

An Education Program following Percutaneous Transluminal Coronary Artery Angioplasty in Saudi Arabia.

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I. Introduction

Coronary Artery Disease (CAD) is one of the most commonly studied cardiovascular disease states in the world (Stone et al., 2016). CAD is associated with chest pain caused by lack of blood supply to the myocardium (cardiac muscle). The pain can cause crushing pressure and tightness in the chest and shoulders (Runmin et al., 2018). The disease's level of surveillance is well deserved considering it is among the primary cause of death in the United States (Douglas et al., 2015). CAD develops when there is impairment to the blood vessels responsible for supplying the heart with blood rich in nutrients and oxygen. The damage is usually as a result of limit to blood flow caused by build-up of plaque (cholesterol deposit) within the coronary arteries that surround the heart (Stone et al. 2016). As the plaque continues to build, the coronary arteries continue to narrow, hence the blood flowing to the heart muscle decreases. The decreased blood flow may result to shortness of breath, angina, or other symptoms such as syncope and the more severe myocardial infarction.

Heart disease cause the highest number of deaths in the United States. CAD particularly affects up to 16.5 million Americans with the disease causing about 610,000 deaths annually (Stone et al., 2016). Research conducted in Kingdom of Saudi Arabia (KSA) revealed 944 of 17232 subjects to have CAD in KSA (Pheng et al., 2017). Men are the most affected and account for more than half of the deaths. The American Heart Association (AHA) indicate that nearly every 40 seconds, an individual in the United States suffers from a heart attack (Mozaffarian et al., 2015). CAD is also highly pandemic given that even with no risk factors, 3.6% of men and about 1% of women are at a lifetime risk of contracting it (Patel, Tajik and Chandrasekaran, 2017). Risk factors for the disease include an elevated low-density lipoprotein (LDL) and/or lower than normal high-density lipoprotein (HDL); hypertension, smoking, diabetes, genetics and being older than 45 years (Douglas et al., 2015). With increased risk factors of up to two or more, the percentages greatly increase as 37.5% of men and 18.3% of women are affected in worldwide. The mortality from CAD has been shown to be gradually decreasing in western countries, but increasing in developing countries (Sanchis-Gomar et al., 2016). The trend has been largely influenced by the levels of economies and advanced health care systems; that provide better facilities and treatment methods to tackle CAD (Barquera et al., 2015).

CAD results in about 610,000 CAD related deaths that occur every year. The disease therefore accounts for a third of all deaths among individuals older than 35 years worldwide (Runmin et al., 2018).

The cost of CAD can be catastrophic. Medical costs of CAD related events include \$17,532 and \$15,540 for acute myocardial infarction in fatal and nonfatal patients respectively; \$2,569 and \$12,058 for angina in stable and unstable states respectively, and sudden death costs \$713 in the US (Mozaffarian et al., 2015). In the US treatment for the disease costs up to \$5.54 million for the first year, while cumulative costs for five and ten years respectively are \$9.2 billion and \$16.5 billion following diagnosis (Russell et al., 1998). The disease is generally a huge economic burden for the health care system in many countries.

A treatment that is often performed for CAD is a Percutaneous Transluminal Coronary Angioplasty (PTCA). PTCA is a process that essentially opens up the blocked coronary arteries, easing pressure on the blood flow and increasing the circulation to the myocardium (Rittger et al., 2015). During recent times, outcomes of the treatment have positively increased with rates of success rising by up to 90% with the advancement of technology and the use of optimal health care systems (Rimac et al., 2017). However, it still contains some limitations such as acute coronary occlusion and restenosis. Acute coronary occlusion rarely occurs however, with just a small percentage of patients being affected during or after the procedure. Restenosis on the other hand, occurs more often with 30 – 40% being affected within six months of the procedure (Heo et al., 2017).

Several therapeutic measures such as coronary artery bypass grafting (CABG) -a surgical procedure for clearing obstructed arteries to enable normal blood flow- and devices such as directional coronary atherectomy that involves (insertion of a catheter into a narrow end of an artery to clear blood flow) have been brought forward to provide solutions for CAD (Douglas et al., 2015). While the medical interventions are continuously improving, patient responsibility is paramount in improving long term patient outcomes.

