INCREASING REFERRAL TO CARDIAC REHABILITATION

A Scholarly Project Submitted in Partial Fulfillment of

The Requirements for the Degree of

Doctor of Nursing Practice

in

The Onanian School of Nursing

Rhode Island College

May 14, 2023

by

Ashley Arnold

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Abstract

Background: Heart disease is the leading cause of death in the United States (US), killing 610,000 Americans each year (CDC, 2017). Cardiac rehabilitation (CR) is a Class I recommendation by the American Heart Association and American College of Cardiology Foundation for patients after coronary artery (Thomas et al., 2018). Completing a 12-week cardiac rehabilitation program after coronary revascularization can reduce all-cause mortality by 20% to 50% (Sandesara et al. 2015). Despite the proven benefits of CR, only 14-35% of heart attack survivors attend CR (Balady et al. 2011; Ades, et al., 2017; AHA, 2017).

Purpose/Specific Aims: There is a gap in the literature on the best approach to improve referrals. The Million Hearts Initiative was created by the CDC with a goal to increase CR participation from 20-30% to 70%. This quality improvement project aims to implement evidence-based interventions to increase referral rates to CR to over 70%.

Methods: Multi-level interventions including the creation of a multidisciplinary team, leveraging the electronic medical record (EMR), automating CR discharge instructions, and 1:1 advanced practice provider education. Documentation was standardized to address NCDR requirements.

Results: There was a statistically significant increase in patient referrals of 32.8% ($p < 0.01$, 95% CI 23.57% – 41.22%) from Quarter 4 2021 to Quarter 4 2022.

Conclusion: Cardiac rehabilitation is an underutilized resource after coronary artery stenting. Leveraging the EMR and providing 1:1 education to the discharging advanced practice providers was shown to have a statistically significant improvement on patient referral to CR.

Key Words: Cardiac rehabilitation; multidisciplinary team; electronic medical record; referral

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INCREASING REFERRAL AND ATTENDANCE TO CARDIAC REHABILITATION

Background and Significance

Every 40 seconds, someone in America has a heart attack (Centers for Disease Control and Prevention [CDC], 2018). Heart disease is the leading cause of death in the United States (US), killing 610,000 Americans each year. Coronary artery disease is the most common type of heart disease attributing to the death of over 370,000 Americans each year (CDC, 2017). Coronary artery revascularization via percutaneous coronary artery stenting or coronary artery bypass grafting are the mainstays of treatment for patients with obstructive coronary disease. According to a Presidential Advisory from the American Heart Association (AHA), 15% of men and 22% of women age 45-64 and 22% of men and women over 65 will have a recurrent heart attack or heart disease related death within five years of their first heart attack Balady et al. (2011). The estimated annual cost of heart disease in 2016-2017 was $219.6 billion (AHA, 2021). Heart attack and coronary artery disease were listed in the top 10 most expensive conditions treated in the United States in 2013 (AHA, 2021).

Cardiac rehabilitation (CR) is a Class I recommendation according to the 2014 American Heart Association and American College of Cardiology Foundation guidelines for the management of patients with non-ST-Elevation acute coronary syndrome (Thomas et al., 2018). Completing a 12-week cardiac rehabilitation program after coronary revascularization has been proven to aid patients in their recovery after coronary artery revascularization and can reduce all-cause mortality by 20% to 50% (Sandesara et al. 2015). Despite the proven benefits of CR, only 14-35% of heart attack survivors attend CR (Balady et al. 2011; Ades, et al., 2017; AHA, 2017). According to the Division for Heart Disease and Stroke Prevention (2020), health care systems save

$4,950 to $9,200 per person per year of life saved for patients who attend CR, compared to those who do not attend. Barriers to attendance to cardiac rehabilitation include low health literacy, lack of perceived need for CR, low patient referral rate, and low strength of the referral (Balady et al. 2011).

To address these common barriers to referral and attendance to CR, the Centers for Disease Control and Prevention (CDC) and American Association of Cardiovascular and Pulmonary Rehabilitation (ACVPR) created a joint task force who created the Million Hearts initiative. The overarching goal of the Million Hearts initiative is to prevent 1 million heart attacks and strokes in 5 years. One of the top priorities of the Million Hearts initiative is to increase CR attendance from 20% to 70% (Ades, et al., 2017). The Million Hearts CR program contains resources for hospitals to implement to increase patient referral and attendance to CR. Key elements of the program include automatic referral within the electronic medical record, use of a liaison, and providing an educational video for patients to watch during recovery (CDC, 2018). A 2010 review by Gravely-Witte et al. studied CR referral strategies and the effects on referral and enrollment rates. The review found automatic hospital-based referrals improved referral rates to CR but did not improve patient enrollment in CR. The combined approach of an automatic referral to CR and providing information to the patient at the bedside had the greatest success of improving referral and attendance to CR (Balady, et al.; Gravely-Witte, et al., 2010).

Problem Statement and Study Question

Despite the proven benefits of cardiac rehabilitation after coronary revascularization, referral rates throughout the country remain low. Few published studies

exist demonstrating sustained increases in referral. The Million Hearts initiative was created by the CDC in conjunction with the American Association of Cardiovascular and Pulmonary Rehabilitation (ACVPR) to increase referral and attendance to CR. The research question for this study is, "can implementing evidenced-based interventions as outlined by the Million Hearts initiative increase referral rates to cardiac rehabilitation."

