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Increasing the Utilization of a Cardiovascular Risk Assessment & Screening Tool through Education in a Primary Care Setting: A Quality Improvement Project

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Increasing the Utilization of a Cardiovascular Risk Assessment & Screening Tool through Education in a Primary Care Setting:

A Quality Improvement Project

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A DNP Project submitted in partial fulfillment of the requirements for the degree of Doctor of Nursing Practice Davis & Henley College of Nursing

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This is to certify that the DNP Project Final Report by

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has been approved by the DNP Project Team on

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Abstract

Background and Significance: The World Health Organization (WHO) (2021) reports that 55.4 million people died worldwide in 2019; cardiovascular diseases due to ischemic heart disease and stroke were the top two leading causes of these deaths. Experts predict that by the year 2030, more than 22.2 million people will die annually from cardiovascular disease (Ruan et al., 2018). Noninvasive cardiovascular screening tests, such as the "Pulse4Pulse" screening tool, are a way to help providers identify patients at high-risk for cardiovascular disease and initiate treatment to reduce future risk.

Purpose: To increase provider utilization of the "Pulse4Pulse" screening test in a primary care office. The outcome measures were to increase the number of completed “Pulse4Pulse” tests; increase the total number of referrals generated from those who completed the “Pulse4Pulse” test; and, increase the revenue yield from patients completing the test. The goals of this project were achieved through health education for the providers and written literature for the patients.

Methods: The Plan-Do-Study-Act (PDSA) Cycle was implemented to help guide the project. The clinical staff's knowledge was assessed through a pre-and post-test following an educational class. A one-paragraph description attached to the "Pulse4Pulse" questionnaire was distributed to each eligible patient when first placed in the examination room. Three months of data was collected. Each month the number of patients eligible for the "Pulse4Pulse" test was recorded as well as completed tests, total number of referrals, total revenue yielded, and number of referrals to specialists.

Outcome: Month 3 to month 4 portrayed a 14% increase in completed tests which met the project goal of 10%. However, the last two months (5 and 6) of the study achieved a 7%

increase. Lastly, early detection of abnormalities and referrals to specialty care and revenue generated for the office also increased.

Discussion: This quality improvement project showed the intervention to improve provider and patient utilization was effective in increasing overall completion rates of the "Pulse4Pulse" screening test. The findings of this study emphasize the importance of education and implementation of a cardiovascular screening tool.

Keywords: cardiovascular screening tool, cardiovascular disease, CV screening tool, primary care, patient outcomes and health outcomes.

Increasing the Utilization of a Cardiovascular Risk Assessment & Screening Tool through Education in a Primary Care Setting:

A Quality improvement project

Problem Identification, Development of Clinical Question, and Evidence Review

Background and Significance

The WHO (World Health Organization) (2020) reports that 55.4 million people died worldwide in 2019; cardiovascular disease (CVD) due to ischemic heart disease and stroke were the top two leading causes of these deaths. They accounted for approximately 17.9 million or 31% of deaths in the world (WHO, n.d.). Experts predict that by 2030, more than 22.2 million people will die annually from a CVD (Ruan et al., 2018). Patients at the highest risk for a CVD are patients with a history of chronic kidney disease, diabetes, excessive alcohol use, hypertension, hyperlipidemia, obesity, and smoking. Modifiable risk factors account for more than 70% of all CVD (Sardarinia et al., 2016). Therefore, the burden of cardiovascular disease can be reduced by disease prevention or early detection (Schwalm et al., 2018). Experts from the American Diabetes Association (ADA), the American Heart Association/American College of Cardiology, and the American Neurologic Association believe in-office, noninvasive screening tests such as the Ankle-Brachial-Index (ABI) (Herraiz-Adillo, Mariana-Herraiz, & Pozuelo-Carrcosa, 2019) and Sudomotor and Autonomic system tests (ADA, 2018) may prevent or detect early CVD. Hence, the experts recommend providers use noninvasive screening tests in the primary care setting to improve the care of patients at risk for CVD.

It is expected that all primary care providers remain knowledgeable on standard primary care practices. This is important when caring for patients who are at risk for cardiovascular disease. As a result, providers who receive ongoing health education can effectively care for their

patients and the communities they serve. Health education methods include medical lectures, posters, leaflets, and videos (Hasanica et al., 2020). Leaflets and posters are widely used by health organizations to serve as reminders and cues to ensure providers follow treatment and practice guidelines (Moerenhout et al., 2013).

Patient-provider communication is also crucial in the primary care setting. Office visits with patients are lengthy and the conversations with patients are complex. Patients may present with multiple complaints during a visit. Unfortunately, providers have limited time assigned for each encounter, and this limits what can be addressed in a single visit (Tai-Seale et al., 2007). Therefore, providers may forget or forego discussing and ordering essential CVD screening tests in patients at risk for CVD. As a result, some patients never have these important screening tests completed. This quality improvement (QI) study will examine provider utilization of a noninvasive cardiovascular screening test, called "Pulse4Pulse", in a primary care setting.

Description of Local Problem and Organizational Priority

The project took place at a primary care office in Connecticut. This primary care clinic provides care to patients of all ages. In this clinic, the "Pulse4Pulse" test is used to screen patients at risk for cardiovascular diseases. Patients who qualify for the test have one or more conditions listed on the screening questionnaire (refer to Appendix I, titled "Pulse4Pulse" Screening Questionnaire). The "Pulse4Pulse" screening test consists of three components to identify asymptomatic disease: autonomic nervous system test, sudomotor test, and an ankle-brachial index test. This test can be easily performed the same day of a routine visit and takes less than 15 minutes to perform. However, use of the "Pulse4Pulse" test in this clinic is low due to lack of provider time, knowledge, and engagement of how useful this test is in managing patients at risk for CVDs. Additionally, patients who are offered the screening test do not have it

completed at the same day visit and fail to schedule a follow-up appointment to have it done at a later date.

Utilizing the "Pulse4Pulse" test in this primary care office will detect patients at risk for cardiovascular diseases. Results from this test will improve health outcomes through early detection, in which modification of current treatment and future adverse events can be prevented. It is crucial that primary care providers assess patients for cardiovascular diseases to implement pharmacotherapy, if needed, and counseling regarding lifestyle and behavioral changes at each visit.

Focused Search Question

The literature was searched for evidence to answer the clinical question in PIO format: Does provider and patient education (P) improve the utilization of a cardiovascular risk assessment tool and noninvasive screening test (I) in adult patients in the primary care setting (O)?

Evidence Search

External Evidence. Five articles were reviewed focusing on CVD risks and screening. Refer to Appendix B for Evidence Review Table. The level of evidence for all studies was Level II, IV, and V (refer to Table 1, Level of Evidence Table, in Appendix A). All five articles examined cardiovascular risks and the utilization of a cardiovascular screening tools with three of the five studies portraying an increase in the use of the tool. Improved health outcomes in adult patients were seen in four of the five studies examined. A more in-depth review of these outcomes will be stated in the evidence appraisal, summary, and recommendations section.

