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Heart Failure Management in a Skilled Nursing Facility

Leigh T. Simpkins

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A DNP PROJECT

TITLE: Heart Failure Management in a Skilled Nursing Facility

STUDENT NAME: Leigh T. Simpkins, DNP, ACNP-BC

DNP PROJECT PRIMARY ADVISOR: Dr. Joyce Knestrick, PhD, FNP-BC, FAANP, FAAN

& DNP PROJECT TEAM MEMBER(S): Dr. Julie Britton DNP, RN-BC, GCNS-BC, FGNLA

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The George Washington University

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Abstract

Background: Reducing heart failure hospital readmissions remains a priority for health systems and is a marker of quality for the Center for Medicare and Medicaid Services (CMS). Heart Failure is the most common cause of U.S. hospital admissions and an effective management program in the nursing home setting is crucial for quality and outcomes.

Purpose: The purpose of this project was to implement and evaluate a Nurse Practitioner/Physician supported heart failure management program in a skilled nursing facility that is able to be incorporated into facility staff workflow, enhances nursing staff knowledge of heart failure, improves identification of patients with a heart failure diagnosis, and reduces facility hospitalization rates over a three-month period of time.

Methods: This was an evidence informed practice implementation and evaluation project that focused on all patients with a diagnosis of heart failure in a suburban skilled nursing facility. Quantitative data was obtained by using the Nurses Knowledge of Heart Failure survey and rehospitalization data was obtained from the practice site.

Results: Eighteen patients were followed by the program. All had timely identification,16.66% experienced a change of condition that triggered medical provider follow up and none had a heart failure related hospitalization. Six nursing staff completed the pretest (mean, [SD], 78.33, [13.29]) and posttest (86.66, [10.80]) and demonstrated a positive relationship between program implementation and nurses' knowledge.

Conclusion: Implementation of a heart failure management program is associated with timely identification of patients, improved nursing knowledge, and timely intervention during changes in condition.

Keywords: heart failure, skilled nursing facility, management, rehospitalization, nursing knowledge, Nurse Practitioner.

Program Implementation and Evaluation of a Heart Failure Management Program in a Skilled Nursing Facility

In the United States, there are nearly 6 million individuals over the age of 65 with a diagnosis of heart failure (Nazir & Smucker, 2015). Heart failure is the primary admitting diagnosis to the hospital for patients over the age of 65 in the United States and nearly a quarter of those will be discharged to a skilled nursing facility (Li et al., 2018)).

The vision of the program site is to set the standard of care in the post-acute and long-term care setting through the provision of excellent care. The implementation of a heart failure disease management program fits with the company's values of care and compassion for the lives being cared for, respect and appreciation, teamwork, focus and discipline on improving the quality of care, creativity, innovation, honesty and integrity.

Background and Significance

The epidemic of heart failure effects over 6.5 million people in the United States (*Heart disease.* 2019) and the incidence in the population over that age of 65 has been reported as high as 21 per 1000 population (Benjamin et al., 2019). Heart failure has been described in the literature as being associated with and a strong predictor of high mortality and hospitalizations in the skilled nursing care population (Foebel et al., 2013). Nearly a quarter of hospitalized persons over the age of 65 are discharged to a skilled nursing facility (SNF) (Li et al., 2018) and frailty associated with the diagnosis contributes to a high mortality and a high hospitalization rate (Zhang et al., 2018). In 2012, CMS enacted the Hospital Readmissions Reduction Program (HRRP) as part of the Patient Protection and Affordable Care Act (ACA). This program sought to force greater accountability onto health systems and providers by reducing payments when

patients admitted with one of six diagnoses required rehospitalization within thirty days of discharge. Because of the increased frailty of and high risk for rehospitalization in heart failure patients (Benjamin et al., 2019), hospitals began to develop strategic partnerships with nursing facilities in an effort to manage costs and ensure that patients continued to receive high quality care. Despite this, the management of heart failure in nursing facilities has continued to be challenging as the result of several factors: the complexity of patients coupled with the limited nursing knowledge and expertise in managing heart failure symptoms, poor systems of communication, variable capacity individual facilities may have to adhere to established guidelines, and poor understanding by patients of their disease and frailty.

Needs Assessment

A needs assessment for the facility was performed and revealed that roughly 25% of the center population had a diagnosis of heart failure however, no protocols were in place to support the management of this population. The organizational strengths and challenges specific to the successful implementation of this project were considered prior to proceeding with the planned change (Appendix A). Internal strengths of the facility included a multidisciplinary staffing model, the ability to monitor patients with an increased frequency, the push to develop preferred partnerships with other health care organizations, the ability to generate and analyze data to compare information within and between facilities, and access to a heart failure program developed by the parent company's Population Health team. Weaknesses of nursing facilities have been documented by multiple sources, are relevant to the study location and include communication styles, facility size, staffing patterns and turnover (Ågotnes et al., 2016). A dearth of trained and knowledgeable staff with regard to heart failure symptoms impacts timely

communication of patient changes in condition (Boscart et al., 2017). Finally, the increased complexity that co-morbid conditions add to the identification of symptoms and frailty of patients, as well as the lack of well-defined disease management programs geared toward this population present challenges that impact optimal patient management (Orr et al., 2015). An anonymous survey of nursing staff at the study site was distributed for this needs assessment but unfortunately the response rate was low. Feedback that was obtained indicated that some Certified Nursing Assistant (CNA) staff felt unheard and undervalued by the Licensed Nursing staff and did not have confidence that their observations about patients would be considered. A study by Howe (2014), evaluating factors related to job satisfaction and job dissatisfaction in nursing facilities showed that poor staffing, and a lack of information, communication and support, as well as a feeling of powerlessness to change their situation contributed to job dissatisfaction for nursing facility staff.

External to the organization opportunities may be exploited to maximize the potential of success for this project. Developing preferred partnerships with local hospitals and home care organizations could help to improve post-discharge outcomes and contribute to directed admissions to the facility that would help to maintain the census. The value of these relationships has been demonstrated by several studies (McHugh et al., 2017; Rahman et al., 2018). Successful implementation and a partnership with local Accountable Care Organizations (ACOs) would also allow the center to obtain a larger market share of patients. Threats to the success of the project included ineffective collaborative relationships with outside entities, a heavy dependence on Medicare and Medicaid for reimbursement which has an impact on staffing, heavy governmental regulations in the industry and competition from other nursing facilities for the same patient population. The study center is in direct competition for admissions from the

local hospital with another facility that offers more modern facilities and a dedicated cardiac rehab program.

The ability of the center to leverage the strengths and opportunities identified may mitigate those factors related to reimbursement and the physical plant. Successful, the center would need to prioritize addressing identified weaknesses in order to offset any threats. This in part may include increasing staff comfort level in adhering to evidence based and clinical practice guidelines as well as enlisting clinical experts for training and support.

Problem statement

Optimizing the management of heart failure in the frail older adult and those individuals with multiple comorbidities in nursing facilities is necessary in order to improve quality of life and reduce the risk of avoidable hospitalizations. A significant amount of literature supporting the management of heart failure in the acute inpatient and outpatient settings exist, however the skilled nursing facility and long-term care patient population has not been included in any large randomized controlled trials (Jurgens et al., 2015). The Society for Post-Acute and Long-Term Care also known as the American Medical Directors Association (PALTC/AMDA) as well as the American Heart Association (AHA) have developed practice guidelines for the management of heart failure in skilled nursing and long-term care, but there currently is no consistently utilized protocol for management in this setting. The parent company to the study facility has developed a congestive heart failure (CHF) management program and worked with various centers on implementation. Nursing knowledge deficits related to heart failure has been identified as a barrier to care in nursing homes (Boscart et al., 2017; Heckman et al., 2016). Additionally, it has been described that ineffective collaboration and communication among multidisciplinary staff

members also contributes to the high frequency of heart failure related hospitalizations (Heckman, Boscart et al., 2018). Implementing and measuring a method by which to reinforce heart failure symptom management and recognition as well as how to communicate this information in the post-acute and long-term care setting will support the (Institute for Healthcare Improvement (IHI) triple aim of improving the health of a population and the patient experience of care in a cost-effective manner and will help to secure relationships with local hospitals and medical practices.

Purpose and aims

The purpose of this project was to implement and evaluate a Nurse Practitioner/ Physician supported heart failure management program in a skilled nursing facility that is able to be incorporated into facility staff workflow, enhances nursing staff knowledge of heart failure, improves patient engagement and quality of life related to their disease, and reduces facility hospitalization rates over a four-month period of time. The aims of the program were to improve identification of patients with a diagnosis of heart failure, to enhance nursing staff knowledge of heart failure symptomatology and management, and to reduce facility hospitalization rates.

