Frequency and Impact of Delayed Decisions Regarding Heart Transplantation on Long-Term Outcomes in Patients With Advanced Heart Failure

Eldrin F. Lewis, MD, MPH,* Sui W. Tsang, BS,* James C. Fang, MD, FACC,* Gilbert H. Mudge, MD, FACC,* John A. Jarcho, MD, FACC,* Carol M. Flavell, MSN,* Anju Nohria, MD,* Michael M. Givertz, MD, FACC,* Gregory S. Couper, MD,† John G. Byrne, MD,† Lynne Warner Stevenson, MD, FACC*

Boston, Massachusetts

OBJECTIVES

We sought to characterize decisions regarding listing of heart transplant candidates and to determine the impact of delayed listing for a transplant on survival.

BACKGROUND

Evaluation and listing for heart transplantation have evolved over the past decade, with the complex decision process often extending beyond the time of initial review. Little is known about the current impact of decisions and timing of listing on outcomes.

METHODS

Decisions were prospectively recorded during the initial committee discussions regarding patients referred for heart transplant evaluation. Survival and transplantation rates were assessed.

RESULTS

A total of 214 patients were evaluated for heart transplantation (age 49 ± 11 years, ejection fraction 21 ± 9%, New York Heart Association class III ± I, peak oxygen consumption 13 ± 4 ml/kg/min). At the initial evaluation, 44% of patients were deemed eligible, 25% were potentially eligible, 19% were ineligible, and 12% were deferred. For eligible patients, 37% of patients were listed within 10 days of evaluation, and a total of 71% of patients were ever listed. Regardless of transplantation, the three-year survival rate in eligible patients not listed early was similar to that in patients listed immediately (85% vs. 77%, p = 0.34). Ineligible and potentially eligible patients had a higher three-year mortality rate than did eligible patients if transplantation occurred (51% vs. 17%, p < 0.001) or not (57% vs. 19%, p = 0.04).

CONCLUSIONS

Using current accepted guidelines, many patients referred for transplant evaluation were not considered eligible for transplantation, and those who were eligible were not often listed immediately. Eligible patients not listed initially did well in the long term, and patients with relative contraindications had worse outcomes with or without a transplant. (J Am Coll Cardiol 2004;43:794–802) © 2004 by the American College of Cardiology Foundation

The overall prevalence of heart failure (HF) continues to increase in the U.S., with an estimated five million people affected (1). This changing prevalence is partly related to improved survival of patients with an acute myocardial infarction, an increasingly older population, and expanded medical and surgical options for the management of advanced HF. Although the prevalence of HF increases, the number of suitable donor hearts has remained relatively constant, with ~2,000 to 2,500 heart transplantsations performed annually in the U.S. (2,3). The increasing number of patients with advanced HF who may benefit from heart transplantation, coupled with the limited donor pool, has resulted in long waiting times before transplantation, as well as potentially increased mortality for those awaiting a transplant.

The evaluation process and listing practices for heart transplantation have evolved over the past 10 years (4). Increasing therapeutic options for these patients have contributed to longer periods of stability before transplantation. Moreover, patients with relative contraindications are more likely to be listed and transplanted than in the past because of improved management strategies. However, little is known about the impact of delaying listing in suitable candidates for heart transplantation undergoing current contemporary management. The objectives of this study were to characterize how a contemporary transplant committee makes decisions regarding the listing of transplant candidates and to determine the impact of early listing versus delayed listing for a transplant on survival among eligible transplant candidates.

METHODS

Study design and patient population. This is a prospective cohort study of patients with a history of HF, referred to Brigham and Women’s Hospital for evaluation for heart transplantation between January 1997 and January 2000. The multidisciplinary Transplant Committee met on a weekly basis, and decisions regarding the suitability and timing of listing for each patient were made by the com-

From the Cardiovascular Division and Cardiovascular Surgery, Brigham and Women’s Hospital, Harvard Medical School, Boston, Massachusetts. Dr. Lewis was supported in part by Grant 1 F32 HL71449-01 from the National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, Maryland.

