In the United States (US), heart failure (HF) is the leading medical condition resulting in hospital admission. Despite advances in treatment, the number of HF deaths has continued to increase. At Carolinas Medical Center (CMC), more than 950 annual HF admissions provided an opportunity to examine morbidity, mortality, and readmission rates. Within the facility there exist two HF disease management programs treating more than 1,500 patients annually. Through a systematic approach to identify the root causes of morbid and less severe complications, the facility addressed process improvement steps to positively impact HF treatment. Included in these strategies was a link to the outpatient continuum of care created for the HF patient.

An examination of the HF program revealed the care to be fragmented, both organizationally and physically. A majority of readmissions could be prevented through closer patient follow-up and more aggressive therapy. Intensive education for staff about the disease management process, medication interventions, smoking cessation, and nutrition counseling was lacking. An interdisciplinary committee, with strong administrative support, was established to evaluate the current program and recommend changes. Delivery of patient care was changed to an integrated care management system model identifying the root causes of the most prevalent operational and clinical deficits. Process improvement steps were immediately implemented. The 30-day readmission rate (all causes) decreased from 18% to 6.1%, the readmission rate for HF decreased from 7.3% to 1.7%, mortality declined by 25%, and morbid complications decreased by 35%. Evaluation of processes and clinical outcomes are ongoing in order to develop strategies for even greater improvement within the HF program.

Keywords: heart failure; process improvement; outcomes

Heart Failure: Improving the Continuum of Care

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Nearly 5 million Americans are living with heart failure, and 550,000 new cases are diagnosed annually (Hunt et al., 2005). Despite the fact that the majority of HF is due to treatable and preventable causes, it is the leading cause of hospitalization for adults in the US, with approximately 1 million admissions annually (Hunt et al., 2005). In 2005 the estimated direct and indirect cost of HF in the US was over $27.9 billion (Hunt et al., 2005). Five-year mortality following diagnosis is greater than 50% (The Advisory Board Company, 2000). The incidence of HF is dramatically increasing. Therefore, improved patient outcomes and quality care from a variety of health care resources, along with creative management strategies, required exploration.

Carolinas HealthCare System (CHS) is the largest health care system in the Carolinas and one of the largest public systems in the nation, comprising more than 4,300 licensed beds with a vast array of services available. CMC is the flagship facility of CHS, with 861 beds. It serves as a quaternary referral center for 14 regional facilities and a 29-county multistate region. CMC admits nearly one thousand patients annually for HF alone.

There were three main driving forces for process improvement in the HF population. First and foremost was to enhance the quality of patient care. Second was controlling the costs of providing care to readmitted patients. Third was the prerequisite of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) related to core measures of documentation and compliance. JCAHO requirements have increased competitive pressures among hospitals by providing the public opportunities to better evaluate service providers based on compliance with these measures.

Analysis of data revealed that patients who were not involved in any of the structured disease management clinics were more likely to be readmitted, presumably because they were not receiving the same level and intensity of follow-up.

The hospital had all the components of an excellent HF program, although it was fragmented organizationally and physically. Analysis of data revealed that patients who were not involved in

any of the structured disease management clinics were more likely to be readmitted, presumably because they were not receiving the same level and intensity of follow-up. A more contemporary and inclusive standard of care needed to be developed and implemented for all HF patients entering the facility. A collaborative interdisciplinary team was formed with the goal of developing a full continuum of comprehensive, sustainable, and consistent services for patients with HF. Each phase targeted quality of life, quality of care, increased adherence to the plan of care, and patient/family satisfaction.

INPATIENT SERVICES

Historically, patients with HF were admitted to any of four telemetry units or the intensive care unit. If telemetry services were not needed, patients were admitted to any available nursing unit. At any one time, patients with HF could be found throughout the facility. Part of the process improvement design involved cohorting the patients to a designated HF telemetry unit with a secondary unit identified for additional patients. A data management query was done and determined the nursing units that had the lowest rate of complications for cardiac patients.

The traditional model for nurses recruited into CMC was to receive routine nursing orientation without specific HF education. Changes implemented included an intensive 3-month educational program for the nurses on the telemetry units taught by a graduate nursing student. Topics included cardiac pathophysiology, pharmacology, assessment skills, core measures indicators, and home health planning.

Previously, smoking cessation tools were available to nursing staff to print for their patients as time and circumstance permitted. Core measures analysis demonstrated below-average scores for smoking cessation education. Therefore, a full-time tobacco addiction counselor/nurse with a behavioral health background was hired. The initial focus of this position was cardiovascular surgery, HF, and acute myocardial infarction patients who currently smoke or have smoked within 1 year. We now have three full-time tobacco addiction counselors.

