

## Development of a Heart Failure Center: A Medical Center and Cardiology Practice Join Forces to Improve Care and Reduce Costs

Douglas B. Chapman, MD, FACC; and Jackie Torpy, RN, BSN

### **Abstract**

**Congestive heart failure (CHF) is a rapidly growing and expensive cardiovascular disorder. Conventional care for CHF is ineffective and results in a cycle of "crisis management" that includes repeated emergency department visits, hospitalizations, and physician visits. Recently, a number of outpatient coronary care centers that provide consistent, aggressive outpatient therapies and extensive patient education have emerged and are successfully breaking this cycle of dependence on hospital services. One such effort is The Heart Institute's Heart Failure Center, the result of a partnership between a private-practice cardiology group and our tertiary-care medical center. Our program includes not only patient education and outpatient infusions of inotropic agents, but an electronic linkage to the emergency department and home healthcare services. Preliminary data show that 16 months after the program was initiated, hospital admissions decreased by 30%, hospital days by 42%, and average length of stay by 17%. An effective outpatient heart failure program can alleviate the economic burden of CHF and improve the quality of patient care.**

*(Am J Man Care 1997;3:431-437)*

**C**ongestive heart failure (CHF) is the most prevalent cardiovascular public health problem in the United States today, and the number of patients diagnosed with CHF is growing rapidly. CHF is the number one diagnosis-related group (DRG 127)

for hospital admissions, and DRG data show that the number of CHF patients has increased 5% annually over the past 5 years.<sup>1</sup>

The evaluation and care of these patients represents a significant economic burden, costing the US healthcare system more than \$10 billion a year.<sup>2</sup> In 1992, Medicare paid out \$2.4 billion for 654,000 hospital admissions for DRG 127 alone.<sup>3</sup> In 1994, there were 840,000 hospital admissions, with an average hospital stay of nearly 7 days for each admission.<sup>4</sup> The average cost per discharge was \$5,104, and the average Medicare reimbursement was \$4,610.<sup>4</sup>

Since most of these costs stem from emergency department and inpatient hospital services, CHF patients represent an important component of uncompensated hospital care. Unfortunately, conventional care for heart failure patients has been remarkably ineffective, and CHF patients commonly embark on a cycle of acute crises, emergency department visits, and hospital admissions.

To reduce these hospital admissions significantly, this cycle of dependence on hospital services must be broken. Resources must be redirected to outpatient management strategies that help identify problems before they become acute and keep patients in relatively good health. Ideally, as much as half of inpatient care for CHF should be provided outside of the hospital setting, if needed at all.<sup>9</sup>

In this article, we describe how a tertiary medical center, the Alegant/Immanuel Medical Center, joined forces with a private-practice single-specialty group, Heart Consultants, PC, to address these growing economic pressures without sacrificing quality of care.

### **The Current "Market"**

Specialized, outpatient heart failure centers designed specifically to address this problem are springing up across the country. These centers take an aggressive, multidisciplinary, and preventive approach to CHF. They give scrupulous attention to medical therapy, close clinical follow-up, and thorough patient

From The Heart Failure Center, division of The Heart Institute, Immanuel Medical Center, Omaha, NE.

Address correspondence and reprint requests to: Douglas B. Chapman, MD, The Heart Institute, 6901 North 72nd Street, P.O. Box 34439, Omaha, NE 68134-0439.

Preparation of this manuscript was supported by an unrestricted educational grant from Sanofi, Inc.

education in an effort to not only reduce emergency department visits and hospital admissions, but to improve quality of life for patients.

Recently, several studies showed that such aggressive care of CHF patients can reduce hospitalizations, morbidity, and mortality.<sup>5-8</sup> In one 8-month, controlled study of patients with moderate to severe heart failure,<sup>5</sup> clinic patients averaged 0.6 admissions for exacerbations of heart failure, whereas control patients averaged 1.3 admissions ( $P<.05$ ). The mortality rate was 10% in the clinic group, compared with 19% in the control group. In another study, such comprehensive management obviated the need for immediate heart transplantation in 30% of patients with advanced heart failure.<sup>4</sup> The patients ( $n=214$ ) in this study had 429 hospitalizations in the 6 months before referral to the comprehensive care program; during the 6 months after the referral, these patients required only 63 hospitalizations. Their mean New York Heart Association (NYHA) class score improved from 3.3 to 2.4. In a third, prospective randomized trial, one St. Louis-based nurse-directed specialized heart failure center significantly reduced readmission rates and medical costs and improved quality of life for heart failure patients.<sup>7</sup> Weekly home visits for elderly patients with severe CHF has also been shown to reduce hospitalizations and morbidity, and to improve functional status.<sup>8</sup>

Our Omaha-based Heart Failure Center at Immanuel Medical Center integrates existing hospital programs, hospital personnel, and private-practice physicians into one comprehensive outpatient program.