One of the problems following PTCA is that patients typically do not alter their lifestyle, meaning they continue to consume an unhealthy diet and often fail to exercise. Months later their arteries end up clogged with cholesterol and fatty acids, resulting in restenosis and readmission. The aim of this process improvement initiative is to reduce restenosis and readmission of patients with – CAD following a PTCA procedure in Saudi Arabia. The process improvement project will establish a group education program with the secondary aim to improve the quality of life through instruction on a healthy diet and exercise regime.

Background

The first discovery of CAD is not quite known, but there are notable individuals in the last millennium who made significant discoveries that ultimately led to its detection. They include: Leonardo da Vinci (1452-1519) who looked into coronary arteries, William Harvey (1578-1647) who discovered the circulatory motion of blood around the body from the heart and Friedrich Hoffman (1660-1742) who noted the disease's impetus as limit to blood flow in the coronary arteries. CAD is a global issue. In 2015, 31% of all global deaths were due to cardiovascular diseases which therefore means the diseases killed about 17.7 million people. Of the 17.7 million people, 7.4 million died from CAD (Douglas et al, 2015, p. 1300). Changes in demographics are occurring with the older population consequently increasing the incidence risk for the disease. Over the next thirty years, incident CAD is expected to increase by 26%, prevalent CAD by 47%, annual deaths by 56% and health care costs by 41%. These increases in the disease burden can only be offset through health objectives aimed at improving cardiovascular health and quality of life. The aim of this process improvement is therefore to reduce readmissions of CAD patients through establishment of a support education program for patients post PTCA intervention. It will involve an education program for post PTCA patients on lifestyle modification following the procedure through classroom teachings.

II. Literature Review

A myriad of authors and scholars have completed research that deals with an education intervention program to enhance quality improvement in an effort to reduce costs incurred and the number of readmissions following PTCA. Articles that are pertinent to the concept of using education intervention programs for improvement of health and quality of life were retrieved from PubMed, CINAHL and COCHRANE Library databases as well as the Google Scholar and the World Health Organisation (WHO) that provides information on patient education program interventions. The following keywords were used: quality improvement, outcomes, CAD, patient education, interventions and readmissions. Other terms used include percutaneous coronary intervention that is sometimes used in the place of PTCA. Numerous articles were found pertaining to PTCA but only 12 articles that met specific criteria for educational programs for CAD patients following PTCA were reviewed.

Patient education reducing readmission through better disease management by Patients

Patient education helps in increasing patient's understanding of their disease states consequently, aiding them in managing the diseases. If patients engage in disease self-management, the presumption is that the rates of readmission to hospitals as a recurrence of the disease state, will be abated. Notorious in making reappearances after treatment is the heart disease patient. One reason for this recurrence can be because of the patient not adapting a healthy lifestyle. Many times, the patients are not even aware of how to manage their heart disease state. A literature reviews to determine the impact of educating patients with heart failure was conducted (Stromberg, 2005). The review revealed a high number of patients lacking in knowledge on heart failure and self-care. The author advocates for education interventions among elderly patients that target learning barriers such as, impaired cognition, misconceptions and low motivation. He also recommends the incorporation of technology such as computer-based education and telemonitoring to improve the interventions (Stromberg, 2005). Computer-based education is also useful for the appraisal of nursing skills with regards to determination of patient needs. A study conducted in a tertiary Magnet facility in Pennsylvania reported the relationship between care transitions and readmission rates (Peter et al. 2015). Patients with heart failure were frequently readmitted prompting the researchers to conduct education intervention programs. As the patients' understanding of their disease state increased the researchers noted a collateral reduction in rates of readmissions.

A comparative study that assessed the impact of patient education on health knowledge and recurrence rates of venous ulcers was conducted (Gonzalez, 2017). Three groups of patients participated in the study: (N=95), group A, B and C is 28, 22 and 45 respectively. Control group is C, group A received education assessment in an earlier study and were only there for a 36 week follow up. Group B received education intervention in the current study and were assessed after 2, 9 and 36 weeks. The education intervention program involved a home based 45-minute interaction with additional use of brochures, visual aids and handouts (Gonzalez, 2017). The results of the study revealed recurrence of the ulcer being lower in group A and group B than in the control group. A prospective study was conducted on group A while a retrospective study was conducted on group B. The study confirmed a correlation between patient education, improved health knowledge and a reduction in venous ulcer recurrence rates. Adams (2010) wrote a review of three issues he considered to be central in improving the impact of patient education on public health. The issues were health literacy, choice architecture and the Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) framework. With regards to health literacy, he advocates for the health system to set parameters of the health interaction as well as personalize the style, content and mode of information delivery. Choice architecture focuses on how small changes in the environment can greatly impact behaviour. Patient education is therefore encouraged, to focus on the effect to enable people to choose certain behaviours. The RE-AIM framework has mainly been introduced by the author as a means of evaluating education programs. These three issues can therefore be used in reducing readmissions through improvement of patient competencies to better handle their health.

