Optimizing Heart Failure Guideline Directed Medical Therapy in Cardiology

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Table of Contents

Section I. Title

Guideline Directed Medical Therapy for Cardiology Providers....1
Table of Contents....2-3

Section II. Introduction

Abstract....4
Background....6
Problem Statement....7
PICOT Question....8
Objectives....8

Section III. Literature Review

Methodology and Evidence Review....9
Review Coverage and Justification....9
Eligibility/Exclusion....10
Synthesis Review....11
Addressing the Problem with Current Evidence....15
Clinical Practice Therapies....15
GDMT Pharmacotherapeutics....16
Significance....17
Theoretical Framework....18
Model for Improvement....19
Theory Application to DNP....20
Major Tenants....20
Plan Do Study Act....22

Section IV. Project Design

Plan....23
Population of Interest....23
Setting....24
Stakeholders....25
Recruitment....26
Tools and Instrumentation....27

Data Collection Process 29
Project Timeline 30
Ethical Considerations 32
Evaluation Plan 32
Implications for Practice 33

Section V. Results

Data Analysis 34
Discussion and Significance 37
Limitations 44
Dissemination 49
Sustainability 50
Conclusion 51

Section VI. References

Section VII. Appendices

Appendix A. Model for Improvement 59
Appendix B. Letter of Support 60
Appendix C. GDMT Protocol 61
Appendix D Education Powerpoint 70
Appendix E. Chart Auditing Tool 75

Abstract

Heart Failure (HF) is a complex, chronic, and debilitating disease, characterized by deficiencies of the heart to pump adequate blood flow that is sufficient to meet body requirements. Despite modern therapeutic innovations, the American Heart Association (2019) projects prevalence rates to increase approximately 46% from 2012 to 2030. Although HF is a major cause of morbidity and mortality worldwide, it remains unknown how close clinicians' adhere to evidence-based recommendations. The development of a standardized HF protocol was concentrated on optimizing the clinician' compliance to guideline directed medical therapies (GDMT) in an outpatient cardiology clinic. Using a convenience sampling approach, three clinicians were selected as the population of interest. Pre- and post-implementation chart audits were conducted on 255 randomized clinician charts, measuring the percentage of adherence, utilization, and benchmark satisfaction based on the Center for Medicare and Medicaid Services (CMS) quality performance measures. Over a four-week timeframe, the documented usage of the GDMT protocol resulted in a 19% rise in clinician compliance, increasing from 71% to 90% overall. Completed satisfactory rates increased immensely within each performance measure related to clinician management of patient' symptoms, their functional level of activity assessment, education provided, and compliance toward recommended HF therapy medications. Furthermore, executing the Fisher's exact test confirmed the beneficial relationship between care deliverance and usage of the protocol, equating a 0.0208 p-value that signifies a positive association. The conclusion of this DNP project indicates an opportunity to optimize clinician care deliverance. With collaborative support, the aid of a standardized protocol exemplifies the potential capability to unify clinical practice therapies (CPT) that reduce patient morbidity and mortality, and improve quality outcomes long-term.

Guideline Directed Medical Therapy for Cardiology Providers

Heart failure remains one of the leading causes of deaths attributable to Cardiovascular disease in the United States. Benjamin et al. (2019) suggests that due to an increase for healthcare needs, the prevalence of cardiovascular disorders such as HF will continue to rise with the aging population. AHA (2019) indicates a projected increase of 46% from 2012 to 2030.

Despite modern therapeutic innovations of GDMT, the increasing prevalence and mortality rate of HF remains unacceptably high. Several organizations have published guidelines for the treatment of HF. These include GDMT recommendations from the American College of Cardiology (ACC) in 2013 and the AHA focused update in 2017. Generally, outpatient clinic studies regarding utilization/compliance of GDMT have not been thoroughly researched and treated according to published guidelines, thus existing barriers hindering optimal care such as education awareness and nonadherence warrant further investigation (Hickling, Nazareth, & Rogers, 2001).

The following DNP quality improvement initiative will be based on the development of a consolidated standardized GDMT protocol implemented in an outpatient cardiology clinic. The focus will evaluate the correlation between optimal GDMT utilization by cardiology clinicians, and their indirect recipient impact upon patient-specific cardiovascular function and clinic performance scores.

Background

Suboptimal treatment of heart failure poses the risk for damage and weakening of the heart muscle and can chronically progress toward an interference of normal everyday activities of daily living. According to the Center for Disease Control and Prevention (CDC), approximately 5.7 million adults in the United States have HF and the associated-spending surrounding treatment are financially estimated to cost 30.7 billion dollars per year (CDC, 2019).

To categorize the stages of HF progression, the New York Heart Association (NYHA) classification scheme has been adapted to assist with quantifying the degree of functional limitation imposed by HF. CMS establishes quality performances measures used in their merit-based incentive program (MIPS) that are used for comparative evaluation against national benchmarks. The MIPS' composite performance score reflects performance benchmarks in areas related to healthcare quality, the promotion of interoperability improvement activities, and financial considerations. Upon submission to CMS, data is updated daily reconciles performance rating based upon current national benchmarks.

In 2018, accumulated MIPS scores from an outpatient cardiology clinic revealed a 70.8% overall performance rating, with 61% of its unsatisfactory rating associated with the quality benchmark. Of the 61% quality performance, the six highest measures used for calculation were unrelated to HF disorder. The HF measures that were presently scored at a rating of 0% performance applicability included: Blood pressure screening, angiotensin converting enzyme inhibitor/angiotensin receptor blockade (ACEI/ARB) therapy for left ventricular systolic dysfunction (LVSD), beta-blocker therapy for left ventricular ejection function (LVEF) < 40%, ACE/ARB therapy for LVSD < 40%, and documentation of current medications. There is an opportunity to optimize GDMT therapy, improve patient outcomes, and increase MIPS scores.

Problem Statement

Although HF is a major cause of morbidity and mortality worldwide, it remains unknown how close clinicians' adhere to GDMT. ACC (2017) notates that although the provider's role is to provide high quality care that serves the patient's best interest, there remain a continuous tension between current best evidence for care at the individual patient level and the concerns at the level of society, health systems, and payers. In the current outpatient cardiology clinic, application of best GDMT remains inconsistent due to the lack of education and/or absent resources available to assist with decision-making. Unfortunately, any measurement to evaluate compliance, adherence, utilization, and impact at the facility remains unknown. According to Fonarow and Ziaeian (2016), CPT therapy recommendations have been shown to improve patient outcomes, yet substantial barriers regarding adherence of GDMT necessitates further exploration.

Purpose Statement

From a cardiology standpoint, conduction of the proposed project aims to effectively implement a consolidated GDMT protocol that optimizes cardiology clinicians' adherence to GDMT; also indirectly impacting cardiovascular function by improving patient outcomes and clinic performance scores overall.

Project Question

Within the timeframe of the DNP program, will cardiology clinicians in an outpatient cardiology clinic benefit from the implementation of a consolidated GDMT protocol that promotes consistency, adaptation, and utilization of optimal HF treatment, and can also potentially foster improved patient and clinic outcomes?

Patient/Problem/Population

The population of interest focuses on cardiology providers in an outpatient setting.

Intervention

To create a HF protocol in an outpatient cardiology clinic that will optimize GDMT clinician' compliance to 100%, improve interdisciplinary awareness evident via 100% usage of the GDMT protocol, and improve patient and MIPS performance scores to 100%.

Comparison

Heart failure progression and outpatient cardiology MIPS scores may be beneficially impacted via continuous usage/compliance of the standardized GDMT protocol without interference across multidisciplinary specialties, as oppose to inconsistent usage of GDMT CPT.

Outcome

Cardiology providers that practice in compliance with HF GDMT may result in an improvement and/or maintenance of individualized heart failure progression and positively improve patient outcomes and outpatient clinic MIPS scores.

Time

The duration to occur within the timeframe of the DNP program.

Project Objectives

- Develop a standardized HF protocol that incorporates current GDMT that is more comprehensible and manageable for clinician assistance.
- Promote the expansion of knowledge and increase compliance by cardiology providers by providing education of current GDMT using a PowerPoint education tool.
- Optimize care deliverance by clinicians that is evident by 100% utilization of protocol.
- Ensure 100% adherence by conducting weekly chart audits over a four-week timeframe.

Literature Review

Methodology and Evidence Review

The complexity of HF therapy encompasses a multitude of management approaches; this document will address the general pharmacotherapeutic interventions of GDMT. Searches were extended to original and updated practice guidelines, randomized controlled trials, clinical trial registries, comparative studies, and systematic reviews that were published in English from the ACC/AHA, Cumulative Index of Nursing and Allied Health Literature, Pubmed, UpToDate, and Google Scholar databases. Key search words included but were not limited to the following: Heart failure, quality of life, mortality, prevention, hypertension, dyslipidemia, barriers, pharmacological treatment, angiotensin-converting enzyme inhibitors, beta-blockers, acute decompensated heart failure, quality measures, performance measures, risk assessment, survival analysis, guideline-directed medical therapy, physician adherence, compliance, and improvement. Main concepts included but were not limited to the following: GDMT adherence, NYHA classification scheme, HF primary and secondary intervention, pharmacologic therapy, identification of barriers, optimizing treatment modalities, and evaluation of influence.

Review Coverage and Justification

To ensure accuracy and prevent bias contradictory to the original interpretation, only primary sources pertaining to GDMT were reviewed; repetitive key words and concepts were filtered for relevant data. These documents were approved by the ACC/AHA and endorsed by the American Association of Cardiovascular and Pulmonary Rehabilitation, American Society for Nutrition, and the American Society of Preventive Medicine (AHA, 2019).

Initially, the totality of search results based upon keywords/terms provided 400 available references. To isolate various irrelevant inquiries, relevant information was filtered by the main

concepts previously identified. The combination of key terms and concepts reduced the appropriate literature relevant to HF to 100 results. Thereafter, additional advanced filters were applied and 10 resources were selected based upon the eligibility and exclusion criteria.

Eligibility

- Literature published within a five-year timeframe.
- Individuals receiving GDMT by ACC/AHA approved recommendations.
- Quantitative and qualitative data of patient outcomes related to suboptimal and optimal care.
- Pharmacologic primary and secondary interventions for individuals at risk for or already diagnosed with HF
- Reporting compliance with GDMT pharmacologic initiation/titration.
- Barriers related to adherence, compliance, and/or utilization of HF GDMT.

Exclusion

- Any medical guidelines unrelated to HF.
- Primary or secondary guideline management not concurrent with ACC/AHA recommendations.
- Institutional duplicate studies published with accumulating number of patients or increased follow-ups, only the most complete reports will be included for quantitative assessment at each time interval.

Review of Study Methods

Upon reviewing the study methodologies in the discussed literature, the emerging themes and methods are relevant for accomplishing the DNP project objectives and goals. Those themes are based upon the common concepts and recommendations derived from an evidence-supported overview from current clinical practice therapies, randomized controlled trials, retrospective and observational studies, mixed-methods comparative studies, integrative reviews, systematic review of peer-reviewed research studies, and exploratory quantitative and qualitative studies. Justification of the supportive text relevant to HF management were derived from the 2019 ACC/AHA cardiovascular guidelines (Arnett et al., 2019), 2017 ACC/AHA HF focused update (Yancy et al., 2017), and the 2017 ACC expert consensus decision pathway for optimization of HF treatment (Yancy et al., 2017). They were adopted to provide an overview of the primary and secondary pharmacologic interventions and recommendation pertaining to HF therapy. Furthermore, these study approaches that are validated by the National Heart, Lung, and Blood Institute's Classification of Recommendation/Level of Evidence, will be useful for translating and disseminating research into practice (Halperin et al., 2016).

Synthesis Review

Heart failure remains a global burden for health-care systems. High mortality rates, significant morbidity, and recurrent hospitalizations are associated with suboptimal GDMT (Yancy et al., 2017). Adherence to GDMT is relatively satisfactory, however many pivotal issues and opportunities to improve patient outcomes are suboptimal and/or unaddressed (Yancy et al., 2017). Among the literature reviews, the influence of suboptimal/optimal primary and secondary intervention upon morbidity/mortality, pharmacotherapeutic management, and the contributory barriers remain a recurring theme. According to Fonarow and Ziaeian (2016),

streamlining guideline-based treatments and improving patient medication compliance are pertinent for the reduction in patient morbidity, mortality, and healthcare advancement.

Morbidity and Mortality Impact

HF remains a major and growing public health concern. Naive patients can misinterpret the literal vocabulary term "heart failure," as a heart that is no longer working and/or a condition with absent treatment therapies (AHA, 2017). A dysfunctional heart deprives bodily cells of adequate blood supply necessary for optimal perfusion. Activities of daily living may be increasingly affected as the chronic disease progresses. This results in fatigue, shortness of breath, and/or cough. Everyday activities such as walking, climbing stairs, or carrying groceries can become very difficult (AHA, 2017). According to the AHA (2013), "By 2030, more than eight million people in the United States will have HF. Between 2012 and 2030, total costs are estimated to increase from $31 billion in 2012 to $70 billion in 2030" (Heidenreich et al., 2013, p. 613). The goals of GDMT therapy aim to improve quality of life and prolong survival.

Adherence to GDMT remains acceptable, however bridging the gap amongst suboptimal compliance and utilization of current evidence creates a potential impact upon mortality rate improvement. The magnitude and quantification of morbidity and mortality reduction has not been fully investigated. Fonarow et al. (2011) conducted a quantitative research study to estimate the potential benefit gained from optimal implementation. Their evaluation concluded that a significant amount of mortality rates per year could be reduced with optimal implementation of a pharmacologic GDMT.

Barriers

"Barriers to guideline adherence include context-specific factors impacting upon provider knowledge, attitudes and behaviors, such as lack of awareness, lack of familiarity, lack of self-efficacy, inertia, patient expectations, and inadequate time or resources" (Hickey et al., 2016, p. 100). Adversities impeding optimal preventative, current, and post therapies remain unclear. However, common associated themes can be divided amongst the following: Education, inexperience, pharmacotherapeutics, patient variables, and financial associations.

Education/Awareness. Educational awareness contributes to the variations in medical management of heart failure. The slow dissemination of knowledge to practice contributes to suboptimal GDMT and appropriate pharmaceutics titration (Fonarow & Ziaeian, 2016). Complex updated guideline recommendations, systematic reviews, and evidence-based reports may hinder the adaptation, utilization, and translation of guideline directed therapies into practice if misunderstood and/or misinterpreted by patients or clinicians making health care decisions (Agency for Healthcare Research and Quality, 2013). In an era of complexity and rapidly changing therapies, improving streamline translation of data amongst numerous CPT recommendations may negate any fears, doubts, or barriers involved with the applicability of research findings into care.

Inexperienced clinicians. Adequate and continuous monitoring of evidenced-based therapies aid with patient outcome improvement. However, patient and geographic characteristics can hinder access and/or availability to specialized HF medical clinics, potentially limiting patient-clinician ideal conformity to GDMT (Hickey et al., 2016). Development of a standardized protocol can enhance communication, coordinate treatment therapies among multidisciplinary professions, and establish consistent patient/provider expectations.

Pharmacotherapeutics. A clear strategic, and structured titration plan is associated with higher achievements of optimal pharmacologic therapy (Hickey et al., 2016). Suboptimal pharmacological initiation/titration of GDMT are responsible for a substantial proportion of avoidable disease progression and mortality (Fonarow et al., 2011). A consolidated protocol that correspondingly enhances multidisciplinary facilitation can improve adherence to ACC/AHA mandated target GDMT, and effectively improve adherence and positively impact patient outcomes (Balakumaran et al., 2018). The 2019 ACC/AHA guideline recommendations strive to modify numerous recommendations into a shorter more readable approach for providers; yet it is still composed of an extensive summary of pages.

Patient variables. Geographic variations of outpatient cardiology clinics and patient-specific factors such as socioeconomic status and health literacy contribute to unacceptably slow adherence rates (Fonarow & Ziaeian, 2016). Physicians are also notoriously poor in recognizing individuals noncompliant with therapy (Roth et al., 2016). Due to the unclear dissemination of HF treatment expectations and objectives, the DNP project aims to streamline GDMT to facilitate successful communication of optimal targeted interventions, adhered to by all stakeholders involved.

Finance. The prevalence, consequences, and hindrance of financial barriers to GDMT contribute to poorer quality of life, higher risk of morbidity and mortality, and suboptimal management of GDMT (Yancy et al., 2017). Financial constraints place a serious burden on adherence if the patient is unable to acquire medications necessary for optimal therapy. "HF is a very costly condition, being the most expensive diagnostic-related group for Medicare" (Fonarow et al., 2011, p. 1028). According to Yancy et al. (2017), implementing new therapy strategies that slow the progression of HF can reduce costs, hospitalizations, and mortality.