Review of literature

Heart failure in skilled nursing facilities is estimated to effect anywhere from 20 to 37% of the patient population (Jurgens et al., 2015). Heart failure rehospitalization rates in skilled nursing facilities have also been found to range anywhere from 27 – 43% (Nazir & Smucker, 2015). Several factors are thought to be critical in the management of this patient population and are detailed as follows and summarized in the Appendix B evidence table Nursing expertise has

been identified as a contributing factor and a number of the articles reviewed supported the concept that improved staff knowledge was essential to improving outcomes for heart failure patients in skilled nursing facilities. The consensus of the authors was that this education should be provided regularly and tailored to meet the needs of all levels of provider (Heckman et al., 2016). Staff education should also be varied with regard to modes of delivery and adhere to established guidelines for disease management (Heckman, Shamji et al., 2018).

Optimizing systems of communication within centers as well as with outside organizations are key in the management of heart failure. Prior to admission, hospitals should be sure to communicate heart failure specific information to receiving facilities such as weight goals, ejection fraction and renal function (Jurgens et al., 2015). The establishment of effective means of interprofessional communication has such a significant impact on outcomes in patients with heart failure in nursing facilities that five of 17 recommendations for managing heart failure in this setting are centered around it (Heckman et al., 2016). Glogowska et al. (2015) addressed the need for clinicians to coordinate services and maintain communication with each other in order to improve patient outcomes. The need for effective communication also extends to that which occurs with the patient in order to help them to manage their health.

While guidelines have been established by the American Heart Association and Society for Post-Acute and Long-Term Care, the translation of that guidance into structured programs is still lacking. Many authors have advocated for the establishment of a guideline supported heart failure management program in this setting (Close et al., 2013; Hoekstra et al., 2010) and studies have demonstrated reduced all cause and heart failure related admissions when heart failure management programs are instituted in both outpatient and post-acute settings (Dolansky et al.,

2016; Lowery et al., 2012). Development of a management program provides the opportunity to improve heart failure assessments (Jurgens et al., 2015) and can help to overcome patient related and organizational barriers (Close et al., 2013).

Adherence to self-care behaviors is critical in the management of chronic heart failure (Segan et al., 2018). Several factors influence the ability for patients to practice self-care including socioeconomic status, health literacy, comorbid conditions, cognitive function and psychological distress (Biddle et al., 2019). In nursing facilities, the ability for patients to manage self-care is influenced by multimorbidity and cognitive impairment (Park et al., 2017). Empowering patients with tailored, interactive and continuous education strategies has been found to be helpful in improving their ability for self-care (Schoberer et al., 2016). Most patients want to be included in decision making as it relates to their heart failure diagnosis (Close et al., 2013) and the literature supports providing education that is based on the individual's capacity, goals of care and caregiver support (Jurgens et al., 2015). Self-management support can positively impact patient outcomes as well as patient and provider/staff satisfaction (Self-Management Support, 2018). Use of a patient self-assessment tool that supports patients in the management of their heart failure by categorizing their status into to three zones (stable, monitor, and in need of immediate intervention) to assist with management has been described in the literature (Weiss et al., 2019) and is supported by the Agency for Healthcare research and Quality (AHRQ) (Red-yellow-green congestive heart failure (CHF) tool. 2008) and the American heart Association (AHA) (Heart failure tools and resources. n.d.).

The strength of evidence presented represents good and consistent validation to support a practice change effort. Implementation of a program that focuses on the clinical development of front-line nursing staff, improved timeliness and accuracy of communication to medical staff and

that is generalizable to settings external to the organization will enhance care delivery. Additionally, these targets are in line with the culture and goals of the organization and supports the triple aim of improving the patient's experience of care and health of the population at a reduced cost.

Evidence Based Translation Model

The John's Hopkins Evidence Based Practice model was chosen to guide the implementation of this project. The model is designed around three linked ideas, inquiry, practice and learning. It is then divided into 19 different steps that begin with the identification of a practice question and ends with dissemination of findings (Dang & Dearholt, 2017). Appendix C provides an outline of the steps of the theory as they relate to this project

Aims and analysis plan

This report describes the implementation experience of a heart failure management program into a skilled nursing facility. In order to assess the impact of the intervention, admissions were monitored daily by the program leader and center Nurse Practitioner to determine the appropriateness of admitted patients to participate in the program. The Nurses Knowledge of Heart Failure survey (Albert et al., 2002) was administered prior to implementation and education was provided on basic heart failure assessment and management. The survey was collected again at the end of implementation to assess retention of information. All-cause readmission data was collected for a four-month period of time prior to implementation and continued throughout implementation. Throughout the intervention during weekly rounds, nursing staff were asked if they were aware of which patients in their assignment

were being followed for heart failure, the current status of heart failure symptoms and stability of participating patient's weights. Reinforcement was provided as needed based upon adherence to the program outline and adjustments were made based upon nursing staff input in an effort to create a process that did not add undue burden to the staff.

Methods

Design

This is an evidence informed practice implementation and evaluation project intended to improve the quality of life of and reduce hospitalizations for patients of a long-term care facility who have heart failure. The project evaluated a heart failure management program and how it may improve nursing knowledge of heart failure, and identification and management of symptoms in order to improve patient quality of life and reduce the incidence of hospitalizations from the facility. The rate of hospitalization for patients and nursing knowledge of heart failure was measured and compared pre and post implementation in order to assess how the program may have had an effect. This project included education to the nursing staff in order to improve their recognition of heart failure symptoms and implementation of daily structured nursing assessments and weekly interdisciplinary rounds in order to monitor and treat patient symptoms.

A logic model was designed in an effort to describe the relationship between the program's processes and intended outcomes (Appendix D) and a Methods Map (Appendix E) describes the process outline for implementation. Step one of the logic model begins with an engaged center team and willing hospital partner that, with organizational support, will implement a heart failure management program. The program includes nursing staff training which will support patient symptom assessment, and the initiation of interprofessional

communication. Educating and training nursing staff regarding heart failure symptom recognition and implementation of interdisciplinary rounds will result in an increase in interdisciplinary communication and timely treatment for patients with heart failure. Implementation of the heart failure management program and increasing appropriate and timely treatment of heart failure, should result in decreased hospitalization rates. Finally, it is anticipated that the decrease in hospitalization rates will result in an improvement in star ratings, patient quality of life, and hospital referrals.

Context

The project took place at a suburban Philadelphia nursing facility. This is a 99-bed facility that has two floors of patient care, the third floor is dedicate to long-term care and the second floor is approximately 60% short-stay half of which has been transitioned to an observation unit to house newly admitted short and long-stay patients for no less than two weeks until they can be confirmed COVID negative. A therapy gym and administrative offices are on the first floor. There is also an embedded Nurse Practitioner, the center has planned to partner with a local hospital's ACO specifically targeting patients admitted for heart failure, and has identified a Cardiologist to support the in-center management of heart failure patients. The start date of regular rounding by this consultation service was unfortunately delayed by the COVID-19 pandemic but they were available for patient specific concerns if needed in an effort to avoid transfers.

Project participants included all patients admitted to the nursing facility with a diagnosis of heart failure and the nursing staff who care for those patients. Approximately 39% of the patient population at the implementation facility carries a diagnosis of heart failure which

amounts to roughly 38 patients at any given time. Because the program's goal was to improve nursing staff and patient recognition and communication of heart failure related symptoms, all patients with heart failure were included in the program. Existing patients were identified through chart review identification of a diagnosis of heart failure, review of medication and evaluation by echocardiogram if no study results were available for review. New patients were identified through direct report from the transferring entity and/or review of medical records.

Recruitment

Because this project addressed an identified gap in quality healthcare, all eligible staff and patients will be included in implementation. No consent was needed for this program implementation as determined by the George Washington University Institutional Review Board and parent company Research Committee.

Risks and Harms

This project was conducted by following evidence-based practice guidelines supported by the American Heart Association and American Medical Director's Association. There is no increased risk to patients by participating however, nursing may experience a change in workflow. Published literature has described that the culture of the organization is one of the most significant factors impacting the achievement of successful program implementation (Li et al., 2018). Other challenges that have been documented are related to communication, workload constraints and other compelling priorities (Edwards & Smith Higuchi, 2018).