Internal Evidence. The American Heart Association (2019) states that lifestyle changes and patient education may prevent up to 80% of CVDs. Risk assessment is a crucial step in the

approach of primary prevention of CVD. The ACC/AHA clinical practice guidelines recommend the use of risk assessment tools to aid in the decision-making process for primary prevention of CVD (Lloyd-Jones et al., 2019). Providing education and preventative screening for patients at risks for CVDs can decrease their risk of having a CVD in the future.

Evidence Appraisal, Summary, and Recommendations

A search of the following databases: CINAHL, Cochrane Database of Systematic Reviews, and MEDLINE was conducted to complete this evidence review. Based on the literature search, keywords searched were: cardiovascular screening tool, cardiovascular (CV) disease, CV screening tool, primary care, patient outcomes, health outcomes, patient education, and patient adherence. Limits/filters included English language, adults, and published between 2012-2020. Refer to Appendix A, Evidence Search, for a complete list of the search terms in each database.

Five articles were reviewed focusing on CVD risks and screening (refer to Appendix B, Evidence Review Table). The level of evidence for all studies were Level II, IV, and V (refer to Table 3 in Appendix C). Risk factors for cardiovascular disease were assessed in all five studies. Four studies Collins et al. (2017), Byrne et al. (2020), Mallaina et al. (2013), and Fatema et al. (2016) found health outcomes, including patient satisfaction, improved in adult patients who had their cardiovascular risk factors assessed and screened. Additionally, a study by Collins and colleagues (2017), provides support that the use of cardiovascular risk assessments can lead to reductions in CVD morbidity and mortality. Lastly, a study by Byrne and colleagues (2020), showed that patients understand their risk factors for cardiovascular disease through educational sessions via mixed media (e.g., written material and visual aids).

Patients consider their healthcare providers the most reliable source of health-related information. Patients will follow treatment plans when they trust their healthcare provider. According to Bussell et al. (2017), it is important providers use simple language and take the time to educate patients. Fostering the patient-provider relationship via good communication has been shown to improve patient adherence to treatment.

In summary, this evidence review provides support that cardiovascular risk assessment and noninvasive screening in the primary care setting will reduce morbidity and mortality from cardiovascular diseases. Therefore, providing continuing education and reminders to providers about the "Pulse4Pulse" screening test and fostering the provider-patient communication during office visits will improve the utilization of the "Pulse4Pulse" screening test in a primary care office.

Project Plan

Project Goals

1. Increase provider and staff knowledge of the cardiovascular risk assessment and screening tool and increase provider utilization of the "Pulse4Pulse" test.
2. Increase patient education through providing a brief explanation of the screening tool upon patient's filling out the form (See Appendix J).
3. Look at revenue earned, number of completed tests and number of referrals for further workup before and after implementing the project.

Context

The primary care office where the project took place is located in Connecticut. The practice is owned by a medical doctor and staff includes himself, one APRN as well as three medical assistants, front desk staff and an office manager. The office is comprised of six total

exam rooms. This primary care clinic acts as a principal point of healthcare services to patient for all ages.

Project Team Members and Roles

Taylor Massey, RN, BSN, DNP candidate was the primary investigator (PI) of this QI project. RoseAnna Petonito, APRN is the Practice Mentor who serves as the role model and expert within the practice setting. Rosemary Johnson, DNP, APRN, ANP-BC is the DNP Project Advisor who is the faculty member that provides expertise and guidance on implementing this QI study.

Key Stakeholders

Key stakeholders included in the QI project included the medical doctor, RoseAnna Petonito, DNP-FNP, the patients and staff. The "Pulse4Pulse" medical technician played a vital role in the project; she was the one who provided the data from month to month in terms of how many patients were eligible as well as who completed the test. She also provided the PI with the yielded revenue for each month. The medical assistants (MA) had the role of placing the patients in their designated exam rooms. If the patients were eligible for the test, the MAs were the individuals who gave the patients the "Pulse4Pulse" questionnaire with the explanation attached. Everyone played a vital role in the success of this quality improvement project. With the dedication from each team member, the implementation of this QI project was made possible.

Possible Barriers to Implementation

Lack of time may be a barrier for primary care providers as well as lack of patient involvement and compliance with partaking in "Pulse4Pulse" screening. Another barrier is insurance not covering the test for the patient as well as lack of support from the staff (Pandhi et

al., 2020). It is important to continue to educate providers on the importance of utilizing this screening tool to decrease future CVD.

Project Design and Methodology

Framework

The framework used for this quality improvement project was the Plan-Do-Study-Act (PDSA) Cycle (IHI, 2020). This model is a four-stage problem-solving model used to improve a process or carry out a change and is commonly used for QI projects. (Institute for Healthcare Improvement, 2021). The four steps in the PDSA Cycle are:

Step 1. **Plan**

The PI will increase the utilization of a cardiovascular risk assessment tool in a primary care setting through education

The goal is to see a 10% increase in the completion of the "Pulse4Pulse" test each month.

Steps to execute:

1. Measure the number of patients who were eligible for the "Pulse4Pulse" screening and got the test completed 3 months prior to the process change
2. Measure the number of patients who had the "Pulse4Pulse" screening test completed 3 months after the process change
3. Compare revenue yield 3 months prior and after practice change
4. Compare number of referrals 3 months prior and after practice change

Step 2. **Do**:

- Through the educational session, providers were able to recognize the importance of having their patients complete the cardiovascular risk assessment tool

- With the implementation of a small explanation attached to each questionnaire, more patients were inclined to filling it out and having the test completed
- More referrals were made as a result of more patients getting the test completed

Step 3. **Study**:

- The goal was to see a 10% increase or higher in the number of tests that were completed each month.
- Total number of referrals and revenue increased each month

Step 4. **Act:**

- Including explanations for patients on screening tools allows them to better understand what will be done
- The providers had enough time to explain the process to each patient as the patient had already read the explanation on the questionnaire prior to seeing the provider
- Offering educational sessions can be beneficial to the providers

Sustainment

In order to reach sustainability, quality improvement initiatives must become the new way of working. Reaching sustainability is not always an easy process and it takes a team of individuals to implement the needed change. For the "Pulse4Pulse" screening tool to be sustained at the primary care office, continued education for staff is crucial and should be done every couple of months. Unfortunately, without the PI being at the office, there is a question if screening patients is priority for the staff. Project method and results will be disseminated to the primary care office so they can see how the increase in completed tests lead to an increase in revenue and referrals to specialty care. Ideally, this method to improve utilization of the "Pulse4Pulse" screening test will continue in order to prevent future CVD.