Addressing the Problem with Current Evidence

Guidelines are only effective if clinicians and patients adhere to the evidence-based recommendations (Arnett et al., 2019). GDMT remains the cornerstone of therapy for HF management, shown to improve patient symptoms, cardiac function, and mortality rates. Evidently proven useful and effective, Fonarow et al. (2011) asserts the adoption and application of CPT remain slow and inconsistent. Thus, further research is necessary to improve widespread application of collaborative system performance and conform/optimize HF therapies that lead to beneficial patient outcomes. Fonarow and Ziaeian (2016) also support an existing necessity to identify additional interventions that reduce the adversities of deficient awareness, compliance, and utilization of GDMT between patient-provider relations. Komajda et al. (2016) proposes additional research is necessary to improve continual compliance and utilization of recommended therapies. The development of the DNP project aims to explore the mutual themes and suggestions noted in order to compile a standardized protocol that enhances compliance/adherence to GDMT.

Current Clinical Practice Therapies

Guideline Directed Medical Therapy

According to Yancy et al. (2017), there are numerous evidenced-based therapies; the ACC developed expert consensus documents intended to streamline steps that clinicians may follow to deliver optimal care that warrant best possible patient outcomes in HF. Guidelines are intended to inform healthcare providers of clinical recommendations by describing a range of generally acceptable approaches for the diagnosis, management, or prevention of specific diseases/conditions (Arnett et al., 2019).

Pharmacologic therapy. The goals of pharmacologic therapy aim to improve quality of life, reduce symptoms, reverse and/or minimize progression of myocardial deterioration, and prolong survival. Established GDMT pharmacologic implementation includes angiotensin converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), beta-blockers, loop diuretics, aldosterone antagonists, and hydralazine/isosorbide dinitritate. According to research by Yancy et al. (2013), the following medication classes have evidently proven to demonstrate symptomatic relief, reduction in hospitalization admission, and an improvement in survival. Despite GDMT recommendations, the complexity of HF management complicates the adherence to adequate initiation, addition, and titration of pharmacotherapeutics. According to Yancy et al. (2017), no clinical trials have specifically evaluated the potential for greater benefit or excessive risk of indicated therapies among patients with multimorbidity. The updated consensus attempts to address the common pivotal issues, but highlights the importance to investigate areas where gaps remain, emphasizing further clarification where incomplete data exists. Conducting the DNP project will assist with pharmacologic clarification, optimizing HF compliance to GDMT management by both patient and clinician, and thus secondarily improving outpatient quality improvement scores overall.

Clinical Improvement

Optimal GDMT recommendations evidently show to reduce morbidity and prolong survival. The reduction of symptoms associated with HF improves quality of life and functional status, secondarily decreasing hospitalization admission rates and mortality (Yancy et al., 2013). Roth et al. (2016) reports an associated 20% higher relative risk of adjusted mortality rates for patients not on GDMT. Comprehensive management involves lifestyle changes, pharmacologic therapy, device therapy, rehabilitation, and referral coordination as needed (Yancy et al., 2017).

Limitations

Primary and secondary intervention of HF encompasses an array of multiple major and minor strategic care therapies. Those mentioned in this project proposal intends to highlight and enhance the major literature citations behind optimal management of general GDMT. This DNP project proposal intends to complement and enhance the associated therapies, but not negate or exclude any other recommendations.

Significance

Heart failure management continues to be a national priority. To ensure that evidence-based data remains current, new information is continually reviewed, with full guideline revised approximately every six years (Yancy et al., 2017). Hickey et al. (2016) noted that a clear, structured titration plan is associated with higher success rates for achieving optimal therapy.

According to Yancy et al. (2017), CPT therapies are only beneficial if adhered to by both providers and patients. Evidently proven to improve patient symptoms, cardiac function, and mortality rates, further research is necessary to improve patient outcomes by reducing the gaps contributing to deficiencies in awareness, compliance, and utilization (Arnett et al., 2019).

The focus of this project aims to review, modify, and consolidate current CPT into a standardized GDMT protocol that cardiology clinicians can use that will beneficially influence cardiovascular care deliverance. If an assessment is performed to determine the barriers of adherence and utilization of GDMT, the appropriate tools and assessment strategies can be developed to optimize cardiology providers' treatment modalities, improving patients' cardiovascular quality of care and outpatient performance scores overall.

Theoretical Framework

Quality improvement is the framework that consists of an ongoing and systematic approach that implements processes and actions that lead to measureable improvements in healthcare (Institute for Healthcare Improvement [IHI], 2019). In an outpatient cardiology setting, the ultimate focus is on improving patients' quality of care and serving the patients' best interests, which aligns with the ACC/AHA's mission of transforming heart health worldwide, using innovation and knowledge to optimize patient-centered cardiovascular care (ACC, 2019).

The Model for Improvement (MFI) was chosen for this DNP proposal due to its recognized simple, yet successful strategy recommendations to efficiently accelerate improvement within the allotted project timeframe (See Appendix A). It is an appropriate tool due to its risk reducing approach that can be executed on smaller sample populations such as an outpatient cardiology clinic. This model described in *The Improvement Guide: A Practical Approach to Enhancing Organization Performance* (Langley et al., 2009), provides a methodical approach for planning, conducting, translating, and implementing evidenced based research into systems of care. This model has been used extensively in healthcare and non-healthcare settings to quickly improve different health care processes and outcomes effectively (IHI, 2019).

Historical Development of the Theory of MFI

Moen (2009) reviews the origin, evolution, and progression of scientific methodology. His research begins with an introduction to Galileo Galilei, considered to be the father of modern science, who combined the science of motion and mathematics to develop the cornerstone of present day scientific methodology. Throughout the 1600-1900s era, Galilei's contribution inspired other famous philosophers such as Francis Bacon, Charles Peirce, William James, John Dewey, and Clarence Lewis to refine this scientific phenomenon. In 1939, Dr. Walter Shewhart

published his version of the "Shewhart Cycle" that contrasts the idea of a linear cycle with a more circular method. In 1950, Edwards Deming, known for the "Deming Wheel," combined the circular approach of the Shewhart Cycle to concomitantly resemble statistical quality control. He presented this edification at a Japanese Union of Scientists and Engineers seminar. Although authorship remains unknown, it is claimed the Japanese created their model based on Deming's theory, stemming the development of the "Plan-Do-Check-Act (PDCA)," aimed for implementation and compliance. Throughout 1950-1990, Deming continually modified his own model to enhance testing and implementation, becoming known today as the "Plan-Do-Study-Act" (PDSA). PDCA and PDSA are related by the scientific method (Moen, 2019).

The MFI, developed by Associates in Process Improvement, is a conceptually simple approach to drive continuous improvement at an accelerated, yet effective rate. It is recognized for its successful use by hundreds of healthcare organizations for improvements on healthcare processes and outcomes (IHI, 2019).

Application of MFI Theory to Current Practice

MFI centers upon a strategic approach for identifying, examining, and accelerating change. The goal of the model is to "combine a continuous process of small tests of change within an overarching aim with a longitudinal measurement process" (Crowl et al., 2015). Applying the model to current practice can be exemplified by the following two experiences.

IHI and API collaboratively employed this methodology to incorporate supplementary education, goal setting, problem solving, and support groups to improve/attain personal goals related to diabetes and heart failure (Glasgow et al., 2002). Their proposal revealed an increasing improvement in self-management from 19% at baseline to 93% in patients with heart failure and from 3% at baseline to 23% for patients with diabetes. Furthermore, by

implementing this test, it highlighted the benefits of testing different strategies to identify alternative interventions that influence optimal care.

The quality improvement approach utilized by Taylor et al. (2007), examined an eight-step fall response system in 19 out of 42 nursing homes in Georgia. Their focus resided on enhancing comprehensive documentation that facilitates clear communication, promotes primary care involvement, and reduces the number of falls among nursing home residents. Proactive strategies such as staff training, additional patient education, and increased clinician involvement were employed to recognize patient safety hazards inducing greater risks for falls. Upon the 19 nursing homes that used the MFI, fall rates maintained stability. However, the 23 nursing homes that did not implement had a 26% increase in falls (Taylor et al., 2007).

The review of an outpatient cardiology's quality improvement performance feedback revealed 0% documented compliance and deliverance of HF GDMT. A gap analysis that compared current practice against recommended evidenced based research, it has become apparent that the current practice therapies revolving around HF management remains suboptimal, thus necessitating further exploratory means that aim to optimize care deliverance. This concern inspired an interest to develop a consolidated protocol in accordance with this model (Langley et al., 2009) that optimizes GDMT, patient outcomes, and clinic measures.

Major Tenets

The MFI is divided into two parts. Part one involves forming the project plan by establishing the aims, measures, and interventions necessary to answer three essential questions (IHI, 2019). The purpose, goals, and measures will determine if change leads toward improvement. Part 2 involves the PDSA cycle that tests change in real-world settings. This scientific method assists with planning, testing, and evaluating change in the real work setting.

Three Essential Questions

Part 1 of the MFI covers three fundamental questions essential for guiding work improvement: (a) What goals do the QI team desire to accomplish? (b) How will the QI team evaluate the change? and (c) What changes can QI team make that will result in improvement? According to Langley et al. (2009), the first question defines the aims and/or objectives trying to be accomplished. It reflects upon the areas of current practice needing improvement and clarifies the goals and outcomes wishing to be fulfilled. The next question determines what hypothesized interventions can actually be tested and evaluated for innovation. "While all changes do not lead to improvement, all improvement requires change" (IHI, 2019, para. 1). Testing smaller populations prior to executing change reduces risk. Hence, the final question uses quantitative analysis to determine if the results beneficially progress toward the goal(s); if so, it is considered an improvement and implementation can begin. The set of balanced health system measures outlined by the Institute of Medicine (IoM, 2001) answers the fundamental questions and will be expanded on below.

Types of Measurements. Measurement is a key step in the MFI because it answers the question, "What changes are being made that can lead to an improvement" (Crowl et al., 2015, p. 369)? The balanced set of measures for all improvement efforts include: Outcome measures, process measures, and balancing measures.

Outcome measures explore the project aims and goals attempting to be accomplished. Process measures evaluate objective data to determine and define the implemented protocol as a progression toward improvement. Balancing measures determine if the proposed protocol implementation will beneficially generate improvement, or if the change negatively interferes with current practice (Martin et al., 2007).

Plan-Do-Study-Act

Part two from the MFI framework applies the PDSA cycle to guide testing and implementation of change. This scientific method is appropriate for planning, testing, and evaluating change. Based upon Deming (2018), the following data is a summary of the steps.

Plan. During the plan stage, the objective(s) is identified and hypothetical predictions with rationales are formulated. A strategic quality improvement approach is developed to execute the test. During this phase, the data needed to be collected is determined based upon the overall objective/goals wishing to be tested.

Do. In this phase, testing is carried out on a smaller scale population. Unforeseen circumstances and/or adverse reactions may occur that warrant modification. Once the outcomes are documented, analysis of the data can begin.

Study. The study phase consists of setting aside time to analyze the data and study the results. It is crucial to compare the conclusions of the test with initial hypothesized expectations and desires. Despite outcome, all data is collected, summarized, and documented. Comparison of the data to initial predictions may warrant refinement if the results are unaligned with the quality improvement aims, objectives, or goals. Thereafter, the final step of the cycle begins.

Act. Based upon the information learned, the plan should be modified if necessary, to align and achieve the desired goals. Any refining changes may warrant repeat testing until any/all conflicting areas are resolved and change is deemed beneficial toward improvement. A new plan may be developed to implement change on a broader scale.

Project Design

The project design focuses upon using a quality improvement (QI) approach for planning, implementation, and evaluation. The design will use a combination of interdisciplinary collaboration, observation and interaction, and quantitative/qualitative analysis to achieve the desired objectives and outcomes. Validated as an easy to use, risk reducing method that rapidly tests change (IHI, 2019), the MFI framework will be used to guide the planning and implementation steps of this project; ensuring that all interventions are optimal, confidential, and safe for all stakeholders. During implementation, HF GDMT education will be provided to all stakeholders and chart auditing will be conducted by the project lead to obtain feedback, while assessing the staff's knowledge, attitude, and usage. The statistical measurements further mentioned will be used to evaluate compliance, impact, and satisfaction.

Population of Interest

The design of the GDMT protocol will be introduced to all staff members employed at the outpatient cardiology clinic. The target population includes three full time cardiology clinicians, two of whom are cardiology physicians and another certified as an advanced nurse practitioner. Supported by leadership, all providers are mandated to participate in the clinic wide change.

The patients and clinic performance scores are indirectly affected from the implementation process, but are not the target of interest regarding optimal GDMT deliverance. Noting the absence of any established means for tracking clinician compliance to GDMT in 2018, a standardized protocol serves as a primary driver to influence optimal evidence-based care delivered by cardiology providers within this outpatient clinic. Successfully influencing a clinic wide practice change will be dependent upon clinician's response.

All cardiology clinicians must possess an active license from their respective boards that

is validated by the Medical Board of Examiners and State Board of Nursing. The specialty of the clinician's patient population must be associated with cardiology-related needs. Moreover, he/she must be able to provide feedback when convenient and as needed.

Exclusion criteria are minimal, pertaining only to clinicians whose specialty is unrelated to cardiology. It also extends to any individuals that do not directly partake in direct patient care. This includes clerical billing, prior authorization, or radiology/nuclear technicians. Although the patients, caregivers, and family members are recipients of the project design, they are not directly involved in the creation, implementation, or dissemination of the project goals and outcomes. Thus, they will be considered a stakeholder impacted, but not recognized as the primary population of interest.

Setting

The data will be collected at an outpatient cardiology clinic located in Las Vegas, Nevada. This small privately-owned facility was opened in 2004 and offers a full range of interventional cardiac and peripheral services. The owner of the clinic is also the head cardiologist of the practice, who has been awarded top interventional cardiologist in Las Vegas, NV from 2015-2018. The project site strives to deliver the highest quality, affordable healthcare services in a safe and compassionate environment enriched by education, science, and technology. Their values center upon teamwork, collaboration, professionalism, and excellence.

The clinic contains eight rooms; five of these rooms are designated for patients, while the others are used for radiology, stress testing, and sleep studies. Heart failure, pulmonary hypertension, coronary artery disease, and peripheral vascular disease are amongst the top conditions/disorders regularly treated. The clinic availability is open Monday-Friday with an estimated 30-50 patients seen per day. The demographics consist primarily of non-Hispanic whites as the largest ethnic group, but are also summed up of many diverse populations. The

average appointment time spent between clinician and patient approximately 15 minutes or less.

Currently, the staff is comprised of twenty personnel: Management is composed of two cardiology physicians, one nurse practitioners, manager, and human resources. Other employees include: Prior authorization, radiology/nuclear technicians, and six medical assistants. In an effort to advance cardiovascular care based upon current evidence-based practice, the clinic employees and leadership encourage the implementation of the DNP proposal by providing a letter of support (See Appendix B).

Stakeholders

All three clinicians remain as the population of interest, however additional stakeholders that will assist with the project interventions also include the office manager and medical assistants. The quality improvement committee for analyzing and evaluating progression/outcomes will include the cardiologist/owner, manager, and project lead nurse practitioner. These individuals have high interest and significant authority/power within the organization, allowing change to be implemented that will influence project goals and outcomes. The office manager and medical assistants are also key stakeholders because of their direct involvement and interaction with the patient population. These individuals have high interests and support for the project proposal. However, they assume little authoritative power within the clinic that is beneficial for project development and evaluation. Therefore, they are not considered a population of interest. The patient population is also considered stakeholders as they are recipients impacted by the delivery of care, but have no effect upon the project design.

Recruitment Method

The recruitment of participants will begin with an assigned meeting date for all staff to attend. During the educational day, the project design, objectives, goals, and timeframe will be reviewed. Participation by all stakeholders mentioned will be mandated, but this requirement will not be a stipulation that affects their current employment status, nor will he or she be financially compensated for the clinic wide practice change. During the informative day, any individuals that do not meet participant criteria will be verbally informed of the rationales surrounding inclusion and exclusion. However, prior to final exclusion, a verbal conversation will take place to clarify all roles and responsibilities. If the participant identifies as meeting criteria, he or she will be accounted for as a stakeholder.

To assure all objectives are clearly understood and completed on time, staff monitoring will be constantly maintained throughout implementation. The project lead's contact information will also be provided to the staff and will be available at any time to address questions or concerns that arise. This action will also aid in fostering a collaborative interdisciplinary rapport within the organization. For four consecutive weeks, recruitment of clinician charts will be obtained using a convenience sample approach, selecting thirty randomized charts per day for chart auditing. All patient and clinician identifiers will be extracted to maintain confidentiality.