Local Context

At the organization where the study took place, CR is located off site, housed in an outpatient medical center. A disconnect exists between the discharging/referring hospital provider and what occurs at cardiac rehabilitation. As noted above, the referring provider plays a large role in patient enrollment. With the lack of provider knowledge surrounding CR, providers are ill equipped to adequately educate and encourage patients to attend CR.

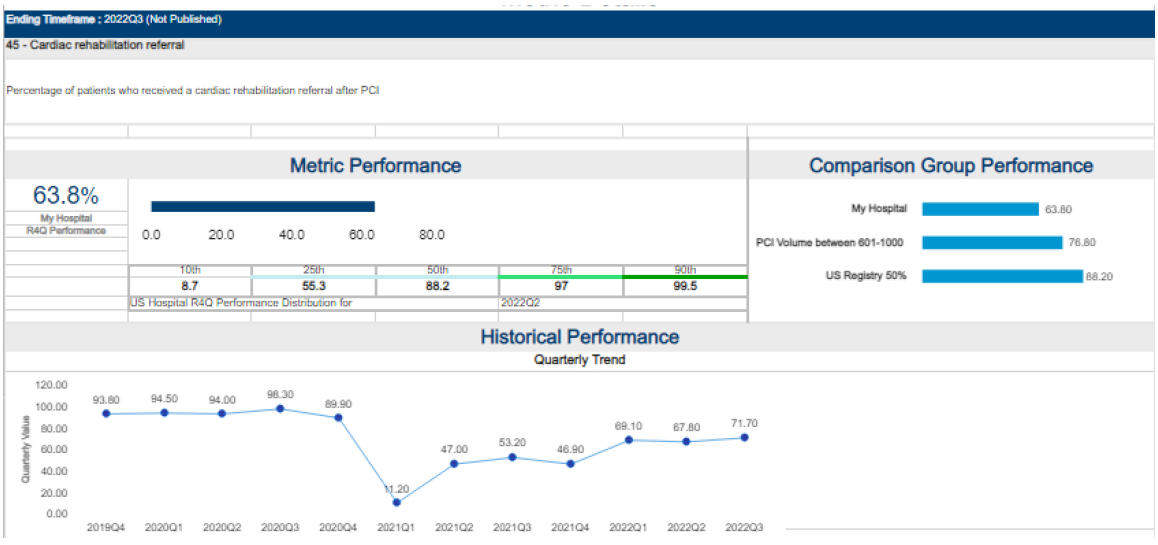
Several factors at the organizational level exist as barriers to referral to cardiac rehabilitation. These barriers include the cumbersome referral order, lack of provider knowledge on the indications and benefits of CR, as well as the necessary documentation to formulate a qualifying referral. The general discharge process for providers is streamlined with the use of order sets. This order set includes all the necessary discharge information for the patient. If the provider does not include a quality metric, aspirin and betablocker after an MI for example, the system will prompt the provider to include these orders or document why they are not ordered. The current order set and prompts do not include the referral to cardiac rehabilitation. The current process of referring a patient to CR involves placing a separate order, which then needs to be cosigned by a physician.

Ideally, the referral to CR should be placed in the discharge order set, or included as a best practice alert, prompting the discharging provider to place the referral for discharge.

The National Cardiovascular Data Registry (NCDR) tracks the percentage of patients who received a cardiac rehabilitation referral after PCI and compares the hospital to similar hospitals throughout the country. The inpatient referral rate for the rolling 4 quarters ending in quarter 3 2022 at the organization is 63.8%. This equates to approximately the 35th percentile when compared to similar hospitals across the nation.

In January 2021, the NCDR changed the requirements of a qualifying referral to CR. For a complete referral, the NCDR has three requirements, a referral order must be placed, a conversation between the patient and provider, and the patient must be provided choice of all the CR programs in the state. These three requirements then need to be documented in the medical record. This change in the measure lead to a large decrease in the referral rates for the organization. Figure 1 outlines the percentage of referrals prior to project implementation, including the drastic decrease in referrals during quarter 1 of 2021 related to the change in requirements for a qualifying referral.

Figure 1: NCDR pre intervention trend



With the primary focus on providing evidence-based, high-quality care, the organization has made several efforts to improve referral to cardiac rehabilitation over the last several years. These efforts have included automated consult orders, a health check spotlight in the news, and individual education with the outpatient office providers. The automated consult order is placed after a patient has a PCI. This prompts a liaison from CR to visit the patient to speak about CR. Many patients are discharged the same day as their procedure and this intervention was not effective. This consult order has also lent to some confusion for the inpatient providers, assuming the consult order is the same as the referral order for CR. The CR team has also advertised on the news in the form of a health check spotlight, highlighting the benefits and activities of CR offered at this organization.

The organization in which this improvement project took place is highly motivated to improve referral and attendance rates to CR. Referral to CR is now a national quality indicator and is reviewed monthly to assess if the organization is meeting the standard of care. This data is extracted from Q-Centrix and reported to the NCDR. Q-Centrix is a company contracted to extract hospital data and report this data to the appropriate registries. The NCDR is the registry in which Q-Centrix reports to. The hospital is then compared to other hospitals throughout the country with similar patient volumes and PCI rates who utilize the NCDR registry.

Change is not a new phenomenon at this organization. With improvements in workflow in the form of best practice alerts, one on one provider education, continued feedback on quality measures, and established benefits of CR, the organization and its providers are in a position to make these positive changes to improve patient outcomes.

