Study objectives: To determine how well triage physicians judge the probability of death or severe complications that require treatment only available in an ICU to maintain life for patients with acute congestive heart failure (CHF).

Design: Prospective cohort study.

Setting: An urban university hospital, a Veterans' Administration hospital, and a community hospital.

Patients or participants: Patients were those visiting the emergency department (ED) with acute CHF, excluding those who already required a treatment only available in an ICU to maintain life, and those with possible or definite myocardial infarction. Physician participants were those caring for the patients in the ED.

Measurements and results: We performed chart reviews to ascertain whether each patient died or had severe complications develop by 4 days. We collected judgments of the probability of this outcome from the physicians taking care of the study patients in the ED. The prevalence of death or severe complications was 43 per 1,032 patients (4.2%). The mean + SD of physicians' judgments of the probability of this outcome was 32.1 ± 28.4%. A calibration curve that stratified these judgments by decile demonstrated that physicians consistently overestimated this probability (p < 0.01). Physicians' judgments were only moderately good at discriminating which patients would have the outcome (receiver operating characteristic curve area, 0.715). Patients admitted to an ICU received the highest average predicted probability (56.4%), followed by those admitted to a telemetry unit (34.1%), to a regular hospital ward (29.8%), and those sent home (17.9%).

Conclusions: Physicians drastically overestimated the probability of a severe complication that would require critical care for patients with acute CHF who were candidates for ICU admission. Their judgments of this probability were associated with their triage decisions, as they should be according to several guidelines for ICU triage. Overestimation of the probability of severe complications may have lead to overutilization of scarce critical care resources. Current critical care triage guidelines should be revised to take this difficulty into account, and better predictive models for patients potentially requiring critical care should be developed.

CHEST 2002; 121:1610–1617

Key words: congestive heart failure; critical care; medical decision making; physician judgment; prognosis; triage

Abbreviations: CHF = congestive heart failure; ED = emergency department; MI = myocardial infarction; ROC = receiver operating characteristic; VA = Veteran's Administration

Some acutely ill patients have obvious, life-threatening complications that require interventions only available in intensive care settings. For these patients, the triage decision is easy. ICUs are often the only place where patients in extremis can receive at least temporarily life-saving therapy, such as IV pressors for severe hypotension. Patients are fre-
critically ill patients who do not immediately require treatments only available in the ICU to maintain life may be very difficult. Such decisions require weighing the benefits of critical care vs its harms and costs. For patients who do not immediately require treatments available only in critical care units to maintain life, this task is very difficult, because no randomized controlled trials have been performed to assess the benefits (or harms) of intensive care.³

However, there are some data suggesting that high rates of iatrogenic complications may occur in the ICU.³ For example, ICU patients are at high risk of venous thromboembolism, upper GI bleeding, and catheter-related infections.⁴ Furthermore, the costs of critical care are great. Since critical care unit beds are a historically limited resource,⁵–⁷ the most important cost imposed by using a critical care bed is depriving another patient of access to that bed. Critical care is also very expensive in monetary terms,⁸ approaching 1% of the US gross domestic product.⁹

Without controlled trials that could identify groups of patients for whom the benefits of critical care outweigh its harms and costs, physicians must fall back to some general principles when making decisions about triage. A series of guidelines from the Society of Critical Care Medicine¹⁰–¹² suggests that patients with the highest priority for ICU admission should be those who already require treatment available only in an ICU to maintain life.¹³ For patients who do not already have a condition that requires intensive treatment, the primary consideration should be the likelihood that the patient will have such a condition develop.¹⁴,¹⁵ For example, some authors¹⁶ have suggested that patients with a >10% probability of having such a condition develop should be admitted to an ICU. If one accepts this proposition, then how well physicians can make triage decisions for acutely ill patients who do not immediately require ICU care to maintain life depends on how well they can judge the probability that an individual patient will have a condition develop that requires such care. To our knowledge, no one has assessed how well physicians can predict this probability.