Interventions

The intervention began with educational sessions delivered to nursing staff by the project leader on basic heart failure signs and symptoms, heart failure management, the daily assessment requirements including the acquisition of subjective data from the Stoplight Zone Tool (Appendix F) (GHC, n.d.), and the process of clinical rounds. Nursing knowledge of heart failure was assessed prior to and at the end of implementation using the Nurses' Knowledge of Heart Failure survey (Appendix G) (Albert et al., 2002). At the time a referral was received from the hospital, the Admissions Director attempted to determine if the patient had a diagnosis of heart failure and made requests that any associated documents (echocardiogram results, lab work, cardiology consult notes) be sent in the transfer documents to the center. If known, heart failure status was communicated to the nursing and medical staff through the EMR once a patient was approved for admission and added to the Cardiac Program patient list in the EMR. Otherwise, heart failure status was identified through nursing report, physician or Nurse Practitioner review of medical records or based upon clinical assessment or concern during admission.

Once admitted and identified as having a diagnosis of heart failure, a patient self-report zone tool was provided to each patient, an admission weight was obtained, and a zone management journal was included in the physical chart. In keeping with organizational protocol, within 24 hours of admission (if admitted Sunday to Thursday) and 72 hours of admission (if admitted Friday or Saturday), the patient was seen and evaluated by a Physician or Nurse Practitioner for a comprehensive exam and review of hospital records. Nursing assessments and care plans were completed as per company policy and the Social Worker coordinated with the medical team to establish patient code status and goals of care. Dietary and Rehab services also established individualized care plans specific to their disciplines.

A minimum of once daily during nursing rounds, patients were assessed for weight gain, new or worsening edema, new or worsening shortness of breath, wheeze or chest tightness, activity tolerance, and orthopnea. Once weekly, each patient in the program was reviewed with the heart failure Nurse Practitioner to assess the stability of symptoms, and control of CHF as well as any other related diseases (diabetes, vascular and cardiac conditions). The educational plan was updated as needed throughout admission.

The heart failure program was supported by a multidisciplinary team. The facility is fortunate to have an imbedded nurse practitioner that, in conjunction with the attending physician, reviews the medical records and performs a detailed physical exam after patients are admitted and as needed throughout admission. Nursing staff coordinated to help identify patients with a diagnosis of heart failure and ensure that orders were entered in the electronic medical record (EMR). The Nurse Educator, Director of Nursing and center Administrator all provided support throughout implementation to identify and trouble-shoot barriers to program success.

Study of the Intervention

In order to assess the impact of the intervention, the Nurses Knowledge of Heart Failure survey was administered prior to implementation and education was provided on basic heart failure assessment and management. The survey was distributed again at the end of implementation to assess retention of information. Throughout the intervention, during weekly rounds, nursing staff were asked if they were aware of which patients in their assignment were being followed for heart failure, the current status of heart failure symptoms and stability of weight. Reinforcement was provided as needed based upon adherence to the program outline and

adjustments were made based upon nursing staff input in an effort to create a process that did not add undue burden to the staff.

In order to establish whether or not the observed outcomes were due to the intervention, adherence to weight measurement and zone tool completion were evaluated throughout the week and process changes were made based on nursing staff input and observations by the program leader. This information was tracked on run-sheets to determine the effectiveness of the intervention.

Measures

Several measures were chosen for studying intervention processes and outcomes and can be found in Appendix H. The Nurses Knowledge of Heart Failure survey was chosen to evaluate baseline and post intervention knowledge of heart failure among center staff. This survey was developed in 2002 and was found to have 100% face and content validity as determined by heart failure nurses and patient education specialists. A subsequent study by Hart in 2011 utilized the same test questions but instead of a dichotomous true/false answer format, removed 3 questions and restructured the responses into a 5-point Likert scale format in an effort to obtain better reliability. In 2018, Sundel and Ea documented that Albert was able to achieve a 100% reliability score and other researchers achieved a kappa score of .70 which was equivalent to sizeable agreement.

Analysis

The goal of this project is to determine whether or not a heart failure management program will decrease all cause hospitalization/re-hospitalization rates for patients admitted to

the nursing facility. Run-charts were used to track the number of patients admitted with a diagnosis with heart failure, adherence to weight measurement, zone tool assessment, and interdisciplinary communication of status changes. All cause rehospitalization rate is tracked by the organization and monthly rates during study implementation was compared to baseline data. Additionally, a pre-test/post-test comparison of nursing staff knowledge of heart failure was assessed prior to study implementation and at its conclusion, frequency of symptom self-reporting documentation by the nursing staff, weight measurement and the number of times the self-reporting tool resulted in a nursing or medical intervention were measured. Qualitative data from staff interviews was used to assessing the nursing staff's comfort level in heart failure knowledge and ability to care for patients with a diagnosis of heart failure as well as facilitators and barriers in the study design that contribute to adherence.

Ethical Considerations

This project was approved by the Research Committee of the project site's parent organization, project site leadership and the George Washington University Nursing Doctoral program leadership. The project was conducted by following evidence-based practice guidelines supported by the American Heart Association and American Medical Director's Association. There was no increased risk to patients by participating however, the author would like to acknowledge that nursing did experience a slight change in workflow under demanding conditions related to the COVID pandemic.

Results

Program implementation began with the identification of existing patients with a diagnosis of heart failure. The admissions director worked to identify patients with a diagnosis of heart failure prior to admission and if unable to, eligible patients were identified either by nursing or the embedded Nurse Practitioner upon admission or during admission. Zone tracking tools were not initially available to place in patient charts and clinical stability was tracked through verbal report from nursing staff while weights were entered in the EMR. Adherence to weight and zone documentation was variable and a meeting with center leadership, the Nurse Practitioner and Program Leader to discuss strategies to improve reliability of admission weights, more consistent capture of routine weights and zone documentation was held. During week four of implementation, reminders were placed at the nursing station for admission orders and an order was placed in the EMR for zone tool completion which resulted in an immediate improvement in both weight and zone documentation. During week five of implementation, an admissions hold was placed related to the COVID-19 pandemic that lasted 33 days. During the admission hold, one patient was noted to have increased shortness of breath (SOB), was evaluated by the Program Leader and managed in the center. Patients that demonstrated stability since program implementation had the frequency of weight and zone documentation adjusted in an effort to alleviate unnecessary burden of documentation for nursing staff. After reopening to admissions, the Program Leader again met with center leadership to discuss the best way of reinforcing program enrollment upon admission however it was another two weeks until a new patient was enrolled. Zone tool data was eventually placed in the EMR to be completed which increased adherence to documentation.

Alignment between aims and outcomes.

Aim 1 - Improved identification of patients with a diagnosis of heart failure: This program sought to improve the identification of patients with a diagnosis of heart failure as soon as possible upon admission to the nursing facility. Data were sourced through review of medical records, 17/18 enrollees (94%) were identified either at the start of the program or upon admission and one enrollee (6%) was identified eight weeks after admission as the result of symptom workup.

Aim 2 – Enhanced staff identification of heart failure symptoms and the communication process related to changes in condition: Monitoring of symptoms was performed through daily nursing assessments of patient vital signs, the presence and stability of edema, weights, shortness of breath, sleep patterns and activity tolerance. Weights were ordered daily for all patients followed by the program and symptoms were to be monitored at least daily and as needed. Throughout program implementation, recording of patient weights were assessed daily. Consistency of obtaining weights was impacted by several factors including the use of agency nursing staff and patient refusals. After coordination with center leadership, the center Nurse Practitioner and unit manager, signs were place at the nursing station and medication carts on implementation day 33 resulting in an increased frequency of weight measurement (Figure 1). Zone tool documentation was initially impacted by nursing staff not always being aware of where the flow sheet was kept and the feeling from nursing staff that having to keep track of symptoms on a piece of paper was outside of their workflow and difficult to keep up with. Despite this, the Nursing staff were aware of which patients were being followed by the program and the absence or presence of symptoms. Once zone documentation was placed in the EMR, there was a greater consistency of documentation (Figure 2).

Three occasions during the project implementation, an enrolled patient was felt to have deteriorating symptoms. One occurrence was triggered by a therapist who noted an increased respiratory rate while working with the patient. The Nurse Practitioner was notified and once the therapy session was complete, an assessment was performed. A second event was triggered by nursing report of shortness of breath (SOB), abnormal breath sounds, and edema. In this case, medications were adjusted, and the frequency of Nurse Practitioner follow up was increased until symptom stabilization. Finally, a previously undiagnosed patient who had been admitted for several weeks was worked up for concern of heart failure related to symptomatic complaints and electrocardiogram (EKG) results. The patient was assessed by the facility Nurse Practitioner and the work up which included an echocardiogram revealed a diagnosis of heart failure.