Purpose Statement and Specific Aims

Despite repeated studies noting the lack of patient referral and attendance to CR (Balady et al. 2011; Gravely-Witte, et al., 2010; Ades, et al., 2017), there is a gap in the literature on the best approach to improving patient referral and attendance. In the manuscript by Ades et al. (2017), the authors described the Million Hearts initiative to increase referral and attendance to CR, a program created by the CDC in conjunction with the American Association of Cardiovascular and Pulmonary Rehabilitation (ACVPR). In addition, despite multiple previous interventions in the study setting, CR referral and participation rates remained low. The goal of the initiative is to increase CR participation from 20%-30% to a goal rate of 70%. The purpose of this project was to utilize the multidisciplinary team to implement evidence-based interventions to increase referral to cardiac rehabilitation.

Conceptual/Theoretical Framework

The ACE Star Model of Knowledge Transformation

The ACE Star Model of Knowledge Transformation was developed by Kathleen Stevens in 2004. The model was developed to bridge the gap between evidence-based nursing research and nursing practice (Stevens, 2004). This model has been used as the conceptual framework for several evidence-based practice quality improvement initiatives.

Prior to discussing the 5 major stages of knowledge transformation, Stevens (2004) discusses the underlying premises of knowledge transformation. Examples of the underlying premises include, knowledge transformation is necessary before research can

be useable, knowledge can be derived from a variety of sources, knowledge exists in a variety of forms, and the form of knowledge determines its usability.

The ACE Star Model includes a 5-point star, with each point representing the five major stages of knowledge transformation. The five stages of knowledge transformation include discovery research, evidence summary, translation to guidelines, practice integration, and process/outcome evaluation (Stevens, 2004). The first point, discovery research, is a stage of generating knowledge. This stage involves the process of traditional research to find the data supporting one's initiative (Stevens, 2004).

The second stage is evidence summary. In this stage, the research and data from stage 1 is summarized into a more manageable form. This evidence can be more easily utilized in the future knowledge transformation process (Stevens, 2004).

The third and fourth stages transform the evidence from the previous stages by translating and integrating the evidence into practice. During the translation stage, the evidence can be summarized into easier to understand and more manageable guidelines. These can also be in the form of protocols or algorithms. During practice integration, the guideline, protocol, or algorithm is implemented at the patient or systems level (Stevens, 2004).

The fifth and final stage of the ACE Star Model of Knowledge Transformation is process and outcome evaluation. During this stage, one evaluates the impact of the new project on the target outcome. Stevens (2004) target outcomes include patient outcomes, provider and patient satisfaction, efficacy, efficiency, economic analysis, or health status (p. 4).

This model has been used as the conceptual framework in a 2006 study by Abbott, et. al. to implement evidence-based guidelines to decrease ventilator-associated pneumonia (VAP) incidence rates and ventilator days. In this project, the 5 stages of the ACE Star Model of Knowledge Transformation were applied. During the discovery phase, the authors noted significant variations in the VAP rates. In the second and third phase, 69 studies were used to create clinical practice guidelines to prevent VAP. In the fourth phase, the guidelines were utilized to provide multidisciplinary education in the form of a learning packet including educational materials. Feedback also played a role in the adoption of the guidelines. Lastly, the project was evaluated, and VAP rates were monitored pre and post implementation. The VAP rates did change at both hospitals, but this was not statistically significant. The hospitals did have a reduced intensive care unit length of stay which did result in a cost savings (Abbott, Dremsa, Steward, Mark, and Swift, 2006).

Applicability to Scholarly Project

The creation of this model is parallel to the utility and creation of the Doctor of Nursing Practice (DNP) as a practice doctorate with the unique essential of translating evidence into practice. Zaccagnini and White (2017) discuss the many factors that lead to the creation of the DNP. The authors note the rapid growth of scientific knowledge combined with the need for patient-centered, evidence-based care. They also note the transformation of doctorate prepared nurses into a role of obtaining and maintaining the most current and evidence-based knowledge to inform their personal practice as well as inflect the practice of others.

The ACE Star Model of Knowledge Transformation is a suitable model for the quality improvement project to improve referral to cardiac rehabilitation (CR). During the first stage of discovery research, articles will be reviewed to justify the importance of referral to CR, as well as ways to improve these metrics. During the second stage of evidence summary, the evidence will be summarized into easily digestible parts including the main barriers and ways to address these barriers to improve patient referral rates. In the third stage, the evidence will be translated into guidelines. The current guidelines have been established by the Centers for Disease Control and Prevention in conjunction with the American Association of Cardiovascular and Pulmonary Rehabilitation (Ades et al., 2017). These guidelines will then inform the next stage of practice integration. The guidelines will be implemented to increase referral, with the expectation of improving patient outcomes. During the final phase of process and outcome evaluation, the author will receive feedback on the process implementation itself, as well as examine if referral rates did improve. The ACE Star Model of Knowledge Transformation is a great fit for this quality improvement project, and is an effect, a linear model which can be used in DNP practice.

Methods

Setting

The quality improvement project took place in a Rhode Island community academic medical center licensed for 247 inpatient hospital beds. The institution performs approximately 1000 percutaneous coronary interventions per year. The Advanced Practice Provider (APP) education took place on the Procedural Care Unit,

Coronary Care Unit, and Inpatient Cardiology Service. The electronic medical record (EMR) interventions were implemented system wide.

Participants

Participants included Invasive Cardiology, Cardiology Critical Care, and Inpatient Cardiology Advanced Practice Providers. Institutional review board (IRB) approval was obtained from the hospital as well as from Rhode Island College.

Intervention

In Quarter 2 2021, an interdisciplinary group including the Director of Cardiology, Director of Cardiovascular Quality, Manager of Cardiovascular APPs, Cardiac Rehab Program Manager, Nurse Manager, and Cardiac Catheterization Lab was created in response to the rapid decline in CR referral rates. In Quarter 4 2021, the Supervisor of APPs in the Cardiac Catheterization laboratory was added to this work group.