Patient education reducing readmissions through increased patient-physician interaction.

Patient-physician interaction is quite instrumental in helping the physician identify complications after treatment of major diseases quite early on. It is also quite helpful in helping the physician implement process improvement techniques on the patient's recovery. This could be in the form of noticing some things the patient does wrong and helping them correct it. Paterick et al. (2017) agrees with this phenomenon in a study in Texas (N=673) that revealed ideas on how to improve health outcomes through suggestions on the patient-physician interaction as well as the role of patient education and self-management programs. The authors advise physicians to spend considerable time with the patients as well as engage in motivated enthusiastic ways to address their needs in order to improve their health outcomes. The authors of the study were quick to note that CAD, diabetes, and hypertension can be minimized by educating the patients on the significance of a healthy diet and physical activity. This then became a highlight of how patient education helps them manage diseases and consequently reduce readmission.

A study conducted by Torisho et al. (2019) examined the influence of physiotherapy interventions and patient education on patient outcomes a year after the performance of a total hip replacement (THR). They used data from the Swedish Hip Arthroplasty Register (SHAR) between the years 2012 and 2015 where they obtained data of 30,756 patients. The outcomes were measured using a visual analogue scale (VAS) for hip pain and surgery satisfaction and EQ-5D index and EQ VAS as quality of life measures. The results revealed that patient education marginally improved the EQ-5D index and EQ VAS while physiotherapy interventions slightly reduced the pain and improved surgery satisfactions as well as caused better EQ-5D index and EQ VAS. The reduced pain and improved surgery satisfaction proved just how the patient-physician interactions were significant to helping the patient's recovery process. Not only is the patient-physician model significant in helping the patient better recover but it is also readily accepted by the physicians.

Job gratification with improved outcomes because of patient education has also been studied. The progress of nurse job gratification, competency and insights of quality of care with regards to a newly implemented patient education programme were studied at a national transplant centre in Norway 2015. Data were obtained from 50 clinical nurses six months after implementation of a renal transplant patient education program. The results revealed that 72% of the nurses were sufficiently competent of the program and the program had been successfully implemented among 54.4% of renal transplant recipients (Urstad et al. 2018). They concluded that the education programs were readily received by nurses.

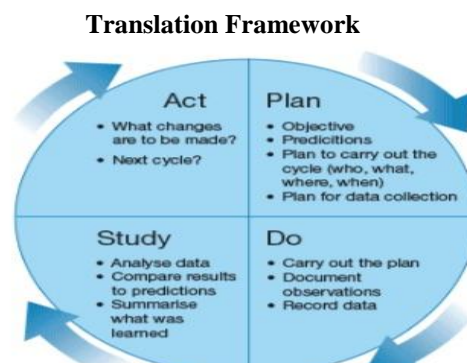
Patient education reducing readmissions through healthier lifestyle practices leading to improved quality of life.

Quality of life is a measure often used to demonstrate the health and comfort of an individual. Higher quality of life frequently precedes better health and reduced hospitalization. One way of achieving an improved quality of life is by patient education that increases an individual's health literacy. Greene et al. (2014) conducted a study on the Swedish Hip Arthroplasty Register (SHAR) to identify associations between levels of education and patient outcomes a year after total hip arthroplasty (THA). They obtained data on THA patient complete with outcome measures from SHAR and cross-referenced them with information on education attainment obtained from national databases. The study showed higher levels of education were linked with higher health related quality of life (HRQoL) and lower VAS pain. Another study conducted by Du et al. (2015)