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Abbreviations and Acronyms

- AICD = automatic implantable cardioverter-defibrillator
- HF = heart failure
- LVEF = left ventricular ejection fraction
- NYHA = New York Heart Association
- UNOS = United Network for Organ Sharing
- VAD = ventricular assist device
- VO2 = oxygen consumption

Committee. Demographic data, cause of HF, duration of HF, New York Heart Association (NYHA) functional status, echocardiographic and cardiac catheterization data, exercise test results, and committee decisions regarding transplantation were recorded for all patients. Listed patients who were stable enough for outpatient management were seen by a HF/transplant cardiologist at least once a month. Routinely, all attempts were made to optimize medical therapy and stabilize the patients’ hemodynamic status at the time of the initial evaluation. The majority of nonlisted patients received close follow-up at our institution, with referring physicians. Although none of the nonlisted patients received a transplant at another transplant center in the New England region, transplantation outside of that region might not have been recognized. The study protocol was reviewed and approved by the Institutional Review Board.

Definition of initial decisions. At the initial evaluation by the Transplant Committee, patients were grouped into four distinct decision categories. 1) Patients without heart transplant contraindications were deemed “eligible” candidates and were thought to be good candidates for transplantation without further evaluation. 2) Patients who were possible candidates but had relative transplant contraindications that posed some concern for an adverse outcome were deemed “potentially eligible” candidates. These patients often required further testing and observation to ascertain their suitability for a transplant. 3) Patients with obvious contraindications to transplantation were deemed “ineligible” candidates. 4) Finally, patients who did not complete the transplant evaluation or appeared too healthy after immediate consideration for a transplant were “deferred” candidates, who, in some cases, had evaluations interrupted due to other cardiac surgery or patient reluctance to consider transplantation.

All patients eventually listed for a transplant were followed to determine the impact of the mean waiting time on the transplant list, transplant rate, and effect of time of listing relative to the evaluation date on overall survival. Patients who were listed within 10 days of completion of their transplant evaluation were considered “early-listed” patients. Patients listed over 10 days after their initial evaluation were considered “delayed-listed” patients.

Data acquisition and statistical analysis. All patients were followed prospectively to determine whether they were listed for a transplant; the time of listing and time of transplant were recorded, if applicable. Among transplanted patients, the United Network for Organ Sharing (UNOS) status at the time of listing and the time of transplant was recorded. Status 1 incorporates the more recent 1A and 1B subcategories and is reserved for patients hospitalized and requiring either mechanical circulatory support or positive inotropic support, whereas status 2 is reserved for all other active patients who are not as critically ill (5). All-cause mortality was assessed for each patient and confirmed using the Social Security Death Index.

Differences between patients in the four decision groups, as well as patients listed early and those not listed early, were assessed using the chi-square test for categorical variables and one-way analysis of variance for continuous variables. Kaplan-Meier curves were created to demonstrate overall survival as well as survival of the subgroups from the time of initial evaluation. Differences in survival were compared by the log-rank test. Evaluation of the effect of “early listing” versus “delayed listing” was performed using the Cox proportional hazards model. Two models were created: one model included follow-up with and without heart transplantation for all patients, and the second model censored patients at the time of heart transplantation, thus measuring medical survival only.

RESULTS

Patient characteristics and committee decisions. A total of 214 patients were evaluated for heart transplantation during the study period, with a mean follow-up of 26 months. The patient population undergoing transplant evaluation had a mean age of 49 ± 11 years, a left ventricular ejection fraction (LVEF) of 21 ± 9%, peak oxygen consumption (VO2) of 13 ± 4 ml/kg/min, and a duration of HF of approximately four years. After excluding six patients who died in the hospital without being listed, a total of 158 patients (76%) received at least one follow-up visit at the cardiology center at our institution, and 50 (24%) received follow-up elsewhere.

A total of 95 patients (44%) were deemed eligible candidates and 53 patients (25%) were potentially eligible candidates for heart transplantation at the time of initial evaluation; 19% of the patients were thought to be poor candidates for transplantation, and the decision was deferred in 12% of patients. Potentially eligible patients often had a history of cancer with uncertain remission status, co-morbid illnesses, potentially reversible pulmonary vascular resistance, impaired renal function, obesity requiring weight loss, or borderline compliance before listing. The major reasons for ineligibility were similar co-morbid illnesses (e.g., diabetes with end-organ damage and renal failure), noncompliant behavior (e.g., ongoing smoking and poor adherence to medication regimens), fixed pulmonary hypertension, and persistent severe obesity with percent ideal body weight >140%. Patients were often deferred for listing due to potential or ongoing improvement in their clinical status. Potentially eligible and ineligible patients
were more likely to have diabetes and chronic renal insufficiency than eligible patients (Table 1). Eligible patients had a longer duration of diagnosed HF than potentially eligible, ineligible, or deferred patients (p < 0.001) and were more likely to have an automatic implantable cardioverter-defibrillator (AICD), either at the time of evaluation or shortly thereafter (p = 0.02). Eligible and potentially eligible patients tended to have more advanced HF. There was no significant difference between the groups with regard to age, gender, race, LVEF, peak VO₂, or percentage of patients achieving a peak respiratory exchange ratio of ≥1.2. At baseline, there were no differences in the use of angiotensin-converting enzyme inhibitors, diuretics, digoxin, beta-blockers, inotropes, or aspirin.