The rapid decline in referral rates in Quarter 1 2021 (89% to 11%) were directly correlated to the new NCDR guidelines for a qualifying referral to CR. Initial interventions included email updates to inpatient providers regarding the new criteria, and handouts to CR were made more readily available on the inpatient units.

To leverage the EMR to improve referral to CR, a smart phrase was created to include all the elements necessary to document a qualifying referral, as required by the NCDR. In Quarter 2 2022, a best practice alert (BPA) was created to prompt providers to enter the referral to CR order, for any patient with a qualifying diagnosis for referral. In

Quarter 4 2022, the CR handout was integrated within the EMR, and was included in the discharge paperwork for all patients with a qualifying diagnosis for referral.

The final intervention during Quarter 4 2022 included 1:1 education with APPs at the hospital. Participation was voluntary. All 26 Cardiology APPs including full time, part time, and per diem providers were sent an email by the project coordinator (Appendix 1). The project coordinator had a list of all 26 hospital Cardiology APPs. Noted in the email, consent was implied based on attendance to the educational session. Participants were able to decline the educational session or leave at any time during the session. Sessions were held in 1:1 or small group sessions based on the APP participant's schedule.

Two weeks after the email was sent, the educational sessions were initiated. The project coordinator confirmed the participants received the email and offered a paper copy of the email. The participants were provided evidence-based education as outlined by the Million Hearts Initiative regarding cardiac rehabilitation (Appendix 2). The education also included hospital-specific education and training. Hospital specific education included the specific steps within the hospital electronic health record to enter the patient referral as well as the use of short cut phrases to accurately document the referral as required by the NCDR database. Along with live educational sessions, participants were provided the PowerPoint via email. Tip sheets were also provided for each department (Appendix 3). Twenty-four APPs participated in the education session.

Participants received feedback regarding referral rates 3 months after the educational sessions. This feedback served as information to sustain the increase in referral rates and opened conversation to improve any barriers identified in the workflow.

Measures

The percentage of patients referred to CR was determined quarterly. Data on patient referral rates were reported from Q-Centrix, the data extraction company contracted by the hospital. The number of Advanced Practice Providers who participated in the education was also collected.

Data on the percentage of patients referred to CR was obtained from the NCDR database each quarter to evaluate the effect of each intervention. The NCDR database was accessed by the Quality Improvement Coordinator at The Cardiovascular Institute. The percentage of patients referred to CR is the number of patients referred divided by the number of patients eligible for CR. No identifiable information was included. Referral rates were shared with the Advanced Practice Provider Teams. Institutional review board (IRB) approval was obtained from the hospital as well as from Rhode Island College prior to implementation.

Analysis

A quantitative data analysis was performed using the Chi-squared test. A significance level of $p < .05$ was utilized for the calculation. The number of patient referrals was divided by the number of patients eligible for CR upon discharge. These numbers were compared from Quarter 4 2021 to Quarter 4 2022.

Ethical Considerations

Institutional review board (IRB) approval was obtained first from Lifespan, and then from Rhode Island College. Patient privacy was ensured as no identifying data was collected. Provider participation was voluntary and only aggregate data on the number of participants was collected. A potential conflict of interest may exist between the project

manager and the APPs. The project manager is the supervising APP for one of the teams and the team may have felt obligated to attend the education session rather than voluntarily.

Results

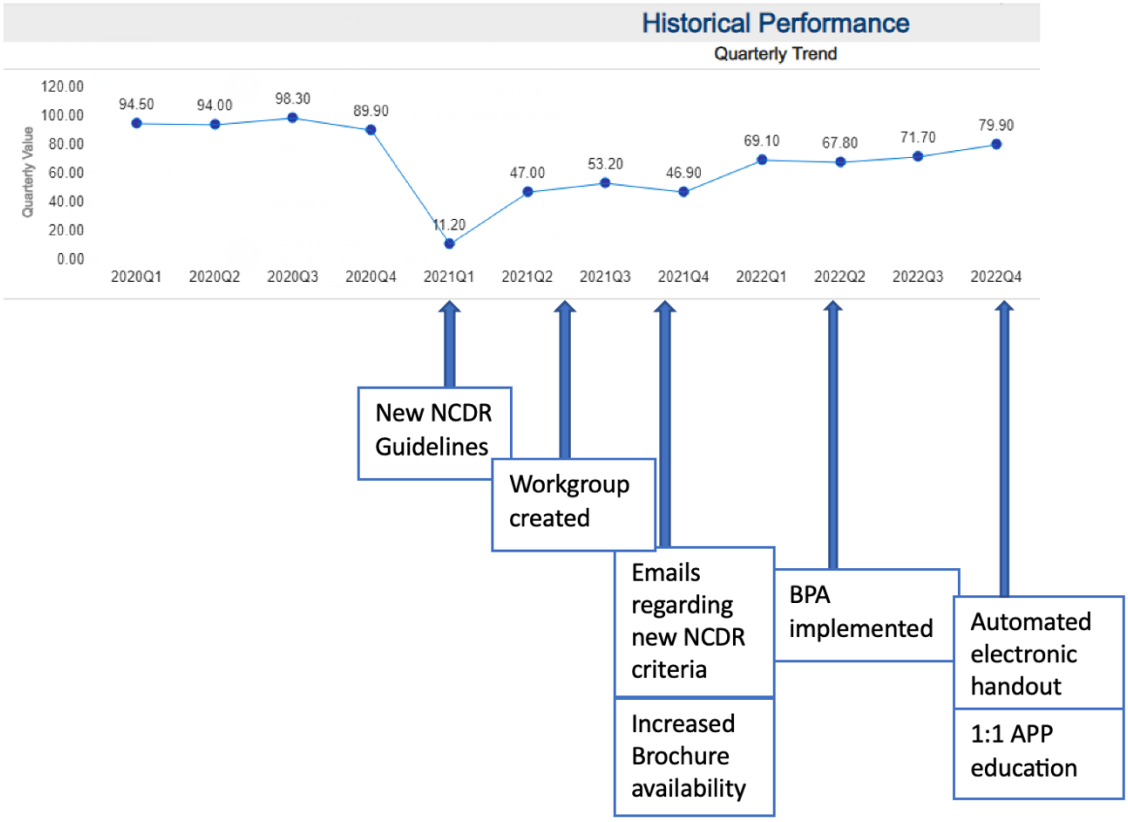
Baseline data was examined from Quarter 4 2021. During this period, 202 patients qualified for referral to CR and 97 patients were referred, for a referral rate of 46.9%. During the Quarter 4 2022 post-intervention period, 197 patients qualified for referral to CR and 157 patients were referred for a referral rate of 79.7%, representing a 32.8% ($p < 0.01$, 95% CI 23.57% – 41.22%) increase in patient referrals.