Tools/Instrumentation

GDMT Protocol

Heart failure is a disease that requires a complex lifelong treatment regimen (Meng et al., 2016). The GDMT protocol serves as a decision support tool for GDMT recommendations. It will entail primary assessment and pharmacologic considerations for each NYHA classification. The CPT mentioned in the protocol has been adapted by the 2013 ACCF/AHA Guideline for the Management of Heart Failure and the 2017 ACC Expert Consensus Decision Pathway for Optimization of Heart Failure Treatment.

According to Ensign et al. (2015), management of HF is complex and individualized, relying on appropriate education, patient-clinician management collaboration, and adequate follow-up to succeed in treatment. While many advances in treatment have occurred, IoM continues to identify an inconsistency between current treatment success rates and what researchers consider to be attainable (Viswanathan et al., 2012). Although many cardiology providers are aware of the most common guidelines, evidence-based research is constantly updated and changing. As previously highlighted, the leadership has supported the initiation of a standardized adaptable GDMT protocol due to the current gap in care delivery related to HF GDMT and absence of resources available for guidance when needed.

Key principles have been included to achieve optimal GDMT with references to common medications used for initiation and titration. Considering GDMT is influenced based upon the symptomatic assessment and progression of HF, the NYHA classification will be incorporated into the protocol to assure that the clinician's treatment plan optimally aligns with evidence-based recommendations (See Appendix C).

Education Tool

The outcomes of this project are important to the continuation of improvements for optimal HF management. Developing and implementing a heart failure educational tool within a cardiovascular clinic improves heart failure knowledge, self-care behaviors, morbidity and mortality, 30-day readmissions, and length of stay (Bryant, 2017). This tool will be used to refresh and inform the clinicians of the recent revisions surrounding GDMT of HF. To achieve the desired outcomes, a PowerPoint presentation will be used to deliver HF education for clinician/staff involvement (See Appendix D).

The material is adapted in conjunction with current AHA/ACA GDMT recommendations (ACC/AHA, 2017). According to the ACC/AGA/HFSA (2017), permissions such as multiple copies, modifications, alterations, or enhancement are not allowed without the express permission of the ACC. This PowerPoint tool is only used for education and the information included has not been revised. Based on their requirements for usage and distribution, it is assumed that consent does not need to be obtained at this time. The HF education topics include: definition/etiology, classification schemes, symptoms, common contributing factors, history and physical, pharmacologic management, and quality performance measures.

Chart Audit Tool

The chart audit data collection tool is significant for improving documentation compliance and adherence to optimal GDMT therapy (See Appendix E). Chart audits will serve to assure optimal CPT, adequate documentation, and performance measures are addressed. Weekly, the chart audit tool will be used to measure clinician performance, compliance, and documentation of current GDMT. The tool will also be used to review provider satisfactory documentation of MIPS quality benchmarks pre and post implementation. HF benchmarks

include: (a) HF symptom and activity assessment; (b) left ventricular ejection fraction assessment; (c) HF with LVSD: ACEI/ARB therapy; (d) HF with LVSD: beta blocker therapy

Data Collection Procedures

Data collection will begin with convenience sampling, using the three cardiology clinicians already employed as the population of interest. Among each clinician, five patient charts per day will be audited for compliance during the four-week implementation period with the remaining two weeks pre-assigned for data collection, analysis, and dissemination. This process will be integrated into the daily routine by the project lead. All personal identifiers will be excluded from data collection/auditing. This will be useful not only for maintaining provider and patient confidentiality, but also for analyzing the data in real time. This process will assist in preventing any delay or inaccessibility to the desired information at a future date. Once the total daily charts have been accumulated, the project lead will fill out a chart audit instrumentation. The auditing tool beneficially serves to record the findings, review the knowledge and skill competencies, and to evaluate compliance/adherence performance to GDMT. The cases that do not meet criteria or deemed questionable for compliance will be reserved for physician review.

In addition to collecting the quantitative data during chart auditing, any qualitative feedback pertaining to the knowledge, skills, attitude, or compliance satisfaction will be obtained. The fifth week of the project design will be designated for analyzing the data. Once the results have been calculated, they will be compared to pre and post implementation results and calculated to display the percentage of clinician compliance and the achievement of quality improvement benchmarks.

Project Timeline

The quality improvement project was introduced in March 2019. After a month of discussing the project, an agreement between an outpatient cardiology clinic and the project lead was obtained on April 3, 2019. Time for planning and preparation of all sections of the proposal began in July 2019 and will continue until October 2019. Approval for implementation is projected to be received by October 23, 2019. Once approval has been obtained, implementation will commence during the first week of the trimester beginning November 6, 2019 and will span over a four-week timeframe. All interventions of the DNP project will be postponed during the last week of November to account for the holiday; thereafter, the final week of implementation will resume. Data collection and analysis will begin during week five. The final week will be designated for disseminating the project results. The table below provides the timeline for project implementation through dissemination.

Project Timeline	
November - December	
Weeks	**Activities**
1 Implementation Begins: Nov. 6	Arrange room with projector for educational powerpoint session with staff
	Assembly of staff to review project timeline and steps for implementation
	Day 1: Perform chart audits collecting the pre-implementation data
	Day 2: GDMT Education: Clinician, manager, medical assistants
	Day 3: GDMT Protocol Training including EHR documentation tutorial: Clinicians
	Day 4: GDMT Protocol Training: Office Manager, Medical Assistants
	Day 5: Perform chart audit, monitoring compliance, adherence, knowledge of protocol usage
	Review progress with DNP clinical instructor, academic mentor, project mentor
	Establish next week's followup dates to obtain feedback (benefits/barriers) of GDMT protocol usage
2 Implementation Continues	Reserve dates/times for bi-weekly staff meetings to address questions/concerns
	Weekly monitoring of clinician/staff compliance, skills, attitude, and knowledge toward GDMT protocol
	Perform daily chart audits
	Review progress with DNP clinical instructor, academic mentor, project mentor
	Establish next week's followup dates to obtain feedback (benefits/barriers) of GDMT protocol usage
3 Implementation Continues	Weekly monitoring of clinician/staff compliance, skills, attitude, and knowledge toward GDMT protocol
	Perform daily chart audits
	Review progress with DNP clinical instructor, academic mentor, project mentor
	Establish next week's followup dates to obtain feedback (benefits/barriers) of GDMT protocol usage
Thanksgiving Holiday	
4 Last Week of Implementation	Bi-weekly staff meeting to address strengths, barriers, questions, and concerns
	Daily monitoring of clinician/staff compliance, skills, attitude, and knowledge toward GDMT protocol
	Perform Chart Audits
	Review progress with DNP clinical instructor, academic mentor, project mentor
	Establish next week's followup dates to obtain feedback (benefits/barriers) of GDMT protocol usage
5 Data Collection / Analysis Begins	Conduct Fisher's test to assess change in % compliance Pre/post data summarized in a 2x2 table with compliant/noncompliant headings
	Use feedback survey to summarize response data; sample size of 3
	Quality improvement comparisons before and after implementation 2x2 table to be used with pre/post headings that address adherence to performance benchmarks
	Review progress with DNP clinical instructor, academic mentor, project mentor
	Discussion with CEO/Cardiologist regarding the significance, limitations, sustainability, and dissemination of data amongst staff
6 Final Week	Arrange end of the week meeting with staff to discuss project outcomes
	Use feedback surveys to summarize response data; sample size of 3
	Conduct final meeting to disseminate DNP project outcomes Designate time/opportunity for group discussion
	Review progress with DNP clinical instructor, academic mentor, project mentor
	Revision and/or Dissemination based upon feedback

Ethics and Human Subjects Protection

The project lead has completed all the required modules in the Collaborative Institutional Training Initiative (CITI). This social-behavioral education course ensures knowledge related to human subjects' research and protection is understood. The clinic providers are mandated to participate in this DNP project; however, they will receive no extra compensation for their time. Participation is not a condition of employment but an effort to increase the quality of care provided. All materials analyzed such as the compliance audit will be void of identifying provider and patient information. The Health Insurance Portability and Accountability Act (HIPAA) standards will be abided and no personal health information will be extracted from the patient charts during chart auditing (US Department of Health and Human Services, 2013). All materials will be kept on a password-protected computer only the project lead has access to.

All clinical activities incorporated into this project are compliant with standard clinical procedures and consistent with established clinical guidelines. Since this is a quality improvement initiative, it is anticipated that the project will be exempt from the formal IRB process. Nonetheless, a completed project determination form will be submitted to TUN's School of Nursing per Touro University Nevada policy.

Plan for Evaluation

The project will be evaluated through the completion of chart audits to analyze the process measures that evidently support the progression toward improvement. The information collected will be compared to baseline chart audits on the percentage of clinician compliance, utilization, and adherence to current recommended therapies. According to Martin et al. (2007), measurements are significant for analyzing the outcomes and to identify what changes can be made that will lead to an improvement. Although no particular measurement evaluation tool is

recommended by the MFI, three key measures must be analyzed to appraise the totality of the quality improvement design; this process includes process, outcome, and balancing measures. A statistician referred by TUN's SoN faculty has been consulted to ensure the appropriate statistical measures are relevant for evaluating the project results. Based on the agreed upon statistical recommendations, data collection and analysis will be measured using the Fisher's exact test to assess the percentage of clinician compliance and for comparative quality improvement achievements before and after implementation.

Implications for Practice

Benjamin et al. (2018) reviews the incidence and occurrence of HF that continues to increase, accounting for an estimated 6.5 million adults in the U.S. With the increasing prevalence and mortality related to HF, many quality initiatives have identified the necessity to improve clinician adherence and utilization of GDMT (AHA, 2017). Generally, outpatient clinic studies have not been thoroughly investigated for adherence/compliance, thus many opportunities or threats may exist that can hinder optimal care (Hickling, Nazareth, & Rogers, 2001). If the barrier is unaddressed, patients suffer from increased morbidity/mortality.

Addressing the global increasing prevalence, morbidity, and mortality rates related to HF will require the recognition and utilization of current GDMT. Compliance and implementation remain an adversity of clinician application due to the complexities surrounding therapies. This confusing barrier impedes or delays clinicians from achieving target goals that have evidently shown to reduce the frequency of morbidity and mortality (Greene et al., 2018).

Data Analysis

The project was evaluated through the completion of chart audits to measure clinician compliance and utilization, and benchmark satisfaction of the standardized GDMT protocol. This data was compared to baseline chart audits taken place during the first week of commencement. Pre-implementation data was collected on the first day; then, following clinician education and GDMT protocol tutorial, randomized chart audits were again conducted on the last day of the first week.

The sum of charts audited throughout the four-week timeframe totaled 255, with 30 charts obtained during the first week of implementation. Collectively, the initial thirty charts attained were randomly selected amongst the clinicians and all patient and clinician identifiers were extracted for confidentiality. Result notes, telephone encounters, office visits, and past visits were also reviewed.

This project retained continuous strong support from leadership, providers, and medical assistants throughout the process. The resources necessary for successful implementation included an educational PowerPoint, GDMT protocol, and chart audit tool. Deliverables for this project included an evaluation of clinician utilization, provider feedback, attitude, and understanding, and a comparison of quality benchmark satisfaction pre and post implementation.

Compliance and Utilization

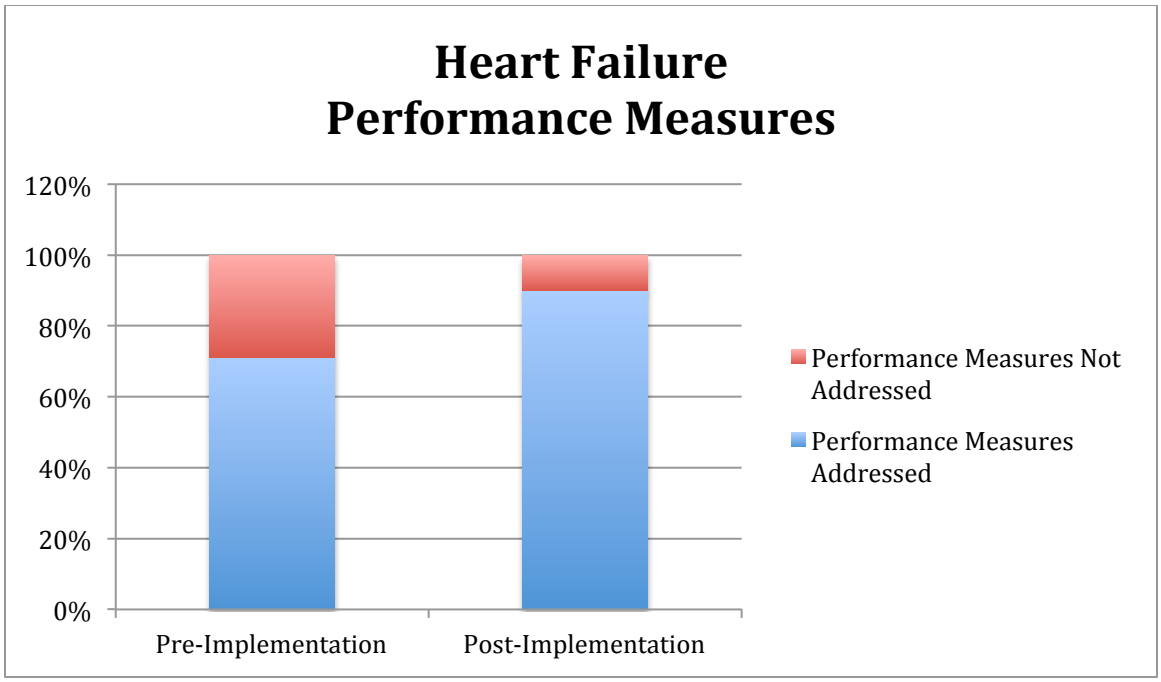
Results			
	Compliance	Noncompliance	***Marginal Row Totals***
Pre-implementation	21	9	30
Post-implementation	198	27	225
Marginal Column Totals	219	36	255 (Grand Total)

The GDMT protocol usage was evaluated to determine if it is related to or has an effect on clinician compliance to optimal HF therapies. According to Kim (2017), the chi-squared test and Fisher's exact test can assess for independence between two variables when the comparing groups are independent and not correlated. Whereas the chi-square test evaluates the independency and/or relationship amongst larger sample sizes, it only provides an estimated approximation because the sample distribution is equal to the theoretical chi-squared distribution (Kim, 2018). Furthermore, while the chi-squared test relies on an approximation, Fisher's test is one of exact tests. In support of this rationale, Sylvia (2018) also recommends testing for categorical data with sample sizes less than five using the fisher's exact test. This test analyzes the difference in proportion displayed in a 2x2 table.

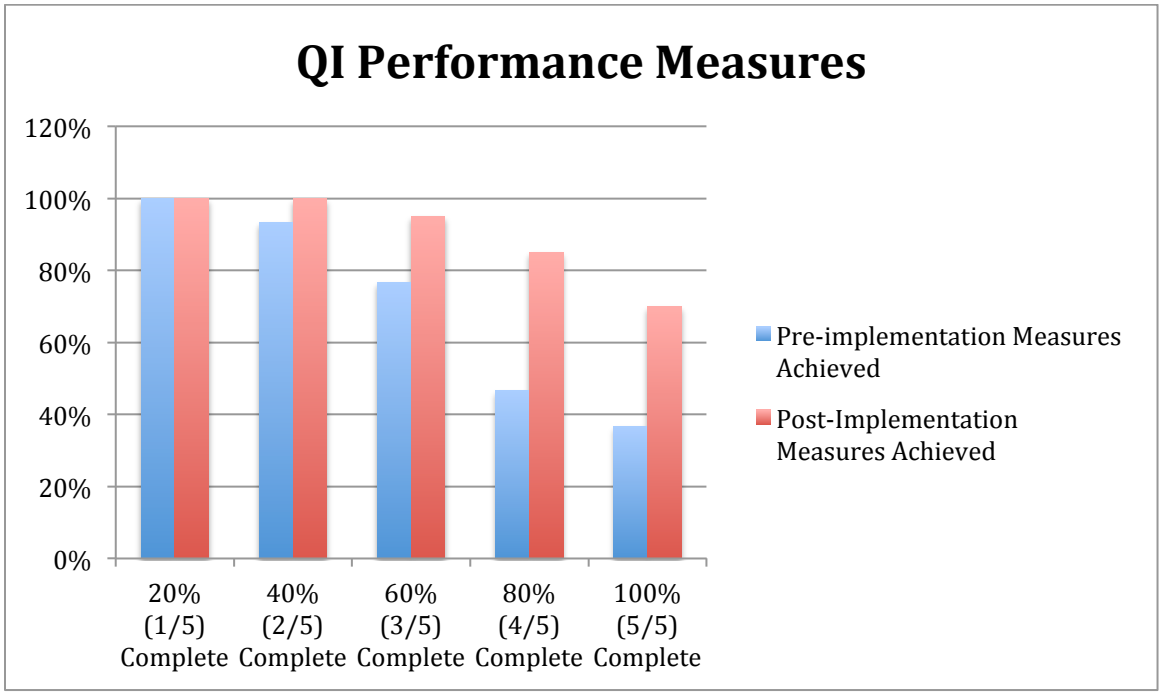
In consideration to the small sample size evaluated throughout the implementation phase, the Fischer's exact test was chosen for this DNP project to test the relationship between compliance and noncompliance pre- and post-implementation. When determining the statistical relationship among the two, an alpha of 0.05 was used as the cutoff for significance. In this analysis, the p-value equated to 0.0208, portraying the result as significant.