Therefore, the current study was designed to answer two questions: what is the quality of physicians’ judgments of the short-term probability of death or severe complications whose development requires ICU care to maintain life for patients with acute congestive heart failure (CHF), and do physicians’ triage decisions regarding individual patients relate to these judgments?

We limited our study to patients with acute CHF. CHF is increasingly prevalent and is a leading cause of hospitalization, especially for elderly patients.¹⁷ Up to 47% of hospitalized patients with CHF go to ICUs.¹⁸ Guidelines for management of CHF either have failed to address triage decision making for patients with acute CHF,¹⁹ or make only vague suggestions about it, eg, that “moderate to severe symptoms usually require hospital admission, generally in a cardiac or ICUs,” in the absence of a definition of moderate-to-severe symptoms.²⁰,²¹ We know of no guidelines that make specific recommendations for how to make triage decisions for patients with acute CHF.

**Materials and Methods**

**Design**

The Predictions and Outcomes of Congestive Heart Failure study²² prospectively identified patients with new or exacerbated CHF presenting to the emergency departments (EDs) of three hospitals, and followed them forward through time. We have previously described its methods.

**Settings**

The three study hospitals—a large urban university hospital that provides care for a large indigent population, a large urban Veteran’s Administration (VA) hospital affiliated with the same medical school that operates the university hospital, and a medium-sized suburban community hospital—were all in the same metropolitan area.

**Patient Population**

We enrolled consecutive patients >16 years old presenting to the ED of the three hospitals from November 5, 1990, to December 31, 1992, for whom new or exacerbated CHF was a major reason for the visit, based on the clinical diagnosis of the patients’ ED physicians. Patients were identified by the physicians in the ED and by search of the hospitals’ ED and admission logs. Patients were enrolled regardless of their disposition after their ED visit, eg, patients who were sent home from the ED were still enrolled in the study. The primary unit of analysis was the ED visit. Patients who visited the ED for acute CHF more than once could be enrolled at each visit, since physicians made triage decisions at each visit. For the current study, however, we excluded visits of patients who returned to the ED within 1 week of a prior enrolled visit, to allow focus on events occurring within 4 days of enrollment.

We asked participating physicians not to enroll patients presenting with acute myocardial infarction (MI) complicated by CHF, because there is general consensus that patients with an acute MI require ICU admission. We further excluded patients who had characteristics suggesting they were having an acute MI at or just after the time of their ED visit based on chart reviews after enrollment. Characteristics we used to identify such patients...
included the following: treatment with thrombolytics or a balloon pump in the ED; the performance of emergency percutaneous transluminal coronary angioplasty; a diagnosis of acute MI made any time on the day of the ED visit, even if this diagnosis occurred after the decision to admit; or evidence of MI on an ECG done in the ED.

Similarly, we also excluded patients who appeared to require ICU care to maintain life at the time of their ED visits, since for them the triage decisions and the probability of developing a complication necessitating ICU care were both obvious. Thus, we excluded patients who had the following events in the ED: hypotension requiring vasopressors (dopamine, dobutamine, norepinephrine, epinephrine, amrinone, or other); conduction disturbance requiring emergency pacemaker insertion; arrhythmia (atrial fibrillation or flutter, supraventricular tachycardia, ventricular tachycardia, ventricular fibrillation, or other) requiring IV medication (adenosine, lidocaine, procainamide, beryllium, dilazem, verapamil, or other) or emergency cardioversion; renal failure requiring emergency dialysis; respiratory failure requiring intubation; or cardiopulmonary resuscitation. We also excluded patients who died in the ED, since no triage decision was possible for them.

Several types of physicians evaluated, managed, and made triage decisions for the enrolled patients in the university and VA hospital EDs. The majority were internal medicine house staff (interns, junior and senior residents, and some subspecialty fellows). A few were house staff, almost all interns, rotating from other specialties, eg, psychiatry, obstetrics-gynecology, and anesthesiology; and a few were subspecialty fellows and attending physicians. During the time of this study, house staff in triage roles at the university hospital were supervised in-house around the clock by ED attending physicians. The physicians who evaluated, managed, and made triage decisions for the study patients at the community hospital were a small group of full-time ED physicians.