Table 1: Chi-Squared Test

	Q4 2021	Q4 2022	*Marginal Row Totals*
Patients Referred to CR	97 (116.3) [3.2]	157 (137.7) [2.71]	254
Patients Eligible for Referral	202 (182.7) [2.04]	197 (216.3) [1.72]	399
Marginal Column Totals	299	354	653 (Grand Total)

The chi-square statistic is 9.672. The *p*-value is .001871. Significant at $p < .05$.

Table 2: Longitudinal Referral Rates with Interventions



Discussion

The purpose of this project was to examine if evidenced-based interventions as outlined by the Million Hearts initiative increase referral rates to cardiac rehabilitation. As evident by this quality improvement project, the multi-faceted, team-based approach to addressing referral to CR as recommended by the Million Hearts initiative, is effective in increasing patient referral to Cardiac Rehabilitation to >70%.

Communication between CR and providers, leveraging the EMR, and providing 1:1 education was integral in improving referral to CR. Initial improvements in referral rates were seen in early 2021 after the workgroup was created and communications were sent out regarding the new NCDR guidelines for referral to CR. Steady improvements in

referral rates were seen as the interventions continued including the BPA implementation, handout automation, and 1:1 provider education.

During the provider education, providers appreciated the automated interventions including the BPA and handout. We anticipated a greater improvement in referral rates after the 1:1 education. This may not yet be reflected in the data as this intervention took place late in Quarter 4 2022. Early indicators reflect a referral rate of 86.5% for Quarter 1 2023.

There are several limitations of this project. First, this project was only implemented at a single organization with a large number of APPs. APPs are a more stable intervention group when compared to other hospitals with different structured care models which may include monthly rotating residents or fellows. Another limitation of this project was the fluidness of interventions. The interventions were continuous and overlapping, therefore it is difficult to extrapolate if one intervention was more influential than another.

The positive trend in referrals appears sustainable over the year. This reflects positive, sustainable interventions. To maintain and continue to improve referral rates, the hospital can explore automatic referral to CR for any patients with a qualifying diagnosis.

Conclusion

Cardiac rehabilitation is an underutilized resource throughout the country. Due to its profound benefits yet lack of uptake, it has gained national attention by the CDC and AACVPR. As fostered by the Doctor of Nursing Practice, this quality improvement project closes the knowledge practice gap to aid providers in providing evidence-based care to improve patient outcomes.

This project addressed referrals to CR but does not address attendance to CR. Although increasing patient referral is the first step in the process, further research and project implementation needs to be done to address patient attendance to CR. This starts with examining the barriers to patient attendance, and then creating interventions to address these barriers.

References

Abbott, C., Dremsa, T., Steward, D., Mark, D., and Swift, C. (2006). Adoption of a ventilator-associated pneumonia clinical practice guideline. *Worldviews on Evidence-Based Nursing*. 139-152.

Ades, P., et al. (2017). Increasing cardiac rehabilitation participation from 20% to 70%: A road map from the million hearts cardiac rehabilitation collaborative. *Mayo Clinic Proceedings*. 92(2). 234-242. doi 10.1016/j.mayocp.2016.10.014

American Heart Association (2021). Heart disease and stroke statistics-2021 update. *Circulation*. 143. e254-e743. doi 10/1161/CIR.000000000000950

American Heart Association (2017). *Facts: Cardiac rehabilitation putting more patients on the road to recovery*. Retrieved from https://www.heart.org/idc/groups/heart-public/@wcm/@adv/documents/downloadable/ucm_493752.pdf

Balady, G., Ades, P., Bittner, V., Franklin, B., Gordon, N., Thomas, R., Romaselli, G., and Yancy, C. (2011). Referral, enrollment, and delivery of cardiac rehabilitation/secondary prevention programs at clinical centers and beyond. *Circulation*, 124(25). 2951-2960. doi 10.1161/CIR.0b013e31823b21e2

Center for Disease Control and Prevention (2018). *Cardiac rehabilitation change package*. Retrieved from https://millionhearts.hhs.gov/files/Cardiac_Rehab_Change_Pkg.pdf

Center for Disease Control and Prevention (2017). Heart disease facts. Retrieved from https://www.cdc.gov/heartdisease/facts.htm