A new patient education folder was designed that compiled the HF booklet, HF Plan of Care (pathway), HF-specific education teaching record, smoking cessation advice, discharge instruction sheet, and low-sodium diet plan. Patient education materials were purchased for Spanish-speaking patients. The HF packet was reviewed with the patient and family by the primary care nurse and other disciplines during the hospital stay.

OUTPATIENT SERVICES

The outpatient arena was fragmented, with two disease management groups having separate clinics with varying degrees of support, including nurses, pharmacists, social workers, dietitians, residents, and physicians. Clear guidelines for admission criteria into their HF disease management groups were already established. The outcomes for both groups were excellent prior to implementation of this hospital-wide process improvement program. The two teams made a decision to integrate their patient support groups. Quarterly support group meetings became more formalized, with guest speakers, pharmaceutical support, and dietary support. These meetings had low-sodium food, handouts, and interactive learning. One offering included stress reduction techniques with yoga and massage therapy. Integration of these two support groups gave patients a more comprehensive offering of support services.

Upon discharge home, follow-up visits were scheduled as openings were available in the various clinics: often 2–3 weeks post-hospitalization. A data management query determined that the majority of readmissions for HF occur within 12 days. Therefore, a concerted effort was made to ensure that follow-up office visits were made within 7–10 working days of discharge. The Outcomes Manager (OM) contacted each physician group directly, and they were agreeable to this request. As the program continues to expand, other physician practices are providing same-day access for patients experiencing HF symptom-related needs. One of the disease management groups has a physician's assistant who holds weekly clinics for dose titration of cardiac medications.

Home health was consulted sporadically for HF management or enrollment in a tele-health system. These consults became more structured in identifying specific needs, including assistance for polypharmacy, new-onset HF symptoms, or simply home safety assessments. The hospital and home health affiliate joined together to create a specialized nursing position. This nurse developed and implemented a telephonic program for following up with patients who were no longer eligible for home health services.

CASE MANAGEMENT

In 1999 the Health Care Financing Administration (HCFA) initiated the National Heart Failure Project. This process improvement project was directed at monitoring and measuring the adherence to established quality measures (The Advisory Board Company, 2000). This project became the driving force for refinement of the HF program at CMC. Over the next 4 years there were many changes, including use of OMs and written materials and modification of the care pathway. A hospital-wide HF steering committee was developed to guide this process.

In 2000, the OM role was developed and became responsible for implementing the HF pathway. Initially, the pathway length of stay was 5 days. The first revised pathway was implemented within 6 months. If patient length of stay exceeded 5 days, a variance sheet was completed and returned to the OM. Variance sheet analysis determined whether the 5-day length of stay was met.

A draft model of a 3-day pathway, to be titled "Plan of Care," was presented and accepted in 2003. The change was based on available data showing a decrease in length of stay with adherence to quality guidelines. In early 2004, as the HF committee came

together, two OMs were assigned to medical record review of patients with HF. The charts were reviewed in real time on a daily basis to assist in compliance with core measures documentation. The OMs focused on potential complications and increased awareness of issues such as need for urinary catheter removal and pneumococcal vaccine assessment. Audit data was provided for the telemetry units on compliance rates with documentation and care. Simultaneously, the OMs hosted a core measures fair for the cardiology division. This core measures education was in the form of a poster presentation and one-on-one discussion pertaining to the rationale behind each of the measures. An open-book posttest was provided for all in attendance.

A cardiac discharge instruction sheet was created to incorporate core measure data points. This tool assisted staff nurses in their documentation as well as in meeting evidenced-based guidelines. Discharge instruction sheets were reassessed and revised with input from staff nurses. To enhance nurses' knowledge of cardiac medications, further continuing education was provided. A pharmacy resident developed laminated pocket cards listing the various classes of drugs. The cards were distributed to all nurses on the cardiology units. In addition, a larger version of the card was taped to medication carts in the cardiology division.

Home care developed a home pathway with emphasis on behavior modification. Specific orders, goals, and teaching plans were addressed.

Biweekly interdisciplinary meetings were reinstituted on the primary telemetry unit. This collaborative effort required tremendous commitment from respiratory therapy, midlevel providers, pastoral care, home health, physical therapy, dietary, HF nurses, transplant team, staff nurses, social work, and clinical care managers.