Dissemination

The primary goal of disseminating evidence is to increase the motivation and ability to use and apply the evidence upon completion of the QI project. There are different ways to disseminate results, such as sending an e-mail, presenting a poster, completing a presentation, posting charts, hand-outs, etc. To disseminate the results for this QI project, a poster will be provided with an abstract as well as all data portrayed in tables and figures. The DNP candidate will present the poster on April 22, 2022 to peers and professors. The DNP candidate will present the final project to the primary care office where the project was completed and, lastly, the DNP student will submit their final project paper to the digital repository for Sacred Heart University in May 2022. The PI also plans to present findings at a professional nursing conference such as the International Conference on Nursing Practice, Quality and Performance.

Timeline

A timeline for this project came be found in (Appendix B).

Resources

1. People:
    a. Preceptor, patients, providers and office staff.
2. Material
    a. The Pulse4Pulse questionnaire is of no cost as these are usually distributed to patients daily. A 2x5 piece of paper is stapled to each Pulse4Pulse questionnaire and provided by the PI.

Review for Ethical Consideration

This project involves educating providers and office staff on the utilization of a screening tool. No patient names were observed. The completed quality improvement tool is portrayed in (Form 1 in Appendix G). The results of this tool portrays that this project meets criteria for a

quality improvement project. This project did not require Sacred Heart University Institutional Review Board approval or to the review board of the primary care office.

Implementation, Evaluation, ROI, Outcome, Results

Project Implementation

In August of 2021, clinical staff knowledge of cardiovascular risk factors as well as their views toward the current screening tool and utilization was assessed. A pretest questionnaire was distributed one week prior to the educational review. Upon the completion of the educational review, a post questionnaire was given directly following a 20-minute PowerPoint presentation. The PI attached a small overview of the "Pulse4Pulse" screening test on each questionnaire for the patient to better understand the test. Data was collected for the previous three months prior to the practice change. Date collected included patients eligible for the "Pulse4Pulse" test, completed "Pulse4Pulse" tests, total number of referrals generated from the tests, and revenue yielded for each month. Data was displayed in an excel spreadsheet.

From September 2021 to December 2021, patients in the primary care office who were eligible to receive the "Pulse4Pulse" test were given the questionnaire. Each month the number of patients eligible for the "Pulse4Pulse" test was recorded as well as completed tests, total number of referrals, total revenue yielded, and the number of referrals to specialists. The data was collected and obtained from the "Pulse4Pulse" medical technician in the office. All data was kept confidential portraying no patient names.

Data Collection

Once a week the PI met with the "Pulse4Pulse" technician who gave the number of completed test and revenue yield from the test that week. The PI met with the other members in the office at the end of each month to speak about their thoughts on how the project was going.

The PI encouraged them to voice their opinions and any needed changes they thought would be beneficial.

Data was collected through a chart provided to the PI by the "Pulse4Pulse" technician for the three months prior to project implementation. September 2021-December 2021 was when the implementation process began and data was collected for each month. Patients who were eligible to receive the test were given a questionnaire and a brief description of the test. Those patients who completed the "Pulse4Pulse" test as well as the number of referrals generated for each completed test was documented. Lastly, the revenue yield was recorded as well for each test completed. This process was repeated for all three months of the study.

Evaluation

Measure and Analysis

The recording and analysis of data was completed with Microsoft Excel. Prior to the educational presentation provided, providers and staff were asked to complete a pre-test made by the PI. Pre and post test scores using mean (M) and standard deviation (SD) was reported as well as a line graph portraying the percent increase of completed "Pulse4Pulse" tests from month to month (e.g., month 1 to 2, month 2 to 3, month 3 to 4, month 4 to 5, and month 5 to 6). Three months post-intervention resulted in greater than a 10% increase in the first month, which was the overall goal of the QI project (refer to Figure 3 in Appendix L).

Outcome Measurements

Prior to implementing the project, a survey was given out to the providers gauging their current thoughts on the screening tool. There were a total of five questions to answer (See Appendix E). Results of the survey concluded that the providers at this primary care office saw

the tool as beneficial for patients but recognized that they themselves were not utilizing the tool as much as they should be.

Data was collected on the three previous months. Data collected included the number of patients who met eligibility for the "Pulse4Pulse" test, the number of patients who completed the test, the total number of referrals and revenue yielded. Utilization of the "Pulse4Pulse" test was not completed very often prior to implementation/intervention, as portrayed in Table 1 (refer to Table 6 in Appendix N). Month 1 to 2 portrayed a -2% decrease in completed "Pulse4Pulse" screening test, while month 2 to 3 portrayed a -3% decrease. Refer to Table 2 for a detailed look at month-to-month calculations and results in Appendix N.

Prior to the educational presentation for clinical staff, staff were asked to complete a pre-test made by the primary investigator. Average scores ranged from 70-100%. Directly following the educational presentation, the same staff completed the post-test, with scores ranging from 90-100%. The educational presentation was beneficial to staff because the average score from the pre-test was 80% *(14.1)* and the post-test average score was 95% *(5.8).*

Utilization of the "Pulse4Pulse" test increased post-intervention. The largest increase occurred between month 3 to 4 with a 14% increase which met project goal of a 10% monthly increase. However, the last 2 months (i.e., months 5 and 6) of the study did not quite achieve the goal of 10%. The percent increase for these months were 7% for each (Refer to Table 2 in Appendix K).

In summary, the findings of this study showed the intervention to improve provider and patient utilization was effective in increasing overall completion rates of the screening test. For example, the percentage of completion in month 1 was 30%. In month 2, it dropped to 28%; it dropped further in month 3 to 25%. After the intervention, completion rate for the "Pulse4Pulse"

test was 40% in month 4, 46% in month 5, and 53% in month 6. Because more patients completed the "Pulse4Pulse" screening test, as predicted the number of referrals to specialty care such as vascular, cardiology and endocrinology, also increased. For example (refer to Table 5 in Appendix M), in month 1 there was a total 4 referrals. For months 2 and 3, there were total of 2 and 3 referrals, respectively. In the three months after implementation of the study, the referral rate increased to 12, 18, and 15 for months 4, 5, and 6, respectively. Revenue yield each month increased as well, with month 4 totaling $4,800, month 5 portraying a $6,560, and month 6 with a yield revenue of $6,880. For detailed explanation of the study findings, please refer to Table 5 in Appendix M.

Barriers Encountered During Implementation

As it is shown in the results, lack of time was not so much an issue in the first month of the QI project. Month four showed great improvement in the number of tests done as well as the number of the referrals sent. Potential barriers to the decrease in the last two months of the implementation phase could possibly have been due to the providers taking their vacations. This resulted in only one provider in the office during this period of the study. Unfortunately, it led to an extremely booked schedule; therefore, the one provider may not have had enough time to talk to patients about the screening tool.