Improvement of staff knowledge of heart failure was assessed with pretest-posttest evaluation using the Nurses Knowledge of Heart Failure Survey. Pretest data were collected through the distribution of surveys to nursing and therapy staff. Because of precautions and restrictions related to the COVID-19 pandemic, individual post-test surveys could not be distributed among the staff and the project leader obtained results through one-on one interview focused on licensed nursing staff. This resulted in a reduced number of posttests obtained. It is notable that there were several survey questions that needed clarification during the post-test which resulted in the respondent changing their answer.

Aim 3 – reduced facility rehospitalization rate: The most variable aspect of the program was incorporation of the heart failure symptom reporting tool into the daily nursing assessment for enrolled patients. In an effort to reduce the rate of rehospitalization, program participants were given a copy of the Zone tool and asked about their symptoms daily by staff. Daily recording of symptoms was not consistent which made tracking subtle changes more

challenging. In order to achieve more consistent information, a reminder was placed in the Electronic Medical Record (EMR) and eventually the entire Zone tool was placed in the EMR which resulted in consistent documentation for all enrolled patients.

No enrolled patients were readmitted to the hospital for heart failure during the study. One patient was admitted for a planned procedure not related to the diagnosis of heart failure and another was admitted for evaluation of symptoms during transport back to the facility from an appointment.

Contextual elements that interacted with the intervention

Early identification of eligible patients was an important aspect of ensuring that orders for daily weights were entered upon admission. The facility having an LPN that managed the nursing desk, reviewed admission information and entered admission orders was an important aspect of ensuring that nursing staff were aware of who was enrolled. Additionally, the presence of a full-time Nurse Practitioner in the building not only supported early identification, it allowed patients experiencing a change in condition to be evaluated in person in a timely manner. The COVID-19 pandemic also had a significant impact on the intervention. Prior to the pandemic, roughly 25% of admitted patients carried a diagnosis of heart failure. During program implementation, 18 patients were enrolled in the program and the maximum number enrolled at any given time was 11 (11%). Additionally, there was a 33-day admission hold midway through the intervention that reduced all admissions including those with a diagnosis of heart failure. Lastly, under federal law 42 CFR § 483.10, patients in nursing facilities have the right to self-determination and may refuse treatments and medications at their will, even if that refusal may

result in harm (Requirements for states and long term care facilities, 2011). Adherence to this regulation had an impact on the ability to obtain weights consistently related to patient refusal.

Unintended consequences

Program implementation was associated with an impact on nursing staff workflow as well as the influence nursing staff had on improving the workflow process. Evaluation of heart failure symptoms was able to be worked into daily assessments without a problem however, consistent recording of this information was hindered by the use of agency staff and paper forms. “The flow sheet is something extra to do. I have to remember to go to it”. “If it was in the computer it would be easier”. “When you have 25 people… I’d forget it less [if it were in the computer]. Trust me”. “Everybody is not doing it because they’re not seeing it”. In an effort to support consistent documentation in such a way that caused limited to no additional burden to the staff, Zone tool assessment data was incorporated into the EMR and organizational leadership was engaged to consider creating a heart failure specific assessment tool within the EMR that will better allow for changes in patient symptoms to be flagged and more visible to nursing and medical staff.

Missing Data

There was no missing data from project implementation.

Software

Microsoft Excel was used to collect and analyze the program data. Tables one and two outline the data collection, evaluation and analysis methods and data dictionary respectively.

Steps used to assure accurate data entry

In order to ensure accurate data entry, the EMR was reviewed at least twice weekly to analyze admission volume, review hospital records and ensure eligible patients were enrolled. As the program progressed, Zone tool documentation was assessed, and accuracy was determined through weekly clinician rounds and discussion with the center nurse practitioner.

General demographics

Population demographics are displayed in Table 3. A total of 18 patients were followed in the program with a mean age of 72.3 years old and a range of 49 – 90 years. Of the participants, eight were female and 10 were male; 13 were White, four were Black and one was Hispanic; seven patients had systolic heart failure, nine had diastolic failure and two had combined heart failure.

Discussion

Data analysis to answer program aims

In order to answer the program's aim of identification of patients with a diagnosis of heart failure, the program leader communicated no less than twice weekly with the center-based Nurse Practitioner and Nursing staff to discuss the diagnoses of new and pending admissions. A Licensed Practical Nurse (LPN) at the nursing station who reviewed new admission data, took report from the hospital and entered admission orders created an advantage with regard to early identification of patients with heart failure. The center-based Nurse Practitioner also supported early identification of patients known to have a diagnosis of heart failure and in one instance, facilitated the timely diagnosis of heart failure in a patient with no prior diagnosis. There were no

patients with a known diagnosis of heart failure who were not identified by either nursing staff or the Nurse Practitioner within 24 hours of admission.

Enhanced staff knowledge of heart failure and communication of changes in condition was evaluated with the Nurses Knowledge of Heart Failure survey and through weekly rounds with the program leader. There were twelve licensed nursing staff that completed the pretest and six of those completed the post test. Of the six licensed nurse staff members that completed the post-test, all had improved test scores. Table 4 details the analysis of the pretest and posttest. The mean score for the pretest was 78.33 compared to the mean post-test score of 86.66. Pearson correlation coefficient was measured at 0.79 and p equaled 0.02 indicating a statistically significant and strong positive relationship between program implementation and nursing knowledge.

During study implementation two out of 18 patients (11%) were noted to have changes in condition that resulted in Nurse Practitioner evaluation. One patient was noted to have increased dyspnea on exertion during therapy, the Program Leader was notified, assessed the patient and left recommendations for the primary team. On another occasion, the center Nurse Practitioner was notified of a patient change in condition, work-up included an echocardiogram which revealed heart failure.

Rehospitalization rate data was obtained through organizational data collection. In the four-month period prior to program implementation 6/40 patients were readmitted to the hospital within 30 days resulting in an overall rate of 15%. During the four-month period of study implementation 12/51 patients were re-hospitalized (23.5%). One of these admissions was for a planned surgical procedure reducing the rate to 21.5%.

Interpretation

As program implementation progressed, modifications to the process had an overall positive impact on adherence to symptom monitoring. As the result of nursing staff feedback, incorporating the assessment criteria in the EMR resulted in increased staff satisfaction with program requirements. Increased staff awareness of eligible and enrolled patients as well as weekly rounding likely had an impact on adherence to program processes. Reinforcement of heart failure symptoms during weekly rounds also may have supported retention of nursing knowledge. Because of the low *n* and confounding COVID pandemic, a direct link between the hospitalization rates immediately before and throughout the intervention is not as easy to determine.

The impact of the project on the staff and systems within the center is not clear related to limited enrollment and admission holds which created a significant deviation from the typical pace of the center. The pandemic itself had a significant impact on center processes and as a result may have had an impact on program outcomes though it is difficult to determine the validity of this due to a lack of comparison.

Admission rates before and during implementation were impacted by the pandemic which had an unknown impact on the program overall. There were 75 admissions during the same period of 2019 resulting in a reduction in admissions of 68% during implementation. Reduced hospital admissions plus health system and patient preferences to reduce potential health system related exposures to the COVID-19 virus also may have impacted both admission volume and the overall complexity of those individuals that were admitted.

Implications for Practice

Successful incorporation of a heart failure management program into the culture of skilled nursing facility will help to improve patient satisfaction and reduce rehospitalization rates. As the United States population over the age of 65 increases and along with it the prevalence of heart failure, successful management of this population will be key in reducing the overall cost of care.

Implications for Healthcare Policy

Skilled nursing facilities are not settings that are typically found to have specialized, disease specific programs. As the nursing facility patient population becomes more complex, the ability to be able to successfully manage those conditions most likely to result in hospitalization will become more and more important. Access to this care will vary geographically and the ability to be able to support the management of these patients by providers that are familiar with the regulations that govern this setting will be vital.

Implications for Executive Leadership

Support for heart failure management by executive leadership will help to expand services offered, improve patient satisfaction and customer service, secure relationships with referring health systems and improve overall quality in skilled nursing facilities.

Implications for Quality and Safety

All cause rehospitalization rate is a CMS quality measure that can be negatively impacted by poor identification and management of heart failure. This measure not only impacts the

patient and skilled nursing facility, it has the potential to impact the referring hospital as well. In addition to rehospitalization from the center, patient knowledge deficits related to heart failure symptoms and management can continue to have an impact after facility discharge. A program that not only supports nursing knowledge but that also reinforces patients' understanding of self-management skills will improve safety and quality within and beyond the walls of the facility.