HOME SERVICES

Many incremental changes were implemented in home care during the system-wide reorganization. Clinical integration through brainstorming and collaboration during interdisciplinary meetings soon became the norm, and ideas gradually became reality. In the past, a stand-alone traditional home care model was the standard. Presently, a HF initiative with home care orders and a dedicated home care coordinator assessing patient needs prior to discharge is the new collaborative model.

Home care developed a home pathway with emphasis on behavior modification. Specific orders, goals, and teaching plans were addressed.

A cardiac monitoring computerized program was also implemented. This program electronically monitors the patient's blood pressure, heart rate, and weight. The vital signs are transmitted daily through a phone line from the patient's home to the nurse monitoring the data. Fluctuating vital signs beyond given parameters prompts a phone call to the patient and the physician. Immediate interventions, such as medication dose titration, often prevent unneeded office visits, emergency department visits, and hospitalizations. Patients feel connected and secure with the new program. In addition, a telephone management program for patients with HF who have had frequent readmissions was implemented. An individualized patient program with cardiac monitoring provides potential cost reductions in medical care to this high-risk population.

DISCUSSION OF FINDINGS

Mortality was reduced from 4.9% to 2.8% after the integrated care management system model was implemented (valid at 90% confidence interval). Possible reasons for this reduction in mortality were related to aggressive discharge planning, follow-up, and focus on potential complications (Figure 1). In addition, the use of device therapy cannot be ruled out as a possible cause for reduction in mortality.

Morbid complications were reduced from 10.1% to 8.0% due to early mobilization, hospital-wide sleep apnea screening, and head-of-bed elevation. Another contributor is the addition of the tobacco addiction counselor. The impact of core measure education may well have indirectly led to decreased morbidity. The OMs and HF nurses completed frequent assessments of volume depletion and made medication modification recommendations to the staff nurses as well as the physicians. Similar discussions occurred regularly in a collaborative manner. The team approach has made this program successful.

Early in the planning phase, directing the patient with HF to one telemetry floor was critical and one of the most difficult undertakings, since it required the assistance of more than one discipline. Multiple discussions with bed management, the emergency department, and specific nursing units were held (Figure 2). It took the better part of 1 year to make this a reality and a success. The most rewarding component was the education and empowerment of the nursing staff. The nurses take great pride in being a specialty floor. Education of staff is ongoing and is the individual responsibility of the HF telemetry unit.

All the measures have decreased 30-day HF readmissions as well as 30-day all-cause readmissions. Focused education for primary care providers of patients with HF, as well as aggressive telemanagment and outpatient clinic follow-up, realized cost savings for the facility. More importantly, it has allowed patients to remain at home to receive their care (Figure 3).

Discussion

CHF Outcomes	Baseline	Post Implementation	Comments
Reduction Mortality	4.9%	2.8%	•Device Therapy •Aggressive Discharge Planning & Follow-up •Focused on potential complications
Reduction Morbid Complication	10.10%	8%	**Pneumonia/Respiratory Failure:** •Early mobilization •Smoking cessation •Sleep apnea screening •Initiation PNA core measures •HOB elevation **Renal Failure:** •Frequent assessment volume depletion •Gentle dehydration medication modifications

Figure 1. Outcomes. PNA = pneumonia; HOB = head of bed.

Discussion

Value added improvements	Baseline	Postimplementation	Comments
Cohorting to telemetry floor	68%	78%	•Educated Primary Care MD's •Collaborated with bed management •Dedicated HF nursing staff
30-Day CHF Readmit	7.7%	5%	•Focused HF Education for Primary Care MD's & Staff •Aggressive telemanagement and outpatient clinic follow-up
30-Day All Cause Readmit	18.2%	11%	

Figure 2. Value Added Improvements.