The impact of COVID-19 was a barrier as well. While the clinic was back to seeing patients in the office, there was an option for patients to complete their exams over telehealth, especially during the first two months (i.e., months 4 and 5) of the project implementation. Due to this possibility, overall "Pulse4Pulse" screening/completion could have been higher if those patients, who were seen on telehealth, came into the office. If a patient does not come into the office to be seen, they will not receive a questionnaire or be offered the "Pulse4Pulse" test.

In month six, one of the medical assistants left the practice. Therefore, this only allowed one MA to room patients. As a result, this may have caused the MA to forget to hand the patient the questionnaire and educational print-out, or the MA was too busy to do so.

Lastly, another barrier was that even though a patient may qualify to receive the test based on their risk factors, not all insurance will cover the test for the patient. This ultimately could result in the patient having to choose either not get the test done or to pay out of pocket.

Return on Investment

The total project timeline was eight months: from April 2021 to December 2021. The target goal of a 10% increase each month was met for the first month but not the second or third. The "Pulse4Pulse" screening test continues to be utilized in the primary care office with the emphasis on receiving the test through provider education to the patient. At this time the target outcome goal of a 10% increase from month to month was met for only the first month. The project achieved an overall increase in utilization of the "Pulse4Pulse" screening test by the providers and completions for eligible patients by the end of the study. No additional resources were required in terms of capital and there was a positive return on investment.

Dissemination

Implications of Project Results to Organization and Practice Community

Implementing education using a presentation and pre and post tests did prove that there was an increase in the utilization of the "Pulse4Pulse" screening test. The primary care office was utilizing this tool before implementation of the project, but screening tests were not always performed for patients who were eligible. Attaching a 2x5 inch piece of paper to each questionnaire was helpful in that the patients had an idea of what this test was, which ultimately did not cause the providers to take more time during each appointment to explain it. While the

work days can get very busy, the providers truly did make an effort to increase the amount of tests to be completed. With the continued implementation of this project in the primary care office, risk factors and potential future cardiovascular disease can be avoided with the utilization of the “Pulse4Pulse” screening test.

Key Lessons Learned

Implementing change must build practice capacity and culture. For change to occur, it needs to be supported by providers and office staff. It takes communication and building a common goal among team members to effect positive change. There is always an opportunity to improve one’s knowledge and education, and it does not matter what role you are in. In short, utilizing the IHI (Institute for Healthcare Improvement, 2021) Model of Improvement provided a method for a successfully implementation of a practice change in a healthcare setting (Taylor et al., 2014).

The original goal before implementation was to see a 10% increase in the number of “Pulse4Pulse” screening tests completed from month to month. It may have been better to set a goal of 5% instead of the 10% that was chosen. This PI learned that change takes time and sometimes that means not starting off with such a high goal. Additionally, the PI did not consider the effects of losing or the reduction of clinical staff would have on patients completing the “Pulse4Pulse” screening test. In summary, setting an achievable goal can influence performance and facilitate the needed change (Aghera et al., 2018).

Sustainability Plan

In conclusion, to achieve sustainability, quality improvement initiatives must become the new way of working. Reaching sustainability is not always an easy process and it takes a team of individuals to implement the needed change (Silver et al., 2016). For the “Pulse4Pulse”

screening tool to be sustained at the primary care office, continued education for staff is crucial and should be done every couple of months. The planning and process for this project and the results will be disseminated to the primary care office and other members of the team. Sharing this information allow them to see the increase in completed tests and the number of referrals generated to specialist as a result. Knowing the value of the "Pulse4Pulse" screening test, through the revenue yield and number of specialty referrals, should be an incentive to keep the clinical staff motivated to maintain and improve the utilization of the "Pulse4Pulse" screening test to prevent future CVD.

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Appendix A

Table 1. Level of Evidence Synthesis

Level of Evidence Synthesis

Legend:
1= Collins et al., 2017
2=Gorenoi & Hagen, 2015
3= Byrne et al., 2020
4=Mallaina et al., 2013
5=Fatema et al., 2016)

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Sacred Heart University

Article Number	1.	2.	3.	4.	5.
Level I: Systematic review or meta-analysis					
Level II: Randomized controlled trial			X		
Level III: Controlled trial without randomization					
Level IV: Case-control or cohort study		X		X	X
Level V: Systematic review of qualitative or descriptive studies	X				
Level VI: Qualitative or descriptive study, CPG, Lit Review, QI or EBP project					
Level VII: Expert opinion					

Appendix B

Table 2. Evidence Synthesis

Evidence Synthesis Table

Article	1.	2.	3.	4.	5.
CV Risk	X	X	X	X	X
CV risk assessment tool	X	X	↑	X	↑
Improved health outcomes in adult patients	↑	NE	↑	↑	↑

Legend:
1= Collins et al., 2017
2=Gorenoi & Hagen, 2015
3= Byrne et al., 2020
4=Mallaina et al., 2013
5=Fatema et al., 2016)

Symbol Key:
X=examined in study
NE= not examined
↓=decrease
↑=increase

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Appendix C

Table 3. Evidence Table

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
1	Collins (2017)	To summarize existing systematic reviews on the impact of global CV risk assessment in primary prevention of CVD in adults	Systematic Review	Screened 6877 studies for inclusion. Published from 2005-2015 and searched 11 databases	Cardiovascular risk assessment Primary prevention Risk score	Systematic reviews of interventions involving global cardiovascular risk assessment relative to no formal risk assessment in adults with no history of CVD	There is some evidence that showed used of global cardiovascular risk assessment leading to reductions in CVD morbidity and mortality	Yes
2	Mansoor (2019)	To identify persons with high risk for CV disease.	Cohort sutdy	Individuals ages 45-64 years old who had data relevant to traditional and nontraditi	CV risk factors Predictions statistics Risk assessment	Using a self-report tool for CV risk assessment called EZ-CVD. Score included	Utilizing a self-report tool such as EZ-CVD is a good way to assess risk of CV disease. There are multiple	Lower level of evidence but great 29alcul

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
				onal CV risk factors Total of 9285 patients met inclusion criteria	Definitions not included in study	6-tiems (age, sex, a self-reported physician diagnosis of HTN, diabetes mellitus, smoking and family history of premature MI. 44 weeks of medication 30alculat and coaching phone calls.	tools that are used to assess CV disease.	
3	Byrne (2020)	To implement primary prevention strategies to assess CV risk	Randomized control trial	212 patients from primary care practice	CV disease Patient education Lifestyle interventions No 30alculat	Patients were prescribed statins for primary prevention of CV disease with total cholesterol level	Results showed that patients better understood their risk factors for CV disease through education sessions	Yes Findins are consistent with existing literature