Clinician QI Benchmarks

When analyzing the clinician documentation associated with the five quality improvement benchmarks notated in the chart audit tool, of the initial thirty charts audited, the totality of heart failure performance addressed measured 71% (21/30) clinician satisfaction. Despite having only completed three days of heart failure review, GDMT protocol tutorial, and EHR refresher, there was an improvement of 19% over the four-week implementation.



Further breakdown of this data displayed 100% (30/30) met 20% adherence, 93.33% (28/30) reached 40% compliance, 76.67% (23/30) reached 60%, 46.67% (14/30) met 80% adherence, and only 36.67% (11/30) provided 100% satisfaction.



The results were surprising considering the short timeframe, small sample size, and larger amount of cumulative chart audited. Post implementation, satisfactory rates increased immensely within each measure, equating to an overall 90% compliance of performance measures addressed. The table above displays a rise in compliance and percentage. Comparing the pre-post performance measure documentation, 100% (225/225) of charts achieved at least 40%, 95% (213/225) satisfied 60%, 85% (191/225) attained 80%, and 70% (158/225) provided 100%

Discussion of the Findings and Significance

Throughout each week, the clinician's knowledge, attitude, and feedback were monitored for any comments or concerns. Agreed upon by all recipients, these evaluations occurred at the beginning and end of each week with intermittent days designated for as needed follow-ups. This provided an opportunity to explore all stakeholders' understanding and satisfaction. Although the protocol was found to be initially confusing, after continual usage, all clinicians expressed an increasing interest to refer to the protocol resource more often than not. Throughout the four-week implementation, no hindrances were apparent and the progression of the DNP design remained on track throughout.

Each week, the staff's attitude and perception were examined toward the GDMT protocol. One clinician noted that prior to introducing the protocol, this individual admitted that although the theoretical and clinical experience have guided his clinical therapy decisions, some of the previous treatments he chose may had been derived from outdated research; therefore, he found the HF education was pleasantly informative. This individual agreed that the implementation of this QI project has been deemed very beneficial, resourceful, and easily adaptable. One clinician recommended expanding the education days to be divided over weeks

for the data to be absorbed, retained, and translated into practice incrementally.

When addressing the overall response of the DNP project design, the feedback from the staff explored whether he/she felt the HF GDMT protocol design, education process, and/or purpose improved efficiency and workflow. Based upon their responses, this protocol development has unified many clinician care plans, but the four-week timeframe of implementation limits dissemination only toward this project site. To overcome this restriction, it was advised that a larger sample set over an extended time period might be a more feasible approach to generalize the results to the overall population.

The outcomes of this project are significant to the sustainability and advancement of heart failure therapies at this outpatient cardiology clinic. To achieve the desired goals, several goals previously mentioned were evaluated during the implementation timeframe.

Heart Failure Education

One of the project objectives aimed to promote the expansion of knowledge and increase compliance by cardiology clinicians by providing education regarding current GDMT using a PowerPoint education tool. By equipping clinicians with an educational resource, this creates the potential to beneficially impact patient outcomes by reducing morbidity and mortality (Bryant, 2017). In this project, the incorporation of the PowerPoint resource served as a guide to ensure continuity of optimal clinical practice therapies, while also promoting a more unified inter- and multi-disciplinary collaboration.

Clinical practice guidelines recommend using the same consistent target dosing therapies if possible and/or tolerated (Marti et al., 2018). However, clinicians continue to face the dilemma when choosing amongst numerous alternatives when decision-making. Reserving educational days was significant for refreshing and/or updating the healthcare team with the

current evidence-based practices surrounding heart failure therapies.

The continuing educational days that were established during the first week of implementation was embraced by all recipients and noted to be informative. To ensure education and documentation was adequate, clinician and staff evaluations were conducted during and post-implementation to determine the efficacy of the PowerPoint tool. The clinicians reported that by reviewing current research, the project impacted their quality of care as follows:

- Professional growth of clinicians via continuing education.
- Recognition of not just clinicians, but also medical assistants as key players in the delivery of quality care.
- Increased clinicians' knowledge on the complexity of heart failure therapies.
- Enhanced interdisciplinary communication between clinicians, leadership, and medical assistants.
- Improved involvement in clinic and patient care education.
- Rise in confidence with decision-making care approaches overall.

The clinic's staff acknowledged that the educational PowerPoint and GDMT protocol has influenced their care deliverance to align more so with optimal evidence-based research. The follow-ups that occurred weekly were valuable to review any necessary misunderstandings or confusion, while also allowing an opportunity for any comments or recommendations for improvement. All clinicians continue to support all further efforts that will maintain sustainability by encouraging a routine continuing education program for staff refresher in the near future. O'Connor (2019) also references the necessity to include the addition of continuing education and possible certifications to maintain sustainability.

GDMT Protocol

CMS establishes quality performances measures used in their merit-based incentive program that are used for comparative evaluation against national benchmarks. Despite a larger post sample size than initial baseline, the totality of each performance measures increased greatly. Uncovered during the analysis of the chart audits, these outcome measures that are related to clinician management of patient' symptoms, their functional level of activity assessment, education provided, and compliance toward recommended heart failure therapy medications, were addressed and documented for completion. The documentation of the performance benchmark satisfactory rates provided an avenue for objectively measuring the details associated with clinician compliance and utilization. The outcome percentages described above exemplify that even in a short-time frame, the usage of the GDMT protocol can enhance care deliverance. Furthermore, the improved satisfaction rates surrounding provider' utilization reveal the protocol to be an advantageous resource that can hope to assist with clinician sustainability within the cardiology clinic for future undertakings.

The findings of the analysis coincided with the hypothesized project outcome that aimed to optimize care deliverance evident by 100% clinician utilization of protocol. The Fisher's exact test was used to confirm an impactful relationship between care deliverance and the beneficial use of a HF protocol implemented into practice. Prior to the conduction of the QI project, this outpatient cardiology clinic did not have an evaluation approach to ensure optimal quality care was being delivered. The documented usage of the GDMT protocol resulted in a 19% rise in clinician compliance and satisfaction, increasing from 71% to 90% overall. Reflecting upon the increase of performance measures from pre to post-implementation, along with the relational significance verified using the Fisher's exact test, it is speculated that the

clinician utilization of the GDMT supports and enables the expansion, promotion, and maintenance of optimal HF care that was sought to also beneficially impact patient and clinic performance care scores.

Chart Audits

Clinician application of the GDMT was assessed through the evaluation of weekly chart audits. The objective of these clinician audits was to ensure 100% adherence and utilization of the standardized protocol. This data was compared to baseline audits on the percentage of national benchmark satisfaction pre and post-implementation. The evaluation of chart audits, both before and after implementation, uncovered that a majority of clinicians are unaware of the performance benchmarks and may not be consistently adhering to optimal evidence practices. The substandard pre-implementation measures revealed an area for educational and care improvement. Assessment of the chart audits also found that inconsistency with performance measure satisfaction places patient outcomes at risk if heart failure therapies are outdated, ignored, or missed.

Although the goal for 100% was not met, based upon the increased performance measures and satisfactory rates that resulted from 71% to 90% compliance, it is encouraging that there may be a positive association with the implementation of the protocol and care deliverance. The analysis of the Fisher's exact test supports this theory by signifying an association amongst the two relations. It is hypothesized that the improved percentage may be contributed by the combination of education, EHR refresher, examination of specific benchmark details, and continuous encouragement and support portrayed from all staff. Therefore, these variables will be important for the sustainability of the process moving forward.

Implications for Nursing

The findings of the DNP project was successful, revealing an opportunity to optimize clinician and patient therapy, and exemplifies the potential capability and contributions to advance healthcare innovation. Clinical scholarship and analytics is useful for the production of a consolidated GDMT protocol and is a key essential to enhance compliance and adherence to therapy recommendations within an outpatient setting. There is a strong likelihood this initiative will be sustainable following the completion of this DNP project. Several strengths, challenges, and inferences were recognized.

Strengths and Challenges

The strengths of this QI project was comprised of various contributions that led to the completion and success of implementation. The main strength that was evident was the support from the leadership and clinicians associated at the outpatient cardiology clinic. The assistance, communication, and encouragement from the entire staff allowed the implementation plan to be accomplished without issues or concerns. An advantageous element that guided the GDMT protocol creation, educational platform, and tool development can be contributed toward the continuous and constructive communication from the recipient providers. With their input, support, and involvement, planning could be easily tailored and personalized toward their interest and recommendations; by personalizing the project design, this increased the tendency for compliance, increased utilization, encouraged an open communication rapport for criticism, and allowed the whole QI process to be enjoyable from beginning to end. Along with the readily available evidence-based research, the support from the academic and clinical mentors was essential for proper guidance throughout the process and helped to assure that no stakeholder was endangered or at risk for any harmful violations throughout this process.

Although planning and implementation was considered "smooth and easy" by all stakeholders, the complexity surrounding HF therapy decision-making did create minor difficulties and confusion upon initial use. One major challenge correlated to the EHR documentation tutorial that was analytically useful to evaluate compliance and satisfaction of the performance benchmarks. Forthcoming, it was advised that supplementary information days should be optional with designated education dates pre-established during non-work day. Correspondingly, the condensed timeframe of implementation over a four-week timespan was limited to the clinicians' scheduled availabilities, which restricted the interest for additional follow-ups to take place; this challenge could have been advantageous for feedback analysis and/or clarification. Nonetheless, the successes and challenges impacting this QI project can be overall contributed to the extensive resources, referrals, and recommendations available.

Alignment with Published Literature

O'Connor (2019) highlights the importance for optimizing adherence to HF recommendations that have shown to not only reduce morbidity and mortality, but also improve quality of life and functional status. In May 2019, the ACC published "A Call to Action for the Heart Failure Team" to encourage the healthcare community to develop a new optimal broad-based GDMT model (O' Connor, 2019). Additionally, recent reports from the Change the Management of Patients with Heart Failure (CHAMP-HF) indicate an opportunity to optimize therapy only if GDMT implementation was further applied by all healthcare multidisciplinary specialties (Greene et al., 2018).

This DNP project aligns with the related literature by fostering a collaborative approach through a standard consolidated HF model that unifies clinician care deliverance and improves patient outcomes. Leadership and staff have verbalized the desire to sustain continuation of the

protocol following completion of the DNP project. O'Connor (2019) proclaims that in order to address this problem on the macro scale of healthcare, it will take commitment from all multidisciplinary stakeholders to achieve these long-term goals for reducing morbidity and mortality, while increasing quality outcomes. Based on the developed protocol and education materials, it is hopeful that the long-term initiation of this process will aid with continuity and become an additional resource for clinician care reference.

Limitations of the Project

Considering this is the first quality improvement initiative conducted at this outpatient cardiology, it was anticipated that numerous adversities were likely to be encountered and learned from. These limitations associated this project occurred during the project design, data recruitment and collection, and data analysis.

Project Design Barriers

Designing the project plan for the cardiology clinic, wherein a template to follow did not previously exist, limitations were likely to occur. When forming the steps of the interventional approach, several noticeable limitations influenced the plans for an ideal quality improvement approach. Those challenges revolved around the work place, education, and complexities surrounding GDMT protocol development.

Work Place. While conducting an initial assessment of the outpatient cardiology clinic, it was challenging to evaluate the clinician's application and adherence to evidence-based GDMT recommendations without any prior definitive quality data available for comparison against local or national performance standards. Based on the lack of education and/or absent resources available to assure compliance, this stimulated the premise to develop a protocol that aided with facilitation that could also track the improvement efforts long-term. The lacking

policies or handbook that typically defines work place responsibilities created uncertainties in role accountability between all stakeholders to perform the desired behaviors. Furthermore, although it was allotted that no funding would be compensated for any participant involvement, nor would an employee conduct or status of employment be placed at risk, mandatory participation could create fears, refusal, or limit the honesty of feedback due to uncertainties of being reprimanded.

Education. Successfully influencing a clinic wide change will be dependent upon the educational tools and clinician receptiveness. Although instructional days were reserved and training materials were given, the tools provided were lengthy and did not account for the health literacy, educational topics, or provision of education. Furthermore, the resourceful PowerPoint provided in this project was generalized and not formatted to support various types of decision-making by different providers. Thus, misunderstanding or inattentiveness to detail may occur or altered behavioral changes that mitigated fears toward accepting change.

In future initiatives, an educational program should be structured according to an evidence-based framework that can aid with facilitation and retention (Gagliardi et al., 2011). The tailored approach should include a closer examination of the organizational and external implementation context in order to better facilitate targeted application of implementation strategies (Van Spall et al., 2016). This purpose is to identify and define features that facilitate guidelines use and examine the elements such as adaptability, validity, applicability, or communication surrounding suboptimal care. These possible interventions could include effective utilization of the EMR systems, multidisciplinary teams, clinical pathways, and multifaceted interventions that include audit and feedback (Shanbhag et al., 2018).

Complexity of GDMT. Limitations can also be inferred based upon the relations amongst the complexity of GDMT therapies and limited educational time reserved. One of the major challenges involved enhancing the clinician's knowledge of the current optimal therapies through the consolidation of a standardized GDMT protocol that is easily adaptable, comprehendible, and resourceful. Through discussion with the clinicians, leadership, and staff, the members felt the protocol should: (a) cover the necessary topics involving decisive pharmacologic choices and alternatives of GDMT, (b) formatted in a visually appealing manner for quick referral when necessary, (c) resourceful by reminding and improving documentation, so that performance benchmarks are met.

Data Recruitment Barriers

Encouragingly, the staff noted that the project carries the potential to influence positive changes that impact clinicians, staff, clinic, and patient outcomes. However, the timing and schedule, sample population, and auditing constraints were major limitations identified during data recruitment and collection.

Time and Schedule. Commencement began on November 6, 2019 and spanned over four-weeks. The allotted timeframe appeared to be a common theme notated during staff follow-ups, indicating that implementation was very short and fast-paced. This was also evidently observed when attempts to schedule dates and times for obtaining feedback posed minor difficulties, especially if attempting to arrange before or after demanding operational days. Additionally, the period of implementation occurred during the Thanksgiving holiday, when clinician and patient population sample may be limited; this also limits the validity of the results in determining the change in percentage caused by the QI design or another external cause.

Lastly, the suspension of the project for one week to account for the holiday warranted an informative refresher that questions the participant's readiness, utilization, and adherence.

Population sample. Using a convenience sample approach, the participating stakeholders were derived from the available employee personnel residing at the local clinic; this limited the population of interest to only three clinicians. When selecting the population of interest, minimal consideration was taken into account involving each clinician's educational background, age, or clinical experience. More so, the randomization of chart selection creates difficulties when attempting to identify any additional variables regarding who or what is contributing to the substandard scores of optimal compliance, utilization, and adherence to current evidence-based practices.

Chart Audit. Mentioned above, the timeframe allotted for conduction of the DNP project was limited. Hence, the amount of charts that were audited prior to commencement in comparison to post-implementation had a huge numerical difference. Whereas only thirty randomized charts were chosen for baseline data obtained during the first week, the following three weeks permitted a significant of charts to be more thoroughly evaluated during and post-implementation. This vast marginal difference before and after interventions may question the reliability and accuracy of results.

Data Analysis Barriers

Determinants of the project analysis were based upon the completion of the project objectives and goals. The summative evaluation of data were measured based on the metrics of clinician compliance and utilization, feedback, and benchmark satisfaction of the standardized GDMT protocol. During data analysis, three limitations were recognized.