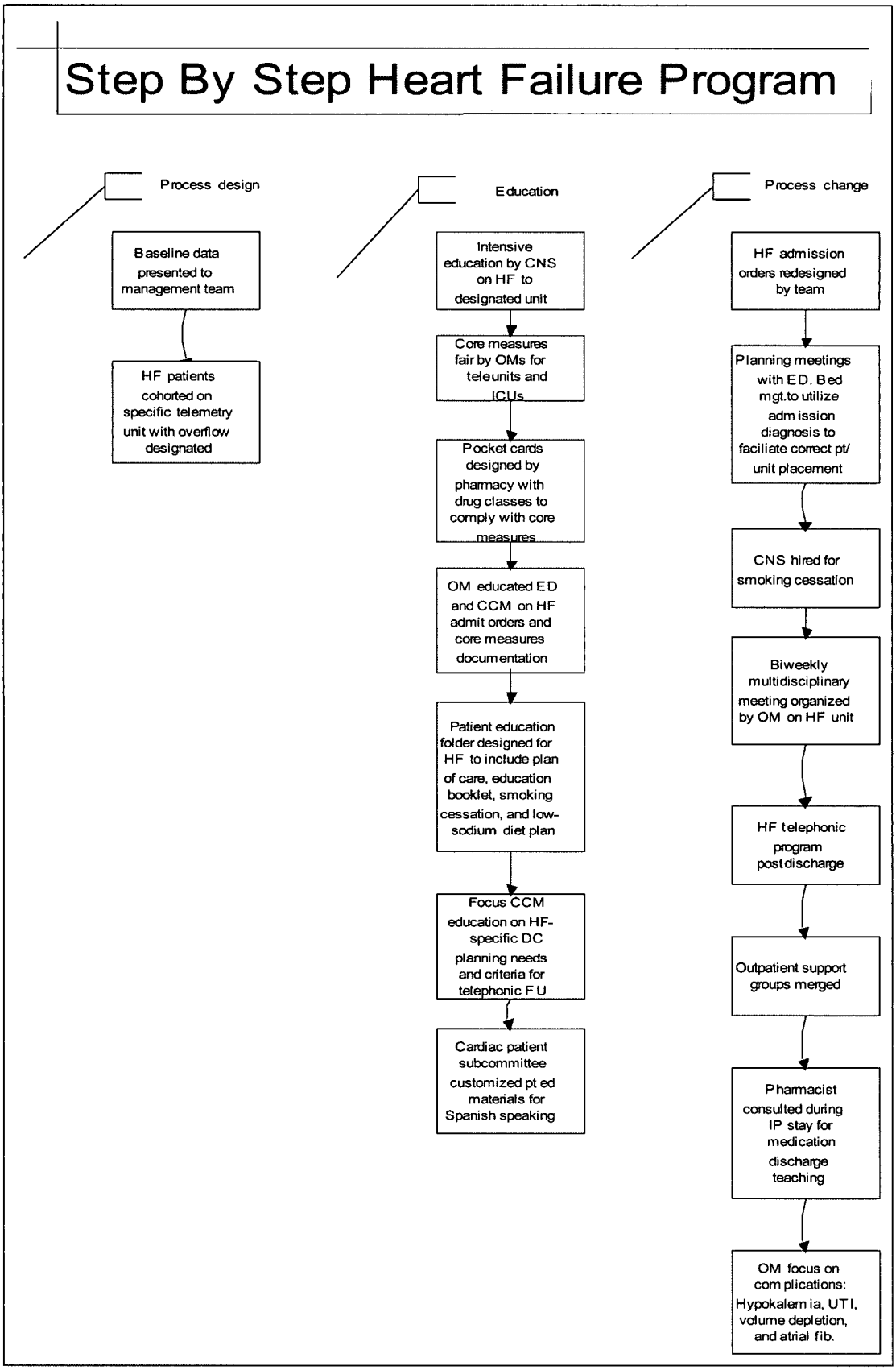

Figure 3. Step by Step Heart Failure Program. CNS = clinical nurse specialist; ICU = intensive care unit; ED = emergency department; CCM = clinical care management; DC = discharge; FU = follow up; mgt = management; pt = patient; IP = inpatient; UTI = urinary tract infection; pt ed = patient education; atrial fib = atrial fibrillation.

FUTURE DIRECTION

Great strides in HF management have been made, but the program is continually being analyzed and refined. One of the critical needs presently on the drawing board is to increase and consolidate the physical space dedicated to HF services. Outpatient care needs to be centralized. Enhanced external counterpulsation therapy, an infusion clinic, and patient education rooms are only a part of the vision. Data are monitored continuously to discover opportunities to reduce morbidity and mortality. An ultimate goal is to apply for JCAHO disease-specific certification. The physician groups within the Carolinas Physician Network have just enlisted a physician's assistant to start a disease-specific HF clinic, and it is expected that more physician groups will commit to this important program. Another goal is to transfer the knowledge and success of this program to other high-risk/high-volume disease management programs. The inpatient focus on complications of volume depletion, nosocomial urinary tract infection prevention, and metabolic abnormalities continues. A change in paradigm to being proactive initiators in disease management is firmly in place. With the ongoing shortage of registered nurses, more telehealth programs are the vision. Future research will enable CMC to be the most comprehensive HF center of excellence in the southeast.

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