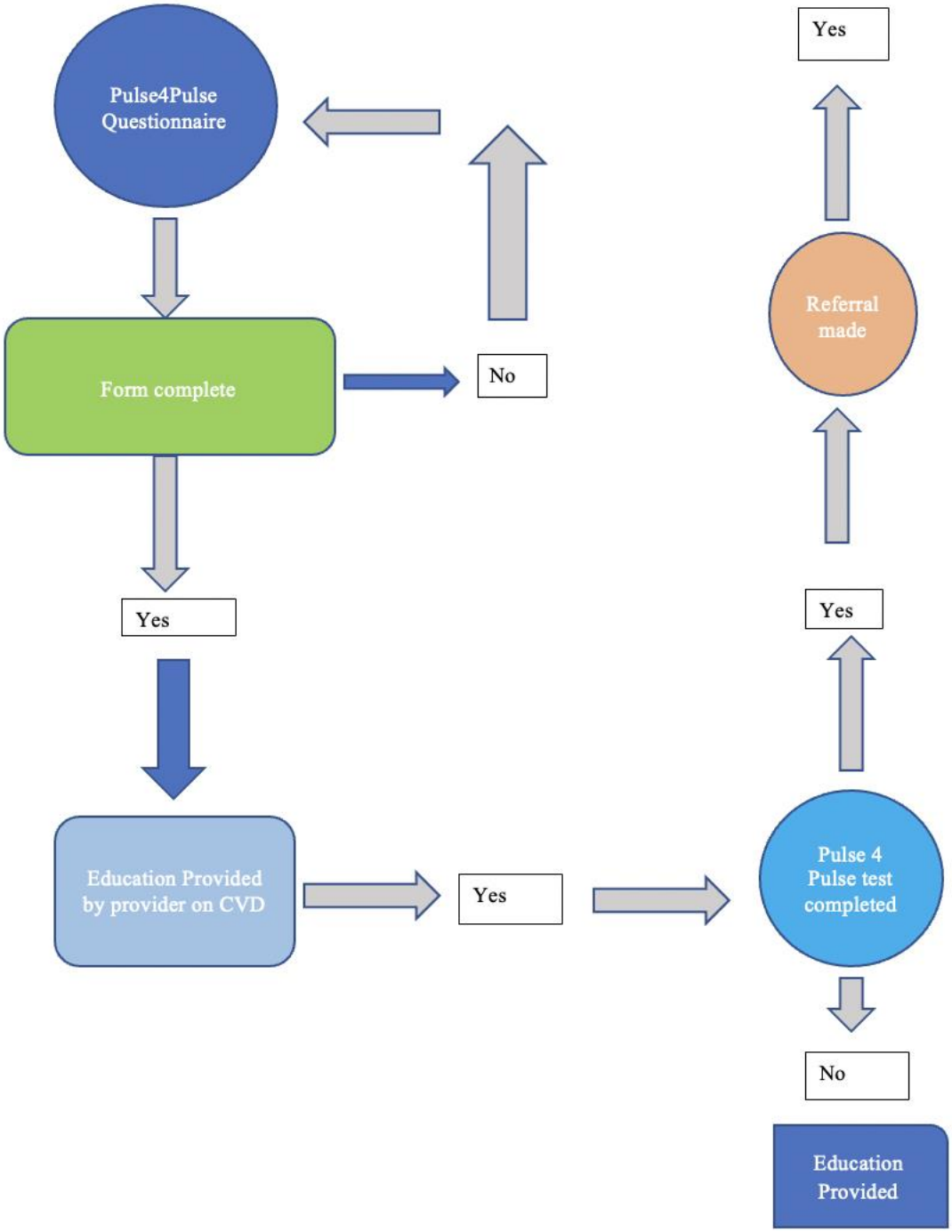
Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
					e31 provided	>5 were randomized. There was a 3R 31alculate31nc that involved two structured group education sessions focusing on med 31alculate to lifestyle behaviors and CV risk 44 weeks of medication 31alculat and coaching phone calls	The 3R multiple risk intervention did not improve adherence to statins for primary prevention of CVD, but did lead to improvement in blood pressure and wasit 31alculate31nce, indicating engagement in health lifestyle behaviors	
4	Mallaina (2013)	To estimate the CV risk	Cross-sectional study	1,439 smokers recruited from	Cardiovascular disease	CV risk was 31alculate using	A high CV risk attributable to smoking	Yes

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
		attributable to smoking using risk assessment tools (CV-ASPIRE)		Europe during 2011. >40 years old, smoked >10 cigarettes / day and had recent blood pressure measurements	Smoking cessation ASPIRE	the SCORE system Risks assessed included CV mortality, coronary head disease, and had CHD.	was consistently demonstrated. Findings reinforce importance of smoking as a significant predictor of long term CV events.	
5	Fatema (2016)	To assess the risk of CVDs among a peripheral rural Bangladeshi population	Cohort study,	66,710 individuals aged 31-74	Cardiovascular disease Hypertension Diabetes Bangladesh	During 2011-2012 the participants were assessed for CVDs using the WHO's risk assessment tool designed for primary care settings in low	Out of all participants, 1170 were found to be at high risk for CVD.	Yes. Strong recommendation to incorporate a

Article number	First author year	Purpose	Evidence type, level of evidence	Sample, setting	Major Variables Study and their Definitions	How major variables were measured	Findings that help answer question	Worth to practice/project, quality of evidence
						resource societies.		

Appendix D

Figure 1. Concept Map



Appendix E

"Pulse4Pulse" Provider Survey

1. Do you provide education on the Pulse4Pulse tool?
    - Yes
    - No
    - Maybe

2. Do you feel that providing more education about the tool would lead to more utilization of the tool in the office?
    - Yes
    - No
    - Maybe

3. Would a brief overview of the tool attached to the questionnaire help you with time and giving less explanation to the patient?
    - Yes
    - No
    - Maybe

4. Do you feel like lack of time with the patient leads to the test not being done?
    - Yes
    - No
    - Sometimes

5. Do you encourage patients to make follow-up appointments to get Pulse4Pulse if they refuse during their appointment?
    - Yes
    - No
    - Sometimes

Appendix F

Table 4. Project Timeline

	Doctor of Nursing Practice Project Roadmap	**Person Responsible: T.Massey**
Component	**Definition**	**Date Done**
Phase 1: Problem Identification and Evidence Review		
Clinical Inquiry including background and significance of problem	Described the local problem of Pulse4Pulse not being implemented enough in the PCP office. Data was obtained from previous 3 months to show the need for this QI project	1/29/21
Organizational priority	Summarize information that supports topic/problem is an organizational priority.	1/29/21
Searchable Question	Focused PIO question was written using evidence searched from the literature.	1/29/21 Modified on 2/14/21
Evidence search	External evidence Summarize search strategy (e.g. databases, keywords, filters/limits, criteria for article selection, tools for critical appraisal). Include practice-based evidence (e.g. evidence-based solutions that experts/other health systems have implemented to address practice problem).	2/13/21
	Internal evidence • Summarize applicable unit/community/department/hospital/organizational level data or data required for national entities (e.g. CMS, NDNQI, AHRQ).	2/13/21
	Perform needs assessment if applicable.	N/A
Evidence appraisal, summary, and recommendations	Organize evidence that answers focused clinical question in a clear concise format (e.g. table or matrix).	2/11/21
	Appraise literature for quality and applicability of evidence using established method (e.g. Johns Hopkins Nursing EBP Research Evidence Appraisal Tool, Joanna Briggs Institute Critical Appraisal Tools, Fuld Institute for EBP critical appraisal tools etc.).	2/13/21