examined the impact of patient education intervention on cancer related fatigue (N=334). The authors indicated that reduced cancer related fatigue would imply better quality of life. A systematic review of randomized control trials (RCTs) obtained from PubMed, CINHAL, Cochrane Library and Web of Science from April 2014 to August 2018 was conducted. The authors reviewed ten RCTs containing 1034 adults, for the impact of patient education on cancer related fatigue (CRF) and reported that the role of patient education on CRF reduction is widely supported. Stenberg et al. (2018) completed a systematic review (N=1274) between 2000 and 2016, of health economic assessments of patient education programs implemented for chronic illness patients. They reviewed 56 articles, 46 of which highlighted better patient outcomes in terms of decreased hospitalization, increased quality adjusted life years and reduced visits to emergency departments as a result of patient education interventions. The systematic review concluded that patient education interventions are effective tools for increasing the quality of life decreasing hospitalizations.

Patient education role in reducing healthcare costs

Costs in healthcare are majorly incurred through treatments administered to various diseases. Therefore, by reducing the impact of the diseases, the treatment costs can be reduced consequently reducing healthcare costs. The treatment costs can be reduced through intervention programs initiated to ensure full recovery of patients previously treated in order to avoid hospitalization should they be readmitted. A study to determine the cost effectiveness of an Acute Rheumatic Fever (ARF) and Rheumatic Heart Disease (RHD) control program, meant to control ARF/RHD in Cuba was conducted (Watkins et al. 2015). A decision tree model was developed based on the ARF/RHD history. The sample population was children aged between 5 to 24 years residing in Rio, Cuba (N=563). Assessment was done on the cost effectiveness of the intervention program. It was found that compared to doing nothing, the intervention program significantly saved on costs of management ARF/RHD among the patients as well as the hospital. Even though the program cost \$202,890, the amount of costs saved on disease management and control was a whopping \$7,848,590 within a period of 10 years. The study therefore proved an intervention program can be successfully used to reduce the costs of readmission. Sidorov et al. agree with this cost saving in their 2002 study to determine if an education intervention program saves costs on management of diabetes (N=6799). This was a comparison study of two groups; those enrolled in an education intervention program for diabetes and those who did not enrol. There were 3,118 patients enrolled in the education program while 3,681 did not enrol. It was found that the patients enrolled in the program experienced fewer readmissions and hence lower costs; the amount spent by each diabetic per month for those enrolled in education intervention program was \$394.62 while those who did not enrol was \$502.8. This difference in costs proves that an education program indeed saves costs due to readmission and disease management.



The Plan-Do-Study-Act (PDSA) Cycle framework will be used to guide the project.

The PDSA is also referred to as PDCA (Plan-Do-Check-Adjust), Deming cycle, Shewhart cycle and the control cycle. It was developed as a reprising four step management process to be used for the regulation and sustained refinement of processes initiatives and products in business and organizations. The cycle was popularized by W. Edwards Deming who was a prolific pioneer of modern quality control (Reed, & Card, 2016). Its concept was formed from the scientific process constructed from Francis Bacon's 1620 *Norvum Organum* comprised of hypothesis, experimentation and evaluation steps. Although the cycle is used mainly in the business world, for process and product improvement, it is also useful as a healthcare process plan, critical in accelerating quality improvement. The framework is a suitable choice for guiding this proposed process improvement project as it come highly recommended as a tool for implementing and documenting change initiatives. PDSA will therefore provide a quick perspective on whether the proposed intervention is likely to succeed as well as enable identification of adjustments necessary for the perpetuation of desired improvements.

Once an intervention's aim has been established, its membership developed and outcome measures useful in ascertaining if the change is highly likely to bring improvement is outlined, it is important to test the

validity of the change in a real-world scenario (Reed, & Card, 2016). The four components of the PDSA cycle are Plan, Do, Study and Act. The Plan stage involves establishment of objectives and tasks necessary for achievement of the desired results whereas the Do stage is an enactment of the ideas conceptualized in the Plan phase. As the plans are enacted, changes experienced in the interventions are usually evaluated and the data is recorded. It is during the Study phase that the data is examined to determine deviations from the expected outcomes delineated in the Plan phase. The testing process implemented during the Do phase is also investigated for deviations from the planned tests that may have altered the results obtained. During this phase, it is often useful to analyse the data in charts in order to highlight trends occurring over several implementations of the PDSA cycle. Finally, the Act phase is reached where insights on process improvement obtained in the Study phase are implemented. Issues to be addressed include problems to be solved and opportunities to be exploited. Afterwards, the cycle is repeated several times for continual improvement.

