

## Cost of Heart Failure to the Healthcare System

*Based on a presentation by John Mackowiak, PhD*

### **Presentation Summary**

From an economic, mortality, and functional standpoint, heart failure is clearly a disease that needs to be targeted. We can develop a model for heart failure to determine the impact that specific management strategies will have on the overall cost to the system, which by itself can tell us

some interesting things because we're currently spending twice as much on transplantation as on digoxin therapy. We can then use this model to assess the impact of different strategies, such as greater use of angiotensin-converting enzyme (ACE) inhibitors or digoxin therapy.

**A** number of estimates have been made as to the costs that heart failure represents to the US healthcare system. They range from \$8 billion a year, to \$10 billion a year,<sup>1</sup> to \$36 billion a year.<sup>2</sup> Interestingly, Parmley's estimate targets 75% of the expenditure for care in the hospital and 20% for long-term care, leaving only 5% for all other forms of care. For all cardiovascular diseases, lost labor and healthcare costs accounted for \$138 billion in 1994.<sup>3</sup> The high mortality rate associated with heart failure is an important contributing factor. Aside from the costs associated with a life lost, we do know that most of the dollars are spent in a patient's last 6 to 12 months of life.

Quality of life can also be assessed for heart failure, and one of the most widely used instruments is the SF-36 scores, in which eight different aspects of functional status are assessed with 36 questions. As people age, there is a decrease in physical function, while surprisingly, the mental health scores seem to go up.

If we examine the SF-36 scores for different diseases, we can see results that indicate a reduction in physical function for heart failure. From a functional standpoint alone—without considering economics or mortality—heart failure is clearly a disease that needs to be targeted.

Data from the PROVED<sup>4</sup> and the RADIANCE<sup>5</sup> studies show a reduction in hospital admissions and in emergency department visits that translates to real savings. In addition, a reduction in treatment failures will also result in savings, because it usually means an office visit.<sup>2</sup>

### **Developing a Model**

A model for heart failure can be developed to determine the impact specific management strategies will have on the overall cost to the system. Table 1 shows a basic model of the system; it assumes a prevalence of 3.5 million heart failure patients in the United States, or 1.3% of the population (265 million). With 722,000 hospitalizations annually, each

**Table 1.** Annual Cost of Heart Failure

|                             | \$/Unit | Rate  | Events     | Cost/Patient   | US Cost                |
|-----------------------------|---------|-------|------------|----------------|------------------------|
| Hospitalization             | \$7,000 | 0.209 | 722,722    | \$1,463        | \$5,059,054,000        |
| Emergency Room Visit        | 363     | 0.042 | 144,544    | 15             | 52,469,617             |
| MD Visit                    | 100     | 3.400 | 11,757,200 | 340            | 1,175,720,000          |
| Laboratory/Diagnostic Tests | 50      | 6.000 | 20,748,000 | 300            | 1,037,400,000          |
| Digoxin                     | 40      | 0.650 | 2,247,700  | 26             | 90,245,155             |
| Digoxin Monitoring          | 50      | 0.325 | 1,123,850  | 16             | 56,192,500             |
| Digoxin tox.                | 1,000   | 0.003 | 11,239     | 3              | 11,238,500             |
| ACE Inhibitors              | 621     | 0.600 | 2,074,800  | 372            | 1,287,413,400          |
| Diuretics                   | 44      | 0.720 | 2,489,760  | 32             | 109,051,488            |
| Cardiac Transplant          | 124,000 | 0.000 | 1,600      | 57             | 198,400,000            |
| <b>TOTAL</b>                |         |       |            | <b>\$2,625</b> | <b>\$9,077,184,660</b> |

patient has a 0.2 risk of being hospitalized in any one year.<sup>6</sup>

When all the numbers are worked out, some of the totals seem low: for example, digoxin prescriptions actually total \$120 million annually, whereas this model shows \$90 million, assuming 100% compliance. This may mean that there are actually closer to 4.5 or 5 million people with heart failure in this country. We also have to remember that these numbers are based on clinical trial data, which may not reflect real-world conditions, because patients in clinical trials are often less sick.