	State recommendations(s) and link to evidence strength and quality and risk/benefits.	
Phase 2: Project Planning		
Project goals	State intended, realistic outcomes of project using established method (e.g. SMART criteria).	2/20/21
Framework	Select framework/model to guide implementation (e.g. EBP model, QI framework, Change model).	2/20/21
Context	Describe project setting and participants or population, or other elements that are central to where the change will occur.	2/20/21
Key stakeholders	Identify agencies, departments, units, individuals needed to complete the project and/or affected by project, and strategies to gain buy-in.	2/24/21
Practice change/intervention	Provided detailed description of practice change or intervention (e.g. new or revised policy).	2/24/21
Evaluation	Summarize plan for evaluating the effectiveness of the practice change. Identify applicable process and outcome data to be collected/tracked and tools to do this. Identify the methods for analyzing/interpreting the data (e.g. control, run or Pareto charts).	2/24/21
Possible barriers to implementation	Identify possible barriers and implementation strategies to mitigate these barriers.	3/19/21
Sustainment	Identify strategies to sustain the change.	3/19/21
Timeline	Create a realistic timeline for project completion.	3/19/21
Resources	Identify all resources (e.g. indirect and direct) needed to complete the project.	3/19/21
Ethical merit	Identify and obtain the required review and approval needed for implementation (e.g. institution, community agency, IRB).	3/19/21
Phase 3: Implementation		
Implement project	Carry out the project using selected implementation framework/model.	9/13/21

	Track any deviations/changes from the project plan.	10/13/21 Complete by 12/13/21
Phase 4: Evaluation		

Results/Interpretation	Using an established method (e.g. run or control charts) display data and interpret project outcomes.	12/30/21
	Report evaluation of the effectiveness of the practice change, including extent the practice change was implemented (process outcome) and extent to which the desired outcome(s) were achieved.	12/30/21
Return on investment	Identify the final resources that were used to implement the project. Calculate and report the return on investment.	Complete by 2/07/22
Phase 5: Dissemination		
Traditional	Disseminate to the project setting in a manner meaningful to them (e.g. executive report, poster, presentation at a meeting, poster with QR code to access details of project, etc.)	Complete by 4/13/22
	Disseminate in the format required by the academic institution (e.g. poster, public presentation) and	
	Prepare final project write-up using established reporting guidelines (e.g. EPQA, SQUIRE) and academic institution requirements.	

Appendix G

Form 1. Ethical Merit

Differentiating Quality Improvement and Research Activities Tool

Question		**Yes**	**No**
1.	Is the project designed to bring about immediate improvement in patient care?	X	
2.	Is the purpose of the project to bring new knowledge to daily practice?	X	
3.	Is the project designed to sustain the improvement?	X	
4.	Is the purpose to measure the effect of a process change on delivery of care?	X	
5.	Are findings specific to this hospital/setting?	X	
6.	Are all patients who participate in the project expected to benefit?	X	
7.	Is the intervention at least as safe as routine care?	X	
8.	Will all participants receive at least usual care?	X	
9.	Do you intend to gather just enough data to learn and complete the cycle?	X	
10.	Do you intend to limit the time for data collection in order to accelerate the rate of improvement?	X	
11.	Is the project intended to test a novel hypothesis or replicate one?		X
12.	Does the project involve withholding any usual care?		X
13.	Does the project involve testing interventions/practices that are not usual or standard of care?		X
14.	Will any of the 18 identifiers according to the HIPAA Privacy Rule be included?		X

Note. Adapted from Foster, J. (2013). Differentiating quality improvement and research activities. Clinical Nurse Specialist, 27(1), 10–3.

Appendix H

Cardiovascular Disease Quiz

Please complete this brief quiz that assesses your current knowledge about cardiovascular disease

1. Which is a cause of heart disease?
    a. Arthritis
    b. Stroke
    c. Thickening of the inside of the arteries
    d. None of the above

2. Which of these three risk factors cannot be controlled?
    a. Medication use, drug use, smoking
    b. Medication use, diet, alcoholism
    c. None of the above
    d. Age, gender, ethnicity

3. What is considered high blood pressure? (Select all that apply)
    a. 92/76
    b. 140/82
    c. 160/80
    d. 100/78

4. What can happen if blood flow in an artery is blocked or restricted?
    a. Stroke
    b. Heart attack
    c. Itchiness
    d. A & B

5. Which of these symptoms is a “classic symptom” of a heart attack?
    a. Difficulty breathing
    b. Pain that radiates from the chest to the neck, shoulders, jaw or arms
    c. Crushing pain in the chest
    d. Indigestion or heartburn

6. In the U.S., 1 in every 4 deaths is caused by heart disease.
    a. True
    b. False

7. The most common type of heart disease in the U.S. is:
    a. Mitral valve prolapse
    b. Arrhythmias
    c. Coronary artery disease
    d. Atrial fibrillation

8. What is a borderline high level for total cholesterol?
    a. 140 mg/dL
    b. 180 mg/dL
    c. 200 mg/dL
    d. 250 mg/dL

