood sugars (prediabetes) in

an employee health population can help prevent complications that can affect the eyes, kidneys, and nervous system (CDC, 2015f). Learning to control blood sugar is essential for management of diabetes. Screening for and management of prediabetes and type 2 diabetes can greatly reduce the risk of developing diabetes complications (CDC, 2015e).

BMI/obesity is a major risk factor for type 2 diabetes. A greater workplace emphasis on glucose screening in overweight and obese employee populations is crucial for early identification of prediabetes and diabetes (CDC, 2015f). Employers can reduce the frequency and the effects of type 2 diabetes in their workforce through regular screening and management. Furthermore, diabetes in all its forms is costly in the working population (CDC, 2015b). The total estimated costs of diabetes were $174 billion, including $116 billion in medical expenditures and $58 billion in lost productivity. Indirect costs include absenteeism ($2.6 billion), reduced productivity ($20 billion) for the employed population, reduced productivity ($0.8 billion) for those not in the labor force, unemployment for disease-related disability ($7.9 billion), and lost productive capacity due to early mortality ($26.9 billion)

High Blood Pressure/Hypertension

The US preventive task force (Siu, 2015) recommends screening for high blood pressure (>120/80 mm Hg) in adults 18 years or older. Sample data (Table 1) revealed that 18% of employees had elevated blood pressure. According to the CDC (2015a), chronically elevated blood pressure or hypertension is consistently one of the top ten most expensive health problems for American employers. The cost of hypertension in the United States has been estimated at $76.6 billion (CDC). Moreover, high blood pressure over time can cause heart disease, stroke, kidney disease, and blindness (James et al., 2014). The purpose of blood pressure screening is to

identify people with high blood pressure levels and refer them for clinical evaluation and treatment.

Relevance to Intended Population

The NC health center identified 5,000 employees eligible for participation in the Premise biometric screening program for 2015. The health center screened 4,157, or 83% of, the eligible employees (Premise Health, 2015). Early identification of preventable disease of employees through screening, counseling, referral, and follow-up (Figure 1) mirrors the changing standards in the healthcare system in the United States (Arena et al., 2014). Increased emphasis on early identification and management of risk factors associated chronic diseases (e.g. heart disease, and diabetes) is relevant for the employees utilizing the health center (Arena et al., 2014). Risk factors associated with preventing heart disease and diabetes have been identified as areas that impact employee health and decrease employer costs (Goetzel & Ozminkowski, 2008). The NC employer has requested additional programming on reducing obesity, heart disease, and diabetes in their employee population.

Theoretical Framework

The diffusion of innovation theory (Rogers, 2010) is the theoretical foundation for this project (Figure 2). Biometric screening and counseling in employee health is an innovative idea being encouraged by companies seeking to decrease the cost of their insurance premiums and improve employee health. Managing the follow-up and referral process at a central NC employee health center will potentially increase the utilization of the employee health centers and identify health concerns before they become problems. Traditionalists often criticize the role of employer-based programs and are slow to adopt new ways of receiving health services. Innovators argue that the ACA (Blumenthal, Abrams, & Nuzum, 2015) has legislated the

importance of healthy behavior, including individuals carrying health insurance. This law has an individual mandate and guidelines for both health providers and health insurance companies. Therefore, this theoretical model, which explains the diffusion of innovation of biometric screening in an employee health center and closes the loop on the clinical referral and follow-up process (Figure 2), fits perfectly as a theoretical framework.

Rogers (2010) classifies five groups of people who will adopt the change in process. The types explained in the model correspond to individuals represent employees in this model:

1. Innovators—The employees who want to be the first to schedule at the health center and try the innovation. These people are very willing to take risks, and are often the first to develop new ideas. Very little, if anything, needs to be done to appeal to this population.
2. Early Adopters—These are opinion leaders in the company. They enjoy leadership roles, and embrace the health center. They are already aware of the need to change and so are very comfortable adopting new health center ideas.
3. Early Majority—These employees are rarely leaders, but they do adopt new health center ideas before the average employee. That said, they typically need to see evidence that the innovation works before they are willing to adopt it.
4. Late Majority—These employees are skeptical of change, and will only adopt an innovation after it has been tried by the majority. Strategies to appeal to this population include information on how many other employees have tried the innovation and have adopted it successfully.
5. Laggards—These employees are bound by tradition and very conservative. They are very skeptical of change and are the hardest group to bring on board. Strategies to appeal to

this population include statistics, fear appeals, and pressure from employees in the other adopter groups.

(Boston University of Public Health, 2013)

Furthermore, Sare and Ogilve (2010) assisted in the conceptualization of the nursing problem (Table 2) assisted in the design of this QIP. This QIP identified a lack of a standardized referral tool, a lack of consistent clinical follow-up, and a lack of data on referrals after abnormal test results. The health center reviewed patient charts and screening tests and determined that providers and clinical staff were consistent with follow-up and referral after biometric screening. Improving referral and follow-up has been theorized to improve the biometric screening process.

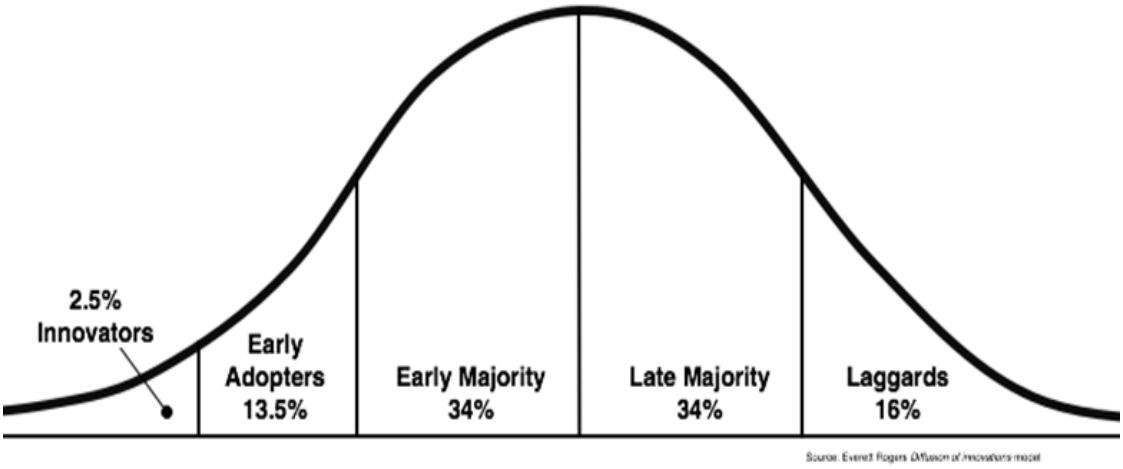

Figure 2. Rogers' diffusion of Innovation theory

Note. "The stages by which a person adopts an innovation, and whereby diffusion is accomplished, include awareness of the need for an innovation, decision to adopt (or reject) the innovation, initial use of the innovation to test it, and continued use of the innovation. There are five main factors that influence adoption of an innovation, and each of these factors is at play to a different extent in the five adopter categories." (Boston University of Public Health, 2013)

Table 2

The components of biometric project theory

1.	Observation. lack of consistent clinical referral and F/U
2.	Observational experience-Chart review
3.	Assumption-consistent referral and F/U affects utilization.
4.	Supporting concepts-lack of evidence on referral and F/U.
5	Hypothesis is formed HO- Referral management makes no difference on pt visits HA-Referral management shows a difference
6.	Theoretical models reviewed and created
7.	Further data collection, literature review, and training planned

Notes. The seven components of theory, Adapted from Sare & Ogilvie (2010). F/U = Follow-up. pt = patient. HO = null hypothesis. HA = alternative hypothesis

Chapter III: Methods

The purpose of this quality improvement (QI) project was to improve the documentation, follow-up, and referral management process at an employee health center in central North Carolina (NC). The employee health center evaluated in this project serves 5000 employees of a central NC company. The health center team was composed of a physician medical director (MD), full time nurse practitioner (NP), multiple part time nurse practitioners, a health center manager who was a registered nurse (RN), a registered dietician (RD), a part time physician, and two medical assistants (MAs). Team members received no additional compensation (beyond their regular wages) for their participation in this project. This QI project occurred between 2015 and 2016 and was part of a larger health promotion project, which is not evaluated here. Data was shared between programs; pertinent population health data was included in this QI project as a reference (Table 3). Employee demographic variables were not analyzed in the QI project. The basis of the QI project was the evaluation of the health center's referral policies and practices after biometric screenings, which varied by screener (Table 5). The project team then standardized the referral process with the creation of an updated referral tool, making it consistent across all screeners (Table 6), and measured the impact of this standardization on participants' post-screening health behavior. The project included evaluation, education, documentation, and patient follow-up.

Sample

In 2015 and 2016, 5,000 employees were eligible to participate in the biometric screening program. Of these 5,000 eligible employees, the health center screened 4,157 employees (83% of eligible employees) in 2015 and 4200 employees (84% of eligible employees) in 2016. To track the effects of the change in referral policies and procedures, a random sample of 420 employees

with abnormal screens (hereafter referred to as “participants”) was collected in 2015 and tracked through 2016. In 2016, this same cohort of participants (with some attrition; only 406 of the original 420 participants were still eligible for employee health screenings in 2016) was screened again and again referred for follow-up; their behaviors after referral were reviewed to examine the effects of the new, standardized referral processes.