PDSA is suitable for education interventions because it has been successfully implemented in many medical fields such as diabetes care. Its iterative process makes it uniquely suited to the regular follow ups required in the post-treatment stage of many diseases (Reed & Card, 2016). The education interventions to be implemented would involve regular counselling on lifestyle practices as well as education on the PTAC and CAD. These are composed of several interactions with the patient where each interaction requires improvement in certain fields. PDSA would therefore suitably act as a quality improvement tool through its systematic and continuous appraisal of the intervention's measurable outcomes. To enact PDSA with education interventions in Saudi Arabia, the first strategy will be to plan (P) the group education program for the patients with (CAD) following post percutaneous Transluminal Coronary Artery Angioplasty (PTCA) intervention in Saudi Arabia. The second step will be to (D)-carryout education sessions in small scales including classroom sessions and hospital instructions. During the education sessions, data on progress can be obtained through questionnaires, visual observations and telephone and email follow ups. The third step will involve studying (S)- to study the effectiveness of the education program through evaluation of data collected in the Do phase. The fourth and final stage will be to act (A) by identifying the changes that ought to be made for further programs. The cycle is then repeated over regular periods of time in order to ensure continual improvement.

III. Methodology

Plan

The process improvement (PI) initiative involves a group education program designed to provide patients with opportunities to learn how to improve their health and enhance their coping mechanisms with regards to CAD. The project will employ the PDSA model to guide the implementation of the evidence-based initiative. The first step will involve setting up of the committee that will oversee the activities of the project to ensure its goals are met. The committee members will be chosen based on their professions. It will, therefore, be composed of the stakeholders that are, hospital administrators, doctors, a cardiologist, a nurse manager, and nurses. Key stakeholders in the process improvement initiative include director of the cardiac center in the tertiary hospital in Riyadh, cardiac physicians at the cardiac center in the tertiary hospital who will be requested to approve eligibility of the patients for reception of the education interventions; nurse managers, nurse educators, medical coordinators, the head nurse of the outpatient department in the cardiac center, patient affairs; physician who perform PTCAs, audio-visual department who will design and print teaching tools for patients; head of the education department who will provide classroom for teaching, Saudi cardiac registered nurses at cardiac center who will provide education session for CAD patients following PTCA intervention in Arabic language, CAD patients post PTCA.

A committee will be meeting twice a week on Mondays and Thursday at 2 pm. After the formation of the committee, several meetings will take place to ensure that the resources for the project are obtained and everything is set up before the educational information sessions begin. The committee members will be charged with coming up with ways of encouraging patients to attend the educational sessions. Any willing post-PTCA patient will be encouraged to join these sessions. The committee will also plan on setting up a website pages for the tertiary hospital in Riyadh that will try to reach out to the community encouraging all to attend. All these media will inform the patients of the project being free of charge and the benefits in health they stand to gain. The PDSA model being implemented for the project directs data to be the collection of data during the classes for evaluation purposes (McGowan and Reid, 2018). This will be in the form of surveys given to the patients for them to highlight issues they face in the venue, teaching methods, time of the classes and the content delivered. During the classes, the nurses will educate the patients using information from evidence-based articles such as that by Smith et al. (2017), the World Health Organization WHO reports and Centers for Disease Control (CDC). The patients will then be provided with reading materials after the classes on content given during the classes to ensure they have references for use at home.

Potential challenges during the intervention program include maintaining continuous patient attendance during each of the educational sessions. The education sessions will be in progress for 3 months from Jan 2020

to Mar 2020. The education sessions will take place at the cardiac center where patients from the tertiary hospital in Riyadh will be meeting for follow up visits after undergoing PTCA interventions.

Plan start date	10th Aug-10th Dec 2019
Implementation (Do)	2nd Jan-11th Mar 2020
Evaluation (Study)	1st Mar-27th Mar 2020
Act Date	27 th Mar 2020

The budget for the project will include educational material such as projectors, computer software and patient writing material (approximately 3000-4000 SAR). A nurse who is willing to learn from the project will assist. There will be free classroom hiring per year for one day each week and class session from 0700 pm to 0800 pm.