Eighty patients (37%) were eventually listed for heart transplantation, with a mean time between evaluation and listing of 85 ± 203 days. As expected, eligible patients were most likely to be listed for a transplant at some point (71%), with only 8 (15%) of the potentially eligible candidates ever getting listed for transplantation (Fig. 1). One patient who was initially ineligible for a transplant was eventually listed, and four deferred patients were eventually listed.

Timing of listing. Among 67 (71%) of 95 eligible patients eventually listed for a transplant, 35 (52%) were listed within 10 days of evaluation (mean time from evaluation to listing 2 ± 3 days) and are classified as “early-listed patients” (Fig. 1). Among the 60 eligible patients not listed early after the evaluation, only 32 (53% of remaining patients) were eventually listed for a transplant (mean time from evaluation to listing 111 ± 144 days). When comparing the baseline characteristics between patients listed within 10 days and patients not listed early (Table 2), the patients listed early had less left ventricular dilation (left ventricular end-diastolic diameter 63 vs. 72 mm, p = 0.01) and lower peak VO₂ (11.4 vs. 13.3 ml/kg/min, p = 0.02). Early-listed patients were initially listed as a UNOS status 1 more frequently than delayed-listed patients (45% vs. 20%, p = 0.04). Patients who were never listed tended to have less coronary artery disease than the listed patients (29% vs. 42%, p = 0.23). There were no significant differences between the listed and nonlisted patients with respect to age, race, gender, or LVEF. There was also no difference in the use of AICD between listed and nonlisted patients (39% vs. 46%, p = 0.49). Seven of the patients (11%) who were
eventually listed underwent high-risk revascularization or valve surgery, as compared with three of patients (11%) who were never listed (p = 0.97). There were no deaths within 30 days of surgery.

Overall survival in the eligible group was excellent, with 87% one-year and 82% three-year survival rates, including survival with or without transplantation. Among 28 eligible patients who were never listed for a transplant, only one patient died during the mean 28-month follow-up period. There was a trend toward improved survival in the eligible, nonlisted patients, as compared with all listed patients, when survival was assessed regardless of transplant status (Fig. 2A). The time of listing had no impact on late survival among eligible patients, with similar outcomes between patients not listed early and those listed early (Fig. 2A). The one-year survival rate in patients not listed early was 92%, compared with a rate of 80% in the early-listed patients (p = 0.10). There was also no difference in the three-year survival rate (85% vs. 77%, p = 0.34). Moreover, only six patients died while actively listed for heart transplantation. In the 35 patients listed early, three of the patients (8.6%) died awaiting a transplant, with a mean time to death after listing of 65 days (range 30 to 111); one of three patients underwent implantation of a ventricular assist device (VAD) before death. The mean time to death after listing among the three patients listed after 10 days following evaluation was