**Table 1.** Goals of The Heart Failure Center

Evaluate and treat reversible causes of heart failure
Maximize quality of life for patients who have chronic heart failure
Provide aggressive outpatient treatment:
– Maximize oral therapy
– Administer infusion therapy
Minimize emergency department visits, hospital admissions, and length of stay
Educate patients to participate actively in their treatment
Make experimental protocols and cardiac transplantation available to patients who do not respond to conventional treatment

### Development of the Heart Failure Center

The Heart Failure Center is a division of The Heart Institute, which was formed when the nonprofit, 400-bed Alegant/Immanuel Medical Center joined forces with Heart Consultants, PC. The Heart Institute is a nonprofit institution located in the medical center. All diagnostic and outpatient clinics are in the medical center, and the examination rooms and physicians' offices are located in the institute, which employs all ancillary personnel. The Heart Failure Center and Heart Consultants, PC, contract exclusively with each other. The Heart Institute has approximately 13,000 active patients, with medical coverage as follows: Medicare (65%), fee-for-service plans (15%), and managed care plans (20%).

Before developing The Heart Failure Center, the administrator and medical director of The Heart Institute researched the clinical and economic consequences of heart failure. They found that chronic heart failure used considerable clinical resources, that the hospital's pool of patients with chronic, medically complex heart failure was large and growing, and that the existing hospital system was unable to provide the ongoing care these patients require. Due to advances in treatments, patients with CHF are living longer, and the majority of patients with advanced heart failure are not receiving heart transplants. The result was recurrent emergency department visits and hospital readmissions.

They also found valuable information from the revealing 1994 *Cardiology Preeminence Roundtable* report on CHF and from a 2-day meeting held by the Cardiology Roundtable.<sup>9</sup> From this research, the administrator and medical director created a specific set of goals for the center that are designed to reduce costs and improve quality of care (Table 1).

The basic structure of The Heart Failure Center is outlined in Figure 1.

**Key Personnel.** The three key positions at The Heart Failure Center are medical director, program (nurse) coordinator, and The Heart Institute administrator. The Heart Institute administrator manages the cost center for The Heart Failure Center and tracks all revenues and expenditures. The medical director is a cardiologist specializing in the management of heart failure, and the program coordinator is a full-time registered nurse trained in heart failure. The program coordinator essentially functions as an extension of the medical director, helping to implement the interdisciplinary program by meeting with all department personnel and educating all staff members.

**Program Implementation.** The key operating objectives of The Heart Failure Center are (1) to provide

consistent care, (2) to ensure that patients frequently visit the center until they are clinically stable, and (3) to prevent acute decompensations that lead to inpatient admissions. To achieve these operating objectives, The Heart Failure Center consistently adheres to a logical medical strategy that minimizes medication switching, maintains therapeutic compliance, promotes good patient-physician relationships, and enhances patients' knowledge about their disease—all of which help prevent exacerbations of heart failure.

To ensure consistency of care, each patient is assigned to one clinician group, and all clinicians in the group follow the same protocol. Standardized clinic visit forms are used. Patients are evaluated the same way at each clinic visit despite different physician styles. Thus, even when a patient is seen by different cardiologists on separate visits, evaluations and decisions are made on the basis of the same clinical parameters.