Limitations

A major limitation of the program includes its timing during a global pandemic. The associated high utilization of agency staffing who were unaware of the initiative and processes related to implementation, reduced admission volume resulting in prolonged periods of time with stable long-term patients both impacted the observed results of the program.

Plans for sustainability

The management of heart failure remains a priority for the study facility. Organizational Nursing leadership is supportive of creating a heart failure assessment in the EMR and the center administrator is in support of continuing implementation to support the relationship with the local hospital's Accountable Care Organization (ACO). The long-term plan for sustainability will be to create a process that is driven by the nursing staff and supported by the center-based Nurse Practitioner for weekly rounding.

Conclusion

Heart failure is a chronic disease with a significant impact on the nursing home patient population. As the population and frailty of individuals over the age of 65 increases in the United

States, implementation of an evidence-based heart failure management program in skilled nursing facilities that supports identification of patients, interdisciplinary communication and is able to be incorporated into nursing workflow will be essential to improving outcomes and patient quality of life.

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Appendix A. SWOT Analysis

	Helpful To achieving the objective	**Harmful** To achieving the objective
Internal Origin {Attributes of the organization}	**Strengths** • Located in suburban Philadelphia with access to several hospitals that are looking for partnerships. • Part of a large organization with many resources. • Leadership focused on quality improvement and team building • Stable CNA staff • Good environment for training and education • Partnerships with Accountable Care Organizations. • Access to a heart failure management program.	**Weaknesses** • Staffing ratios. Short-term patients transitioning to long term • Available protocol not in use • Heart failure education is not routine. • Star rating. • Vacant positions • CNA staff does not feel empowered.
External Origin {Attributes of the organization}	**Opportunities** • Insurance and health system preferred partnerships. • Introduction of the Patient Driven Payment Model • Participation in LTC-ACO • Taking advantage of grants and civil money penalties.	**Threats** • Changing payment systems, dependence on Medicare/Medicaid, excessive regulation, increasing patient acuity • Competition from a large facility nearby facility • Other organizations have dedicated heart failure/cardiac rehab programs, Full RN nursing staff, modern environment, private rooms. • Not taking advantage of QI opportunities. • Dependence on Medicare/Medicaid.

Appendix B. Evidence Table

Article #	Author & Date	Evidence Type	Sample, Sample Size, Setting	Study findings that help answer the EBP Question	Observable Measures	Limitations	Evidence Level & Quality
1	Biddle. 2020	secondary analysis of a randomized multicenter trial (REMOTE-HF)	n = 349; inpatient and outpatients from academic healthcare settings in three states.	Anxiety and depression are associated with a reduction in self-care activities. Gender, mood and perception of control should be considered when delivering education on self-care.	Anxiety, depression and perceived control had a statistically significant (p<.05) impact on self-care.	secondary analysis, rural population (may not be generalizable).	Level I evidence; good quality
2	Close. 2013	nested qualitative study	n = 17 patients, 8 care staff, 3 nurses, 5 GPs. Interviews nested within the larger HF in CH study (RCT). Care homes in northern England	an onsite HF program introduced during the trial was able to overcome barriers identified and was accepted by patients and staff.	Residents valued additional visits and the opportunity to participate in decisions. Residents in the control group expressed frustration over lack of visits and resignation about disease process.	the input of patient relatives was not incorporated. Meaningful Resident feedback was not always possible.	Level III evidence; good quality
3	Dolansky. 2016	Case study of QI initiative.	n = 231 Single SNF in a suburban setting	Incorporation of a DMP and progressive practice changes using PDSA method contributed to an improvement in rehospitalization rates over a 4 year period.	display characteristics of a "learning" organization.	Only one center was studied.	Level V evidence; Good quality

4	Foebel. 2013	Prospective longitudinal cohort study	546 residents from 42 LTCs in 3 urban centers	Heart failure is associated with and is a strong predictor of high mortality and hospitalizations in LTC	Individuals with heart failure are admitted to LTC from hospital at a higher frequency ($p = .01$), had more hospitalizations in the year preceding admission than those w/o HF ($p < .001$) and had a higher mortality than those without HF ($p < .001$)	difficulty coordinating with LTCs. High staff turnover; difficulty collecting information.	Level III evidence; high quality
5	Glogowska. 2015	Qualitative interview	24 clinicians in primary, secondary and community care in England	Working with colleagues across settings of care improves outcomes.	two main themes were found to present the greatest challenge to clinicians - communication within teams and with patients.	low n	Level III evidence; good quality
6	Heckman et al. 2017	Mixed -methods repeated measures	convenience sample of two units in two LTC facilities. N = 27	There was an improvement in staff scores on HF knowledge and ability to identify clinical HF. Enhanced collaboration was associated with mutual learning.	Staff reports perceived increase in confidence and self-efficacy, improved assessment and clinical proficiency, and more effective collaboration. Statistically significant improvement in HF knowledge using Bridge scales.	small study, low power; no randomization,	Level II evidence; good quality
7	Heckman. 2016	Report on third phase of a Mixed-methods study focused on creation of recommendations	n/a	17 recommendations focused on the improvement of communication within and between facilities, improvement of HF knowledge among LTC staff, engaging front line staff, the development of facility-wide interventions.	n/a	limited number of LTCs included in workshops	Level IiI evidence; good quality

8	Heckman. 2018	Literature Review	21 articles	multimodal education and adherence to guidelines are important aspects of management programs.	n/a	None of the interventions described if/how HF management was tailored to the individual	Level V evidence; good quality
9	Hoekstra. 2010	secondary qualitative outcomes from Multicenter RCT (COACH)	n = 442 patients, 32 RNs	Patients reported satisfaction with both DMP and in those with advanced HF, treatment and education goals were more likely to be reached in the more intensive DMP	The majority of Patients and nurses felt both DMPs were sufficient in achieving goals but more so for patients with moderate-severe HF. Patients and nurses felt that the home visit component achieved its goals.	limited validation of questionnaires (face validity only). Age difference between responders and non-responders.	Level III evidence; good quality
10	Jurgens. 2015	Scientific statement	experts representing nursing, medicine (cardiology, geriatrics, NH physicians, palliative medicine), pharmacology, PT, dietary, research, quality of care. Peer review by the American Association of HF nurses, AHA, HFSA	Organized staff education, collaboration with colleagues within and outside of the facility, optimizing system and provider processes and palliative care to manage symptoms are needed to improve outcomes.	n/a	n/a	Level IV evidence; high quality