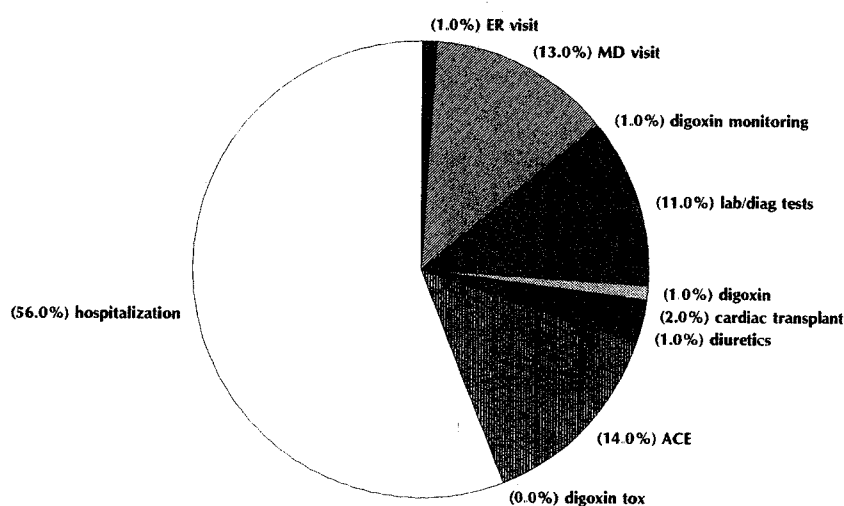
These numbers can be extrapolated to generate the expenditures for each category, as shown in Figure 1. This can tell us some interesting things; for instance, we're currently spending more than twice as much on transplants as we are on digoxin therapy.

Such a model allows us to generate specific data for specific populations. For instance, a rapidly growing Medicare HMO, with 15,000 enrollees, will have a 5% prevalence of heart failure, which is a conservative estimate. Plugging those

numbers into the model produces a total annual cost of \$2 million for treating heart failure in those 750 patients.

This model can also be used to assess the impact of different strategies. For instance, if we know that ACE inhibitor therapy will reduce the risk of hospitalization by 34%, increasing the use of ACE inhibitors from 60% to 70% could achieve a net savings of \$39 million annually, without even considering the effect on emergency room visits, office visits, and diagnostic tests.

**Figure 1.** Expenditures for Heart Failure Treatment



The impact of increasing the penetration of digoxin therapy from 65% to 75% can also be examined. Based on the 23% reduction in hospitalizations seen in the DIG trial,<sup>7</sup> a net savings of \$94 million annually, or \$27.00 per patient, can be achieved. Reducing the use of digoxin therapy from 65% to 55%, which could conceivably happen with no active promotion or reinforcement of the strategy, could result in a net cost to the system of \$483 million, or \$140 per patient.

A study by Ward and colleagues<sup>8</sup> examined two policy choices—discontinuing digoxin or continuing digoxin. They based their estimates on different baseline figures and found that discontinuing digoxin—to a utilization of zero—would cost the system more than \$1 billion. Continuing digoxin—at 100% utilization—would be associated with a cost of \$688 million, so the net savings associated with continuing digoxin was more than \$400 million, or \$324 per patient. Using the estimates from our model, a net savings of \$1.4 billion, or \$776 per patient could be realized.

In any model, a number of assumptions have to be made, all of which will affect the bottom line. It is important to examine each cell in the model to ensure that the numbers reflect the real situation for that particular population. In addition, we must remember that it takes a great deal of work to make any of these strategies happen: reducing or increasing utilization by 10% requires a huge effort.

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... DISCUSSION HIGHLIGHTS ...

**Cost of Heart Failure**

**Dr. Leider:** One way to look at a spreadsheet like (Table 1) this is to focus on the two top lines—hospitalization and emergency room visits—as well as, hopefully, cardiac transplantation. These are where the savings can be realized, not in the drug therapies. In fact, you can see that some of the therapies actually go up a little.

**Dr. Brunton:** Cardiac rehabilitation is not included in the model, which would probably end up saving a huge amount of money. Some of these people are still employed, and their lost labor cost has a real impact on society.

**Dr. Bijou:** Another issue is compliance. We can assume approximately 70% to 80% compliance in clinical trials, as opposed to 50% to 60% in the real-world setting, and that's with monotherapy; with triple therapy, an optimistic estimate would be 30% to 50%.

**Dr. Brunton:** I wonder where the physician's cost to the plan comes in, because most plans are capitated, in which case the physician's cost is fixed.