Performance Standards. There is a strong indication that the project design is accepted, more efficient, and has optimized clinician care deliverance. However, without any clinic history or ability for quantitative comparison against previous performance standards, the results of this project are encouraging, yet inconclusive. Processes and performance benchmarks are key measurement tools, but comparison of the data analysis against expected results is necessary to fully evaluate the practice change. Statistical significance of the workplace, workflow, and measurement standards help represent the maintenance of organizational change that aligns with other database benchmarks. However, without any previous data available, comparison is limited to this study.

Feedback Evaluation. Data interpretation variations are possible due to the informal and summative verbal feedback attained during each follow-up. Based on the positive feedback and workload responses during each follow-up assessment, the intent to adopt this QI project for performance and workflow efficiency improvement is likely. However, measuring voluntary self-reporting based on verbal feedback still presents bias. The limited amount of designated educational training days creates difficulties when evaluating the progression and enhancement for clinician improvement. During follow-up visits, wishful thinking or an over estimation of one's competencies, knowledge, skills, and attitudes is conceivable, influencing the validity of results as an improvement.

QI Testing. Caution should be taken when formulating generalized conclusions that are based solely on one local and small sample sized population of interest, whose outcome measurements were based on one statistical indicator. Although the Fisher's exact test identifies the significance of the statistical comparison before and after chart audits, it does not reveal anything about the size or magnitude of the difference in this project (Connelly, 2016).

Optimistically, the results from the Fischer's test does support the potential for future change as a significant improvement, but conducting this clinic's first QI design during a short timespan with a limited population merely opens an avenue for research opportunities forthcoming. More so, because differences in data can frequently happen by chance variation, this justifies the necessity to repeat the study to determine if the difference is greater than chance alone. Hence, additional quality testing should be included to ensure change has improved for long-term sustainability.

Dissemination

Plans for dissemination of this project will occur through the development of a PowerPoint presentation. On February 14, 2020, the results will be presented online at the Touro University of Nevada with hopes for potential continuation of the initiative following completion. Prior to the presentation, it will be reviewed by the clinical, academic, and project mentors, and revised accordingly. In hopes of publication, the findings will also be submitted to the Journal of Nurse Practitioner, which is a peer-reviewed journal for that concentrates on the nursing education, educational research, and policies.

Correspondingly, sharing my efforts amongst my professional colleagues, other disciplines, and the general public are important ways to improve outcomes. Hence, the results and conclusions will also be discussed amongst the leadership team, providers, and staff at the outpatient cardiology clinic, supporting further efforts for long-term sustainment. Subsequently, additional dissemination plans will also be submitted electronically to the Doctors of Nursing Practice online repository; this archive contains a collection of non peer-reviewed publications that will aid in sharing amongst the scholarly and consumer community. By doing so, the post will foster a collaborative engagement with practice partners, display the professional impact on improvement outcomes, and support the growth and foundation for a sustainable change in future

practice (DNP Inc., 2015). Finally, the clinic's cardiology providers have agreed to aid in the dissemination process by sharing the results locally with their fellow colleagues and peers residing in Las Vegas. This paves an opportunity to impact the micro, mezzo, and macro levels of this community, while unifying collaborative relationships in the healthcare population.

Sustainability

There is a strong probability that the purpose, goals, and objectives of this QI project will continue following completion. As previously mentioned, the amount of support from the entire staff was surprising, yet astounding. Based upon the last staff meeting, the inferences suggested for future QI endeavors should expand beyond a four-week timeframe and could include additional clinicians and/or multidisciplinary collaborations. The positive responses pertaining to the HF PowerPoint prompts a potential necessity for additional educational days in the future. One clinician recommended that since clinical practice therapies are complex and continually changing, holding quarterly or bi-annually continuing education days would help reinforce and enhance the knowledge and understanding surrounding optimal HF GDMT. The Agency for Healthcare Research and Quality (AHRQ, 2013) also supports this recommendation by notating that education should be ongoing and consistently reinforced in order to improve patient and quality improvement initiatives.

Despite the initial confusions regarding utilization and understanding of the protocol, the transition throughout the steps of implementation progressed efficiently. The optimistic and enthusiastic responses obtained during each weekly staff follow-up supports an achievement of the project question that aimed to promote consistency, adaptation, and utilization of optimal HF treatment, while also fostering improved patient and clinic outcomes.

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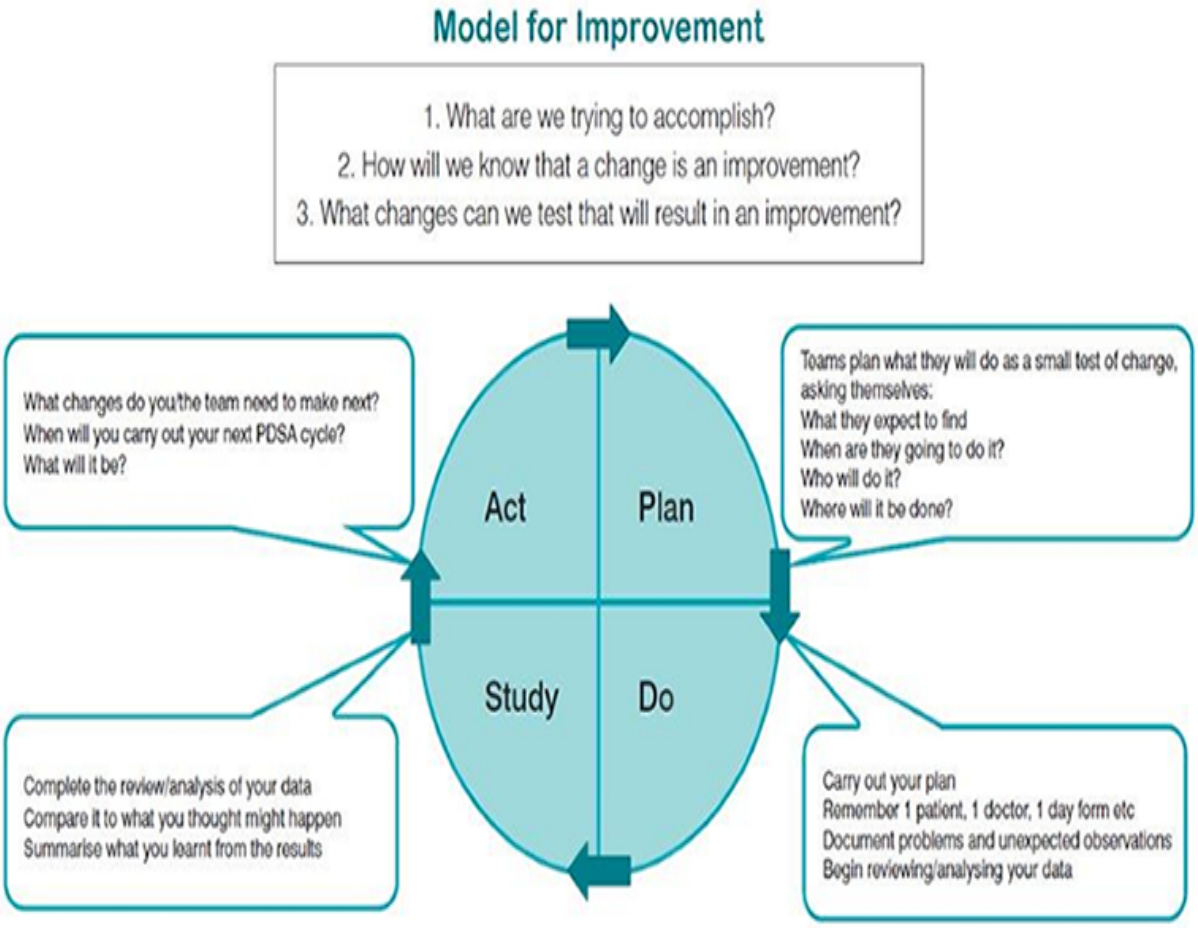
Appendix A. Model for Improvement



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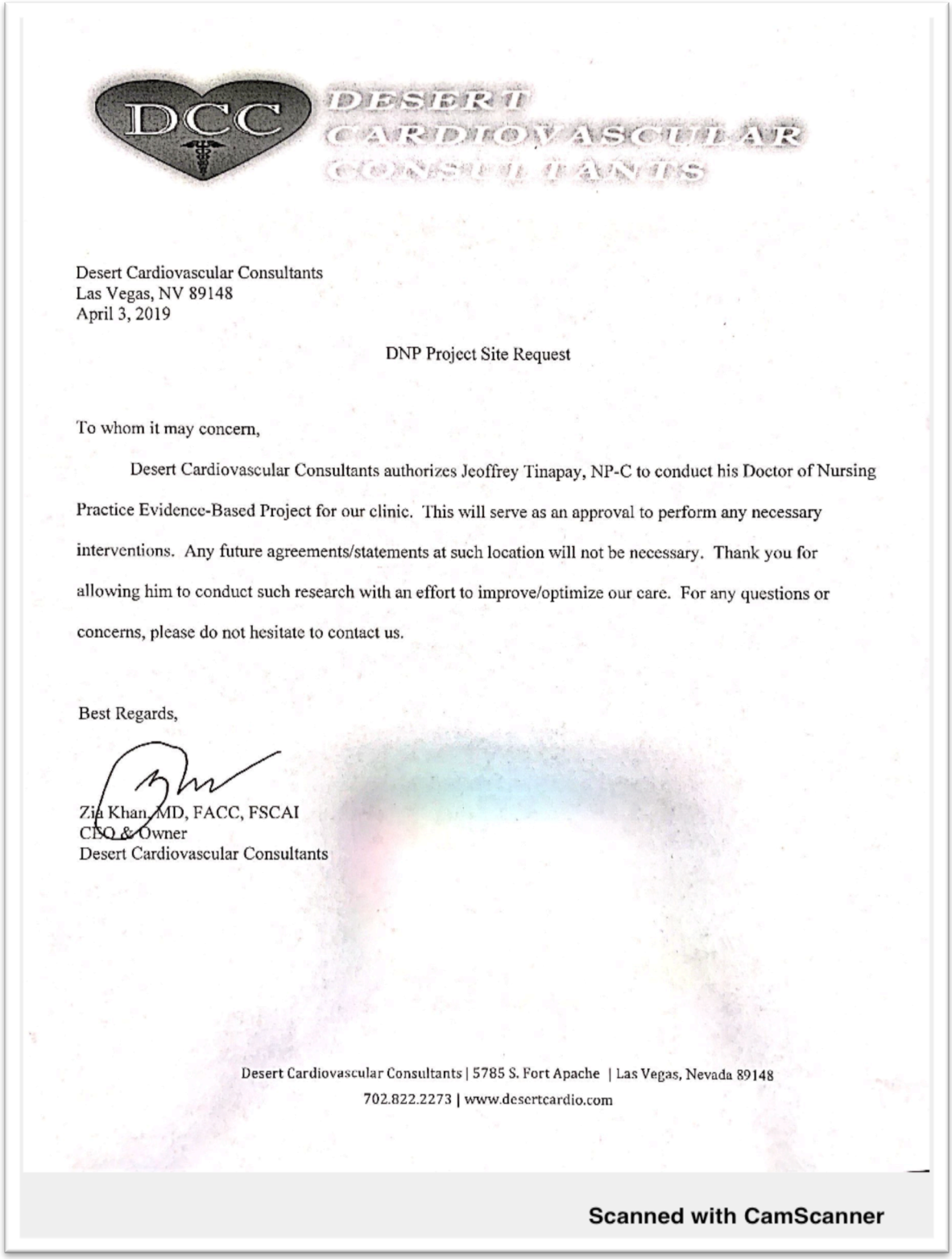
Appendix B. Letter of Support



DESERT CARDIOVASCULAR CONSULTANTS

Desert Cardiovascular Consultants
Las Vegas, NV 89148
April 3, 2019

DNP Project Site Request

To whom it may concern,

Desert Cardiovascular Consultants authorizes Jeoffrey Tinapay, NP-C to conduct his Doctor of Nursing Practice Evidence-Based Project for our clinic. This will serve as an approval to perform any necessary interventions. Any future agreements/statements at such location will not be necessary. Thank you for allowing him to conduct such research with an effort to improve/optimize our care. For any questions or concerns, please do not hesitate to contact us.

Best Regards,

Zia Khan, MD, FACC, FSCAI
CEO & Owner
Desert Cardiovascular Consultants

Desert Cardiovascular Consultants | 5785 S. Fort Apache | Las Vegas, Nevada 89148
702.822.2273 | www.desertcardio.com

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Appendix C. GDMT Protocol

Desert Cardiovascular Consultants

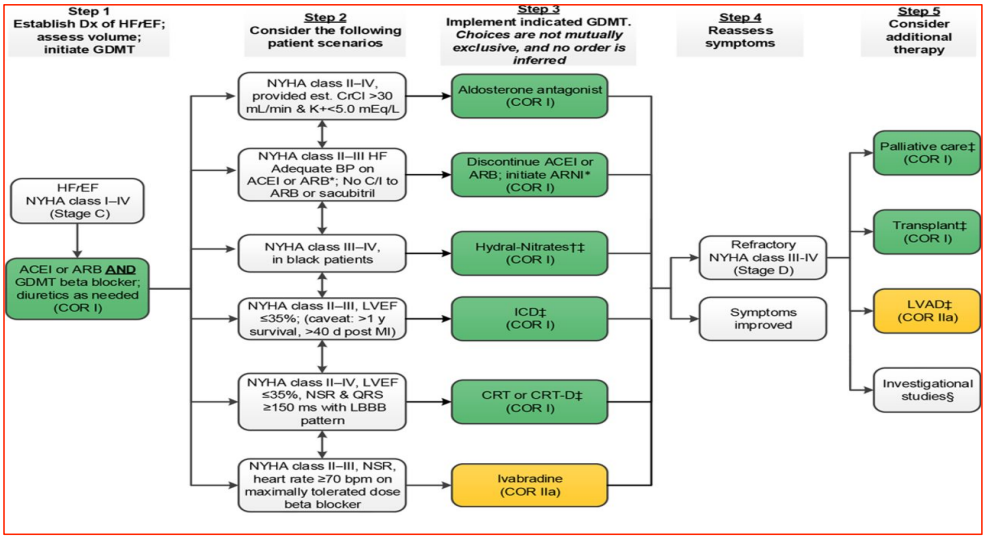
Heart Failure Protocol

Decision Support Tool: Refer to the appropriate page for assistance

1. **Conduct History and Physical Examination**
2. **Primary/Preventative Interventions for suspected Heart failure** **Pg. 2**
   - **Symptom and Assessment Considerations**
   - **Risk Screening**
   - **Laboratory / Radiology Review**
3. **Establish progression/diagnosis of HFrEF or HFpEF**
4. **Implement indicated Guideline Directed Medical Therapy.**
5. **Establish Follow-up date as directed.**

Refer to indicated Pharmacologic treatment pathway for GDMT

NYHA Class (None), ACC/AHA Stage A **Pg. 3**
NYHA Class I, ACC/AHA Stage B **Pg. 4**
NYHA Class II-IV, ACC/HA Stage C (LVSD ≤ 40%) **Pg. 5**
NYHA Class II-IV, ACC/HA Stage C (LVEF ≥ 40%) **Pg. 8**



Adapted from '2017 ACC Expert Consensus Decision Pathway for Optimization of Heart Failure Treatment,' by Yancy et al., 2018, Journal of the ACC, Published by Elsevier

The HF protocol does not override the clinician's responsibility of healthcare professionals to make decisions appropriate to the circumstance of the individual

Symptoms

Common Symptoms	Assessment Parameters
Shortness of Breath **Decreased Urination** **Chest Pain or Heaviness** **Edema** (Feet, hands, abdomen, sacrum, general) **Weight Increase/Decrease** (2-3 lbs. in 24 hours or 3 lbs. in 1 week) **Dry, hacking cough** (white, foamy) **Increased Weakness or Fatigue** **Confusion, Agitation, Restlessness**	**Vital Signs** **Daily Wt, Abdominal Girth** **Heart Sounds** (S3, S4, dysrhythmia, murmurs) **Lung sounds** (Wheezing, crackles, rhonchi, or diminished) **Orthopnea** Paroxysmal Nocturnal Dyspnea (# of pillows needed to breathe lying down) **Mental Status Assessment** (Psychosocial coping, depression, anxiety)

Risk Screening	Laboratory Considerations	Study Considerations
Hypertension	CBC, CMP, BMP	EKG
Renal Dysfunction	BNP, HgbA1C, UA	Echocardiogram
Diabetes	Renal / Thyroid Panel	Stress Test
Pulmonary Disease	Lipid / Liver Panel	CXR, CT, MRI, U/S
Ischemic Disease	Iron Studies	U/S, TCD