Implementation (Do)

Education sessions will be held every Tuesday evening at 7 pm for one hour for CAD patients post-PTCA intervention in Riyadh. Secondary interventions will include telephone follow-ups for patients unable to attend visits at the tertiary hospital. However, the nurse will have to inquire on the patient's home environment to determine the immediate influence of environmental and cultural settings on the progress of the educational sessions. The patients will mainly be educated on the impact of their lifestyle choices on their general health and CAD progression, importance of adherence to medication prescribed by the doctor and the necessity of seeking medical attention when experiencing certain unusual effects after the PTCA performance (Johnson et al., 2009). Various medical reports highlight the lack of health literacy among many patients. Many patients often lack the knowledge on how to respond to various medical conditions that may occur after PTCA intervention (Dahhan et al., 2015). Such inefficiencies in self-care make them highly prone to several hospital readmissions and occurrence of restenosis, all of which incur great medical costs to the patients and the hospitals as well.

IV. Evaluation

The hospital readmission and recurrence rates of restenosis identified from the hospital medical records of the tertiary hospital will be keenly studied and evaluated. After the group education intervention is complete, a follow up to determine who among the patients were readmitted back to the hospital due to restenosis or any other complications of CAD will be made. In addition, an analysis of the educational sessions will be carried out from the data that was collected from the start of the educational sessions.

Data Analysis

Project Objectives

The project involves the establishment of a patient education initiative in a hospital in Saudi Arabia in an effort to reduce costs of readmissions associated with coronary artery disease after the performance of PTCA. The Plan-Do-Study-Act model will be implemented for the initiative whereby data including attendance and survey reports collected during the 'Do' phase in accordance with developments experienced during the process of putting the initiatives to place. The data that will be collected in the 'Study' phase will enable insight into the patient education initiatives' effectiveness.

Data sources and collection methods

Reports detailing readmission rates and recurrence rates of restenosis obtained from the cardiac centre in the tertiary hospital will provide a major source of objective data on the effectiveness of the patient education interventions; however, it is noted that extraneous variables such as patient's health status (and comorbidities) and attendance rates are considered. A reduction of the hospital readmission and restenosis recurrence rates would be key in determining if patient education served to reduce the costs of the CAD after the performance of the PTCA. The response of the patients to the interventions will also be essential in determining their coping mechanisms and adherence to the initiatives. Therefore, surveys will frequently be carried out for the patients to communicate any issues they had with the interventions as well as feedback on what they appreciated about them. Telephone follow up calls to discuss ways of improving the interventions over a period of one-year will be carried out. Participation in the educational sessions will be difficult to quantify although nurses will strive to roughly note interest among the patients in the classes and extracurricular activities such as lifestyle modification.

Analysis Methods

The project majorly utilizes descriptive statistics in order to obtain a measure of the effectiveness of the interventions. The descriptive statistics will then have left room for inferential statistics to make predictions on adjacent populations not used in the study. Statistical Package for the Social Sciences (SPSS) will be quite useful in the analysis of survey data. The program contains text analytics that will be able to uncover insights

into answers provided in open ended survey questions (DiMaggio, 2015). It will also provide visual tools to create density charts for the visualization of attendance rates as well as hospital readmission and restenosis recurrence rates. Furthermore, in the utilization of inferential statistics it contains a modeler program that is useful in creating and studying predictive models. Excel sheets will be used for the organization and management of data. Objective data obtained from the attendance rates as well as the hospital readmission and restenosis recurrence rates will be organized into the excel sheets to enable quick and easy access to data for analysis. Excel's data tab also provides descriptive statistics for data analysis that will aid in the calculation of means, medians, standard deviations, errors and variance in the data organized into it (Chaamwe & Shumba, 2016). Visual presentations such as tables and pie charts will also be used to illustrate the descriptive statistics results. They will be generated by excel further demonstrating its use in the statistical calculations and presentation of the data collected. A T test will be useful in inferential statistics where it will reveal differences between two sample populations based on age and gender as well as differences in data over different periods of time (Aron, 2017). Correlational between demographic data (age /gender) and recurrent incidences in readmission and restenosis occurrence will be analysed using correlation study.