The screening process was as follows. Eligible screening candidates made online or phone appointments with the health center according to their schedules. During the scheduled screening periods (January through June 2015 and January through July 2016), the health center had regular hours (7:30–4:30 Monday through Friday) and dedicated 3–4 hours of clinical time per day to screenings. Screens were completed based on appointment time and/or participant arrival time. Three screens could be completed per time slot, and screens were randomly assigned to screeners based on participant arrival time. A 10% sample of total population screened by heath center was established by primary investigator. This sample size was supported in the literature (Israel, 1992)

Procedures, Data Collection, and Ethics

Organizational approval was obtained (Appendix A) and internal review was completed by East Carolina University (Appendix A). All data was confidentially kept in a password encrypted computer in a locked office. Screeners recorded data on our approved paper screening tool (Appendix D): fasting cholesterol, lipids, glucose, height, weight, and blood pressure. Data was shared with the employee. In 2015, (pre-intervention), the screening data was not entered into the health center EHR database; instead, paper records were collected and alphabetically organized. During this period, there was no standardized referral and follow-up procedure, and screeners decided independently whether to tell participants to get further tests, to see their

primary care physician, or to simply recommend follow-up. In 2016, the post-intervention process included scanning a copy of the screening tool into the EHR and using a standard referral and follow-up tool; for abnormal results, follow-up appointments were encouraged, and when possible, were scheduled for the participant using the standard referral tool. Figure 3 is a process map that outlines the biometric screening and referral process for 2015; it also shows where issues were identified and changes that were made to the process in 2016. Using the updated referral process (Table 6), abnormal screens identified in 2016 were referred back to the health center or to an outside provider, and red-flag values were reviewed by a nurse practitioner. Figure 4 outlines the QI process which occurred after the referral.

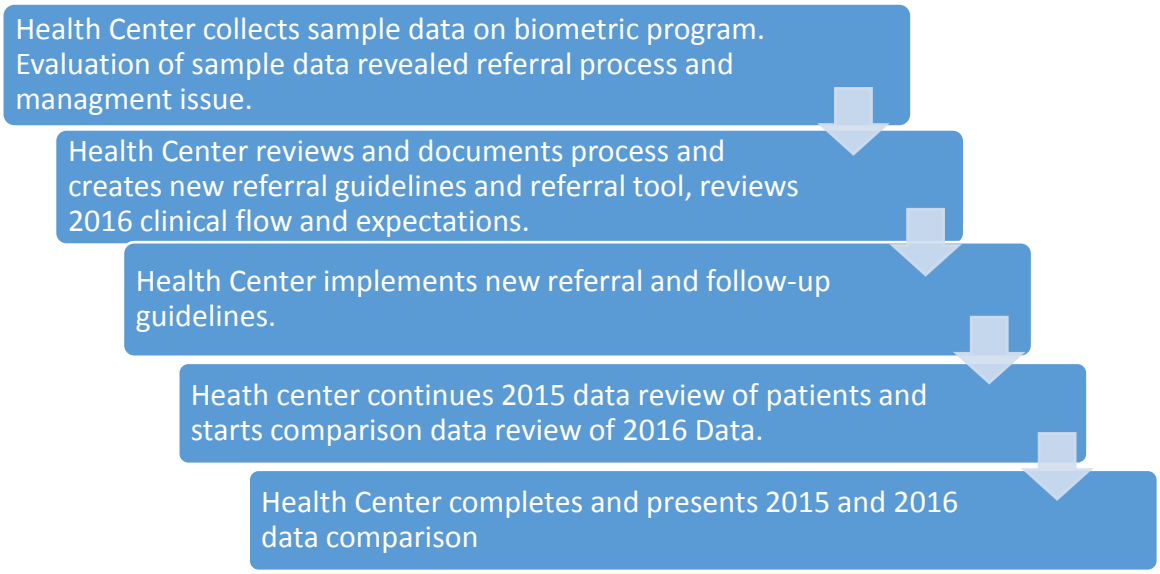

Figure 3. Process map: Proposed biometric flow of patients at BCBS NC-Durham.

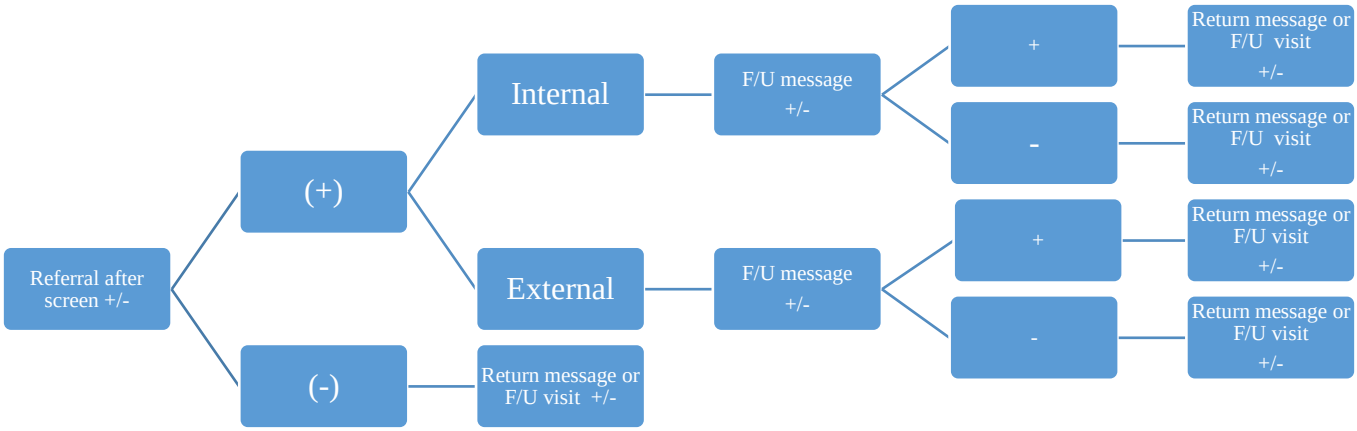

Figure 4. Process for retrospective chart review.

Each box represents a step in the review process. First, chart is reviewed for referral. If referral was made, notation on type of referral and follow-up (F/U) was documented. The chart was then reviewed for a return visit to the health center or follow-up message for the patient. Randomized charts were reviewed to avoid duplication. A workbook was kept on reviewed charts; see Appendix B.

Data Analysis

After sampling was completed (n = 406), the primary investigator reviewed the data for 2015 and 2016, reviewing, tracking, and comparing charts. Figure 4 gives an overview of the comparative and retrospective chart review. Descriptive statistics (Microsoft Excel) were utilized for analysis.

Timeline

This project was carried out from September 2015 through September 2016. Appendix C outlines the timeline for the project.

Evaluation Method

Clinical questions were evaluated by chart review. The data was collected from the EHR and placed into a Microsoft Excel spreadsheet (Appendix B). First, the referral process was assessed. Was a referral given to the employee? Did the employee/patient accept or defer the referral? Did the employee/patient return to the health center? The new process and referral tool was implemented in 2016 and data was compared between 2015 and 2016. An Excel spreadsheet was kept and reviewed daily and updated. The data set is available on request.

Chapter IV: Results

The purpose of this QIP was to improve the referral process after biometric screening at a central North Carolina employee health center. Biometric screening referrals for 2015 and 2016 were reviewed.

Sample Descriptive Statistics

5,000 employees were eligible for participation in the biometric screening program for 2015 and 2016. In 2015, the central North Carolina health center screened 4,157 employees (83% of the eligible employees). In 2016, 3,442 employees (69% of the eligible employees) were screened by the health center, and 758 of the remaining eligible employees were screened by outside providers rather than at the research site; thus, a total of 4,200 employees (84% of eligible employees) were screened in 2016 (Premise Health, 2016). The primary investigator collected a random sample (see methods) of 420 participants with abnormal screens in 2015 and tracked these participants from 2015 to 2016. In 2016, this same cohort of participants was re-screened and re-referred for follow-up. Only 406 of 2015's original 420-participant cohort were available for comparison in 2016; after updating the sample by comparing against employee records and testing for eligibility, 336 of the original participants, or 83% of the sample, were available for comparison. (This participant attrition is in part due to changing participant eligibility for the health screenings.)

Screens were reviewed in the EHR. 406 screens were evaluated for eligibility; 336 (83% of the sample) of these participants were eligible for comparison, meaning that in both 2015 and 2016 they were eligible for the biometric program and participated in the screenings. In 2015, the total number of referrals was 522; in 2016, the total number of referrals was 449. This analysis

does not include the 758 screens completed by outside providers or the data set collected by the larger health promotion project.

Table 3

Comparison of biometric data 2015–2016

	Sample population data			
	n	%	*N*	%
Total screens reviewed 2015	406	10%**	4157	10% reviewed
Total screens reviewed 2016	406	12%**	3442**	10% reviewed
Total referrals 2015	522	13%**	***	***
Total referrals 2016	449	13%**	2415	70%*
Total referrals attended 2015	36	11%*	***	***
Total referrals attended (first 6 months of 2016)	58	17%*	237	10%**
Referral attendance projection for 2016	116	34%*	474	20%**
Total deferrals by employees 2015	100	30%*	***	***
Total deferrals by employees 2016	142	42%*	1252	52%
Tracked provider visits 2015, Q2			453	***
Tracked provider visits 2016, Q2			656	

Note. * = Data was rounded, 2015, 2016 data based on completed and eligible screens n = 336. screens. ** = Data based on health center screening. *** Data not available. **** = Data was estimated. Emp = Employees. Comp = Completed. Q2 = Quarter 2: April, May, June.