Stage A, NYHA (None) Recommendations:
1. HTN and HLD should be controlled to lower the risk of HF. *(LOE: A)*
2 Obesity, DM, tobacco, and/or cardiotoxic agents, should be controlled or avoided. *(LOE: C)*
3. In patients with idiopathic dilated cardiomyopathy, a 3-generational family history should be obtained to aid in establishing the diagnosis of familial cardiomyopathy. *LOE: C)*

2017 ACC HF Optimization Principles
Initiate & Switch
Titration to Targeted Dose
Referral to Multidisciplinary
Care Coordination for team-based
Address Adherence challenges
Specific Cohorts Considerations
Cost of Care Consideration
Manage increasing complexities
Manage Comorbidities
Palliative/Hospice Care

NYHA Functional Classification
Class I: No Sx, No limits on Activity
Class II: Mild limitations,/SoB with activity
Class III: Moderate symptoms and limitations. SoB with slight activity
Class IV: Severe Sx / limitations. SoB at rest

ACC/AHA Stages of HF
Stage A: At high risk, No structural dz or Sx
Stage B: Structural Dz but without Sx of HF
Stage C: Structural Dz with hx or current Sx
Stage D: Refractory- specialized intervention

Adapted from '2017 Pathways for Optimization of Heart Failure Treatment for Optimization of Heart Failure Treatment,' by Yancy et al., 2017, Journal of the ACC, Published by Elsevier

All recommendations with Stage A HF also apply to those with Stage B HF

NYHA Class I, Stage B

Stage B, NYHA Class I Recommendations:
In all patients with a recent or remote history of MI or ACS and reduced EF, ACE inhibitors should be used to prevent symptomatic HF and reduce mortality. In patients intolerant of ACE inhibitors, ARBs are appropriate unless contraindicated. (COE/LOE: 1A)

In all patients with a recent or remote history of MI or ACS and reduced EF, evidence-based beta blockers should be used to reduce mortality. (COE/LOE: 1B)

In all patients with a recent or remote history of MI or ACS, statins should be used to prevent symptomatic HF and cardiovascular events. (COE/LOE: 1A)

In patients with structural cardiac abnormalities, including LV hypertrophy, in the absence of a history of MI or ACS, blood pressure should be controlled in accordance with clinical practice guidelines for hypertension to prevent symptomatic HF. (COE/LOE: 1A)

ACE inhibitors should be used with a reduced EF to prevent symptomatic HF (COE/LOE: 1A)

Beta-blockers should be used with a reduced EF to prevent symptomatic HF (IC)

To prevent sudden death, placement of an ICD is reasonable in patients with asymptomatic ischemic cardiomyopathy who are at least 40 days post-MI, LVEF of 30% or less, have reasonable expectation of survival with a good functional status > 1 year (COE/LOE: 1IB)

Nondihydropyridine calcium channel blockers with negative inotropic effects may be harmful in asymptomatic patients with low LVEF and no symptoms of HF after MI. (COE/LOE: IIIC)

Achieving Optimal GDMT
Up titrate in small increments to target dose or highest tolerated dose
Certain patients may require more monitoring of VS, labs during titration
Discourage sudden D/c of meds without discussion with clinicians.
Consider temporary adjustments during acute episodes of noncardiac illness
Educate PT, family, and other clinicians about expected benefits/treatment plan

Diuretic Drugs Commonly Used

Loop	Initial	Max
Bumetanide	0.5-1.0 qd/BID	10 mg
Furosemide	20-40 mg qd/BID	600 mg
Torsemide	10-20 mg QD	200 mg

Thiazide	Initial	Max
Chlorothiazide	250-500 mg qd/BID	1000 mg
Chlorthalidone	12.5 – 25 mg QD	100 mg
Hydrochlorothiazide	25 mg qd/BID	200 mg
Indapamide	2.5 mg QD	5 mg
Metolazone	2.5 mg QD	50 mg

K-Sparing	Initial	Max
Amiloride	5 mg QD	20 mg
Spirinolactone	12.5-25 mg QD	50 mg
Triamterene	50-75 mg BID	200 mg

All recommendations with Stage A/B HF also apply to those with Stage C HF

Pharmacologic Treatment for HFrEF Continued

Digoxin: Recommendations
Digoxin can be beneficial, unless contraindicated, to decrease hospitalizations. (COR/LOE: IIB)

Anticoagulation: Recommendations
Patients with chronic HF with permanent/persistent/paroxysmal AF and an additional risk factor for cardioembolic stroke (history of hypertension, diabetes mellitus, previous stroke or transient ischemic attack, or ≥75 years of age) should receive chronic anticoagulant therapy. (IA)

The selection of an anticoagulant agent (warfarin, dabigatran, apixaban, or rivaroxaban) for permanent/persistent/paroxysmal AF should be individualized (IC)

Chronic anticoagulation is reasonable for patients with chronic HF who have permanent/persistent/paroxysmal AF but without additional risks for cardioembolic stroke. (IIB)

Anticoagulation is not recommended in patients with chronic HFrEF without AF, a prior thromboembolic event, or a cardioembolic source. (IIIB)

Statin: Recommendations
Statins are not beneficial as adjunctive therapy when prescribed solely for HF (IIIA)

Omega-3 Fatty Acids: Recommendations
Supplementation is reasonable to use as adjunctive therapy.

Other Drugs: Recommendations
Nutritional supplements in treatment are not recommended. (IIIb)
Hormonal Therapies other than to correct deficiencies are not recommended. (IIIc)
Long-term positive inotrope not recommended and may be harmful, except as palliative. (IIIc)
Calcium channel-blocking drugs are not recommended as routine treatment. (IIIA)

Drugs Commonly Used for HFrEF

ACE I		
Drug	**Initial**	**Maximum**
Captopril	6.25 mg TID	50 mg TID
Enalapril	2.5 mg BID	10-20 mg BID
Fosinopril	5-10 mg QD	40 mg qd
Lisinopril	2.5-5 mg QD	20-40 mg qd
Quinapril	5 mg BID	20 mg qd
Ramapril	1.25–2.5 mg qd	10 mg qd
Trandolapril	1 mg qd	4 mg qd

ARBs		
Drug	**Initial**	**Maximum**
Candesartan	4-8 mg qd	32 mg qd
Losartan	25-50 mg qd	50-150 mg qd
Valsartan	20-40 mg BID	160 mg BID

Beta blockers		
Drug	**Initial**	**Maximum**
Bisoprolol	1.25 mg QD	10 mg QD
Carvedilol	3.125 mg BID	50 mg BID
Carvedilol CR	10 mg QD	80 mg QD
Metoprolol Succinate	12.5-25 mg QD	200 mg QD

Hydralazine/Isosorbide Dinitrate		
Drug	**Initial**	**Maximum**
Fixed-Dose Combo	37.5/20 mg TID	75/40 mg TID
Hydralazine/ Isosorbide Dinitrate	25-50 mg TID/QID	300 mg TID/QID

All recommendations with Stage A/B HF also apply to those with Stage C HF

Pharmacologic Treatment for LVSD <40% (HFrEF)

Stage C, NYHA I-IV

Diuretic: Recommendations
Diuretics are recommended in patients with HFrEF who have evidence of fluid retention, unless contraindicated, to improve symptoms. (COR/LOE: IC)

ACE Inhibitors: Recommendations
ACE inhibitors are recommended in patients with HFrEF and current or prior symptoms, unless contraindicated, to reduce morbidity and mortality. (COR/LOE: IA)

ARBs: Recommendations
ARBs are recommended in patients with HFrEF with current or prior symptoms who are ACE inhibitor intolerant, unless contraindicated, to reduce morbidity and mortality. (COR/LOE: IA)

- ARBs are reasonable to reduce morbidity and mortality as alternatives to ACE inhibitors as first-line therapy for patients with HFrEF, especially for patients already taking ARBs for other indications, unless contraindicated
- Addition of an ARB may be considered in persistently symptomatic patients with HFrEF who are already being treated with an ACE inhibitor and a beta blocker in whom an aldosterone antagonist is not indicated or tolerated. (COR/LOE: IIA)
- Routine combined use of an ACE inhibitor, ARB, and aldosterone antagonist is potentially harmful for patients with HFrEF. (COR/LOE: III/A)

Beta Blockers: Recommendations
Use of 1 of the 3 beta blockers proven to reduce mortality (eg, bisoprolol, carvedilol, and sustained-release metoprolol succinate) is recommended for all patients with current or prior symptoms of HFrEF, unless contraindicated, to reduce morbidity and mortality. (COR/LOE: IA)

Aldosterone Receptor Antagonists: Recommendations
Aldosterone receptor antagonist are recommended to reduce morbidity/mortality with NYHA class II–IV HF; LVEF ≤ 35%, unless contraindicated; following an acute MI; hx of DM.

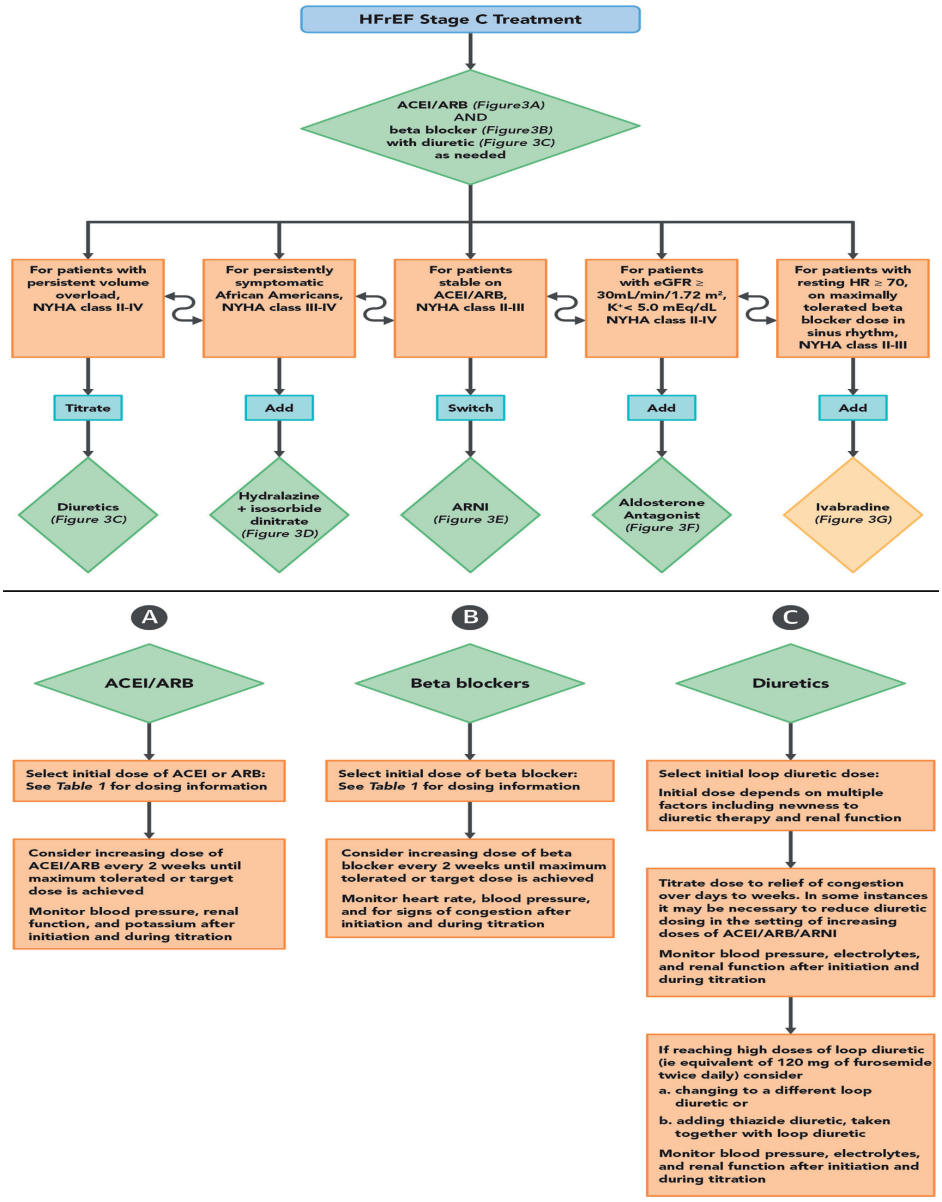
Careful monitoring of potassium, renal function, and diuretic dosing should be monitored to minimize risk of hyperkalemia and renal insufficiency. (COR/LOE: IA)

- Creatinine should be 2.5 mg/dL or less in men or 2.0 mg/dL or less in women (or estimated glomerular filtration rate >30 mL/min/1.73 m2), and
- Potassium should be less than 5.0 mEq/L.

Hydralazine and Isosorbide dinitrate: Recommendations
The combination of hydralazine and isosorbide dinitrate is recommended to reduce morbidity and mortality for patients self-described as African Americans with NYHA class III–IV HFrEF receiving optimal therapy with ACE inhibitors and beta blockers, unless contraindicated. (IA)

A combination of hydralazine and isosorbide dinitrate can be useful to reduce morbidity or mortality in patients with current or prior symptomatic HFrEF who cannot be given an ACE inhibitor or ARB because of drug intolerance, hypotension, or renal insufficiency, unless contraindicated. (IIb).

Pharmacology Algorithm



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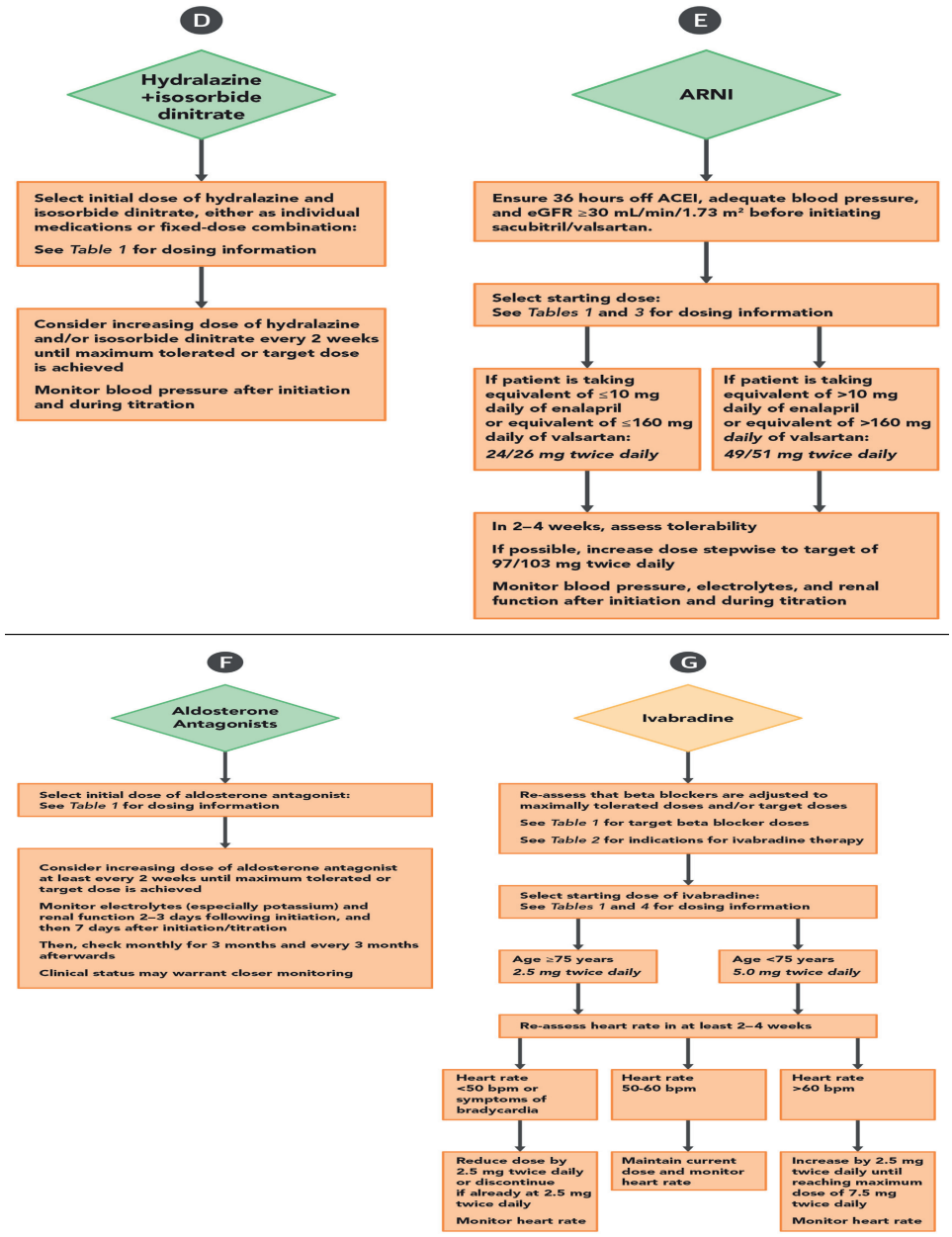