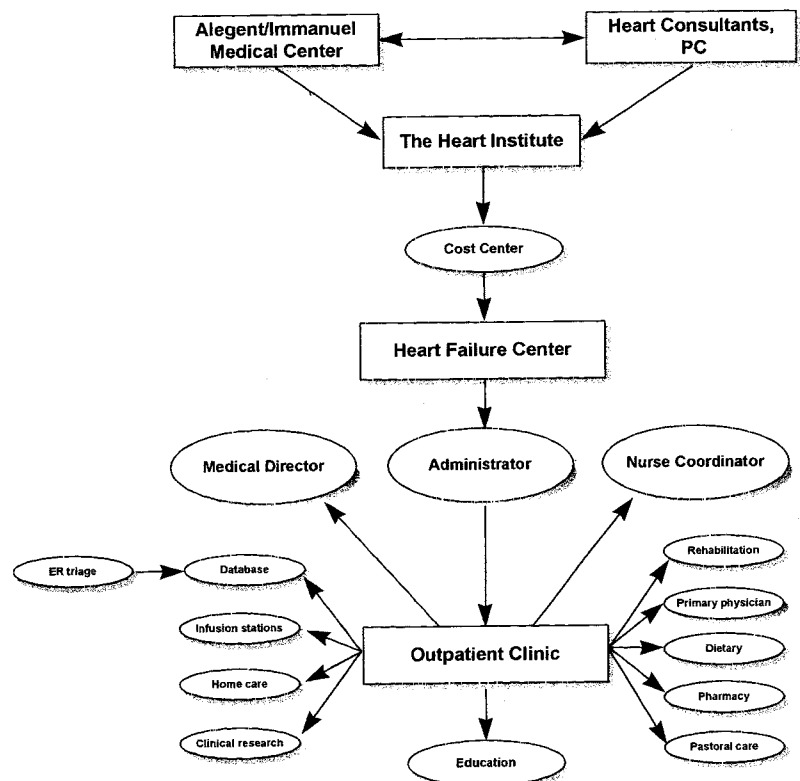
The protocols are established by The Heart Failure Center, and they focus on treatment as well as education. For instance, all patients with systolic dysfunction must receive an angiotensin-converting-enzyme (ACE) inhibitor, provided they have no contraindications to these drugs. Selected patients who have severe (NYHA classes 3 and 4) heart failure receive intravenous inotrope (milrinone or dobutamine) infusions. Table 2 and Table 3 present our treatment protocols for heart failure patients taking ACE inhibitors and outpatients receiving intravenous milrinone treatment, respectively.

At the center, aggressive care and frequent follow-up visits are key to achieving and maintaining clinical stability and, thus, preventing acute cardiac decompensation. Initially, patients are seen weekly until they stabilize medically. Thereafter, patients are seen at least every 6 weeks. At each visit, patients are evaluated with the same rigor as if they were enrolled in a controlled experimental protocol. Electrolyte levels and renal function are monitored at each clinic visit, and laboratory results are available before the patient leaves so immediate adjustments in medication can be made. After the patient stabilizes, maximum oxygen consumption is measured to help deter-

mine cardiac function. This information helps the medical staff determine if the patient is a candidate for heart transplantation.

*Patient Education and Support.* At The Heart Failure Center, patient education is paramount, because well-educated patients tend to participate much more actively in their treatment. We educate patients about their disease, proper diet, and compliance with medications, and if needed, weight-loss programs. The more patients know about their medications, dosages, and why they are needed, the more effectively they can subjectively assess symptoms. The more patients understand the rationale of the treatment strategy, the more likely they are to comply with their medication and dietary regi-

**Figure 1.** This diagram illustrates the development of The Heart Failure Center, a division of The Heart Institute at Alegant/Immanuel Medical Center, a tertiary-care medical center, and Heart Consultants, PC, a private-practice cardiology group.



**Table 2.** Protocol for Treatment with ACE Inhibitors

1. If possible, use well-studied agents with known target dosages; eg, captopril 50 mg tid, or enalapril maleate 10 mg bid
2. Record baseline renal function before initiating therapy so changes can be appreciated.
3. Start at one quarter to half the target dosage and titrate upward weekly as clinical symptoms, blood pressure, and laboratory results allow
4. Monitor blood pressure and clinical symptoms, such as dizziness and cough, weekly. Also evaluate electrolyte and blood urea nitrogen (BUN) or creatine levels weekly. If the creatine level rises significantly, discontinue the angiotensin converting enzyme (ACE) inhibitor. If potassium level rises, try increasing loop diuretic.
5. After achieving ACE-inhibitor target dosage, patient can be seen monthly
6. If patient does not tolerate agent used because of rash or cough, try another ACE inhibitor before using other forms of afterload therapy
7. Other forms of afterload therapy include hydralazine HCl plus nitrates. The target dosage of hydralazine is 300 mg to 400 mg/day; the target dosages for nitrates are 40 mg tid for isosorbide dinitrate and 120 mg/day for long-acting nitrates. Titrate drug dosages in the same way as for ACE inhibitors (steps 3 and 4).