Quality Improvement Question 1

The first QI question was: "Does a consistent referral management process, using intervention tool, make a difference in clinical documentation of the participant screen? Does the EHR have a biometric screen in 2015? In 2016?" This question was intended to ensure that each participant whose records were compared were indeed eligible in both 2015 and 2016.

Of the 406 screens from 2015 that were reviewed, 3 of these screens (0.8%, or < 1%) were documented in the EHR; the remaining screens were pulled from paper notes and placed into an Excel spreadsheet for comparison. The review of three screens in the EHR in 2015 highlights a clinical documentation issue in 2015. Team members requested an improved documentation process, and scanned 2016 biometric results in the EHR. In 2016, 322 of these 406 screens (79%), were fully documented in the EHR; 3 were usable and not documented in the EHR. In other words, 81 participants changed status between 2015 and 2016. Fifty of these participants (12%) were lost because they were no longer eligible for the biometric screening program in 2016. Twenty more (5%) completed the 2016 screen, but their records were either unusable or not fully documented. 14 (3%) of screens were usable and not fully documented. A clear difference in documentation was produced when screens were scanned into the EHR, preferably during the screening session; of screens that were entered into the EHR on the same day, 336 screens, or 83%, were found to be eligible for comparison, 3 were not documented in EHR, 11 were not fully documented. This simple process change created more initial work for the project team in 2016 and did save work after the screen were completed. Figure 5, clearly displays tangible results. Clinicians found that the EHR's initial follow-up message and subsequent communication to the employee was well received, easy to find in the EHR, and usable during future patient encounters.

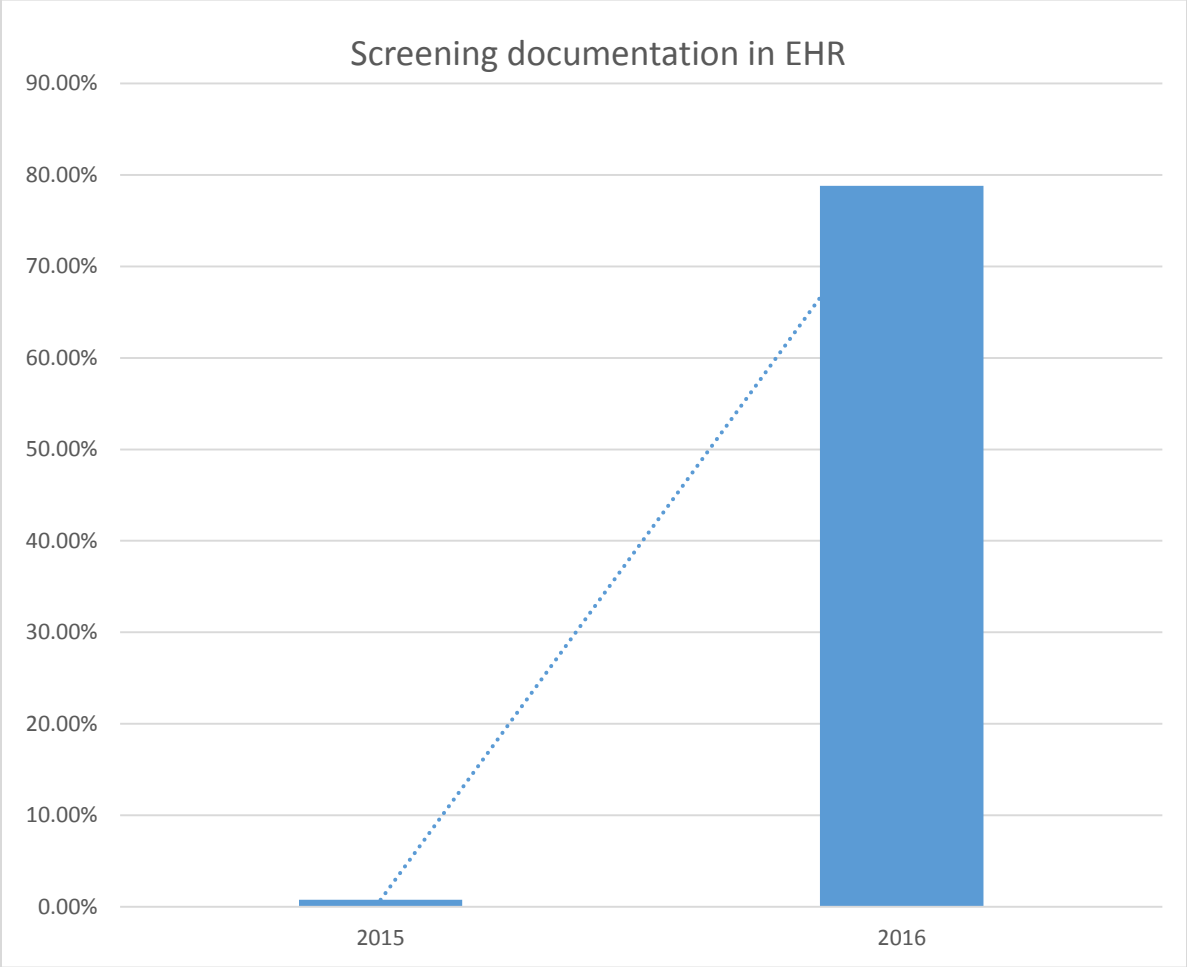

Figure ***Error! Unknown switch argument.***. Biometric screens documented in EHR, 2015–2016. 2015 records were primarily kept on paper and documented on a separate cloud-based computer server. 2016 screens were scanned into the EHR and the cloud-based computer server. To be included in the analysis, screens needed to meet eligibility criteria and have screening data for both 2015 and 2016.

Quality Improvement Question 2

The second QI question was: "Is there is a difference in clinical documentation at the health center with a consistent referral management process, including clinical tracking and participant follow-up? Does the EHR have a referral? Did the participant return to the health center?"

Upon review, 406 sample screens, 336 of 406 (83%), were usable and documented in the EHR. The total number of documented referrals for 2015 was 522. Total number of referrals for 2016 was 449, for a total number of referrals (2015–2016) of 971. However, screeners did not always clearly document every referral; this issue was addressed, discussed, and clarified. Screeners were using the tool as instructed and were given credit for the referral based on the updated guidelines and intervention tool (Table 6) documentation was updated on (Appendix D).

Post-screening electronic follow-up messages to employees who had abnormal results improved from 2015 to 2016. In 2015, 11 electronic follow-up messages about abnormal screenings were documented in EHR—about 3% of the biometric screenings produced a electronic follow-up recommendation. In 2016, 108 electronic follow-ups, or 32% of the total number of screenings performed in that year, were documented in the EHR. Interestingly, documented phone follow-up messages *decreased* from 2015 to 2016. In 2015, there were 168 documented phone follow-ups; this is about 50% of the total sample participant biometric screens performed in that year. In 2016, however, there were only 97 phone follow-ups—29% of the total number of screenings performed. In 2015, the total number of documented follow-up appointments that participants actually attended was 36 (11%). The total number of follow-up appointments that have been attended so far in 2016 is 58 (17%); by the end of the year, 2016 is projected to have a total of 116 follow-up appointments. The total number of documented

follow-up appointments for 2015 and 2016 is projected to be 152 (45%). The data suggests a decrease from 2015 to 2016 in the total number of documented referrals, although the percentage is similar at 13% (Table 3); it also indicates a clear increase in electronic follow-up messaging, a decrease in phone follow-up messaging, and an increase in the number of attended referrals.