Adapted from '2017 ACC Expert Consensus Decision Pathway for Optimization of Heart Failure Treatment,' by Yancy et al., 2018, Journal of the ACC, Published by Elsevier

All recommendations with Stage A/B HF also apply to those with Stage C HF

Treatment for EF >40% (HFpEF)

Systolic and diastolic blood pressure should be controlled in patients with HFpEF in accordance with published clinical practice guidelines to prevent morbidity. (IB)

Coronary revascularization is reasonable in patients with CAD in whom symptoms (angina) or demonstrable myocardial ischemia is judged to be having an adverse effect on symptomatic HFpEF despite GDMT. (IIaC)

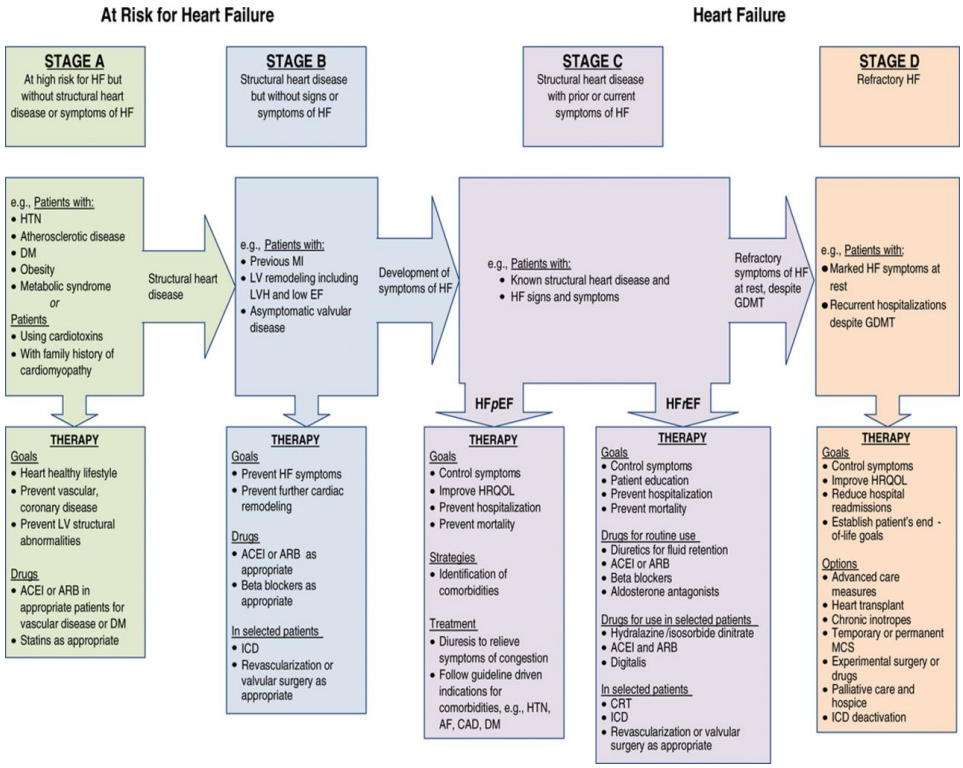
Management of AF according to published clinical practice guidelines in patients with HFpEF is reasonable to improve symptomatic HF. (IIaC)

The use of beta-blocking agents, ACE inhibitors, and ARBs in patients with hypertension is reasonable to control blood pressure in patients with HFpEF. (IIC)

The use of ARBs might be considered to decrease hospitalizations (IIB)

Routine use of nutritional supplements is not recommended for patients. (IIIC)

Summary of Treatment Algorithm for HFrEF Treatment



Adapted from '2013 ACCF/AHA Guideline for the Management of Heart Failure,' by Yancy et al., 2013, Published by Journal of the ACC, Copyright ACC/AHA, Inc

Key Points

Ten Considerations to Improve Adherence	Ten Principles to Guide Optimal Therapy
Capitalize on adherence opportunities (In-hospital./pre-discharge)	Target doses are associated with best outcomes
Consider the Patient's Perspective (Start with goals of therapy, use aids)	If target doses of all relevant therapies are limited, address factors limiting GDMT first
Simplify Medication regimens when possible	Optimal Beta Blocker target doses have best effect on HFrEF outcomes
Consider costs and access	Not all HR meds impact outcomes equally
Communicate with other clinicians (Utilize Electronic Health Records)	African-Americans experience further benefit from the use of Hyd/ISDN therapy
Educate with practical, friendly information (Medications, Disease, Self-Monitoring)	Primary device therapy and CRT should only be considered after 3-6 mo. of optimal doses
Recommend tools that support adherence Pill Boxes, Alarms, Reminders	Symptomatic Congestion should be treated with diuretics irrespective of other therapies
Consider behavioral supports	Optimize Team Based Care
Anticipate Problems – communicate plan	Tolerability and side effects in part depend on how and when medication prescribed
Monitor adherence and target patient's at risk	Focus on both the symptoms and functional capacity as well as improving cardiac function

Adapted from '2017 ACC Expert Consensus Decision Pathway for Optimization of Heart Failure Treatment,' by Yancy et al., 2018, Journal of the ACC, Published by Elsevier

Follow-up Visit

Symptoms
Laboratory
Review

Are Symptoms Stable (NYHA Class)
Pulse Assessment Rate/Rhythm
Weight/Fluid Assessment
Renal. Liver. Sodium. Potassium. Etc. Stable?

Medication Review

ACEI/ARBs at maximum tolerated dose?
Beta-blocker at maximum tolerated dose?
MRA/AA at maximum tolerated dose?

Documentation

Hx documented, including pertinent past medical history, social history, family, and review of systems?

Was the physical examination appropriate for the problem or diagnoses?

NYHA/Stage classification correctly identified Patient Education Provided?

Diet, Exercise, Weight Monitoring?

Other

Optimal Management of co-morbidities (hypertension, hyperlipidemia, diabetes)

Annual Visit Established

Depression/Anxiety/ETOH Screened

Smoking cessation, if appropriate

Flu/Pneumococcal Vaccine

Appendix D. PowerPoint Presentation

Optimizing HF GDMT in Cardiology

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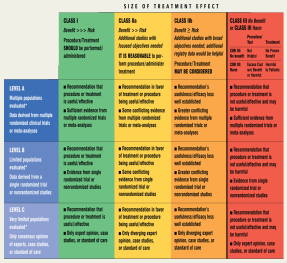
Citation

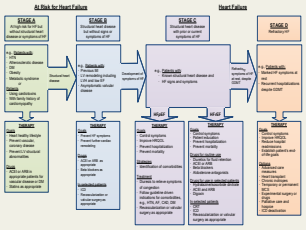
This slide set is adapted from the 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure. E-Published on April, 201, available at: https://doi.org/10.1016/j.jacc.2017.04.025

The full-text guidelines are also available on the following Web sites:
American College of Cardiology: www.acc.org
American Heart Association: professional.heart.org
Heart Failure Society of America: www.hfsa.org

Classification of Recommendations and Levels of Evidence



Stages, Phenotypes and Treatment of HF



Outline

- Heart Failure Overview
- Classification Levels
- Symptoms
- Common Contributing Factors
- History and Physical Examination
- Pharmacologic therapies
- Quality Metrics/Performance Measures

What is Heart Failure?

- Congestive Heart Failure means that your heart is not pumping blood as well as it should.
- Body is not getting enough oxygen rich blood it needs to function properly.
- Fluid starts to build up in your body and may cause symptoms such as shortness of breathe, weakness, fatigue and swollen legs, feet and/ or abdomen

What is Heart Failure? (cont.)

- CHF is a condition where the heart doesn't pump as well as it did.
- The heart muscle may be weakened as a result of a heart attack, high blood pressure, a viral infection, diabetes, obesity, excessive alcohol use or smoking
- There are many signs and symptoms of HF. Some of these are listed on the following slide to help understand the disease process and recognize early warning signs.

Definition of Heart Failure

Classification	Ejection Fraction	Description
I. Heart Failure with Reduced Ejection Fraction (HFrEF)	≤40%	Also referred to as systolic HF. Randomized clinical trials have mainly enrolled patients with HFrEF and it is only in these patients that efficacious therapies have been demonstrated to date.
II. Heart Failure with Preserved Ejection Fraction (HFpEF)	≥50%	Also referred to as diastolic HF. Several different criteria have been used to further define HFpEF. The diagnosis of HFpEF is challenging because it is largely one of excluding other potential noncardiac causes of symptoms suggestive of HF. To date, efficacious therapies have not been identified.
a. HFpEF; Borderline	41% to 49%	These patients fall into a borderline or intermediate group. Their characteristics, treatment patterns, and outcomes appear similar to those of patient with HFpEF.
b. HFpEF; Improved	>40%	It has been recognized that a subset of patients with HFpEF previously had HF-rEF. These patients with improvement or recovery in EF may be clinically distinct from those with persistently preserved or reduced EF. Further research is needed to better characterize these patients.

Symptoms

- Shortness of breath (dyspnea) with or without activity
- Persistent coughing or wheezing
- Swelling (edema) in your legs, ankles, feet or abdomen
- Rapid or irregular heartbeat
- Lack of appetite or possible nausea
- Altered Mental Status, confusion, or delirium

Common Contributing Factors

- High blood pressure (hypertension)
- Heart Attack
- Coronary Artery Disease
- Diabetes
- Obesity
- Alcohol
- Irregular heartbeats
- Sleep Apnea
- Smoking
- Infection

Classification of HF

ACCF/AHA Stages of HF		NYHA Functional Classification	
A	At high risk for HF but without structural heart disease or symptoms of HF.	None	
B	Structural heart disease but without signs or symptoms of HF.	I	No limitation of physical activity. Ordinary physical activity does not cause symptoms of HF.
C	Structural heart disease with prior or current symptoms of HF.	I	No limitation of physical activity. Ordinary physical activity does not cause symptoms of HF.
		II	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in symptoms of HF.
		III	Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes symptoms of HF.
D	Refractory HF requiring specialized interventions.	IV	Unable to carry on any physical activity without symptoms of HF, or symptoms of HF at rest.

History and Physical Examination

History and Physical Evaluation

A thorough history and physical examination should be obtained/performed in patients presenting with HF to identify cardiac and noncardiac disorders or behaviors that might cause or accelerate the development or progression of HF.

Volume status and vital signs should be assessed at each patient encounter. This includes serial assessment of weight, as well as estimates of jugular venous pressure and the presence of peripheral edema or orthopnea.

Diagnostic Testing

Diagnostic Tests

Initial laboratory evaluation of patients presenting with HF should include complete blood count, urinalysis, serum electrolytes (including calcium and magnesium), blood urea nitrogen, serum creatinine, glucose, fasting lipid profile, liver function tests, and thyroid-stimulating hormone.

Serial monitoring, when indicated, should include serum electrolytes and renal function.

Diagnostic Tests (cont.)

A 12-lead ECG should be performed initially on all patients presenting with HF.

Screening for hemochromatosis or HIV is reasonable in selected patients who present with HF.

Diagnostic tests for rheumatologic diseases, amyloidosis, or pheochromocytoma are reasonable in patients presenting with HF in whom there is a clinical suspicion of these diseases.

Recommendations for Noninvasive Imaging

Recommendation	COR	LOE
Patients with suspected, acute, or new-onset HF should undergo a chest x-ray	I	C
A 2-dimensional echocardiogram with Doppler should be performed for initial evaluation of HF	I	C
Repeat measurement of EF is useful in patients with HF who have had a significant change in clinical status or received treatment that might affect cardiac function, or for consideration of device therapy	I	C
Noninvasive imaging to detect myocardial ischemia and viability is reasonable in HF and CAD	IIa	C
Viability assessment is reasonable before revascularization in HF patients with CAD	IIa	B
Radionuclide ventriculography or MRI can be useful to assess LVEF and volume	IIa	C
MRI is reasonable when assessing myocardial infiltration or scar	IIa	B
Routine repeat measurement of LV function assessment should not be performed	III: No Benefit	B

Prevention of Heart Failure

- Prevention of initial injury
  - Treat hyperlipidemia
  - Treat diastolic/systolic hypertension
  - Smoking Cessation/Counseling
- Prevention of further injury
  - Thrombolyitic/angioplasty in acute myocardial infarction
  - ACEI and/or Beta Blocker
- Prevention of post-injury deterioration
  - ACEI

Pharmacologic Treatment Recommendations

Recommendations for Stage A

I IIa IIb III
A

Hypertension and lipid disorders should be controlled in accordance with contemporary guidelines to lower the risk of HF.

I IIa IIb III
C

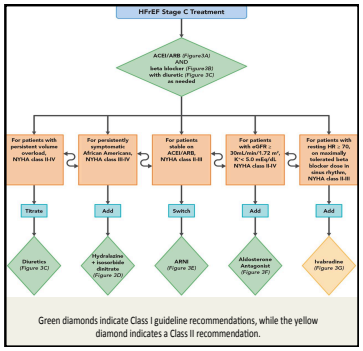
Other conditions that may lead to or contribute to HF, such as obesity, diabetes mellitus, tobacco use, and known cardiotoxic agents, should be controlled or avoided.

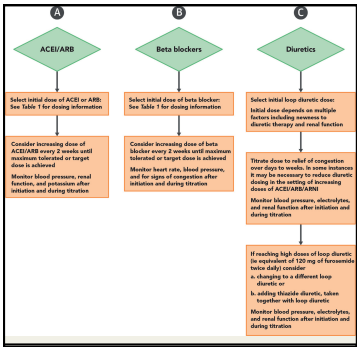
Get echo in patients with family history or are using cardiotoxic medication

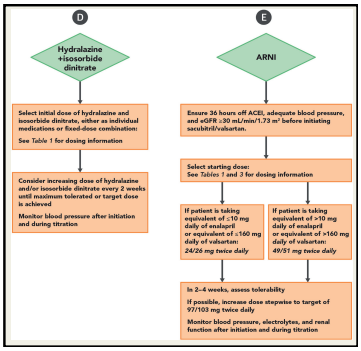
Use ACEI in patients with hyperlipidemia, diabetes, or hypertension

Recommendations for Treatment of Stage B HF

Recommendations	COR	LOE
In patients with a history of MI and reduced EF, ACE inhibitors or ARBs should be used to prevent HF	I	A
In patients with MI and reduced EF, evidence-based beta blockers should be used to prevent HF	I	B
In patients with MI, statins should be used to prevent HF	I	A
Blood pressure should be controlled to prevent symptomatic HF	I	A
ACE inhibitors should be used in all patients with a reduced EF to prevent HF	I	A
Beta blockers should be used in all patients with a reduced EF to prevent HF	I	C
An ICD is reasonable in patients with asymptomatic ischemic cardiomyopathy who are at least 40 d post-MI, have an LVEF ≤30%, and on GDMT	IIa	B
Nondihydropyridine calcium channel blockers may be harmful in patients with low LVEF	III: Harm	C







Pharmacological Therapy for Management of Stage C HFrEF

Recommendations	COR	LOE
Diuretics		
Diuretics are recommended in patients with HFrEF with fluid retention	I	C
ACE Inhibitors		
ACE inhibitors are recommended for all patients with HFrEF	I	A
ARBs		
ARBs are recommended in patients with HFrEF who are ACE inhibitor intolerant	I	A
ARBs are reasonable as alternatives to ACE inhibitor as first line therapy in HFrEF	IIa	A
The addition of an ARB may be considered in persistently symptomatic patients with HFrEF on GDMT	IIb	A
Routine *combined* use of an ACE inhibitor, ARB, and aldosterone antagonist is potentially harmful	III: Harm	C

Pharmacological Therapy for Management of Stage C HFrEF (cont.)

Recommendations	COR	LOE
Beta Blockers		
Use of 1 of the 3 beta blockers proven to reduce mortality is recommended for all stable patients	I	A
Aldosterone Antagonists		
Aldosterone receptor antagonists are recommended in patients with NYHA class II-IV HF who have LVEF ≤35%	I	A
Aldosterone receptor antagonists are recommended in patients following an acute MI who have LVEF ≤40% with symptoms of HF or DM	I	B
Inappropriate use of aldosterone receptor antagonists may be harmful	III: Harm	B
Hydralazine and Isosorbide Dinitrate		
The combination of hydralazine and isosorbide dinitrate is recommended for African-Americans, with NYHA class III–IV HFrEF on GDMT	I	A
A combination of hydralazine and isosorbide dinitrate can be useful in patients with HFrEF who cannot be given ACE inhibitors or ARBs	IIa	B

Pharmacologic Therapy for Management of Stage C HFrEF (cont.)