Table 2. Baseline Characteristics of Eligible Patients Based on Time of Listing

<table>
<thead>
<tr>
<th>Variable</th>
<th>Early Listed (n = 35)</th>
<th>Late Listed (n = 32)</th>
<th>Never Listed (n = 28)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>50 ± 12</td>
<td>48 ± 10</td>
<td>48 ± 12</td>
<td>0.57</td>
</tr>
<tr>
<td>Male (%)</td>
<td>66</td>
<td>75</td>
<td>68</td>
<td>0.70</td>
</tr>
<tr>
<td>White (%)</td>
<td>81</td>
<td>93</td>
<td>82</td>
<td>0.36</td>
</tr>
<tr>
<td>Coronary artery disease (%)</td>
<td>46</td>
<td>38</td>
<td>29</td>
<td>0.38</td>
</tr>
<tr>
<td>Left ventricular ejection fraction (%)</td>
<td>24 ± 13</td>
<td>20 ± 6</td>
<td>20 ± 7</td>
<td>0.18</td>
</tr>
<tr>
<td>LVEDD (mm)</td>
<td>63 ± 17</td>
<td>72 ± 13</td>
<td>69 ± 10</td>
<td>0.01</td>
</tr>
<tr>
<td>New York Heart Association class (%)</td>
<td>I</td>
<td>6</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>9</td>
<td>22</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>54</td>
<td>63</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>31</td>
<td>9</td>
<td>29</td>
</tr>
<tr>
<td>Orthopnea (%)</td>
<td>50</td>
<td>38</td>
<td>54</td>
<td>0.42</td>
</tr>
<tr>
<td>Peak VO2 (ml/kg/min)</td>
<td>11.4 ± 4</td>
<td>13.3 ± 4</td>
<td>14.5 ± 5</td>
<td>0.02</td>
</tr>
<tr>
<td>Peak RER 1–1.2 (%)</td>
<td>79</td>
<td>56</td>
<td>27</td>
<td>0.04</td>
</tr>
<tr>
<td>Peak RER ≥1.2 (%)</td>
<td>21</td>
<td>38</td>
<td>55</td>
<td>0.23</td>
</tr>
<tr>
<td>Sodium (mEq/l)</td>
<td>135.4 ± 5.0</td>
<td>135.9 ± 7.0</td>
<td>137.6 ± 5.0</td>
<td>0.58</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>1.3 ± 0.8</td>
<td>1.2 ± 0.7</td>
<td>1.1 ± 0.4</td>
<td>0.55</td>
</tr>
<tr>
<td>Duration of HF (yrs)</td>
<td>4.6 ± 4.9</td>
<td>5.4 ± 8.0</td>
<td>3.9 ± 2.9</td>
<td>0.72</td>
</tr>
<tr>
<td>AICD</td>
<td>40</td>
<td>38</td>
<td>46</td>
<td>0.77</td>
</tr>
<tr>
<td>UNOS status 1 at listing (%)</td>
<td>45</td>
<td>20</td>
<td>—</td>
<td>0.04</td>
</tr>
<tr>
<td>UNOS status 1 at transplant (%)</td>
<td>57</td>
<td>35</td>
<td>—</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Data are presented as the mean value ± SD or percentage of patients.

Abbreviations as in Table 1.
218 days (range 5 to 336), with one patient dying after VAD implantation. The risk of death was not different in the delayed-listed patients compared with the early-listed patients, even after adjusting for NYHA, peak VO$_2$, and left ventricular size (hazard ratio 0.71, 95% confidence interval 0.29 to 1.79; $p = 0.47$). There was also no difference in mortality when censoring patients at the time of transplantation, focusing only on pretransplant events (Fig. 2B).

A total of 54 (57%) of 95 initially eligible patients eventually underwent heart transplantation, representing 83% of all transplanted patients. Of these transplanted patients, 12 (19%) underwent VAD support as a bridge to transplantation, and four (6%) underwent high-risk revascularization or valve surgery between the time of evaluation and eventual heart transplantation. When comparing early-listed and delayed-listed patients, there was no difference in the waiting time to transplantation after the initial listing ($127 \pm 126$ vs. $141 \pm 174$ days, $p = 0.75$) or in the overall transplant rate (83% vs. 78%, $p = 0.63$). The overall post-transplant mortality rate was similar in the two groups.
Three of the early-listed patients (10.3%) died within one month after transplantation, compared with none of the delay-listed patients (p < 0.10). By one year, there was no difference in the post-transplant mortality rate between early- and delayed-listed patients (17.2% vs. 16.0%, p = 0.90), with the most common causes of death being early graft failure and infection. This one-year mortality rate is comparable to the national one-year post-transplant mortality rate of 17.6% in 1999 (3). Five of the 67 eligible patients who were initially listed were eventually deactivated, and two patients remain active on the waiting list.

Outcomes of patients not initially eligible. The chance of listing and transplantation among those patients not initially considered as eligible candidates was much lower, with only 8 (15%) of 53 potentially eligible patients, 4 (15%) of 26 deferred patients, and 1 (3%) of 40 ineligible patients ever getting listed; 11 of 13 of these listed patients underwent transplantation (Table 3). The mean waiting time after transplant listing for these 11 candidates was 165 days, and the other two listed patients have not died awaiting a transplant. However, 43% of the potentially eligible patients and 33% of the deferred patients required VAD support as a bridge to transplantation, as compared with 15% of eligible patients (p = 0.16). Moreover, patients not initially eligible had a tendency toward a higher three-year post-transplant mortality rate (Fig. 3) than transplanted patients who were initially thought to be eligible (57.1% vs. 20.4%, p = 0.06). Finally, between 10% and 15% of patients underwent high-risk cardiovascular surgery with good 30-day survival, with the exception of two of four deferred patients who died peroperatively (p = 0.06).