**Dr. Mackowiak:** That's true in some systems, but in discounted individual practice systems there is still an impact.

**Mr. Bobo:** We're talking about changing behaviors and the chemistry in these patients. Has anyone taken into account the high risk of changing this and the cost of achieving such a change?

**Dr. Gheorghiade:** That involves primary prevention.

**Dr. Wendt:** No one pays for preventive medicine. That has to change.

**Dr. Leider:** Theoretically, the incentive is there for managed care to pay for primary prevention but only if the patient stays long enough. Fortunately, in the Medicare population, we are seeing switch rates of only 4% to 5%, which helps the economics a great deal.

**Dr. Kasper:** Actually, it goes beyond simply preventive medicine. We also have to look at access, especially in the poorer populations. If a Medicaid patient can't get to his or her clinic visit, does it make sense for the government to pay for a taxi to the clinic? We're really talking about re-engineering a person's life—not his or her medications.

**Mr. Bobo:** In Atlanta, which has 3.5 million people in the Medicaid budget, more money is spent on transportation than on the drugs. I'm trying to make recommendations about where to spend these limited resources. Although many great things can be done by changing the patient's prescription profile, we really have to find out what's going to change the patient's behavior.

**Dr. Leider:** Some really aggressive managed care organizations have learned to do whatever it takes—send a nurse to the home or pay for transportation—because they know the savings in hospitalizations (in the 50% to 70% range) will more than recover the cost.

**Mr. Bobo:** We need some rational way to adapt the private sector models to the public sector through demonstrated interventions that work, where the economic payoff is really there. But I'm not sure there is enough money coming into the system to let the public sector evolve as the private sector has.

**Dr. Mackowiak:** In this patient population, we can't worry about the cost of the intervention. We have to look at the condition of the patient. We can't wait for the hospitalization to move him or her into the next stage of treatment, because then the cost has been already incurred. The purpose of the treatment is to prevent the event, not wait for it. If you do, you've paid for it twice.

**Dr. Bijou:** Part of that decision involves how often you want to see a patient and whether the patient is being followed by the specialist or the primary care physician. Do you want to see the patient frequently, and catch him or her in a decline, or do you schedule to see the patient every 6 months? Will the primary care physician be as careful in watching the weight and in checking for signs and symptoms of deterioration?

**Dr. Leider:** There are two parts to that question. First, should the heart failure

patient be followed by a primary care physician or a specialist? Second, do they even need to see a doctor, or could a nurse or trained family member provide follow-up? What's the most cost-effective way to provide surveillance and monitoring?

**Dr. Brunton:** The primary care physician may have the best opportunity to establish an ongoing relationship and watch for key indicators.

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—Stephen Brunton, MD

**Ms. Southwell:** One of the critical components in such a situation is the education of the caregiver, who may wonder: "When should I start to be concerned? When should I call the physician?" Caregivers are not sure what to look for, and that's the biggest challenge—providing them with ongoing information and enlisting their involvements with their patient's well-being.

**Dr. Brunton:** However, the most important person in this process should be the patient. There are many reasons why patients don't want to be involved. The designation "heart failure" is a terrible term that gives patients a reason to go into denial. Noncompliance is probably greater in this disease than in any other. It's a question not only of understanding but also commitment. It has a great impact on self-esteem, so self-deception is common. It is almost easier not to acknowledge the disease and the limitations at least until you get to New York Heart Association class III and IV,

when the disease is forcing itself on you. But at class I or II, it's just as easy to modify your activity as your lifestyle.

**Dr. Wendt:** We must get the patient's family involved. The minute this diagnosis is made, the spouse needs to modify the dietary pattern, the patient needs to get into an exercise program and he or she has to modify habits such as smoking. If we don't modify patients' behavior before getting them into long-term therapy, we've already lost the battle.

**Dr. Gheorghiad:** Part of the problem with lifestyle modification is that we tend to generalize, because we have not divided these patients into different groups. As long as we continue to group these patients together, there will be continued controversy.

**Dr. Bijou:** Terminology is also very important. Many patients are frightened by a diagnosis of "heart failure." So we tell them they have a "weak heart" or "hardening of the heart." Two examples of very effective communication that have been used by advertising campaigns are "high blood pressure—the silent killer," and "the clot buster." Maybe we need someone with advertising expertise to figure out the most effective way to convey this message.

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