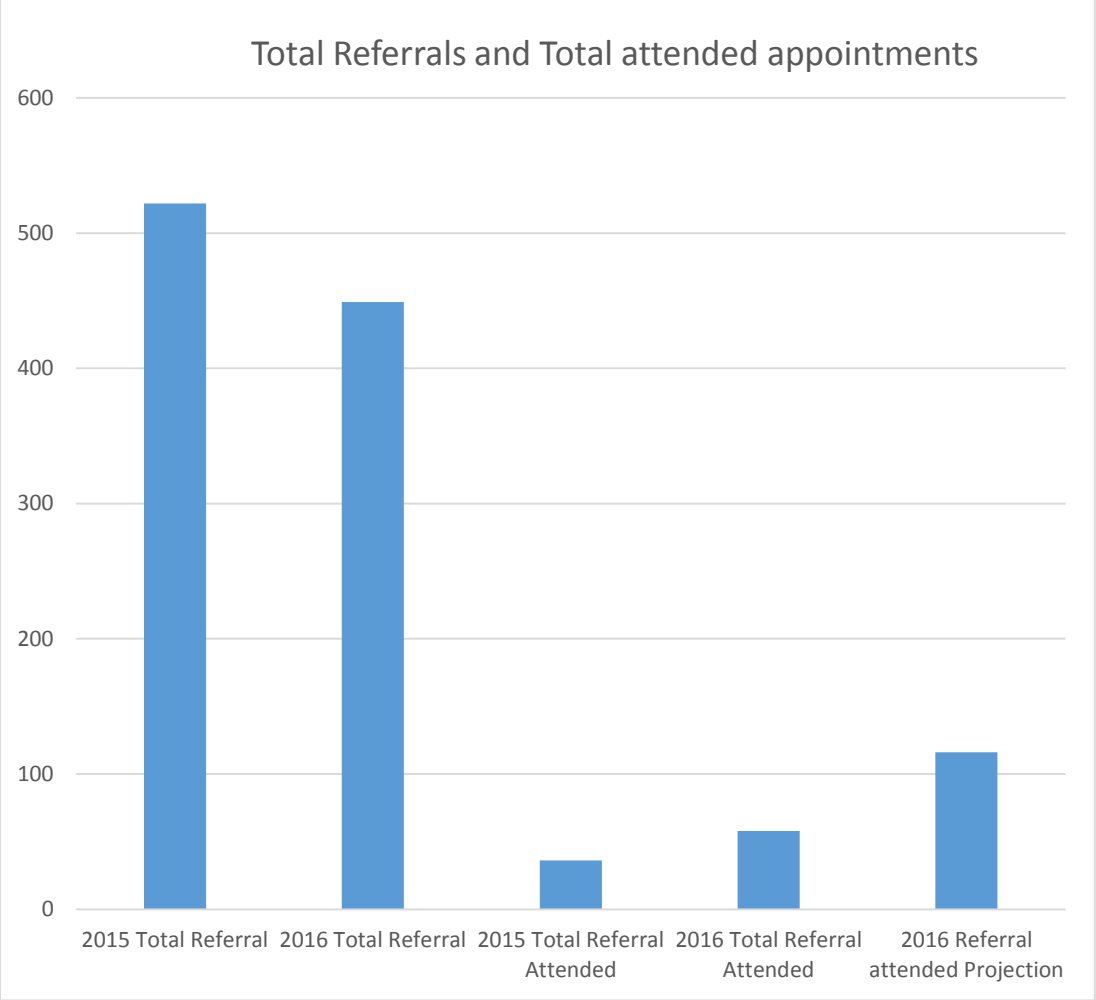

Figure 6. Total referrals for 2015 and 2016. Attended referrals and projection noted.

Quality Improvement Question 3

The third QI question was, “Does a consistent referral management process, including tracking, and patient follow-up make a difference in observed participant volume at the health center?”

After reviewing 406 sample screens, 336 of 406 (83%), were usable for comparison between 2015 and 2016. Fifty of these screens (12%) belonged to participants who were no longer eligible for biometric screening in 2016. Twenty (5%) of the participant screens had missing data, e.g. did not complete the screen in 2016. In 2015, the total number of participants who attended their referral was 36 (11% of sample); in 2016, the total number of participants who attended their referral was 58 (17%) at the 6-month mark. By the end of 2016, it is projected that, 116 participants (35%) will attend referral appointments. The data indicated a positive trend in provider visits between 2015 and 2016: in 2015, 107 of 336 (32%) of 2015 participants returned to the health center for a visit. In the first 6 months of 2016, 96 of 336 (29%) screened participants returned to the health center for a provider visit. This projects to 192 (57% of screened employee) visits over 12 months, an increase of 85 provider visits over 2015. Again, the updated process an increase in follow-up visits over 2015. As part of sample analysis, population data collected by our team displayed a positive trend between 2015 and 2016. An increase of 203 visits, or 45% of the total number of employee visits, was recorded between 2015 and 2016. A consistent referral management process, including tracking and patient follow-up, appears to have made a difference in observed patient volume at the health center.

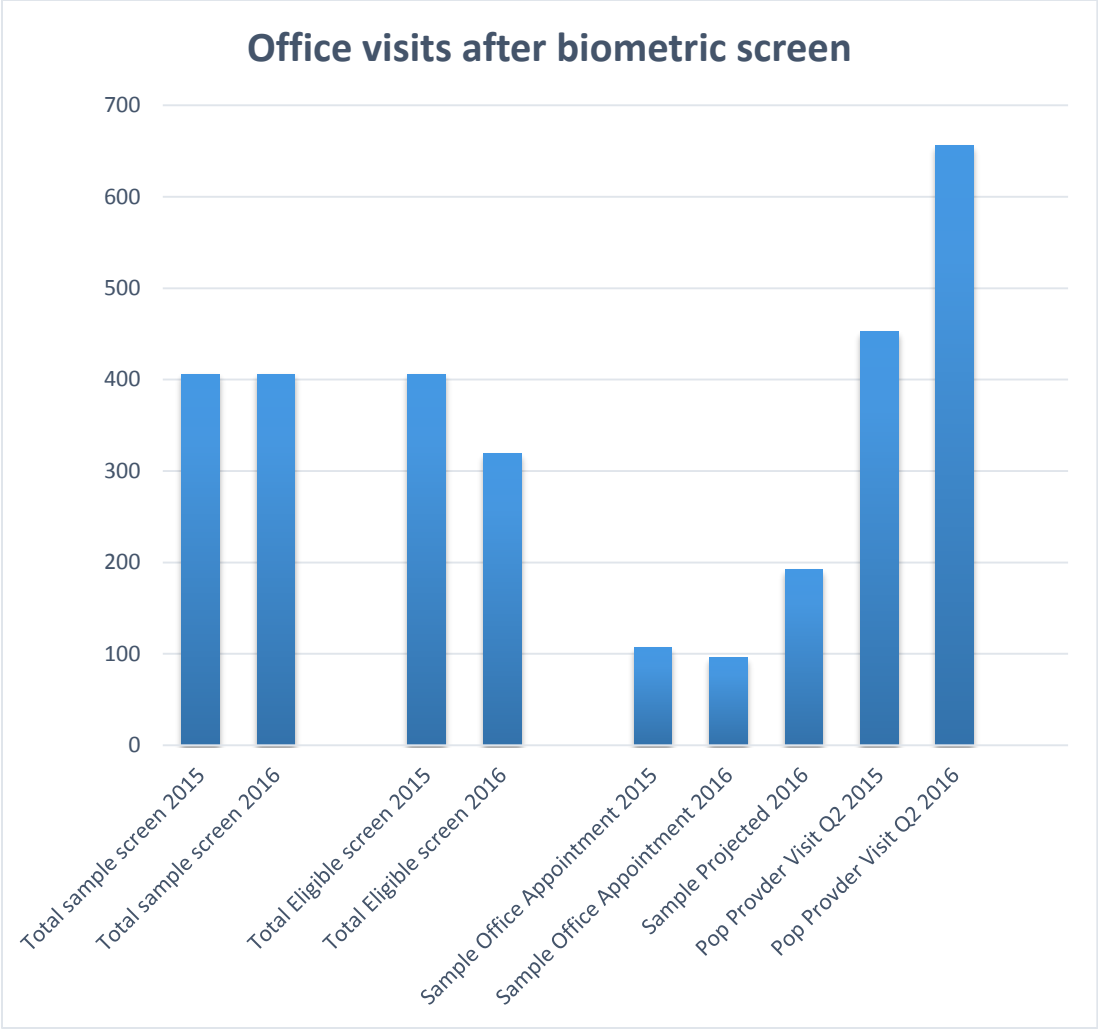

Figure 7. Office visits after biometric screen.

Quality Improvement Question 4

The fourth QI question was, “What is the frequency of referrals for elevated BMI, elevated glucose, elevated cholesterol, and elevated lipids?”

The total number of employees sampled for comparison across 2015 and 2016 was 406; the total number of usable screens in 2016 was 336. The total number of referrals for elevated glucose in 2015 was 93 (28%); in 2016, it was 104 (31%), an increase of 11 referrals. The frequency of referrals for elevated blood sugar was higher in 2016, a finding consistent with clinical observation in the health center. The total number of referrals for elevated blood pressure in 2015 was 60 (17%); in 2016, it was 50 (15%), a decrease of 10 referrals. The total number of referrals for elevated lipids in 2015 was 122 (36%); in 2016, it was 101 (30%), a decrease of 21 referrals. The total number of referrals for elevated BMI in 2015 was 247 (74%); in 2016, it was 194 (57%), a decrease of 53. The frequency of referrals for elevated blood pressure, elevated lipids, and elevated BMI all decreased from 2015 to 2016. These findings are interesting and deserve further study. Clinical observations in the health center do support fewer unnecessary referrals for these issues. The new guideline appears useful in providing a framework for screeners when making employee referrals.