Focusing only on the patients who did not receive a heart transplant, there still remains a significant difference in survival between the patients, based on the Transplant Committee’s initial decision (Fig. 4). Eligible patients had a much better survival than potentially eligible or ineligible patients, with an 83% three-year survival rate. This survival among eligible patients is significantly better than the three-year survival of potentially eligible candidates (69%, p = 0.02) and ineligible candidates (38%, p < 0.001). Although patients ineligible for a transplant had a much poorer outcome than the other groups, half of the deaths in

<table>
<thead>
<tr>
<th>Variable</th>
<th>Eligible (n = 95)</th>
<th>Potentially Eligible (n = 53)</th>
<th>Ineligible (n = 40)</th>
<th>Deferred (n = 26)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least 1 follow-up visit (%)</td>
<td>96</td>
<td>63</td>
<td>43</td>
<td>76</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Listed for transplant (%)</td>
<td>71</td>
<td>15</td>
<td>3</td>
<td>15</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean time to listing (days)</td>
<td>54 ± 113</td>
<td>178 ± 288</td>
<td>1,381</td>
<td>92 ± 46</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Transplanted (%)</td>
<td>57</td>
<td>13</td>
<td>3</td>
<td>12</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Bridge to transplant (%)</td>
<td>15</td>
<td>43</td>
<td>0</td>
<td>33</td>
<td>0.16</td>
</tr>
<tr>
<td>Mean time from listing to transplant (days)</td>
<td>135 ± 152</td>
<td>218 ± 239</td>
<td>52</td>
<td>43 ± 31</td>
<td>0.21</td>
</tr>
<tr>
<td>Death before transplant (%)</td>
<td>7</td>
<td>38</td>
<td>63</td>
<td>23</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Death after transplant (%)</td>
<td>20</td>
<td>57</td>
<td>0</td>
<td>0</td>
<td>0.06</td>
</tr>
<tr>
<td>High-risk cardiovascular surgery (%)</td>
<td>11</td>
<td>15</td>
<td>10</td>
<td>15</td>
<td>0.78</td>
</tr>
<tr>
<td>30-Day survival†</td>
<td>100</td>
<td>87</td>
<td>100</td>
<td>50</td>
<td>0.06</td>
</tr>
<tr>
<td>Ventricular assist device (%)</td>
<td>13</td>
<td>9</td>
<td>0</td>
<td>12</td>
<td>0.14</td>
</tr>
</tbody>
</table>

*Percentage of patients transplanted requiring support with a ventricular assist device. †Percentage of survival among postsurgical patients. Data are presented as the percentage of patients or mean value ± SD.

Figure 3. Overall survival of patients with and without a transplant based on the initial decision of the Transplant Committee. Potentially eligible patients (hatched bars) had worse outcomes than eligible patients (solid bars) both with and without a transplant.

Figure 4. Kaplan-Meier survival curves for all-cause mortality before and after transplantation in all patients (n = 214) stratified by the initial decision of the Transplant Committee. Eligible and deferred patients had better survival than patients who were potentially eligible or ineligible at the time of the initial evaluation.
this group of patients occurred within the first six months after the evaluation.

**DISCUSSION**

This study demonstrated that in applying currently accepted criteria for heart transplant candidacy, the majority of patients referred for a transplant are never listed, and those who are listed are not often listed immediately after the initial evaluation. Among the eligible candidates who were not believed to need immediate listing, there did not appear to be a significant survival disadvantage to extending the period of observation after the initial evaluation. Moreover, the overall survival of eligible patients with advanced HF is good on medical therapy and is much better than the survival of patients who are not eligible for a transplant. Patients considered potentially eligible but not initially eligible, because of various concerns, had more co-morbid illnesses and seemed to do worse both with and without a transplant, despite being on a similar medical regimen.

Decision-making for patients with advanced HF is rapidly changing. Therefore, advanced HF programs must evaluate the increasingly complex medical therapies available to determine the most optimal management plan for individual patients. Because of these therapies, survival of HF patients is improving. As the one-year survival of many HF patients approaches that of newly transplanted patients, the importance of careful and appropriate selection of patients for heart transplantation increases.