Division for Heart Disease and Stroke Prevention (2020). Cardiac rehabilitation at a glance. Retrieved from https://millionhearts.hhs.gov/data-reports/factsheets/cardiac.html

Gravely-Witte, S., Leung, Y., Nariani, R., Tamim, H., Oh, P., Victoria, C., and Grace S. (2010). Effects of cardiac rehabilitation referral strategies on referral and enrollment rates. *Nature Reviews Cardiology*. 7(2). 87-96. doi 10.1038/nrcardio.2009.223

Sandesara, P., Lambert, C., Gordon, N., Gletcher, G., Franklin B., Wenger, N., and Sperling, L. (2015). Cardiac rehabilitation and risk reduction. *Journal of the American College of Cardiology*. 65(4). 389-395. doi 10.1016/j.jacc.2014.10.059

Stevens, K. R. (2004). ACE Star Model of EBP: Knowledge Transformation. Academic Center for Evidence-based Practice. The University of Texas Health Science Center at San Antonio. Retrieved from http://nursing.uthscsa.edu/onrs/starmodel/star-model.asp

Thomas et al. (2018). 2018 ACC/AHA clinical performance and quality measures for cardiac rehabilitation. *Journal of the American College of Cardiology*. 71(16). 1814-1837

Zaccagnini, M., and White, K., (2017). *The Doctor of Nursing practice essentials: A new model for advanced practice nursing.* Burlington, MA: Jones & Bartlett Learning.

Appendices

Appendix 1: Letter to Participants

Dear Cardiology Advanced Practice Provider,

At Lifespan, we strive to provide quality, evidence-based care to our patients. As a result, a spotlight has been placed on improving cardiac rehabilitation (CR) referral rates after percutaneous coronary artery intervention (PCI). Currently, referral rates to CR at The Miriam Hospital are 50%. This equates to the 20th percentile when compared to similar hospitals throughout the country. As Advanced Practice Providers, you play a major role in referring patients to CR.

To assist in increasing referrals to CR, I would like to welcome you to a 1:1 session to review the indications, benefits, and activities of CR. We can also discuss how to place the order within EPIC and the necessary documentation. I will be rounding on the units for those who are interested in the educational session.

Attendance to the session is voluntary and you can decline to attend or leave at any time. Choosing to participate or not participate will not affect your employment or evaluation for continued employment. No personal information will be collected but aggregate data on the number of educational attendees will be collected. The percentage of patient referrals will be examined before and after the educational sessions. This research project serves as part of fulfilling my Doctor of Nursing Practice requirements.

For more information, please feel free to contact myself or Dr. Wu.

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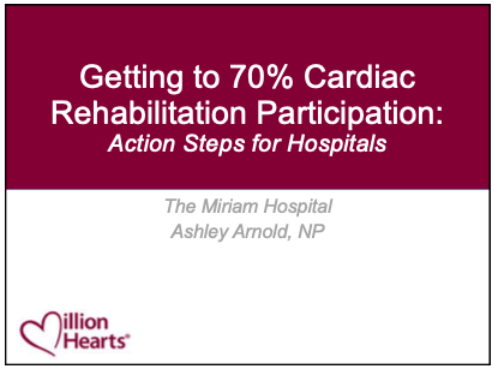
If you have any complaints about this study or would like more facts about the rules for research studies, or the rights of people who take part in research studies, you may contact the Director, Research Protection Office in Lifespan Office of Research at (401) 444-6246.

Appendix 2: Cardiac Rehabilitation Education



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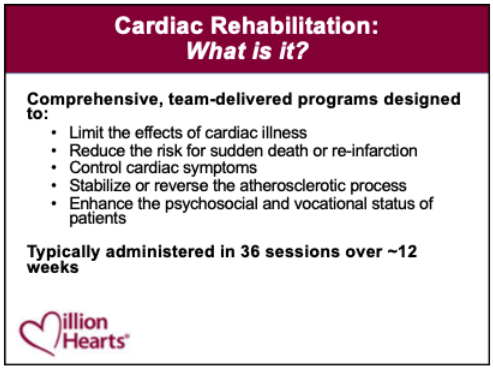

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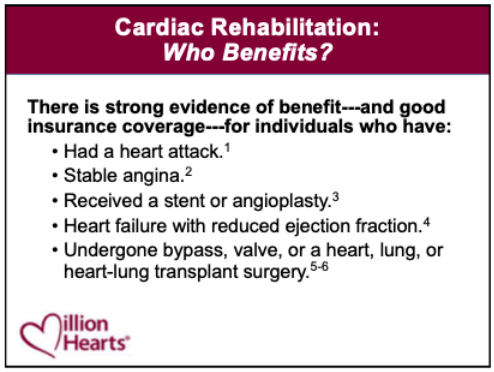

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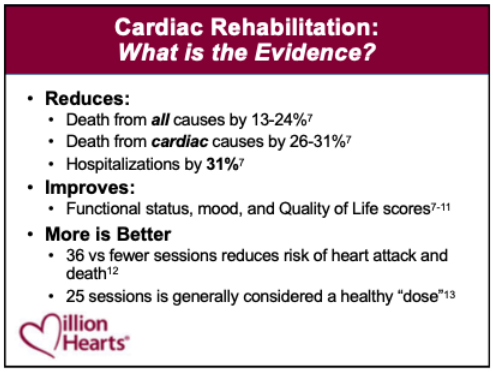