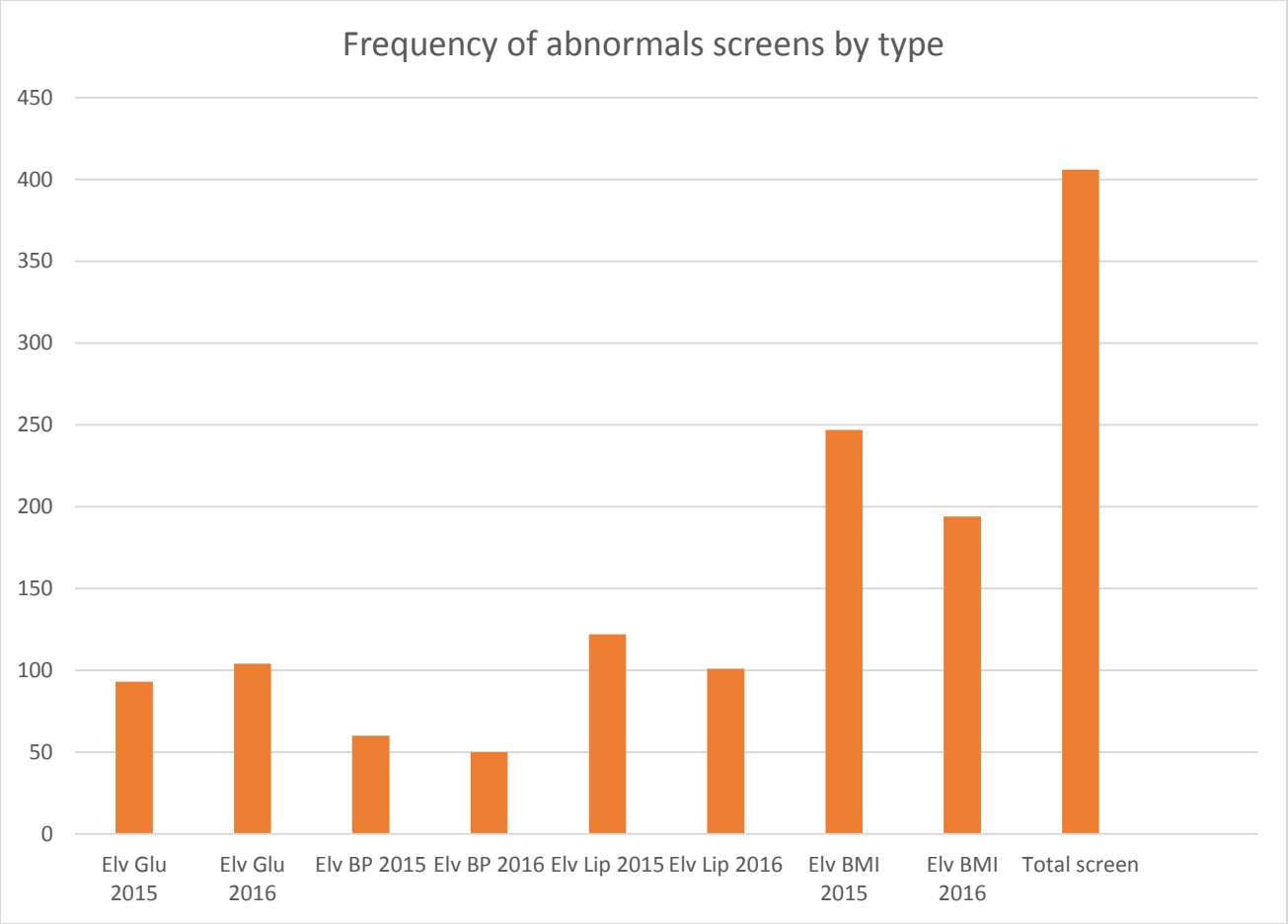

Figure 8. Frequency of abnormal screens.

Chapter V: Discussion

The purpose of this QIP was to improve the referral process after biometric screening at a central North Carolina employee health center. Biometric screening referrals for 2015 and 2016 were reviewed. This chapter discusses the study's findings, implications, theoretical relationships, limitations, delimitations, and conclusions, and offers recommendations for practice derived from this study

Importance of Referral Management After Biometric Screening

Improving the post-biometric screening referral management process in this central NC employee health center made a difference: it improved clinical documentation, increased patient volume, improved clinical utilization of services, and directed referrals to local providers. In the project, there was an intervention into an ongoing process of performing annual biometric screens for employees and then referring employees with negative health markers (blood sugar, blood pressure, etc.) for follow-up testing and care with the clinic's primary care provider or their own health care providers. A health center clinical team created a standardized referral process and tool as an intervention (Table 6). The team then collected employee health data via the usual annual biometric screenings and used the new standardized referral system to follow up with the participants. The team compared screening sample data (n = 336) from 2015, the year prior to the intervention, to data collected in 2016 from the same sample of participants; the comparison was intended to examine whether the standardized referral process increased the likelihood that patients would follow up on the negative health markers with the clinic's primary care provider or with their own primary provider. Improvements were recorded. The employee health center improved its documentation of screening results by approximately 79%. The updated referral management process and tool improved participant follow-up by 23%. Patient

volume for the primary clinic provider increased from. Referrals to the clinic dietician increased by approximately 4%. Referrals to local primary care providers increased by approximately 11% (Figure 10).

In addition, the health center identified, and improved documentation of, participants with abnormal blood sugar, blood pressure, lipids, and elevated body mass; review of the documentation revealed a decrease in referrals for elevated blood pressure, elevated lipids, and elevated body mass, while referrals increased for elevated blood glucose (Figure 8). Observations by the clinical biometric team also noted an improvement in the referral process. The reduction of referrals likely indicates fluctuations in biometric measurements as well as many questionable referrals. Looking back to 2014, the employee health center had very little data on the biometric values of participants or clinical utilization related to biometric screening, thus the importance of validating the intervention tool and biometric findings in future years is crucial for dissemination of project findings. At this time, data and clinical observations support a high level of continued participant engagement in the biometric screening program (Table 3) and an increase in the number of employees utilizing the health center services between 2015 and 2016.

Furthermore, the updated referral process and creation of the referral tool generally increased employee acceptance of the biometric screening program. For example, the entire employee health team improved their electronic communication for clinical follow-up between 2015 and 2016, while phone follow-up decreased. Telephonic follow-up messaging should be improved in future years, and this processes is being reviewed. Referrals to the primary clinic provider (NP) decreased; however it appears participants who completed the new screening process were more likely to return to the health center for clinical services. Additionally,

referrals were more appropriately directed to the clinic dietician and to local primary care providers. These referral patterns should continue to be tracked for quality assurance. The quality improvement process in this health center should continue to be monitored to measure the sustainability of the process improvement and to validate the referral tool. Plainly, consistent referral guidelines using a standardized referral process and tool created a coherent clinical message and increased the number of employees using the employee health center between 2015 and 2016.

Implications

This quality improvement process and tool development come out of a paradigm shift over the last decade toward allowing data-driven quality improvement to guide clinical practice A standardized quality improvement process can help employer wellness programs reduce risk factors that increase risk for nonclinical disease, including obesity, cardiovascular disease, diabetes, and hypertension. Dement (2015) clearly demonstrated an estimated return on investment (ROI) of $2.53 for every dollar spent on health promotion programs. An essential component of employer health promotion programs is efficient referral management after biometric screening; providers who aim for continued clinical success with biometric screening and patient follow-up in employee health should consistently review screening methods, results, patient counseling, and reported care for all screened employees (Dement, 2015). For example, many participants in our project resisted the idea of screening in the absence of disease or symptoms of disease; employees reported concerns about screening methods, screening results, effects of positive screens on cost of participant health care, and concern about employer bias. After two years spent evaluating changes to the process of referral management after biometric

screening and eliciting feedback from participants, the project was renewed due to program success. Data-driven quality improvement benefits clinical practice.

Further evaluation should quantitatively and qualitatively measure employee interaction with both trusted health care providers and health screening. Valuable information can be gathered from surveying participants about consistent clinical staffing and clinic accessibility. In this study, point of care testing generated positive feedback from participants, and abnormal results were quickly identified and triaged. How does this process compare with traditional lab testing on measures of participant follow-up? QI is a continuous process and this project generated significant participant feedback.

Improving referral management after biometric screening was a successful quality improvement project in this central NC company. This has demonstrated positive effects from changes in the documentation and referral process for employees who participate in a screening program. Early identification of nonclinical disease in a health insurance risk pool may impact an employee's body measurements before irreversible clinical disease damage is done; it may also bend the cost curve associated with managing chronic disease. Further quantitative and qualitative research should be conducted to evaluate participant satisfaction with the process, identify additional possible clinical improvements, and estimate the cost savings of health promotion programs that include biometric screening.

Relationship to Theoretical Framework

The theory of diffusion of innovation can help to conceptualize how employees in a corporation adopt innovations to their health care (Rogers, 2010). The theory of diffusion of innovation should ground future studies of the relationships between referral management, biometric screening, and health promotion in order to better understand how individuals and

groups accept or reject health care innovations (Figure 2). For example, many initiatives require leadership support to be successfully diffused; other initiatives, which diffuse laterally or from the bottom up, tend to be spread by employees' peers and peer groups within their organization. Because this central NC employee health center has strong leadership and a hierarchical management structure, obtaining the support of company leadership for referral management after biometric screening was critical to program success. The referral management QI project was presented to the leadership in charge of corporate wellness before implementation; only once leadership was on board did the project move forward. Leadership support is imperative for diffusion of a new process (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2005). Individuals perceive change to their employer benefits differently; while the majority will follow leadership, some employees will continue to be skeptical of the process innovation. For example, our team increased the total number of referrals for 2015 to 2016 and also reported an increase in employee deferrals from 2015 to 2016 (Table 3). Further investigation using survey data would help clarify the reason for patient deferral, many of the participants do not use the health center, why? Observation and feedback by screeners indicate some participants are skeptical of the relationship between their employer and the health center. It this accurate, or just hearsay? The impact of the employer/employee relationship on diffusion of innovation, and specifically as it relates to referral management for nonclinical disease, should be the subject of further study (Rogers, 2010).

Limitations

There were four major limitations to this QIP. The first limitation was the scope of the project. Referral management after biometric screening was one part of a larger ongoing study on health promotion in this corporation. The employee health center coordinated with a larger

wellness team, and some data for the larger project was collected and reviewed before this QI project was begun (Table 1). The researchers overseeing the larger wellness study decided that this sub-project could be split off and managed independently by the local health center team. The primary investigator and project team have recommended further study and coordination with the entire wellness team before a final assessment of referral management in this population is made.