Sustainability

Evaluation of this PI project will be conducted with careful consideration of the PI framework and plan. The PDSA approach has been chosen for the execution of the patient education initiatives. It clearly outlines that evaluation will occur during the study phase after the analysis of the data. It mainly involves reviewing the approaches used in the education interventions based on the data collected about them. The reports will aid in improving the interventions during the next educational sessions by correcting on drawbacks and reinforcing the strengths noted for the first set of sessions. Therefore, data will be collected during the classes as well as other out-of-class interventions and afterwards analysed using descriptive statistics as applicable (Cook, 2010). Other numerical data will be evaluated as well in relation to aims and objectives of the PI project. Microsoft office Excel will be used to organize and manage data. Insights are then to be worked on in the next classes.

Evaluation of progress of project will be conducted in consideration of certain benchmarks that reflect the project's own objectives. These benchmarks include adherence to the framework put in place during the planning of the project, satisfaction of the stakeholders' interests in the project, adherence to timelines established during planning of the project, financial impact of the patient education interventions and sustainability of the project in terms of maintenance of success rate progress. The stakeholders involved in the project include the director of the cardiac centre in the tertiary hospital, nurse manager in cardiac centre , nurse educators, medical coordinators, head nurse of cardiac OPD, nurse in charge of cardiac OPD, patient affairs in cardiac centre, physicians involved in the actual PTCA procedure, CAD patients post PTCA intervention, project audio-visual department (for printing teaching tools in hospital), head of education department (to provide and arrange classroom for teaching in the hospital) and financial department for funding. All the stakeholders would of course wish for reduction of costs of treatment and reduction in readmission rates to occur. They would also love to see appreciative compliance of the patients with the programs to ensure their better physical and mental health as they proceed with the interventions. In terms of financial impact of the interventions, data on the costs of treatment incurred by the patients during readmissions will be compared to a minimal cost objective established during the planning phase of the project. Large deviations will indicate setbacks in the interventions whereas minimal deviation will indicate positive progress in their implementations (Yuan et al. 2015). Adherence to the PI framework will then be evaluated based on the successful collection of data during each class and insightful evaluation of the data afterwards.

Sustainability of the project will be evaluated in terms of feasibility, cost, resources, and outcomes (Aarseth et al. 2017). Funds spent on each intervention will be tabled against the budget allocated for them. Large deviations will indicate the project is becoming less feasible whereas small deviations like unavailability of teaching resources will indicate the project is more likely to be sustained. Data on the attendance and participation rates will also offer insight into the project's sustainability as the patients are essential to the study of the impact of the interventions. High attendance and participation rates will indicate the project is more likely to be sustained as well as continued funding by the donating administrators. It is very likely that the donating administrators will continue with the project so long as it achieves its objectives, in particular cost reduction. Therefore, significant reduction in hospital readmission rates and costs of treatment will act as indicators to the project's active sustainability.

V. Discussion

Interpretation

Data analysis will reveal parameters such as mean, standard deviation and errors of data sources including hospital readmission rates and attendance rates These parameters will aid in the interpretation of the

data. The mean will provide an overview of the attendance rates to the classes and hospital readmissions that occur during the interventions. As standard deviation is usually an indication of deviation of data from mean, it can then aid in revealing how effective the derived mean for the attendance rates and hospital readmission rates is in representing the data (Weir et al., 2018). A low standard deviation will indicate the mean accurately represents the rates whereas a high standard deviation will imply a new way to represent the data is necessary. This is where the Statistical Package for the Social Sciences (SPSS) will be useful through the provision of the histogram for the data. The histogram will show how the attendance rates for every class varies as well as the hospital readmission rates across the program period.

The parameters will then be compared to findings of related studies done in the past. An example is a study conducted by Kristine A. Scordo in 1999 which involved the use of home-based interventions such as patient education for the reduction of hospital readmissions among patients with congestive heart failure. Findings for the study included reduced unplanned hospital readmission rates of 125 to 64 and reduced accrued hospital costs of Aus\$10,600 to \$5100 (Scordo, 1999, p.124). These will be compared to the medical records of patients involved in this study and differences occurring in the findings will be recognized and evaluated. For this study, an incident rate ratio can also be calculated by comparing the mean of the hospital readmission rates predating the education intervention program and the rates after the program. These can then be compared to the findings of a study by Kripalani et al. in 2014 that highlighted strategies for reducing hospital readmission rates. Among the strategies was patient education which accounted for reduced hospital utilization in 30 days with a reduced incidence rate ratio of 0.695 (Kripalani et al., 2014, p.471-485). This incidence rate ratio will then be compared to that of the study to evaluate the similarities and differences.