Recommendations	COR	LOE
Digoxin		
Digoxin can be beneficial in patients with HFrEF	IIa	B
Anticoagulation		
Patients with chronic HF with permanent/persistent/paroxysmal AF and an additional risk factor for cardioembolic stroke should receive chronic anticoagulant therapy*	I	A
The selection of an anticoagulant agent should be individualized	I	C
Chronic anticoagulation is reasonable for patients with chronic HF who have permanent/persistent/paroxysmal AF but without an additional risk factor for cardioembolic stroke*	IIa	B
Anticoagulation is not recommended in patients with chronic HFrEF without AF, prior thromboembolic event, or a cardioembolic source	III: No Benefit	B
Statins		
Statins are not beneficial as adjunctive therapy when prescribed solely for HF	III: No Benefit	A
Omega-3 Fatty Acids		
Omega-3 PUFA supplementation is reasonable to use as adjunctive therapy in HFrEF or HFpEF patients	IIa	B

Pharmacological Therapy for Management of Stage C HF*r*EF (cont.)

Recommendations	COR	LOE
Other Drugs		
Nutritional supplements as treatment for HF are not recommended in HFrEF	III: No Benefit	B
Hormonal therapies other than to replete deficiencies are not recommended in HFrEF	III: No Benefit	C
Drugs known to adversely affect the clinical status of patients with HFrEF are potentially harmful and should be avoided or withdrawn	III: Harm	B
Long-term use of an infusion of a positive inotropic drug is not recommended and may be harmful except as palliation	III: Harm	C
Calcium Channel Blockers		
Calcium channel blocking drugs are not recommended as routine in HFrEF	III: No Benefit	A

Drugs Commonly Used

Drug	Initial Daily Dose(s)	Maximum Doses(s)	Mean Doses Achieved in Clinical Trials
ACE Inhibitors			
Captopril	6.25 mg 3 times	50 mg 3 times	122.7 mg/d (421)
Enalapril	2.5 mg twice	10 to 20 mg twice	16.6 mg/d (412)
Fosinopril	5 to 10 mg once	40 mg once	----------
Lisinopril	2.5 to 5 mg once	20 to 40 mg once	32.5 to 35.0 mg/d (444)
Perindopril	2 mg once	8 to 16 mg once	----------
Quinapril	5 mg twice	20 mg twice	----------
Ramipril	1.25 to 2.5 mg once	10 mg once	----------
Trandolapril	1 mg once	4 mg once	----------
ARBs			
Candesartan	4 to 8 mg once	32 mg once	24 mg/d (419)
Losartan	25 to 50 mg once	50 to 150 mg once	129 mg/d (420)
Valsartan	20 to 40 mg twice	160 mg twice	254 mg/d (109)
Aldosterone Antagonists			
Spironolactone	12.5 to 25 mg once	25 mg once or twice	26 mg/d (424)
Eplerenone	25 mg once	50 mg once	42.6 mg/d (445)

Drugs Commonly Used (cont.)

Drug	Initial Daily Dose(s)	Maximum Doses(s)	Mean Doses Achieved in Clinical Trials
Beta Blockers			
Bisoprolol	1.25 mg once	10 mg once	8.6 mg/d (118)
Carvedilol	3.125 mg twice	50 mg twice	37 mg/d (446)
Carvedilol CR	10 mg once	80 mg once	----------
Metoprolol succinate extended release (metoprolol CR/XL)	12.5 to 25 mg once	200 mg once	159 mg/d (447)
Hydralazine & Isosorbide Dinitrate			
Fixed dose combination (423)	37.5 mg hydralazine/ 20 mg isosorbide dinitrate 3 times daily	75 mg hydralazine/ 40 mg isosorbide dinitrate 3 times daily	~175 mg hydralazine/90 mg isosorbide dinitrate daily
Hydralazine and isosorbide dinitrate (448)	Hydralazine: 25 to 50 mg, 3 or 4 times daily and isorsorbide dinitrate 20 to 30 mg 3 or 4 times daily	Hydralazine: 300 mg daily in divided doses and isosorbide dinitrate 120 mg daily in divided doses	----------

Treatment of HF*p*EF

Recommendations	COR	LOE
Systolic and diastolic blood pressure should be controlled according to published clinical practice guidelines	I	B
Diuretics should be used for relief of symptoms due to volume overload	I	C
Coronary revascularization for patients with CAD in whom angina or demonstrable myocardial ischemia is present despite GDMT	IIa	C
Management of AF according to published clinical practice guidelines for HFpEF to improve symptomatic HF	IIa	C
Use of beta-blocking agents, ACE inhibitors, and ARBs for hypertension in HFpEF	IIa	C
ARBs might be considered to decrease hospitalizations in HFpEF	IIb	B
Nutritional supplementation is not recommended in HFpEF	III: No Benefit	C

Quality Metrics
Performance Measures

Guideline Recommended Practice

In general, patients with LV dysfunction or HF present to the healthcare provider in 1 of 3 ways:

1. **Decreased exercise tolerance.**
   - Complaints of tolerance reduction due to dyspnea and/or fatigue on exertion.
2. **Fluid retention.**
   - Complaints of leg or abdominal swelling, difficulty lying flat, or weight gain as primary or only symptom.
3. **With no symptoms or symptoms of another cardiac or non-cardiac disorder.**

Assessing Symptom and Activity Level

Recording NYHA Class should occur at each office visit to quantify the degree of functional limitation imposed by HF.

New York Heart Association (NYHA) Classifications

NYHA Class	Symptoms
I	No limitation of physical activity. Ordinary physical activity (e.g., walking , climbing stairs) does not cause symptoms of HF.
II	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in symptoms of HF.
III	Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity, e.g. walking short distances (20-100 yards), causes symptoms of HF.
IV	Unable to carry on any physical activity without symptoms of HF, or, symptoms of HF at rest.

Adapted from the 2013 Guidelines for the Diagnoses and Management of Heart Failure in Adults. Journal of the American College of Cardiology, 2013; 62: 150-239. Retrieved from: https://www.acc.org/tools-and-practice-support/clinical-toolkits/heart-failure-practice-solutions

Performance Measure Reporting

What's Being Measured

Percentage of all patient visits, ≥ 18 years of age with a diagnosis of heart failure, which have documented quantitative results of current activity level and clinical symptoms evaluations.

How to Satisfy this Measure

Document the results of both the *current activity level* and *clinical symptoms* of your HF patients (≥ 18 years) at each office visit.

Exceptions are made for those with documentation of medical reason(s) for not evaluating both components (eg, severe cognitive or functional impairment).

Adapted from the 2013 Guidelines for the Diagnoses and Management of Heart Failure in Adults. Journal of the American College of Cardiology, 2013; 62: 150-239. Retrieved from: https://www.acc.org/tools-and-practice-support/clinical-toolkits/heart-failure-practice-solutions

Performance Measurement Set (cont.)

Measure	Description*	Care Setting	Level of Measurement
1. LVEF assessment	Percentage of patients aged ≥18 y with a diagnosis of HF for whom the quantitative or qualitative results of a recent or prior (any time in the past) LVEF assessment is documented within a 12 mo period	Outpatient	Individual practitioner
2. LVEF assessment	Percentage of patients aged ≥18 y with a principal discharge diagnosis of HF with documentation in the hospital record of the results of an LVEF assessment that was performed either before arrival or during hospitalization, OR documentation in the hospital record that LVEF assessment is planned for after discharge	Inpatient	• Individual practitioner • Facility
3. Symptom and activity assessment	Percentage of patient visits for those patients aged ≥18 y with a diagnosis of HF with quantitative results of an evaluation of both current level of activity and clinical symptoms documented	Outpatient	Individual practitioner

Adapted from the 2013 Guidelines for the Diagnoses and Management of Heart Failure in Adults. Journal of the American College of Cardiology, 2013; 62: 150-239. Retrieved from: https://www.acc.org/tools-and-practice-support/clinical-toolkits/heart-failure-practice-solutions

Performance Measurement Set (cont.)

Measure	Description*	Care Setting	Level of Measurement
4. Symptom management†	Percentage of patient visits for those patients aged ≥18 y with a diagnosis of HF and with quantitative results of an evaluation of both level of activity AND clinical symptoms documented in which patient symptoms have improved or remained consistent with treatment goals since last assessment OR patient symptoms have demonstrated clinically important deterioration since last assessment with a documented plan of care	Outpatient	Individual practitioner
5. Patient self-care education†‡	Percentage of patients aged ≥18 y with a diagnosis of HF who were provided with self-care education on ≥3 elements of education during ≥1 visits within a 12 mo period	Outpatient	Individual practitioner
6. Beta-blocker therapy for LVSD (outpatient and inpatient setting)	Percentage of patients aged ≥18 y with a diagnosis of HF with a current or prior LVEF <40% who were prescribed beta-blocker therapy with bisoprolol, carvedilol, or sustained release metoprolol succinate either within a 12 mo period when seen in the outpatient setting or at hospital discharge	Inpatient and Outpatient	Individual practitioner Facility

Adapted from the 2013 Guidelines for the Diagnoses and Management of Heart Failure in Adults. Journal of the American College of Cardiology, 2013; 62: 150-239. Retrieved from: https://www.acc.org/tools-and-practice-support/clinical-toolkits/heart-failure-practice-solutions

Performance Measurement Set (cont.)

Measure	Description*	Care Setting	Level of Measurement
7. ACE Inhibitor or ARB Therapy for LVSD (outpatient and inpatient setting)	Percentage of patients aged ≥18 y with a diagnosis of HF with a current or prior LVEF <40% who were prescribed ACE inhibitor or ARB therapy either within a 12 mo period when seen in the outpatient setting or at hospital discharge	Inpatient and Outpatient	Individual practitioner Facility
8. Counseling regarding ICD implantation for patients with LVSD on combination medical therapy†‡	Percentage of patients aged ≥18 y with a diagnosis of HF with current LVEF ≤35% despite ACE inhibitor/ARB and beta-blocker therapy for at least 3 mo who were counseled regarding ICD implantation as a treatment option for the prophylaxis of sudden death	Outpatient	Individual practitioner
9. Post-discharge appointment for heart failure patients	Percentage of patients, regardless of age, discharged from an inpatient facility to ambulatory care or home health care with a principal discharge diagnosis of HF for whom a follow-up appointment was scheduled and documented including location, date and time for a follow-up office visit, or home health visit (as specified)	Inpatient	Facility

Adapted from the 2013 Guidelines for the Diagnoses and Management of Heart Failure in Adults: Journal of the American College of Cardiology, 2013, 62: 150-239. Retrieved from: https://www.acc.org/tools-and-practice-support/clinical-toolkits/heart-failure-practice-solutions

Conclusions

- Evidence-based guideline directed diagnosis, evaluation and therapy should be the mainstay for all patients with HF.
- Effective implementation of guideline-directed best quality care reduces mortality, improves QOL and preserves health care resources.
- Ongoing research is needed to answer the remaining questions including: prevention, nonpharmacological therapy of HF including dietary adjustments, treatment of HF*p*EF, management of hospitalized HF, effective reduction in HF readmissions, and more precise use of device-based therapy, among others.

10 Principles for Successful Treatment of HF

How to implement GDMT...	How to address challenges with...	How to manage...
I. Initiate & Switch Treatment algorithm for guideline-directed medical therapy including novel therapies (*Figure 2* and *3*)	**III. Referral** Triggers for referral to HF specialist (*Table 6*)	**VIII. Increasing Complexity** Ten pathophysiologic targets in HFrEF and treatments (*Table 15*)
II. Titration Target doses of select guideline-directed heart failure therapy (*Tables 1, 2, 3, 4, 5*)	**IV. Care Coordination** Essential skills for a HF team (*Table 7*)	Ten principles and actions to guide optimal therapy
Considerations for monitoring	Infrastructure for team-based HF care (*Table 8*)	**IX. Comorbidities** Common cardiac and non-cardiac comorbidities with suggested actions (*Table 16*)
	V. Adherence Causes of non-adherence (*Table 9*)	**X. Palliative/Hospice Care** Seven principles and actions to consider regarding palliative care
	Interventions for adherence (*Table 10, 11*)	
	VI. Specific Patient Cohorts Evidence based recommendations and assessment of risk for special cohorts: African Americans; older adults; frail (*Table 12*)	
	VII. Cost of Care Strategies to reduce cost (*Table 13*)	
	Helpful information for completion of prior	

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Appendix E. Chart Auditing Tool

Desert Cardiovascular Consultants

Chart Audit Tool

New/Established Patient: _____ Reviewer Initials: _____

Consultation Date: _____ Last Visit: _____ Date of Audit: _____

NYHA/HF Stage: _____

Brief medical history/ diagnosis: _____

Clinical Symptoms: _____

Age: _____ Sex: M or F BP: _____ HR: _____ O2%: _____

Initial Labs/Diagnostics Performed: _____

Left Ventricular function assessed:_____ Method: ☐ Echocardiogram ☐ Cardiac catheterization ☐ MUGA sca

Were the following GDMT medications prescribed?	Y	N	Not Indicated	Agent Prescribed	Contraindication		Comments/ Reasons for Not Prescribing
					Y	N	
Ace inhibitor	☐	☐	☐		☐	☐	
ARB (if ACE inhibitor intolerant or in addition to ACE inhibitor)	☐	☐	☐		☐	☐	
Beta-Blocker	☐	☐	☐		☐	☐	
Aldosterone antagonist	☐	☐	☐		☐	☐	
Loop diuretic	☐	☐	☐		☐	☐	
Thiazide diuretic	☐	☐	☐		☐	☐	
Digoxin	☐	☐	☐		☐	☐	
Nitrates, prescribed dosage: ☐ Sublingual/PRN ☐ Topical/Oral	☐	☐	☐		☐	☐	
Hydralazine	☐	☐	☐		☐	☐	
Warfarin	☐	☐	☐		☐	☐	
Aspirin	☐	☐	☐		☐	☐	
Clopidogrel (Plavix) ☐ 3 months ☐ 6 months ☐ 12 months ☐ Indefinite	☐	☐	☐		☐	☐	
Lipid-lowering agents Statin: Other:	☐ ☐	☐ ☐	☐ ☐		☐ ☐	☐ ☐	

GDMT Documentation	Y	N	Not Applicable	Reason not performed	Comments
Was the history adequately documented, including pertinent past medical history, social history, family, and review of systems?	☐	☐	☐		
Was the physical examination appropriate for the problem or diagnoses?	☐	☐	☐		
Were appropriate diagnostic tests and labs ordered?	☐	☐	☐		
Were appropriate medication dosage, and duration used?	☐	☐	☐		
NYHA/Stage classification correctly identified based upon symptoms?	☐	☐	☐		
Patient Education Provided? Diet, Exercise, Weight Monitoring?	☐	☐	☐		
Optimization of Medical Therapy	**Y**	**N**	**Not Applicable**	**Reason not performed**	**Comments**
Adherence to Stage A recommendations?	☐	☐	☐		
Adherence to NYHA I / Stage B recommendations?	☐	☐	☐		
Adherence to NYHA I-III/Stage C recommendations?	☐	☐	☐		
Adherence to NYHA IV/Stage D recommendations?	☐	☐	☐		
Pharmacologic management progressing/titrated to target dose?	☐	☐	☐		

Heart Failure Performance Measures

Performance Measure Addressed	Criteria	Y	N	Not Applicable
Symptom and Activity Assessment	Percentage of patient visits for those patients aged ≥18 y with a diagnosis of HF with quantitative results of an evaluation of both current level of activity and clinical symptoms documented	☐	☐	☐
Left Ventricular Assessment	Percentage of patients aged ≥18 y with a diagnosis of HF for whom the quantitative or qualitative results of a recent or prior (any time in the past) LVEF assessment is documented within a 12 mo period	☐	☐	☐
LVSD ACE/ARB Therapy	Percentage of patients aged ≥18 y with a diagnosis of HF with a current or prior LVEF <40% who were prescribed ACE inhibitor or ARB therapy either within a 12 mo period when seen in the outpatient setting or at hospital discharge	☐	☐	☐
LVSD with Beta Blocker Therapy	Percentage of patients aged ≥18 y with a diagnosis of HF with a current or prior LVEF <40% who were prescribed beta-blocker therapy with bisoprolol, carvedilol, or sustained release metoprolol succinate within 12 months	☐	☐	☐
Patient Education Provided	Percentage of patients aged ≥18 y with a diagnosis of HF who were provided with self-care education on ≥3 elements of education during ≥1 visits within 12 months	☐	☐	☐