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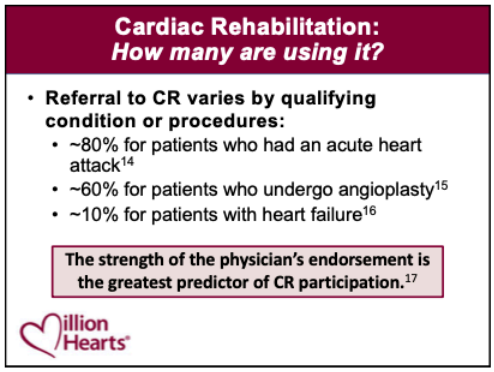

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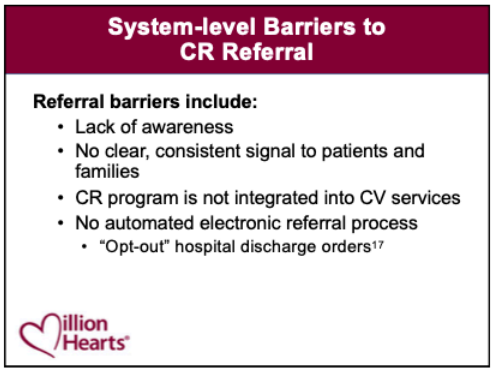

6

Patient-level Barriers to CR Participation

Participation barriers include:

- Logistics
  - Transportation/parking
  - Convenient hours
  - Proximity of programs
- Cost-sharing
- Competing responsibilities
- Cultural and language issues[18]

Only **20% to 30%** of eligible people in the U.S. are participating in cardiac rehabilitation.[18]

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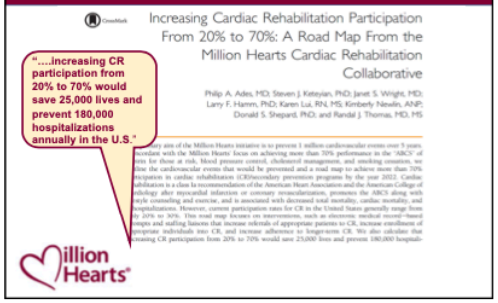
7

Increasing Cardiac Rehabilitation Participation From 20% to 70%: A Road Map From the Million Hearts® Cardiac Rehabilitation Collaborative



Increasing Cardiac Rehabilitation Participation From 20% to 70%: A Road Map From the Million Hearts Cardiac Rehabilitation Collaborative

Philip A. Ades, MD; Steven J. Keteyian, PhD; Janet S. Wright, MD; Larry F. Hamm, PhD; Karen Lui, RN, MS; Kimberly Newlin, ANP; Donald S. Shepard, PhD; and Randal J. Thomas, MD, MS

"....increasing CR participation from 20% to 70% would save 25,000 lives and prevent 180,000 hospitalizations annually in the U.S."

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8

Cardiac Rehab: *How many are using it?*

- **Participation rates vary by diagnosis and procedures.**
  - Higher for heart attack (~14%) and bypass surgery (31%)[19]
  - Lower for patients with heart failure (<3%)[20]
- **Lower participation rates among:**
  - People of color,
  - Women,
  - Elderly, and
  - People with co-morbidities or low socio-economic status[19, 21]
- **Significant geographic variation**[22, 23]

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References

1. Smith SC Jr, Benjamin EJ, Bonow RO, et al. AHA/ACCF secondary prevention and risk reduction therapy for patients with coronary and other atherosclerotic vascular disease: 2011 update; a guideline from the AHA and ACC Foundation endorsed by the World Heart Federation and the Preventive Cardiovascular Nurses Association [published correction appears in J Am Coll Cardiol. 2015;65(14):1495]. *J Am Coll Cardiol.* 2011;58(23):2432-2446.
2. Anderson JL, Adams CD, Antman EM, et al. ACC/ AHA 2007 guidelines for the management of patients with unstable angina/non ST-elevation myocardial infarction. *J Am Coll Cardiol.* 2007;50:e1–157.
3. Levine GN, Bates ER, Blankenship JC, et al. 2011 ACCF/AHA/SCAI Guideline for Percutaneous Coronary Intervention. A report of the ACC/AHATask Force on Practice Guidelines and the Society for Cardiovascular Angiography and Interventions. *J Am Coll Cardiol.* 2011;58:e44–122.
4. Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol.* 2013;62(16):e147-e239.
5. Eagle KA, Guyton RA, Davidoff R, et al. ACC/AHA 2004 guideline update for coronary artery bypass graft surgery. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol.* 2004;44:e213–310.
6. Sibilitz KL, Berg SK, Tang LH, et al. Exercise-based cardiac rehabilitation for adults after heart valve surgery. *Cochrane Database Syst Rev.* 2016;3:CD010876.
7. Heran BS, Chen JM, Ebrahim S, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev.* 2011;(7):CD001800
8. Taylor RS, Brown A, Ebrahim S, et al. Exercise based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized controlled trials. *Am J Med.* 2004;116:682–92.
9. Rejeski WJ, Foy CG, Brawley LR, et al. Older adults in cardiac rehabilitation: a new strategy for enhancing physical function. *Med Sci Sports Exerc.* 2002;34:1709–13.
10. Oldridge N, Streiner D, Hoffmann R, Guyatt G. Profile of mood states and cardiac rehabilitation after acute myocardial infarction. *Med Sci Sports Exerc.* 1995;27:900–5.
11. O'Connor CM, Whellan DJ, Lee KL, et al. Efficacy and safety of exercise training in patients with chronic heart failure: HF-ACTION randomized controlled trial. *JAMA.* 2009;301(14): 1439-50.
12. Hammill BG, Curtis LH, Schulman KA, et al. Relationship between cardiac rehabilitation and long-term risks of death and myocardial