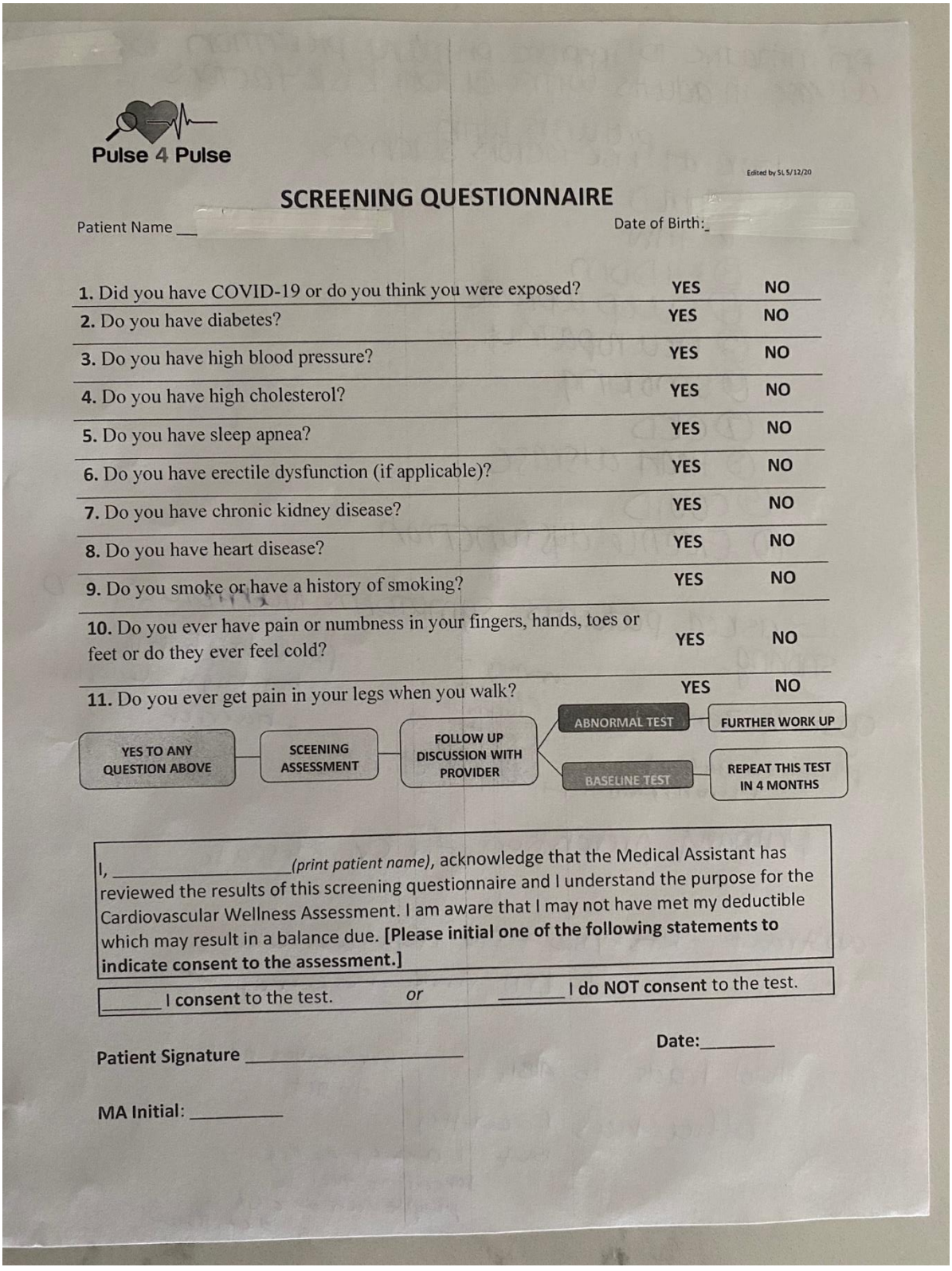
9. What are the main tests used to identify asymptomatic diseases that Pulse 4 Pulse testes for?
    a. Sudomotor Test
    b. Autonomic Nervous System Test
    c. Ankle-Brachial Index Test
    d. All of the above

10. Does this test offer reimbursement for the office?

    a. Yes
    b. No
    c. Not sure

Appendix I

Pulse4Pulse Questionnaire



Pulse 4 Pulse

Edited by SL 5/12/20

SCREENING QUESTIONNAIRE

Patient Name ___ Date of Birth:_

1. Did you have COVID-19 or do you think you were exposed?	YES	NO
2. Do you have diabetes?	YES	NO
3. Do you have high blood pressure?	YES	NO
4. Do you have high cholesterol?	YES	NO
5. Do you have sleep apnea?	YES	NO
6. Do you have erectile dysfunction (if applicable)?	YES	NO
7. Do you have chronic kidney disease?	YES	NO
8. Do you have heart disease?	YES	NO
9. Do you smoke or have a history of smoking?	YES	NO
10. Do you ever have pain or numbness in your fingers, hands, toes or feet or do they ever feel cold?	YES	NO
11. Do you ever get pain in your legs when you walk?	YES	NO

YES TO ANY QUESTION ABOVE → SCEENING ASSESSMENT → FOLLOW UP DISCUSSION WITH PROVIDER → ABNORMAL TEST → FURTHER WORK UP

FOLLOW UP DISCUSSION WITH PROVIDER → BASELINE TEST → REPEAT THIS TEST IN 4 MONTHS

I, _____*(print patient name)*, acknowledge that the Medical Assistant has reviewed the results of this screening questionnaire and I understand the purpose for the Cardiovascular Wellness Assessment. I am aware that I may not have met my deductible which may result in a balance due. **[Please initial one of the following statements to indicate consent to the assessment.]**