This study characterized the decision process of a multidisciplinary Transplant Committee, as well as the impact of these decisions on survival. Less than half of patients referred to this transplant center were initially deemed to be eligible for a transplant. Overall, approximately one-third of patients referred for possible heart transplantation were ever listed for a transplant, a rate that is similar to the rate of listing described previously (6).

Among the eligible patients, those who were listed early after evaluation had more severe decompensation than did patients not listed immediately, as demonstrated by lower peak VO₂ and a higher rate of initial listing as UNOS status 1. Survival of the eligible patients who were medically managed was excellent and higher than the survival of post-transplant patients in this study, as well as the mean post-transplant survival reported by the Cardiac Transplant Research Database institutions (7). The early listing of eligible patients who were thought by the Transplant Committee to have more severe decompensation may have contributed to the excellent survival among the remaining patients on medical management.

There was no apparent detriment to delaying the time of listing among other eligible patients. Over half of the high-risk cardiovascular surgeries were performed in patients who were not listed immediately after evaluation, with an excellent perioperative mortality rate. The number of deaths among patients actively waiting for a transplant was similar in both groups, and only one eligible patient died without being listed for a transplant. Moreover, early deaths among the early-listed patients suggest that correct risk stratification may have improved overall survival among the listed group. Furthermore, delayed listing did not lead to a difference in post-transplant survival.

There are many potential benefits of not listing patients immediately after evaluation. At the time of evaluation, some patients may not have accepted their diagnosis and prognosis. Patients’ estimation of their prognosis may impact their decisions (8). With a relatively fixed donor pool and more patients surviving to advanced HF, restriction of the criteria for listing patients minimizes the waiting list for a transplant in the sickest population (9). There is evidence that restrictive criteria for heart transplantation may allow increased survival for both transplanted and medically managed patients (10). Deferring transplantation until necessary increases the opportunity for advances in post-transplant management to benefit the individual patient and may potentially increase their overall survival, as the post-transplant course is still associated with a limited life expectancy (11). Furthermore, patients on the waiting list for a transplant may suffer more depressive symptoms and a decline in emotional well-being (12). Patients who improve after being listed may have a difficult time with the prospect of being removed from the list and their loss of status as a “candidate.” The risks of postponing listing in earlier eras have diminished with the expanding use of AICD in outpatients and with the option of VAD as a bridge to transplantation if the patient deteriorates (13).

Although the majority of eligible patients who were medically managed were in NYHA class III or IV, the overall survival in this group was better than that of historical controls. This potential improvement in survival of these patients is supported by recent trials. The placebo arms in recent trials describe a one-year mortality rate in class III and IV HF patients of 15% to 20% (14), which is better than the prognosis in the COoperative North Scandinavian ENalapril SUrvival Study (CONSENSUS) over a decade ago (15). Moreover, the excellent survival in carefully selected patients who are eligible candidates for a transplant suggests that the difference in survival between transplantation and medical management among ambulatory patients may not be as great with current therapeutic options. With the new therapeutic options available (14, 16, 17), there is an increasing rationale for re-evaluating the optimal time of listing (18). Thus, in patients in whom the Transplant Committee is not certain of the need to proceed immediately to transplantation, careful follow-up and re-evaluation seem appropriate and adequate.

In comparison, patients who were ineligible candidates had a worse survival than eligible patients. These ineligible patients did not undergo follow-up as often, partly due to early mortality after the evaluation and patient preference to be seen locally. The survival of potentially eligible patients initially was not dramatically different from that of eligible
Some patients may have benefited from the expanding indications for AICD for primary prevention of sudden cardiac death. However, the favorable outcomes both before and after transplantation suggest that many eligible patients may be managed effectively by close surveillance in a specialized transplant center.

Conclusions. The decisions of the Transplant Committee regarding patients referred for a heart transplant are not frequently finalized at the time of initial evaluation, and the majority of candidates are never listed. For eligible patients not believed to need immediate listing, there does not appear to be an adverse effect of delaying the time of listing. Few of the potentially eligible patients were ever listed, and this group of borderline transplant candidates had poorer pre- and post-transplant outcomes, compared with eligible patients. The unfavorable overall outcomes in these borderline patients both with and without a transplant justify continued careful evaluation of relative contraindications and future investigation to determine optimal management strategies both with and without transplantation, including the impact of these decisions on patients’ health-related quality of life.

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Reprint requests and correspondence: Dr. Eldrin F. Lewis, Cardiovacular Division, Brigham and Women’s Hospital, 75 Francis Street, Boston, Massachusetts 02115. E-mail: eflewis@partners.org.

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