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References

13. Suaya, J.A., Stason WB, Ades PA, et al., Cardiac rehabilitation and survival in older coronary patients. *J Am Coll Cardiol.* 2009;54(1):25-33.
14. Beatty AL, Li S, Thomas L, et al. Trends in referral to cardiac rehabilitation after myocardial infarction: data from the National Cardiovascular Data Registry 2007 to 2012. *J Am Coll Cardiol.* 2014;63:2582–2583.
15. Aragam KG, Dai D, Neely ML, et al. Gaps in referral to cardiac rehabilitation of patients undergoing percutaneous coronary intervention in the United States. *J Am Coll Cardiol.* 2015;65:2073–88.
16. Golwala H, Pandey A, Ju C, et al. Temporal trends and factors associated with cardiac rehabilitation referral among patients hospitalized with heart failure: findings from Get With The Guidelines-Heart Failure Registry. *J Am Coll Cardiol.* 2015;66:917–28.
17. Ghisi GL, Polyzotis P, Oh P, et al. Physician Factors Affecting Cardiac Rehabilitation Referral and Patient Enrollment: A Systematic Review. *Clin. Cardiol.* 2013;36(6):323-335.
18. Ades PA, Keteyian SJ, Wright JS, et al., Increasing Cardiac Rehabilitation Participation From 20% to 70%: A Road Map From the Million Hearts Cardiac Rehabilitation Collaborative. *Mayo Clin Proc.* 2017;92(2):234-242.
19. Suaya JA, Shepard DS, Normand SL, et al., Use of cardiac rehabilitation by Medicare beneficiaries after myocardial infarction or coronary bypass surgery. *Circulation.* 2007;116(15):1653-62.
20. Park LG, Schopfer DW, Zhang N, et al. Participation in Cardiac Rehabilitation Among Patients with Heart Failure. J of Cardiac Failure. 2017;23(5):427-431
21. Castellanos LR, Virnamontes O, Bains NK, et al. Disparities in Cardiac Rehabilitation Among Individuals from Racial and Ethnic Groups and Rural Communities-A Systematic Review. *J. Racial and Ethnic Health Disparities.* 2018 Mar 13. [Epub ahead of print].
22. Fang J, Ayala C, Luncheon C, et al. Use of Outpatient Cardiac Rehabilitation Among Heart Attack Survivors - 20 States and the District of Columbia, 2013 and Four States, 2015. *MMWR Morb Mortal Wkly Rep.* 2017;66(33):869-873.
23. Beatty AL, Truong M, Schopfer DW, et al. Geographic Variation in Cardiac Rehabilitation Participation in Medicare and Veterans Affairs Populations: An Opportunity for Improvement? *Circulation,* 2018.117.029471.

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Miriam Hospital Data

- Only ~50% of patients are referred→ 20th percentile in nation
- Patients cannot attend if they are not referred

Million Hearts®

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Qualifying diagnoses

- PCI/Stent
- STEMI/NSTEMI
- CABG
- Valve repair or replacement
- Angina
- Heart Failure with an EF <35%

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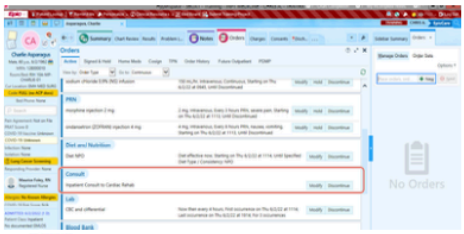
This is not a referral



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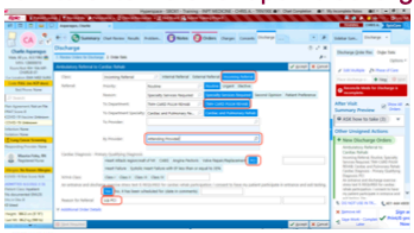
How to enter referral upon discharge



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Documentation of referral

- .heartrehab:
  - "Discussed cardiac rehab with patient, brochure given and referral made upon discharge."

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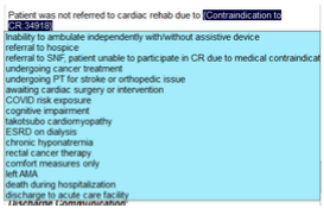
Documentation if patient does not meet criteria

- .norehab



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Questions?

- Contact Ashley Arnold via Secure Chat, email or phone

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Appendix 3: Cardiac Rehabilitation Referral Tip Sheet

Cardiac Rehabilitation Referral Tip Sheet

Qualifying Diagnosis

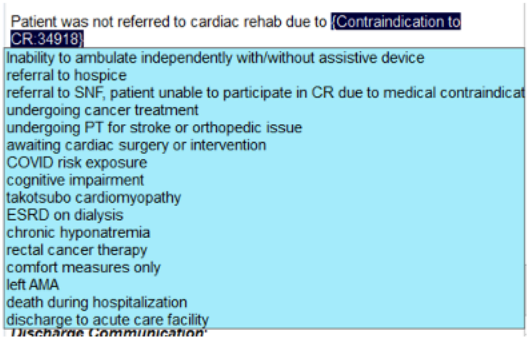
- PCI/Stent
- STEMI/NSTEMI
- CABG
- Valve repair or replacement
- Angina
- Heart Failure with an EF <35%

Documentation of referral

- heartrehab:
  - "Discussed cardiac rehab with patient, brochure given, and referral made upon discharge."

Documentation if patient does not meet criteria

- norehab



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