The second major limitation is the potential conflict of interest between the health center team, the employer, and the program participants. The employee health center team has the advantage of being on site and convenient for participants, but its status as an employee benefit does create a potential conflict of interest and potential bias in the results in the QI study. Critics may argue that the health center team could benefit from an improvement in participant involvement, or that collecting health information about employees at work does not preserve objectivity or the privacy that should exist between health care provider, employer, and employee. Employers may use the data to identify unhealthy employees and terminate them from the company. The primary investigator acknowledges this type of behavior exists within unethical corporations and did not observe or perceive this behavior in this corporation. This limitation is acknowledged and limit the generalizability of any study or quality improvement project completed in an employee health center. However, participant privacy was rigorously protected. Screeners and providers collected data in a locked and privacy-protected environment. All electronic data was encrypted. Employers were given only aggregate data and have no access to employee health records without employee consent. Employees in this central North Carolina corporation were not forced to participate in the program; the program was a benefit of their employment and appropriate consents were discussed with all employees; further discussion of

informed consent was beyond the scope of this quality improvement project. The corporate wellness team managed informed consent and all details related to participant consent for the entire program. The primary investigator completed a formal IRB process and this QI project was deemed exempt, as it was a retrospective chart review that did not directly involve employees as human subjects.

The third major limitation in this QI project is the role of the primary investigator (PI). The PI of this QIP also provided care for employees, and this could potentially have altered results to influence outcomes. However, it should be noted the PI did not receive any additional compensation or benefit from the QIP. This project would have been completed regardless of who was involved with the data collection. Resources for the project were limited; this limitation was also a benefit, as the primary provider of the health center was directly involved with improving care for employees. The intention of the QIP was to improve the quality of care being provided to employees and to identify employees who would benefit from increased provider involvement in their health care. Early identification of abnormal biometric screens and participation in the referral process was clearly beneficial to all involved in this project. The health center did have other providers, and they had very limited roles in this project as they were not full-time staff. The QIP required continuous involvement over the last two years. Most part time staff filled in coverage gaps and did not fully participate in follow-up process. They screened participants, used the intervention tool, entered data, made referrals, and did not have any further contact with participants. Thus most of these referrals had no contact with the PI and did not receive documented follow-up from the PI. Despite this limitation, documented follow-up with participants increased. Lastly, referrals to the PI decreased during this project, and deferrals increased—a finding that may mitigate concern about potentially biased results.

The last major limitation relates to health center staff referring patients to other health center staff. As previously stated, no financial incentives were received by clinical staff involved in the QIP. In fact, staff members volunteered hundreds of additional hours to this employee QIP. The referral improvement process, which is intended to match abnormal screens to the most appropriate available provider, underwent a transparent team QIP. It should be noted that internal referrals trended downward from 2015 to 2016 (Figure 10), and the health center screened fewer employees between 2015 and 2016 (Table 3). All limitations acknowledged in this QIP highlight the importance of continued study and reflection for employee health center providers and administrators.

Delimitations

Delimitations include exclusion of normal biometric screens from examination; a limited number of screeners; exclusion of demographic data; and lack of advanced statistical analysis. The sample examined in this employee health population comprised abnormal screens only, and as the total number of employees screened by the health center decreased between 2015 and 2016, the sample size of abnormal results also decreased. Comparing data for one to two more years would provide a better approximation of referral patterns over time. Additionally, employees with normal screens should be encouraged to continue to take part in screenings each year. Not only would this increase the pool of potentially abnormal scans available for tracking by the QIP team, but having a consistent number of employees regularly undergoing screenings would ensure an appropriate number of screenings for meaningful examination.

The limited number of screeners was intentional. This project required that all screeners behave in a consistent manner during data collection and referrals; limiting the number of data collectors was crucial to the project's success, and it also helped to keep costs down. Participants

with normal health screens were not included in the sample since they did not need referrals; however, further study comparing the sample to a control group would provide further data on clinical utilization, and the health center team has discussed a further study of this type. Collection and evaluation of demographic data and advanced statistical analysis are being performed by the research team on the larger project; these were beyond the scope of this QIP.

Conclusions and Recommendations for Practice

Using a standardized referral process and intervention tool improved the biometric screening program in this central NC employee health center. Basic process changes in referral management—the use of a standardized referral tool—made a difference in referral patterns after biometric screening**.** Our employee health center recommends using a standardized referral process and creating tools that fit the particular needs of a participant population. Collecting data before any intervention is recommended. Screening data is helpful to providers when it's easily available, and a copy of each employee's screening data should be included in each employee's health record. After an abnormal screen, participants should be given a referral using a standardized work sheet. Using uncomplicated and consistent principles, our health center improved referral management after biometric screening.

Employee health centers offer a unique and challenging environment for studying referral management after biometric screening. Health center teams should focus on contacting and following up with interested patients who have been given referrals, while continuing to work with patients who deferred services. Employee health centers will continue adding and losing participants and should continue following participants and encouraging participation in the biometric wellness program. Expanding and coordinating employee health services to meet the growing need of employees with obesity and diabetes is recommended. Adding hemoglobin A1C

testing for participants with an elevated fasting glucose is a logical addition to biometric screening. Additional resources focusing on health promotion and disease management programs with participants utilizing employee health will benefit from managing and following referrals after biometric screening.

Referral variables related to gender, race, and socioeconomic status should also be explored to further test the validity of this QIP. Health care access and affordability for employees who have abnormal screens are significant issues which are addressed in the literature, and not specifically analyzed in this QIP. Lastly, employees and employers must both acknowledge their role in identification, treatment, and management of heart disease, diabetes, and obesity. The cost of care for this employee population will be significant as it ages. Using the employee health care models to identify and manage chronic disease developed by the North Carolina Institute of Public Health (NCHIP), The Centers for Disease Control (CDC) and US Census Data (2016) are the next logical steps in planning further research on this pivotal population in North Carolina.

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Table 4

Sample of Search and MESH Terms Used for Project

1.	((“manpower”[Subheading] OR “manpower”[All Fields] OR “employees”[All Fields]) AND (“referral and consultation”[MeSH Terms] OR (“referral”[All Fields] AND “consultation”[All Fields]) OR “referral and consultation”[All Fields] OR “referrals”[All Fields])) AND (“loattrfull text”[sb] AND “2011/11/02”[PDAT] : “2016/10/30”[PDAT] AND “humans”[MeSH Terms] AND English[lang] AND (jsubsetaim[text] OR jsubsetn[text] OR medline[sb]) AND “adult”[MeSH Terms]) AND ((jsubsetaim[text] OR medline[sb]) 79 papers
2.	biometric[All Fields] AND (“diagnosis”[Subheading] OR “diagnosis”[All Fields] OR “screening”[All Fields] OR “mass screening”[MeSH Terms] OR (“mass”[All Fields] AND “screening”[All Fields]) OR “mass screening”[All Fields] OR “screening”[All Fields] OR “early detection of cancer”[MeSH Terms] OR (“early”[All Fields] AND “detection”[All Fields] AND “cancer”[All Fields]) OR “early detection of cancer”[All Fields]) AND (“occupational health”[MeSH Terms] OR

("occupational"[All Fields] AND "health"[All Fields]) OR "occupational health"[All Fields] OR ("employee"[All Fields] AND "health"[All Fields]) OR "employee health"[All Fields])

27 papers

3. (employee[All Fields] AND ("referral and consultation"[MeSH Terms] OR ("referral"[All Fields] AND "consultation"[All Fields]) OR "referral and consultation"[All Fields] OR "referral"[All Fields]) AND ("diagnosis"[Subheading] OR "diagnosis"[All Fields] OR "screening"[All Fields] OR "mass screening"[MeSH Terms] OR ("mass"[All Fields] AND "screening"[All Fields]) OR "mass screening"[All Fields] OR "screening"[All Fields] OR "early detection of cancer"[MeSH Terms] OR ("early"[All Fields] AND "detection"[All Fields] AND "cancer"[All Fields]) OR "early detection of cancer"[All Fields])) AND ("2011/11/02"[PDat] : "2016/10/30"[PDat] AND "humans"[MeSH Terms] AND "adult"[MeSH Terms])

6 Papers

4. (("occupational health"[MeSH Terms] OR ("occupational"[All Fields] AND "health"[All Fields]) OR "occupational health"[All Fields] OR ("employee"[All

	Fields] AND “health”[All Fields]) OR “employee health”[All Fields]) AND (“economics”[MeSH Terms] OR “economics”[All Fields] OR “economic”[All Fields]) AND impact[All Fields]) OR (“wellness programmes”[All Fields] OR “health promotion”[MeSH Terms] OR (“health”[All Fields] AND “promotion”[All Fields]) OR “health promotion”[All Fields] OR (“wellness”[All Fields] AND “programs”[All Fields]) OR “wellness programs”[All Fields]) AND (systematic[sb] AND “loattrfull text”[sb] AND “2011/11/02”[PDat] : “2016/10/30”[PDat] AND “humans”[MeSH Terms] AND English[lang] AND jsubsetaim[text] AND “adult”[MeSH Terms]) 43 papers
5.	http://scholar.google.com.jproxy.lib.ecu.edu/scholar?q=The+rising+cost+diabetes+and+obesity+and+hypertension+and+lipids+and+employees+of+BCBS+NC&btnG=&hl=en&as_sdt=1%2C34&as_ylo=2012 52 papers

Note. Sample of search methods in PubMed and Google scholar, additional searches in CINAHL, Google, and Bing search engines.

Table 5

Biometric Health Testing, 2015 guidelines

	Normal	B High	High	Low	Refer & F/U
Total Chol	<200	>200	>250	**	Over 250
Trig	<150	150–199	>200	**	Over 200
HDL	50–60	**	**	<40	< 40 with another elevated category.
LDL	<100	130–159	>160	<100	>160
Glucose	60–100	100–125	126	<60	>101
BP Systolic	<120 & >90	120–139	>140	TBD	>140
BP Diastolic	< 80 & >60	80–90	>90	TBD	>90
Body Mass Index (BMI)	18–25	25–28	>28	<18	>28

Note. Chol = Cholesterol. Trig = Triglycerides. HDL = High-Density Lipoprotein. LDL = Low-Density Lipoprotein. BP = Blood Pressure. B = Borderline. Referral time frame not F/U = Follow-up. TBD = To Be Determined.