**Table 3.** Protocol for Intravenous Milrinone Lactate Treatment for Outpatients

Infuse milrinone according to the following administration schedule:

- 50 g/kg iv push slowly over 10 minutes, then
- 0.375 g/kg/min x 1 hr, then
- 0.5 g/kg/min x 1 hr, then
- 0.375 g/kg/min x 1 hr, then
- Discontinue infusion

Intravenous Medication Pump

Perform telemetry

Monitor vital signs every 15 min for 1 hr, then as often as needed every hour

Obtain patient's body weight both before and after infusion

Measure electrolyte, BUN, creatine, and magnesium levels at each infusion

Monitor and record intake and output of fluids

Use telemetry emergency standing orders for ventricular irritability and symptomatic bradycardia

Follow hospital's established guidelines for potassium levels of <4.0 mEq/L

Notify physician if any of the following occur:

- Symptomatic changes in BP of >20 mm Hg up or down from baseline
- Enhanced ventricular ectopy changed from baseline
- Onset of worsening shortness of breath
- Symptomatic heart rate changes of >20 beats/min (increase or decrease)
- Significant weight gain, presence of peripheral edema, rales, paroxysmal nocturnal dyspnea, orthopnea, change in functional capacity noted at patient's arrival
- Lab results show clinically significant changes

Reinforce the need for a low-salt diet and the 1,500-cc fluid restriction, review when to call, remind about taking daily weights, and review the need for compliance with medications

mens and, in turn, minimize disease exacerbations and hospitalizations.

The patient education process is multidisciplinary, because a team approach allows us to teach many patients while maintaining a high patient satisfaction level. A formal, one-on-one curriculum developed for heart failure patients begins in the hospital, before patients are discharged. The floor nurse, dietitian, pharmacist, physician, and program coordinator all answer questions and discuss CHF and its treatment with patients.

The pharmacist helps answers patients' questions about medications and adverse effects, encourages compliance, and answers physicians' and patients' questions about drug-drug interactions and medication delivery. Patients receive a medication satchel, which helps them remember to take their medications with them to the center, where the drugs are then reviewed routinely by the pharmacist. Later, during visits to the center, the cardiologist, program coordinator, and ancillary personnel continue to actively educate patients about their disease.

The dietitian plays an important educational role as well. Most patients must make long-term dietary changes and have questions about nutrition. The dietitian spends time with each patient after the physician visit. This minimizes the physician's time spent with the patient and maximizes the patient's satisfaction with care.

Rehabilitation personnel encourage patients to exercise to preserve muscle mass. They also use the time patients spend in rehabilitation to provide group support and encourage return visits by maintaining an enjoyable atmosphere. Spouses participate in this program as well, and this provides a strong support system for the patient.

The hospital's pastoral care department helps patients who have heart failure accept their disease and organizes support groups for patients and family members. Hospital volunteers also help achieve this objective. Volunteers visit with patients during infusions to help make the experience more tolerable. These hospital personnel also place reminder calls to patients the day before appointments and arrange transportation if needed. They can also provide emotional support, since some volunteers themselves

have had spouses in the heart failure program. The center also offers pamphlets, books, and videos to patients to reinforce the educational process.

**Infusion Stations.** Although few outpatient centers offer outpatient infusions of inotropic agents, infusion stations represent a key element of our center's strategy. These stations, which are designed to allow administration of intravenous fluids and diuretics as well as inotropes, allow us to administer infusions of milrinone and dobutamine on an outpatient basis. The Heart Failure Center provides milrinone and dobutamine infusions three times a week to carefully selected patients who have advanced (classes 3 and 4) CHF; these patients represent 80% to 85% of our CHF patient base.

The infusion stations also support the emergency department, as they are also used to treat acute episodes of decompensation, perform hemodynamic monitoring and elective cardioversions, and administer antiarrhythmic therapy. As a result, these stations help to decrease hospital readmissions while improving the patient's quality of life (by preventing hospital admissions), and these benefits are now beginning to be recognized.<sup>10-12</sup>

**Emergency Department Link.** Ideally, the care of patients with chronic CHF does not involve the emergency department. Realistically, though, patients often present to the emergency department, and in these cases, our main goal is to prevent unnecessary admission. We are able to achieve this goal because we keep a database of our heart failure patients that is readily accessible from the emergency department.