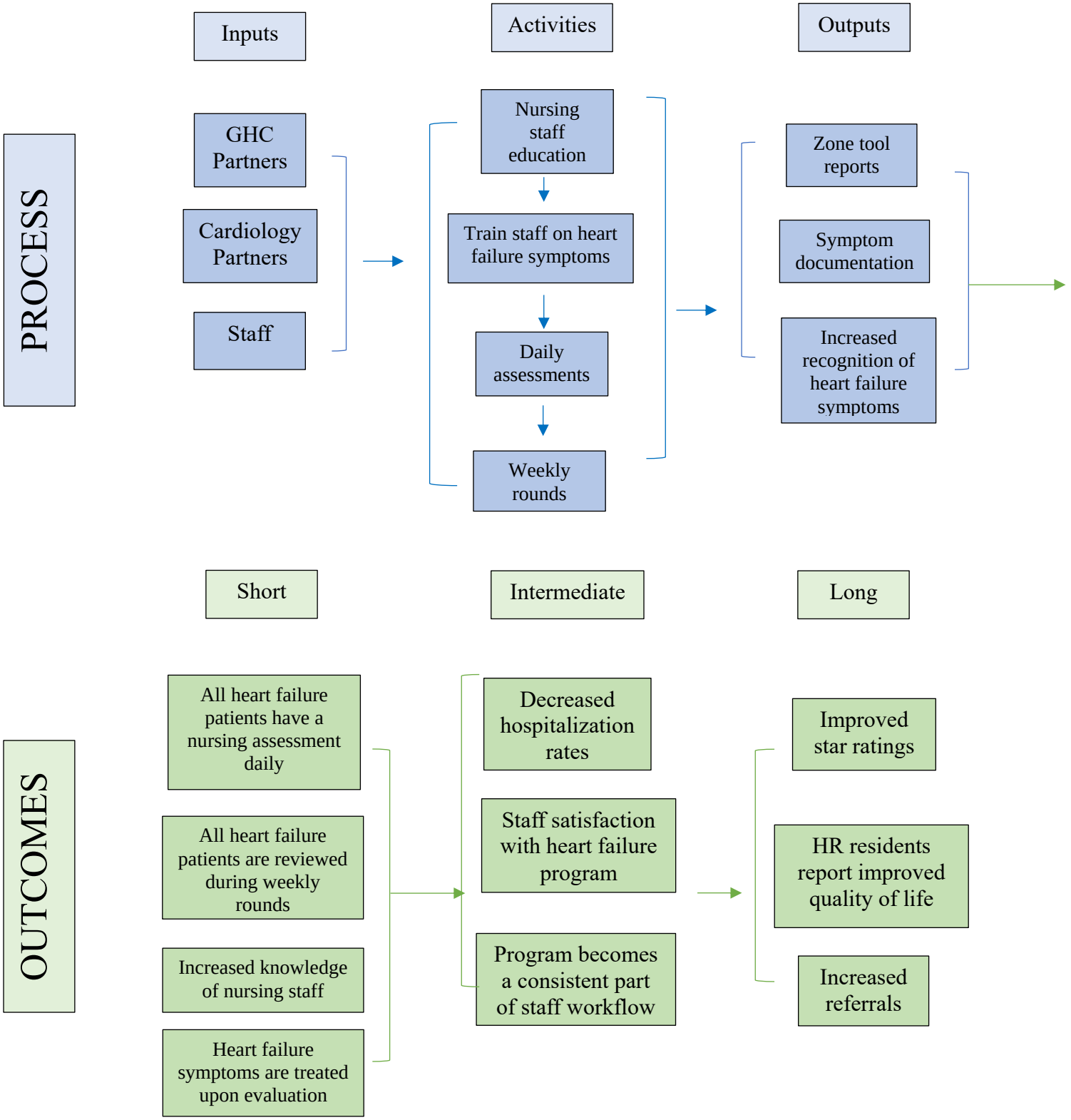
11	Lowrey et al. 2011	prospective, quasi-experimental	Veterans, n = 969; 6 VA medical centers	Patients receiving care in an NP-led DMP showed a decrease in HF and all cause readmissions.	year 1 mortality <.001; year 1 HF admissions <.001; year 1 all cause readmissions <.001	Could not rule out the use of outside providers. No randomization.	Level II evidence; good quality
12	Nazir. 2015	systematic review	5 QI projects	No RCT between 1990 and 2014 regarding the management of HF in SNF. Evidence based processes and formal procedures are required to ensure high quality care.	n/a	no experimental evidence was reviewed.	Level III evidence; good quality
7	Segan. 2018	qualitative study	n= 31 patients in a tertiary care center	Limitations in self-care strategies showed gaps in knowledge, recognition of deterioration and limited self-motivation. Adherence to self-care is related to knowledge.	55% of participants reported weight gain but only 12% of those initiated an appropriate plan.	low n, single setting	Level III evidence; poor quality
9	Weiss. 2019	QI project	home based palliative care program. N = 8	Zone tool helped patients and caregivers to recognize the signs and symptoms of heart failure.	patients and caregivers felt the tool was somewhat easy to understand and helpful in enabling them to recognize symptoms of HF exacerbations.	small n. limited detail on postimplementation surveys.	Level V evidence; low quality

15	Zhang. 2018	meta-analysis	20 publications	Frailty is associated with an increase in both mortality and hospitalizations for patients with heart failure.	Frailty increases the risk of all-cause mortality 1.59 fold (p , .0001)and increases the risk of hospitalization 1.31 fold (p < .0001)	moderate heterogeneity in pooled all cause mortality. Unable to differentiate between DHF and SHF. Confounding factors limit the ability to determine the exact effects of frailty.	Level II evidence; good quality

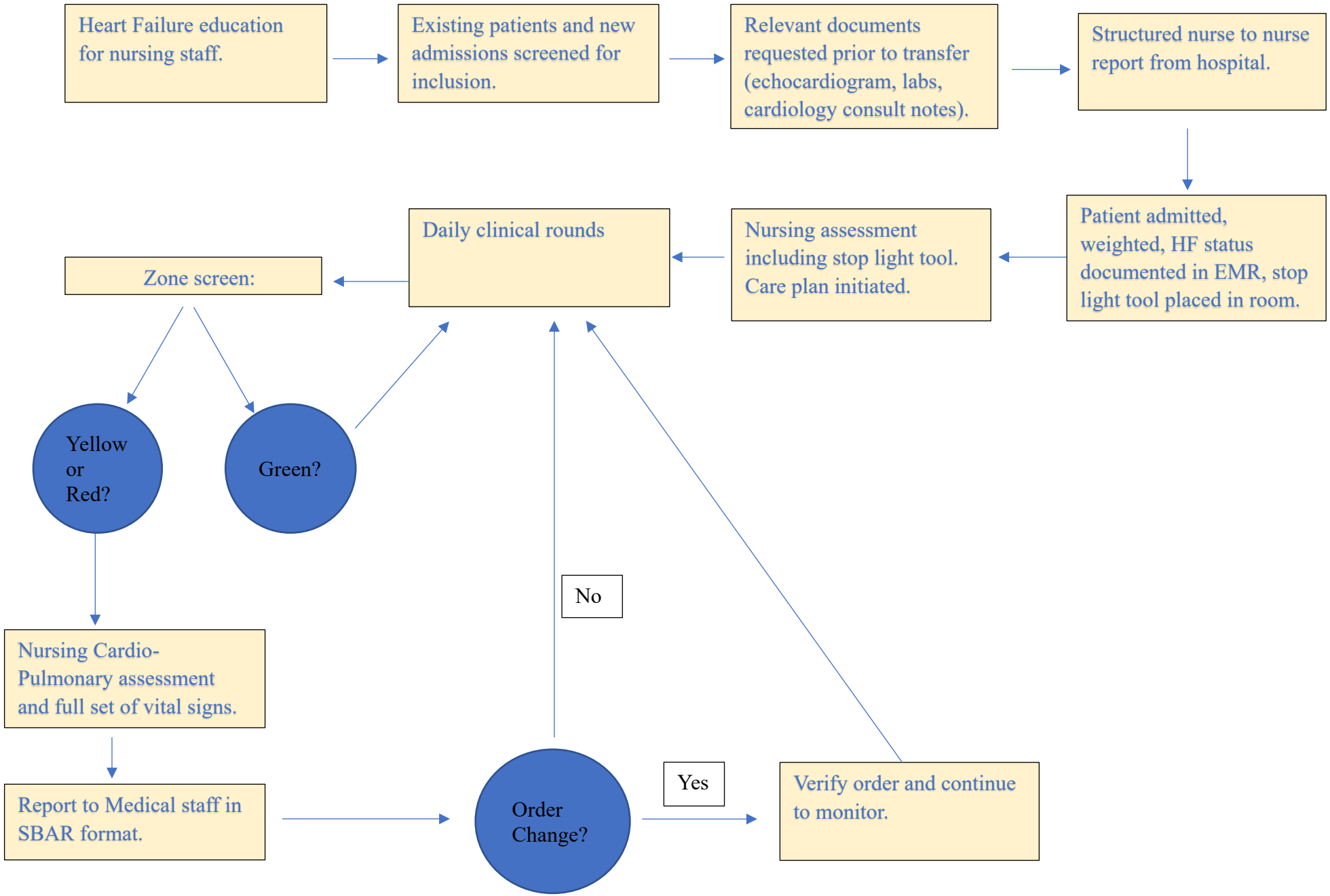
Appendix C. Johns Hopkins Evidence Based Practice Model