Implications

The Plan-Do-Study-Act framework will be implemented for this project and it will be the main component underlying the planning and execution of the project. Therefore, the success of the project will inherently highlight the effectiveness of the framework. The framework could thus begin to be implemented across various fields such as product improvement in software development and food industry as well as service improvements in hospitality and teaching (Larrucea et al., 2016). The success of the project would also imply the effectiveness of patient education in reducing hospital readmissions and treatment costs. Therefore, hospital administrators, doctors and nurses will start recognizing its benefits and thus start implementing it across various faces of medicine and nursing. This will include education in proper living and medication as patients visit the hospital and telephone follow-ups after treatment (Peter et al., 2015). Education will be established as a solution where literacy has been quite a problem in the society such as in environment protection, crime and information technology. It will thus affect policy making regarding mentioned fields such as the mandatory placement of environmental awareness in school curriculum. If the project succeeds, patient education initiatives will be implemented across many hospitals in KSA. Reductions in the cost of treatment will then result in allocation of more resources towards research of treatments as well as purchasing of advanced medical equipment.

Limitations

In carrying out the patient education initiative, the project is limited by insufficient incentive provided to the patients for them to arrive to the classes. The patients will be in post-treatment phase and many will prefer just staying at home as opposed to coming to the classes to be taught. Successful education requires intensive interactivity between educators and learners which is hard to implement within the confines of classrooms. The patients would also find more excitement in meeting with different professionals such as psychotherapists, physicians and paramedics as opposed to interacting with just nurses throughout the course. Therefore, it would be advisable for future projects implementing patient education to raise a higher budget in order to provide a more effective and engaging learning environment. Implications for clinical practice could include the involvement of different professionals during a patient's treatment process in order to increase his engagement and show him the seriousness of the process. For nursing and healthcare in general it suggests the use of varying means in care and treatment to alleviate the burden of disease and enable patients have a better outlook on hospitals.

VI. Conclusion

The project will involve establishment of patient education initiatives in Saudi Arabia for the reduction of costs and readmissions associated with coronary artery disease after the PTCA. The Plan-Do-Study-Act model will implement for the initiative whereby establishment of objectives and tasks necessary for achievement of the objectives will be set during the Plan phase. The Do phase will involve the actual implementation of the classes to educate the patients on ways to improve their health through proper teaching classes about healthy lifestyle after PTCA intervention and during these classes data will be collected. Data to

be used in the study include attendance rates and answers to surveys conducted in the classrooms. Other data will also be collected outside the classes including hospital readmission rates and treatment costs from the medical records of cardiac centre in tertiary hospital in Riyadh. These data will then be analysed during the Study phase after the classes through descriptive statistics to provide descriptions of the sample population used for the study in order to obtain a measure of the effectiveness of the interventions. The data will then be analysed using tools such as the Statistical Package for the Social Sciences (SPSS), Microsoft Excel, T tests and correlation studies. The results of the project will then be evaluated using benchmarks such as the framework used, timelines set, financial impact and interests of the stakeholders.

Outcome measures for the project's efficiency and effectiveness will include the hospital admission rates, hospital treatment costs and attendance rates for the classes. Data collected on these measures will be reviewed by the Institutional Review Board of quality department in tertiary hospital. The project will be expected to last for three months between 2nd Jan to 11th Mar 2020 after which the evaluation will be carried out for 3 weeks and prior to which planning will be carried out for 8 weeks. Estimated costs include free charge for the classroom hiring per year and 3000-4000 SAR for the education material per year. The project's implications include the implementation of the PDSA framework across various fields such as product improvement in software development and service improvements in hospitality. It would also involve the implementation of patient education in various hospitals across KSA. Education would be established as a cornerstone solution to literacy problems in environmental awareness, crime and information technology. The project's success will therefore affect policy making, research, manufacturing, education, hospitality, healthcare and innovation. Limitations in the project however exist in its provision of little incentive to the patients for them to always attend the classes. It also presents little interactivity between the nurses and the patients aside from inside the classrooms. The limitations would therefore encourage later projects to allocate more resources in ensuring the education initiatives are as much interactive as possible and engaging.

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