When a clinic patient presents to the emergency department, this database helps the emergency physician and the on-call cardiologist judge the severity of the decompensation and objectively assess the need for inpatient care. The database contains essential medical information about the patient's chronic compensated state. These easy-to-read, on-line records contain dates and results of past echocardiograms, cardiac catheterization, bypass procedures, radionuclide ventriculography, and oxygen consumption results. They also house patient trends in weight, blood pressure, subjective symptoms, renal function, and electrolyte status.

When needed, the emergency department physician can provide intravenous diuresis until the patient improves clinical-

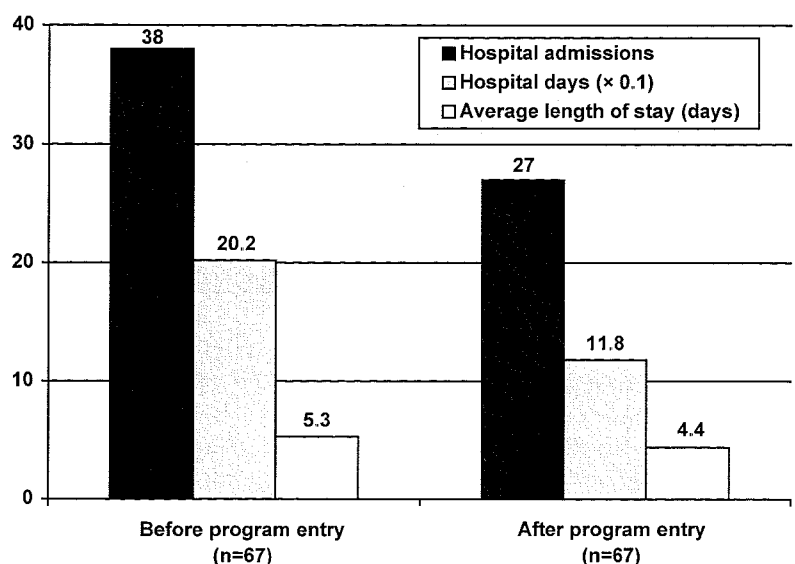
ly or is transferred to The Heart Failure Center. The patient is hospitalized only when neither treatment option is possible.

**Home Healthcare Nursing.** The center employs a home healthcare nurse whose primary role is to detect clinical decompensation that may occur between clinic visits. The home healthcare nurse can report changes to the program coordinator 24 hours a day to hasten adjustments in medication and prevent hospitalization. The nurse also determines when a detected change in clinical status is serious enough to warrant a visit to the center.

For consistency of care, the home healthcare nurse also sees patients on regular clinic days and works with patients to reinforce the importance of compliance with medications and diet. The nurse also confirms the patient's next clinic appointment to ensure that patients do not get lost to follow-up, even after a missed appointment.

**Clinical Research.** With the help of clinical research funding, our center also develops and offers alternative treatments for patients with end-stage heart failure who no longer respond to conventional medications. The availability of different treatment options gives patients and families emotional sup-

**Figure 2.** Improvements in Outcomes Tracked by The Heart Failure Center's Cost Center



Two admissions accounted for 32 hospital days (27%)

port and hope. Patients can also choose to participate in research protocols at various stages in the disease process.

*Cost Tracking.* We have also found our cost center to be very important, because it has allowed us to objectively evaluate the impact of the center on hospital costs.

The cost center tracks all revenue from outpatient infusions and other procedures, such as central line placement, thoracentesis, and intravenous diuresis, which are sent through the hospital's billing system. The cost center does not track revenue from clinic visits, which are billed by the private practice group.

The cost center also tracks all patient care and ongoing costs. The total cost of caring for patients with CHF begins when left ventricular dysfunction is diagnosed and includes all medications, physician visits, emergency department visits, and hospitalizations. The major cost is hospitalization. At our institution, each CHF admission costs about \$9,000, and patients with chronic heart failure are admitted two to three times a year. Even if each patient had only one fewer hospital admission per year, the outpatient program would result in notable savings.

Ongoing costs include supplies for infusions and outpatient procedures, development of brochures and educational materials, and salaries for the program coordinator, a recreational therapist, and the dietitian.