Step 1	**Recruit an interprofessional team:** The administrator and director of nursing at the facility where the project is to be implemented have been recruited as have involved stakeholders from the division of Population Health and the Research Committee.
Step 2	**Define the Problem:** The team has identified the gap in practice and has discussed why the current gap is a problem. Discussions were had about factors that impact the problem and concerns regarding the steps that will need to be taken towards resolution.
Step 3	**Develop and refine the EBP question:** The question went through phases of refinement to ensure that the topic is both manageable and meets the needs of the facility.
Step 4	**Identify and engage stakeholders:** Organization leadership has been engaged and the facility has confirmed partnership with the ACO of the local hospital which we hope will add to the resources of the center as well as direct heart failure patients to the center.
Step 5	**Determine responsibility for Project leadership:** I will be responsible for project leadership
Step 6	**Schedule Team Meetings:** Project and center leadership have begun to discuss target population and implementation timeline. Meetings will continue and time frequency adjusted based on the needs of the center and project.
Steps 7-11	The search for evidence to support the project and appraisal of the level and quality of each piece of evidence has been completed along with summarization, synthesis of evidence and recommendations which include an assessment of the risks and benefits of making the change.
Step 12	**Determine feasibility, and appropriateness of recommendation(s) for translation pathway:** The team leader and center leadership will communicate with the front-line staff and appropriate leadership of our intention to move forward with the practice change and will obtain feedback from those stakeholders as we move forward.
Step 13	**Create an action plan**: An action plan and timeline have been created and ongoing solicitation of feedback from stakeholders will guide the project through implementation.
Step 14	**Secure Support and resources to implement the action plan:** this process has already begun. Front line staff has already been made aware of an impending practice change and feedback has been solicited regarding their questions and concerns about the changes. Discussions about how to provide ongoing support to staff have already begun between the project leader and the Director of Nursing.
Step 15	**Implement Action:** How and when verbal and written communication will be delivered is still being considered. This will be finalized prior to implementation.
Step 16	**Evaluate Outcomes:** This will occur after the project has been completed
Step 17	**Report outcomes to stakeholders:** After evaluation of outcomes, they will be reported to the appropriate organization leaders both at the center level and in the larger organization. Ideally, a plan will be made to replicate the project in other facilities.
Step 18	**Identify next steps:** This step will help to refine the plan and optimize ithe process for the study center as well as other facilities.
Step 19	**Disseminate the findings:** The final step, the outcome of the project will be shared with center and organization leadership with the goal of also sharing within the larger post-acute and long-term care community and the University.

Appendix D: Logic Model



Appendix E. Methods Map



Appendix F. Heart Failure Stoplight Zone Tool (GHC, n.d.)

The following criteria should be discussed, observed or noted daily during Clinical Rounds for all patients with CHF

	Criteria	Green Zone	Yellow Zone	Red Zone
Based on Objective Assessment	***Follow Up Requirements***	***Continue to monitor***	***Follow up with medical provider within 4 hours***	***Follow up with medical provider immediately.***
	Vital Signs	Baseline vital signs and no jugular vein distention	Slight elevation is baseline vital signs	Vital signs (including resp rate) elevated from baseline and/or jugular vein distention
	Review Weight	No weight gain, less than a 3 lbs weight gain in a week or 1 lb or less gain in a day6	Weight gain 3 - 4 lbs in a week or 2 lbs in a day	Weight gain of 5 or more lbs in a week or 3 or more lbs in a day
	Review Oxygen Saturation levels	Oxygen Saturation levels > 95% or at baseline	Oxygen Saturation levels < 95% or less than baseline	Oxygen Saturation levels < 90% or less than baseline
Based on Input from Patient	**Breathing - Have there been any breathing changed since yesterday?**	Clear lungs, baseline respiratory rate No Shortness of breath	Increase in cough or shortness of breath with limited activities	Abnormal lung sounds, Unrelieved shortness of breath at rest
	Lower Extremity Edema - Have there been any changes in swelling of the legs, ankles or stomach area?	No swelling	Slight/ Increase in swelling	Increase in swelling from previously noted- skin indented if wearing a sock
	Sleep pattern – Have there been any changes in the sleep pattern from the previous night?	No change	Needed more pillows to get comfortable to sleep	Woke up feeling more confused or less rested than usual
	Activity Tolerance – Have there been any changes in how patient feels during activities?	No Shortness of breath	Increase in cough or shortness of breath with limited activities	Unrelieved shortness of breath at rest

Early identification is key*. The earlier signs and symptoms of Heart Failure are noticed and treated the greater opportunity to improve patient quality of life*

Appendix G. Nurses' Knowledge of Heart Failure (Albert et. al, 2002)

Survey questions

1. Patients with HF should drink plenty of fluids each day. (F)
2. As long as no salt is added to foods, there are no dietary restrictions for patients with HF. (F)
3. Coughing and nausea/poor appetite are common symptoms of advanced HF. (T)
4. Patients with HF should decrease activity and most forms of active exercise should be avoided. (F)
5. If the patient gains more than 3 pounds in 48 hours without other HF symptoms, they should not be concerned. (F)
6. Swelling of the abdomen may indicate retention of excess fluid due to worsening HF. (T)
7. If patients take their medications as directed and follow the suggested lifestyle modifications, their HF condition will not return. (F)
8. When patients have aches and pains, aspirin and non-steroidal anti-inflammatory drugs (NSAIDs like ibuprofen) should be recommended. (F)
9. It is ok to use potassium-based salt substitutes (like "No-Salt" or "Salt Sense") to season food. (F)
10. If patients feel thirsty, it is ok to remove fluid limits and allow them to drink. (F)
11. If a patient adds extra pillows at night to relieve shortness of breath, this does not mean that the HF condition has worsened. (F)
12. If a patient wakes up at night with difficulty breathing, and the breathing difficulty is relieved by getting out of bed and moving around, this does not mean that the HF condition has worsened. (F)
13. Lean deli meats are an acceptable food choice as part of the patient's diet. (F)
14. Once the patient's HF symptoms are gone, there is no need for obtaining daily weights. (F)
15. When assessing weight results, today's weight should be compared with the patient's weight from yesterday, not the patient's ideal or "dry" weight. (F)
16. The following 5 statements reflect signs or symptoms that patients may have. Mark "yes" (T) or "no" (F) to signify that a patient should notify their HF physician of these signs or symptoms: BP recording of 80/56 without any HF symptoms. (No/F)
17. Weight gain of 3 pounds in 5 days without symptoms. (Yes/T)
18. Dizziness or lightheadedness when arising that disappears within 10-15 minutes. (No/F)
19. New onset or worsening of fatigue. (Yes/T)
20. New onset or worsening of leg weakness or decreased ability to exercise. (Yes/T)

Appendix H. Measures Table

Domain	Measure	Description
Structural Measure	Physician/Advanced Practitioner support is included in program processes	Program will be supported in the center by a Physician, Nurse Practitioner or Physician Assistance and will include weekly rounding and as needed telephonic follow up.
Structural Measure	Heart failure patients are identified upon admission	All patients with a diagnosis of heart failure will be identified by the admissions and nursing staff prior to or at the time of patient arrival.
Structural Measure	Heart failure interdisciplinary team rounds with a Physician or Nurse Practitioner are performed once weekly.	Frequency of weekly rounds that occur on each enrolled patient.
Process Measure	Heart failure symptom self-reporting tool is completed in daily nursing assessment for applicable patients.	Percent of enrolled patients who receive a heart failure zone tool upon admission to facility.
Process Measure	Heart failure assessments are performed by nursing staff for applicable patients daily.	Frequency of nursing assessments completed each day
Process Measure	Timely interdisciplinary team communication regarding changes in heart failure symptoms occurs.	Frequency of times that a change in a patient's reported zone on the self-assessment tool triggers interdisciplinary communication.
Process Measure	Deteriorating heart failure symptoms are addressed and treated upon evaluation.	The frequency of times that a drop in zone as reported on the self-assessment tool triggers Physician or Nurse Practitioner assessment and management.
Outcome Measure	Center hospitalization rate for heart failure patients.	Percentage of heart failure patients hospitalized over a one-month period
Outcome Measure	Staff knowledge of heart failure	Pretest/post-test results from all facility nursing staff.
Balance Measure	Staff satisfaction with the heart failure management program	Frequency that Nursing staff expresses satisfaction with program processes by the end of implementation
Balance Measure	Staff ability to adjust workflow to accommodate program requirements	Number of staff that report being able to incorporate program process into their workflow.