_____ **I consent** to the test. *or* _____ **I do NOT consent** to the test.

Patient Signature _____ **Date:**_____

MA Initial: _____

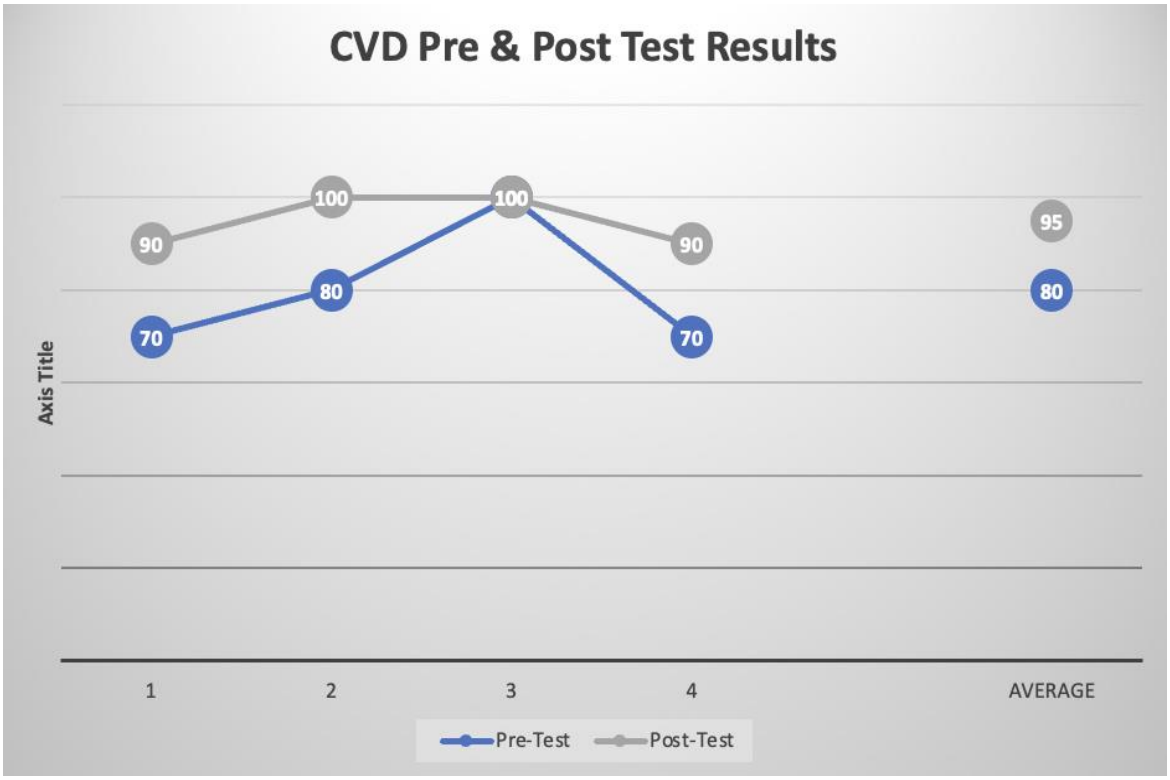
Appendix J

Explanation of "Pulse4Pulse" for Patients

The "Pulse4Pulse" is a test that will help your provider and you know what your possible risk for having a heart attack, stroke, or bad blood flow to your legs and feet in the future. Having these health issues can have a negative influence on your life and cause detrimental health outcomes. If you answered "yes" to any of these questions, you should have this test completed. This test can be done here in the office and only takes 15 minutes. This test will not cause you any harm. The test consists of having your blood pressure checked and having stickers placed on your arms, legs, and feet. Once you complete the test, you will get a phone call from your provider in 3-7 days to go over your results. If you have any questions, you can discuss them with your provider during your health visit today.

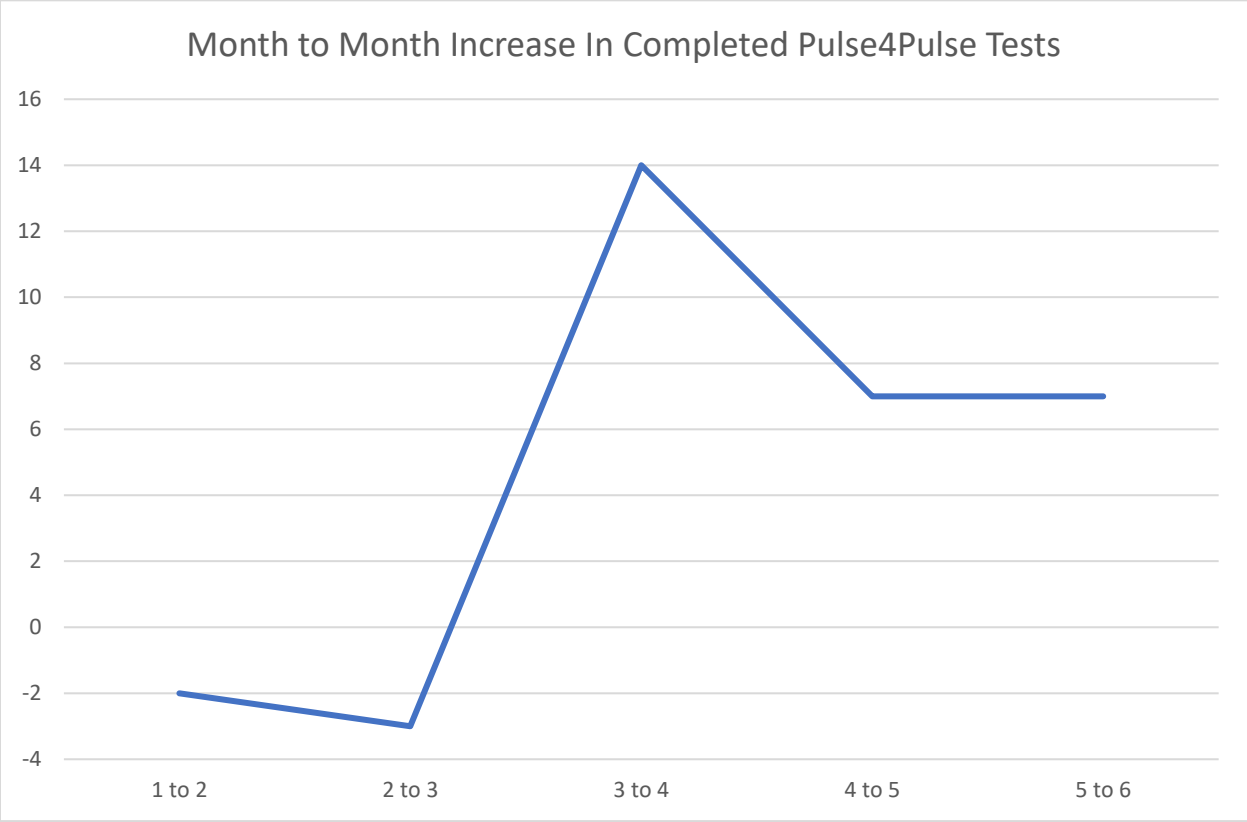
Appendix K

Figure 2. Cardiovascular Pre/Post Test Results



Appendix L

Figure 3. Month to Month Increase



Appendix M

Table 5. Month to Month Results

	Eligible for Pulse4Pulse n	*Completed Pulse4Pulse n*	*Total number of Referrals n*	*Revenue Yield ($)*	*Cardiovascular Test Scores M(SD)*
*3 months prior**					
Month 1	*60*	*18*	*4*	*$2,880*	*N/A*
Month 2	*75*	*21*	*2*	*$3,360*	*N/A*
Month 3	*68*	*17*	*3*	*$2,720*	*N/A*
*3 months after***					
Month 4	*77*	*30*	*12*	*$4,800*	*N/A*
Month 5	*82*	*38*	*18*	*$6,560*	*N/A*
Month 6	*80*	*43*	*15*	*$6,880*	*N/A*
Cardiovascular Test Scores					
*Pre-test****	*70*	*80*	*100*	*70*	*80(14.1)*
*Post-test*****	*90*	*100*	*100*	*90*	*95(5.8)*

*Represents data collected 3 months before the process change

**Represents data collected 3 months after the process change

***Collected 1 week before provider educational seminar

****Collected after provider educational seminar (same day)

N/A: no data

Appendix N

Table 6. Calculations and Results

Total Eligible	*Total Completion*	*Month*	*Calculation to obtain % of completion*	*% of completion*	*Month to Month*	*Calculation to obtain change in month-to-month completion rate*	*Month-to month completion rate in %*
60	*18*	*1*	*18/60=*	*30*	*1 to 2*	*28-30=*	*-2%*
75	*21*	*2*	*21/75=*	*28*	*2 to 3*	*25-28=*	*-3%*
68	*17*	*3*	*71/68=*	*25*	*3 to 4*	*40-25=*	*14%*
77	*30*	*4*	*30/77=*	*39*	*4 to 5*	*46-40=*	*7%*
82	*38*	*5*	*38/82=*	*46*	*5 to 6*	*53-46=*	*7%*
80	*43*	*6*	*43/80=*	*53*			

Appendix O

Figure 4. Poster Presentation