*Outcomes Research.* Recently, we conducted a preliminary evaluation of 67 CHF patients before and after their enrollment in The Heart Failure Center to determine the comparative number of hospital admissions, the number of hospital days, and the average lengths of stay. We followed these patients for a minimum of 1 year before enrollment and for an average of 16 months after enrollment. Our patient population consisted of 44 men and 23 women ranging in age from 39 to 89 years (mean age: 64.7 years). Eighty-four percent were white. CHF resulted from coronary artery disease in 68% of patients, idiopathic disease in 16%, and other causes in 16%. Fifty percent of our patients had advanced heart failure (classes 3 and 4), 47% had class 2 heart failure, and 3% had class 1 heart failure.

When the two populations were compared, we noted decreases ranging from 17% to 42% for all three parameters evaluated (Figure 2). Hospital admissions for the 67 patients dropped 30%, from 38 before program enrollment to 27 after implementation. The number of hospital days decreased 42%, from 202 days to 118 days. Average length of stay decreased almost one full day (17%), from 5.3 days to 4.4 days.

We also found that 1 year of frequent visits to our center costs less than a single hospital admission for heart failure. Each year in the outpatient clinic, a patient is seen an average of 15 to 20 times at an average cost of \$2,000, or less than one-quarter of the \$9,000 cost of one hospital admission for CHF. Our findings, although preliminary, suggest that The Heart Failure Center is helping to decrease hospital admissions, hospital days, and average length of stay, and as a result, significantly reduce costs associated with CHF.

## Conclusions

Conventional care for CHF is ineffective and results in repeated crises, emergency department visits, and hospital admissions—all which drive up hospital costs significantly. When resources are redirected to aggressive and effective, multidisciplinary outpatient care that includes ongoing patient education/support, outpatient infusions, and home healthcare, many of these patients can be maintained in relatively good health. Problems can be identified before they reach crisis proportions. Provided they also allow for effective and open communications with the emergency department physicians, these outpatient programs can dramatically reduce emergency department visits and hospital admissions and, thus, decrease healthcare costs. Just as importantly, they can improve quality of life for the patient by preventing repeated, acute medical situations.

## REFERENCES

1. Health Care Investment Analysts Inc., Ernst & Young LLP. *Medicare Summary Information for Top Five Diagnosis-related groups*. Baltimore, MD: Health Care Investment Analysts Inc. and Ernst & Young LLP; 1995.
2. American Heart Association. *Heart and Stroke Facts: 1994 Statistical Supplement*. Dallas, TX: American Heart Association National Center; 1994.
3. Health Care Financing Administration (HCFA). *MedPAR Database*. Baltimore, MD: HCFA Bureau of Data Management and Strategy, Office of Statistics and Data Management; 1992.
4. Health Care Financing Administration (HCFA). *MedPAR Database*. Baltimore, MD: HCFA Bureau of Data Management and Strategy, Office of Statistics and Data Management; 1994.
5. Hunn D, Pedersen WR, Becker R, et al. Benefits of attending a heart failure clinic. *Circulation* 1990;82:III-609 Abstract.

6. Fonarow GC, Stevenson LW, Walden JA, et al. Impact of a comprehensive management program on the hospitalization rate for patients with advanced heart failure. *J Am Coll Cardiol* 1995;Feb(special issue):264A. Abstract.
7. Rich MW, Beckham V, Wittenberg C, et al. A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. *N Engl J Med* 1995;333:1190-1195
8. Kornowski R, Zeeli D, Averbuch M, et al. Intensive home-care surveillance prevents hospitalization and improves morbidity rates among elderly patients with severe congestive heart failure. *Am Heart J* 1995;129:762-766.
9. Cardiology Roundtable. *Beyond Four Walls. Cost-Effective Management of Chronic Congestive Heart Failure*. Washington, DC: The Advisory Board Company; 1994.
10. Marius-Nunez AL, Heaney L, Sibler E. The role of intermittent inotropic therapy in the heart failure clinic of Michael Reese Hospital and Medical Center. *Congestive Heart Failure* 1995;July/Aug:30-33.
11. Friedman AW, Minella RA, Silver SJ, et al. Reduced hospital admissions with chronic inotropic therapy for resistant congestive heart failure. *Congestive Heart Failure* 1995;Nov/Dec:19-23.
12. Rauh RA, Schwabauer NJ, Enger EL. A community hospital based congestive heart failure program: Impact on admission rate, length of stay, and readmission rate in an elderly population. *Am J Geriatric Cardiol* 1996;5(2):51. (Abstract).