Table 6

Updated biometric health testing: standard referral, same-day referral, and immediate consult values, 2016

	Positive screen	Standard referral	Same Day Referral	Immediate Consult or offer to call PCP	Priority
High Glucose	>100 Fasting >140 Non-Fasting	100—199 Fasting 140–199 Non-Fasting NP 3–5 days	**200—249 Fasting** **200–399 Non-Fasting** NP	**>250 Fasting** **>400 Non-Fasting** NP	1
Low Glucose	**<60** **Provide snack**		**50–60** NP	**<50** NP	
BP Systolic	>120	140–159 NP 1 week	160–179 NP	**>180 or <90** NP	2
BP Diastolic	>80	90–99 NP 1 week	100–109 NP	**>110 or <50** NP	
Total Chol	>200	240–349 RD 2 weeks	>350 NP		3
Trig	>150	150–199 RD 2 weeks	>200 RD		
HDL	<40	<40 RD 2 weeks			
LDL	>130	>160 RD 2 weeks			
Body Mass Index (BMI)	>28	30.0—39.9 RD 2 weeks	>40 <18 RD		4

Note:

- Bolded values = Immediate consult with provider.
- If more than one value requires a standard referral, the Priority order determines what the referral is made for.
- If 3 or more values are positive but not high enough for referral on their own, provide referral to NP for 2 weeks.
- If any values are positive or if they have questions, offer option of consult with EAP, RD, or NP.

Table 7

Watson's Ten Carative Factors

1.	Humanistic system of values
2.	Faith-Hope
3.	Sensitivity to self and others
4.	Developing helping-trusting, caring relationships
5.	Expressing positive and negative feelings and emotions
6.	Creative, individualized, problem solving caring process
7.	Transpersonal teaching-learning
8.	Supportive, protective, and corrective environment
9.	Human needs assistance
10.	Existential-phenomenological and spiritual forces

Notes. (Watson 1999, 2008). Reviewed in McEwen &Willis (2011). Humanistic = human values based on respect, openness, and understanding. Transpersonal = An intersubjective human to human relationship, both the nurse and the patient are affected by experience. Existential and spiritual forces = acceptance of a larger life process, a binding life-force inherent in all humans.

Table 8

Reviewed sample referrals by abnormal screen, percentage, and follow-up

	Elv Glu 2015	Elv Glu 2016	Elv BP 2015	Elv BP 2016	Elv Lip 2015	Elv Lip 2016	Elv BMI 2015	Elv BMI 2016
Freq of R	93	104	60	50	122	101	247	194
Tot 2015–2016	*	197	*	110	*	223	*	441
yes/ total	22.91%	25.62%	14.78%	12.32%	30.05%	24.88%	60.84%	47.78%
no / total	62.07%	52.96%	70.20%	66.26%	54.93%	53.69%	24.14%	30.54%

Notes: Elv = Elevated. GLU = Glucose. BP = Blood Pressure. Lip = Lipids. BMI = Body Mass index. Tot = Total.

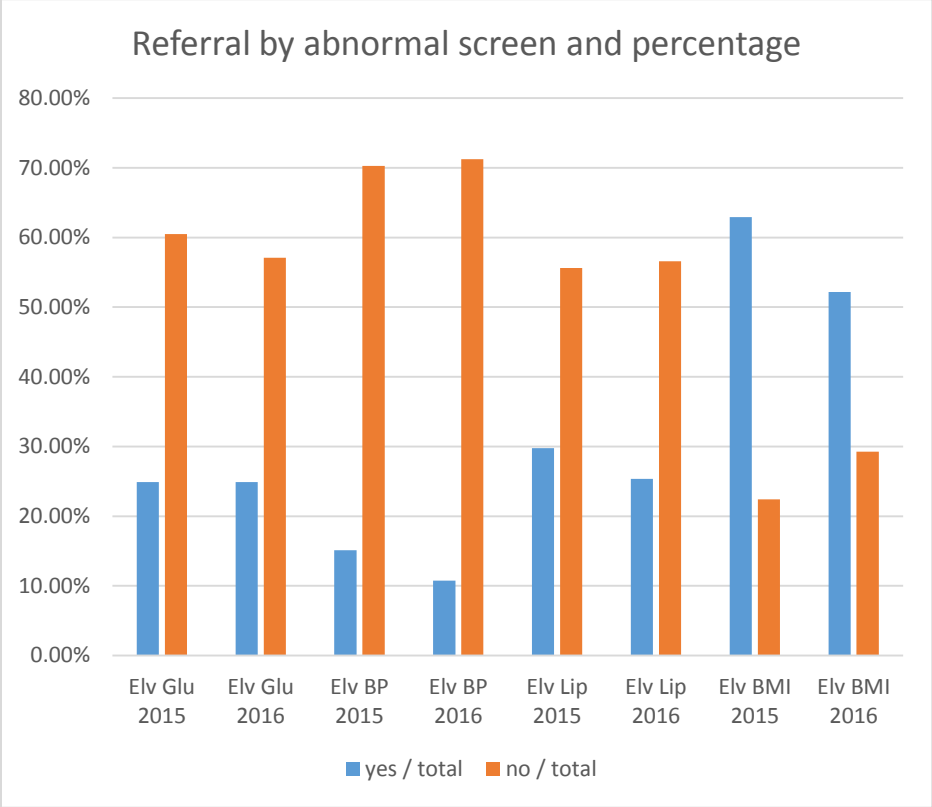


Figure 9. Referral by abnormal screen and percentage.

Yes = referral. No = No referral. Elv = elevated. Glu = glucose. BP = blood pressure. Lip = Lipids.

BMI = body mass index

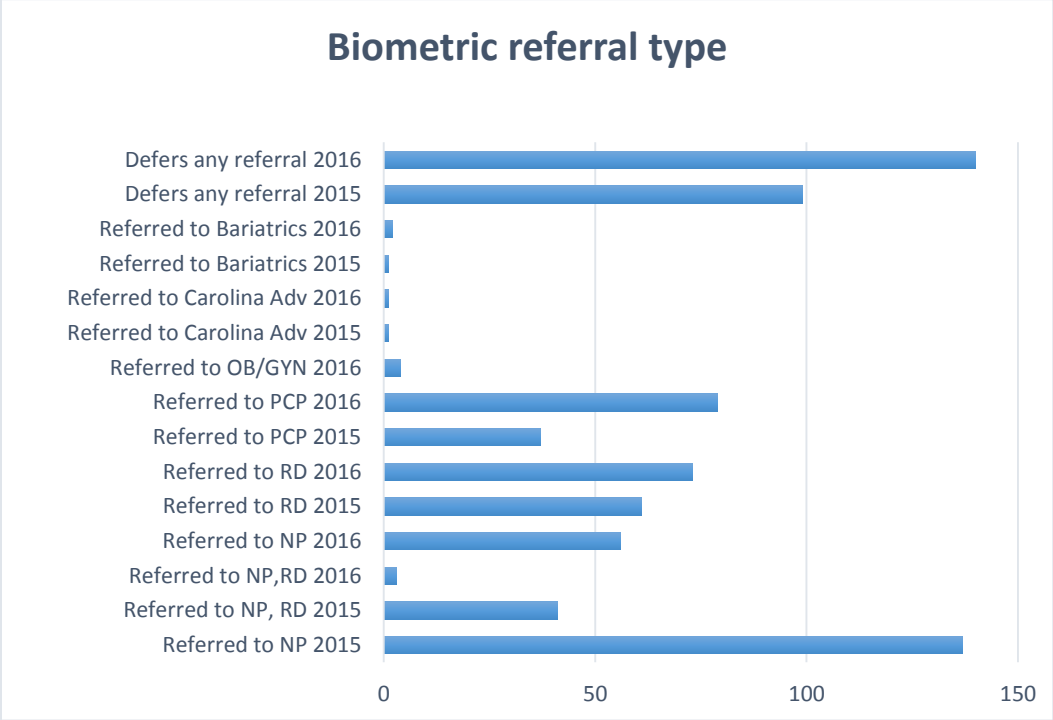


Figure 10. Referral type.

Appendix A

ECU IRB Approval Form

EAST CAROLINA UNIVERSITY
Office of Research Integrity and Compliance (ORIC)
University & Medical Center Institutional Review Board (UMCIRB)
Brody Medical Sciences Building, 4N-70• 600 Moye Boulevard • Greenville, NC 27834
Office **252-744-2914** • Fax **252-744-2284** • **www.ecu.edu/irb**

TO: Gene Farrug, ECU College of Nursing, DNP Program

FROM: Office for Research Integrity & Compliance (ORIC)

DATE: March 7, 2016

RE: DNP Project

TITLE: Improving Referral Management after Biometric Health Screening

This activity has undergone review on 3/7/2016 by the ORIC. A Doctor of Nursing Practice candidate is planning a health improvement initiative to improve the referral management process after biometric screening at an employee health center. The goal is to improve health care quality and utilization of employee health services and revise the policy of referral management at the health center.