Table 1. Data collection, evaluation, and analysis methods

Aims/Evaluation Questions	Measures	Measure Type	Data Source	Recruitment Method/ Population	Timing/Frequency	Calculation/ Statistics	Goal/ Benchmark
Improve the identification of heart failure patients upon admission.	% of patients that are added to the program list within 24 hours of admission	Structural	EHR chart review	All patients admitted with a diagnosis of heart failure.	Every new admission and readmission	Percentage. Denominator = number of heart failure program participants during study period. Numerator = number of patients added to the program within 24 hours of admission.	75%
Incorporate Heart failure symptom self-reporting tool into daily nursing assessment for applicable patients.	% of program patients that self-report symptoms daily	Process	Chart review	All patients admitted with a diagnosis of heart failure.	Weekly and as needed for 3 months	Percentage. Denominator = number of heart failure program participants. Numerator = number of participants who have documentation of Zone tool completion.	100%
Improve recognition and communication of deteriorating heart failure symptoms	Frequency of times a deteriorating zone change fails to trigger NP/MD evaluation	Process	EHR chart review and Provider survey	All nursing staff	As needed for 3 months	Frequency. The number of times a patient is noted to have deteriorating symptoms compared to the number of times an NP/MD intervenes for deteriorating symptoms	75%
Improve staff knowledge of heart failure	% improvement in post-test results	Outcome	Pretest-post test results from nursing staff	All nursing staff	Administered two times pre and post intervention	Percentage.	10%

Table 2. Data dictionary

Data Element	Data Label	Data Type	Definition/Purpose	Data Values & Coding
Number of enrolled patients	Enrolled	Numeric	Number of individuals being followed in the program.	numeric value
Project Day	Day	Numeric	Day of project	numeric value
Hospitalization rate	Hosp	Numeric	percentage of patients with an unplanned admission or readmission to the hospital.	numeric value
Weights	Wt	Numeric - continuous	Number of weights obtained in a given day	numeric value
Percent of Weights measured	PerctWt	Numeric	percentage of enrolled patients weighed in a day	numeric value
Zone Tool	Zone	Numeric	number of patients with a zone recorded in a day	numeric value
Percent of Zone Tool completion	PercZone	Numeric	percentage of Zone tool completion for enrolled patients per day	numeric value
Change in Condition	CIC	Numeric	Number of patients with a change in condition on a given day	numeric value
Interdisciplinary Communication	Report	Numeric	number of times an observed change in condition was identified with the zone tool	numeric value
Nursing knowledge of heart failure	Knowledge	Categorical	Is there an improvement in nursing knowledge of heart failure post intervention?	Pre-test Post-test 1 = improved score 2 = unchanged score 3 = lower score

Table 3. Demographics

Patient	Age	Gender	Race	type of HF
1	71	F	1	1
2	73	M	2	3
3	89	F	1	2
4	67	F	1	2
5	89	F	2	1
6	68	F	1	1
7	86	F	1	1
8	74	M	1	2
9	74	F	1	2
10	79	M	1	3
11	67	M	1	2
12	61	F	1	2
13	49	M	3	1
14	90	M	1	2
15	70	M	2	1
16	77	M	1	1
17	67	M	1	2
18	51	M	2	2

Note: Gender: F = female, M = male. Race: 1 = White, 2 = Black, 3 = Hispanic. Type of heart failure (HF): 1 = systolic, 2 = diastolic, 3 = combined (systolic + diastolic).

Table 4. Paired sample t-test

t-Test: Paired Two Sample for Means

	Pre-test	*Post-test*
Mean	78.3333333	86.6666667
Standard Deviation	13.2916014	10.8012345
Variance	176.666667	116.666667
Observations	6	6
Pearson Correlation	0.78941788	
Hypothesized Mean Difference	0	
df	5	
t Stat	-2.5	
P(T<=t) one-tail	0.02724505	
t Critical one-tail	2.01504837	
P(T<=t) two-tail	0.0544901	
t Critical two-tail	2.57058184	

Figure 1. Weight Trend Run Chart

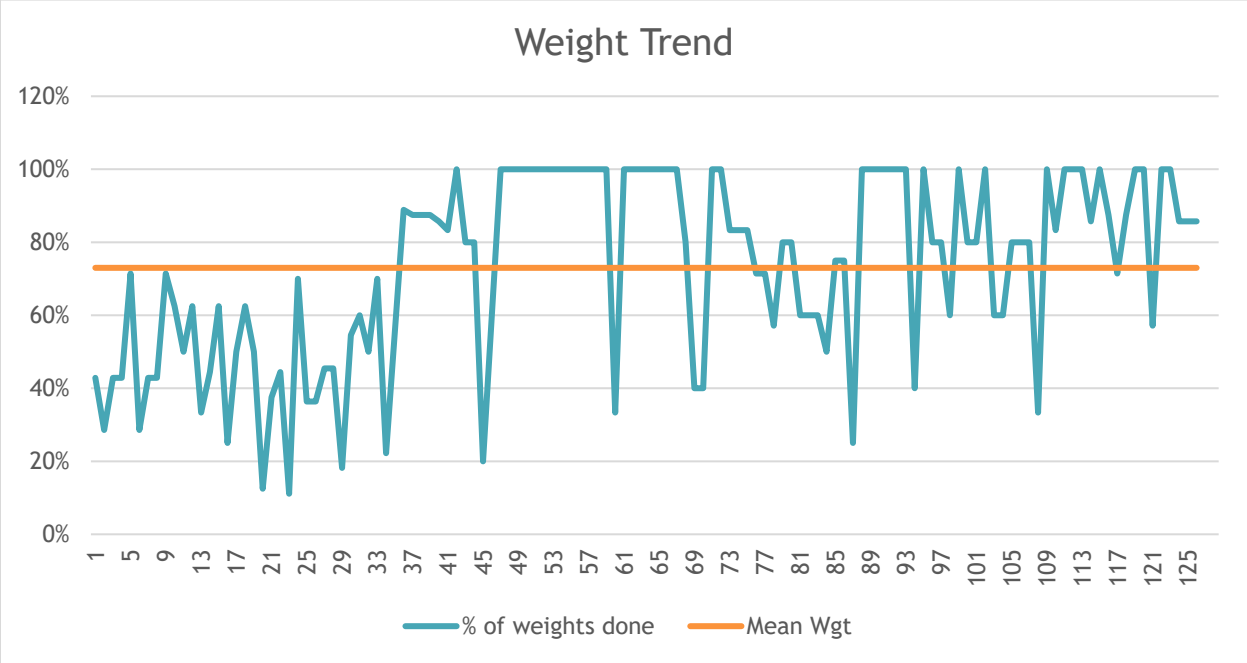


Figure 1. Percentage of weights obtained for heart failure program patients. Numerator = number of patients with a weight documented in the EMR on a given day. Denominator = number of patients followed in the program on that day.

Figure 2. Zone Tracking Tool Run Chart

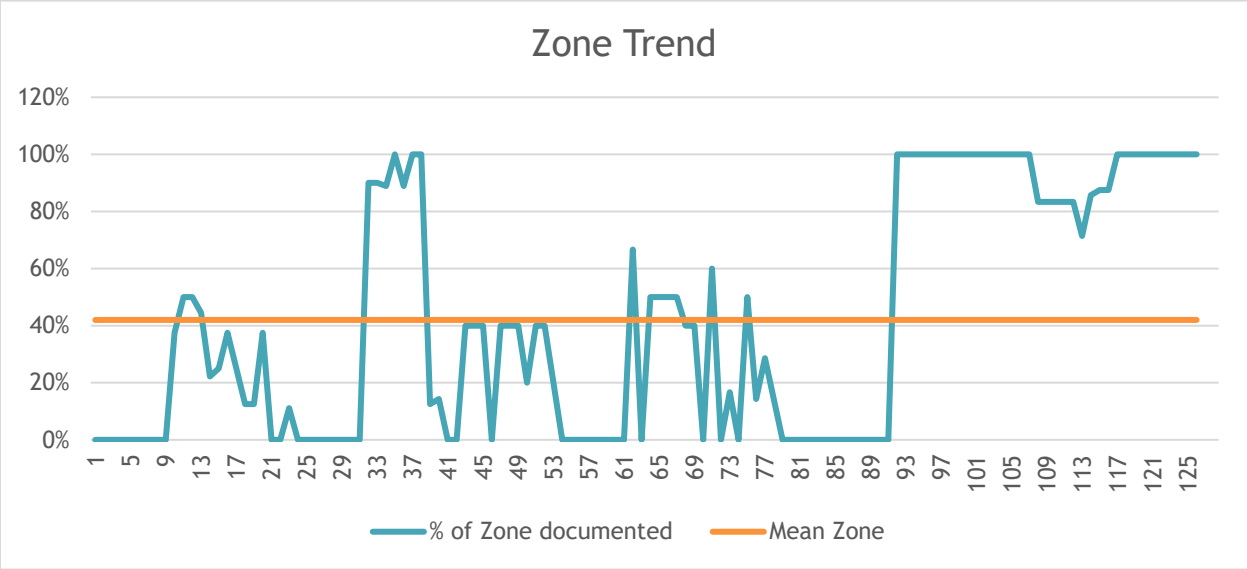


Figure 2. Percentage of program patients with a documented zone. Numerator = number of patients with a zone documented on a given day. Denominator = number of patients followed in the program on that day.