This activity is deemed outside of UMCIRB jurisdiction because it does not meet the current federal descriptions for human subject research. Therefore, this activity does not require UMCIRB approval. Contact the office if there are any changes to the activity that may require additional UMCIRB review or before conducting any human research activities

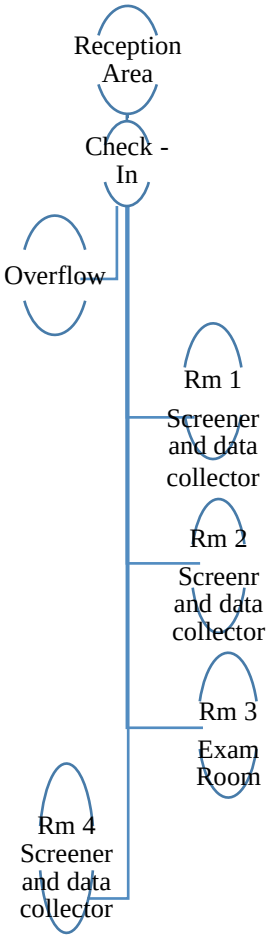
Relevant Definitions for Human Subject Research:

- *Research* means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy, whether or not they are conducted or supported under a program which is considered research for other purposes. For example, some demonstration and service programs may include research activities
- *Human subject* means a living individual about whom an investigator (whether professional or student) conducting research obtains:
  (1) Data through intervention or interaction with the individual, or
  (2) Identifiable private information.

The UMCIRB applies 45 CFR 46, Subparts A-D, to all research reviewed by the UMCIRB regardless of the funding source. 21 CFR 50 and 21 CFR 56 are applied to all research studies under the Food and Drug Administration regulation. The UMCIRB follows applicable International Conference on Harmonisation Good Clinical Practice guidelines.

Appendix B

Biometric clinical flow and documentation



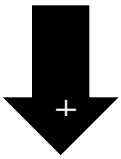
Biometric flow of patients at BCBS NC-Durham Reception area = Medical assistant (MA) or available clinical staff will manage reception desk and start data collection tool using Premise Health software and electronic medical record. Screening Rooms 1, 2, & 4 = MA, registered nurse, or registered dietician. Screening by cholestech. Screens include fasting lipids, glucose, height, weight, and blood pressure. Room 3 = Exam room, NP or alternate staff for clinical exam. Overflow = Extra waiting area, front desk will manage overflow. A couch and snacks will be available for patients requiring extra care, refreshment, or a short rest (see Figure 3).

Chart Review Flowsheet

1. Does the chart have a copy of a biometric screen and consent?

+ / -

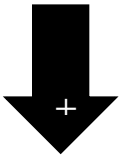
If (+) move on to step 2. If (-), look for screen and consent. Note on spreadsheet and move on to next chart.



2. Was the screen positive (+) (abnormal) or negative (-) (normal).

+ / -

If abnormal move on to step 3, if normal, did the patient return to health center? Stop, document and move on to next chart.

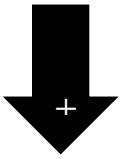


3. Was a referral indicated and completed (+/-)? Was the referral internal or external?

If referral was indicated and completed (+), indicate internal or external and move to step 4.

+ / -

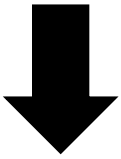
If (-), stop, document, and move on to next chart.



4. Did the health center follow-up on the referral (documentation in EHR)?

+ / -

If (+) document and move on to step 5, if (-) document and move on to step 5.



5. Did the patient return to the health center or follow-up on the message from the health center?

Document + /—and stop.

Documentation Workbook Example

Data will be kept in a password protected Microsoft Excel Workbook, see screen shot.

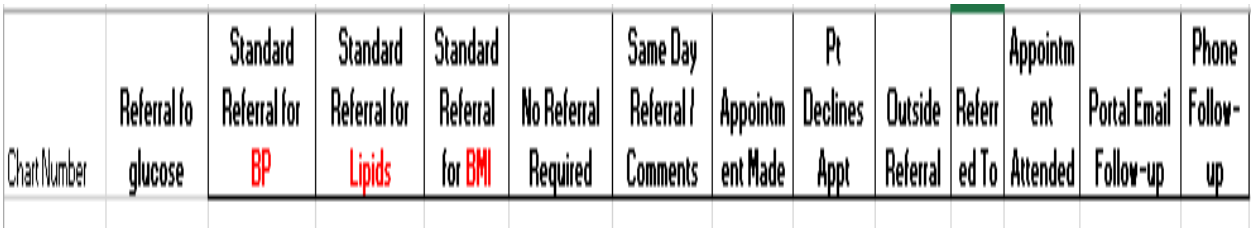


Chart Number, Referral for glucose, Standard Referral for BP, Standard Referral for Lipids, Standard Referral for BMI, No Referral Required, Same Day Referral / Comments, Appointment Made, Pt Declines Apt, Outside Referral, Referred To, Appointment Attended Portal Email Follow-up, Phone Follow-up

Appendix C

Timeline for Biometric Project

	Dates	Activity
1.	8/15–9/15	Completed follow-up on 2015 screens, started literature review
2.	8/29/2015	Completed CITI IRB training
3.	9/1–12/1/16	Explore Pubmed, CINAHL, NIH, CDC databases
4.	9/8–9/11/15	Submission of project idea and draft of abstract
5.	9/13–9/16	Completed DNP intensive training
7.	9/16–12/1/16	Theory review on diffusion of innovation
8.	9/19/2015	Submitted table and abstract to faculty members
9.	10/8/2015	Reviewed, sorted, and presented data on 2015 biometric screen
10.	10/12–10/30	Reviewed data findings with Director of Site Operations and Med Director
11.	10/30/2015	Add Diabetes education project, not part of ECU project
12.	11/01/15	Re-submit abstract, obtain final approval.
13.	11/2/15	Submit Draft of project for feedback.
14.	11/3–11/30	Work on final project
15.	11/15/15	Premise work group and BCBS meeting
16.	11/30/2015	Submit final draft of project
17.	12/6/2015	Submit project Log.
18.	12/6/-12/21	Project planning and work assignments
19.	12/21–1/4/16	Break-Gene Lit review time.
20.	Jan 2016	Prepare for IRB submission.
21.	Jan 2016	Set up project health database, workbook, and EMR.
22.	1/26/2016	Start Biometric screens and collecting data. Work on theory review.
23.	Feb 2016	Attend DNP intensive training.
24.	March 2016	Review project.

25.	April 2016	Data collection and review.
26.	May 2016	Data collection.
27.	June 2016	Attend DNP intensive training, data collection.
28.	July 2016	Sort and Scrub Data.
29.	Aug 2016	Review and Analyze Data.
30.	Sept 2016	Present data and project at Intensives.
31.	Sept-Nov 16	Finish Project, plan for 2017.
32.	Dec 2016	Graduate.

Notes. Timeline is projected.

Appendix D

Biometric Project Screening Tool

CONFIDENTIAL BIOMETRIC HEALTH TESTING

Name: _____ **Date:** _____ **Date of Birth:** _____

Male □ Female □ **Height:** _____ **Weight:** _____

Fasting: Yes□ No□ **Cotinine: Positive □ Negative □** **Pregnant: Yes □ No □**

SCREENING	RESULT	GUIDELINES		RECOMMENDATIONS FOR AT RISK LEVELS (NON-PHARMACEUTICAL)
Body Mass Index (BMI)	_____	18.5—24.9 25.0—29.9 ≥ 30	Healthy Weight Overweight Obese	▪ BMI may not account for variations in muscle mass and body fat ▪ Reduce weight by 5–10% ▪ Choose more nutrient rich foods
Blood Pressure	_____	**Systolic** < 120 120–139 ≥ 140	**Diastolic** < 80 80–89 ≥ 90	▪ Ideal ▪ Prehypertension ▪ Hypertension
LDL ("Bad" Cholesterol)	_____	< 100 100–129 130–159 160–189 ≥190	Ideal Near / Above optimal Borderline High High Very High	▪ Reduce your weight ▪ Reduce cholesterol, saturated fat, and trans fat intake ▪ Increase soluble fiber intake ▪ Increase physical activity
HDL ("Good" Cholesterol)	_____	**Men** < 40 ≥ 60	**Women** < 50 ≥ 60	▪ High Risk ▪ Desirable
Total Cholesterol	_____	< 200 200–239 ≥ 240	Desirable Borderline High High Risk	▪ Reduce your weight ▪ Reduce cholesterol, saturated fat, and trans fat intake ▪ Increase physical activity
Triglycerides	_____	< 150 150–199 200–499 ≥ 500	Normal Borderline High High Very High	▪ Reduce your weight ▪ Limit alcohol if you drink ▪ Limit sugary drinks ▪ Increase physical activity ▪ Eat fish high in omega-3 fatty acids (salmon, mackerel, and tuna)
Glucose / Blood Sugar	_____	**Fasting** < 100 Normal 100–125 Pre-Diabetes ≥ 126 Diabetes	**Non-Fasting** <140 Normal 40–200 Pre-Diabetes ≥ 200 Diabetes	▪ Reduce your weight by 5–10% ▪ Reduce cholesterol, saturated fat, and trans fat intake ▪ Increase physical activity

Recommendations: It is recommended that you provide a copy to your primary care provider and if there are abnormal findings, schedule an appointment for further testing. These results are considered preliminary and are not a diagnosis.

Signature of Health staff or Agent: _____

Cholestech LDX

"The Alere Cholestech LDX System is a small, portable analyzer and test cassette system. It uses reflectance photometry to measure the amount of substances in the blood." In this project it will measure blood glucose and blood lipids (Alere Cholestech LDX System User Manuel, 2015).