The study received approval by the Institutional Review Board of Virginia Commonwealth University, Medical College of Virginia Campus, in 1989. Participating patients gave either oral or written consent for an interview done several days after hospital admission, and subsequent interviews at 90 days and 1 year after enrollment. The Institutional Review Board waived the need for informed consent for participating physicians.

**Data Collection**

We asked the physicians caring for the study patients in the ED to complete a data collection form within 24 h. On it, we asked, “As best you can, estimate the probability that this patient will develop a severe complication (ie, one that usually requires treatment in an ICU) within 4 days of initial ED visit.” We provided a blank with a percent sign, prompting physicians for a numeric response. We gave the physicians no aid in making these judgments. No hospital had a formal policy to guide them in this task. We used the same form to determine physicians’ triage decisions, supplemented by review of the patients’ charts.

We assessed whether each patient died or had a severe complication develop that requires care usually only available in an ICU to maintain life within 4 days after the ED visit by chart reviews covering the ED visit, the index hospitalization, and any subsequent hospitalizations. Chart reviewers were nurses or physicians unaware of the study hypotheses. They used a standardized, pilot-tested instrument. To ascertain survival within 4 days of the ED visit, we also used, when necessary, data from interviews with patients or surrogates, and reviews of hospital databases, of the state vital status index, and the Social Security Death Index. We defined severe complications again as acute MI, hypotension requiring vasopressors, conduction disturbance requiring emergency pacemaker insertion, arrhythmia requiring IV medication or emergency cardioversion, renal failure requiring emergency dialysis, respiratory failure requiring intubation, and cardiopulmonary resuscitation.

**Analysis**

We used the calibration curve as a graphical measure of “reliability” of the physicians’ judgments, or the degree to which the predicted probabilities corresponded, in a relative-frequency sense, to what actually happened.23 We grouped patients into deciles (0 to 10%, 11 to 20%, 21 to 30%, etc) according to the physicians’ probability predictions. The calibration curve is the plot of the mean probability estimate for the patients in each decile vs the actual rate of the outcome predicted (death or severe complications) within 4 days for these patients. We compared the significance of differences between the observed outcome rates and the average predicted probabilities for each decile using one-sample $\chi^2$ tests.

We used the receiver operating characteristic (ROC) curve to measure the discrimination of the physicians’ probability judgments. The curve is a plot of the true-positive rate, ie, sensitivity, vs the false-positive rate, ie, one minus specificity, found by treating the judgments as diagnostic tests, and using increasingly stringent cutoffs for “test positivity.”24 The area under the ROC curve provides an index of discrimination independent of cutoff criteria and prevalence of disease. If one were to randomly choose one patient who died or had a severe complication, and another who experienced neither, the area equals the probability that the patient who died or had a severe complication was judged to have a higher probability of these outcomes. We compared ROC curve areas for groups of patients using the method of Hanley and McNeil.25

We compared numeric judgments of the probability of death or severe complications across triage decisions using analysis of variance. To assess the relationship between judgments of the probability of death or severe complications and the ICU triage decision, we also performed ROC curve analysis. We compared rates of death or severe complications within 4 days of the ED visit across triage decisions using the $\chi^2$ test.

**Results**

**Patient Selection, and Patient and Physician Characteristics**

Figure 1 shows how we arrived at the patient cohort (n = 1,032) for the present study. The patient characteristics of patients in the cohort are shown in Table 1. The mean ± SD patient age was 66.86 ± 11.39 years. There were 370 patients (35.9%) seen at the university hospital, 544 patients (52.7%) seen at the VA hospital, and 118 patients (11.4%) seen at the community hospital. Caring for these patients in the ED were 186 physicians, who each managed from 1 to 60 patients. The physicians’ characteristics appear in Table 2.

**Prevalence of Death or Severe Complications**

Of the 1,032 patients, only 43 patients (4.2%) died or had a severe complication develop within 4 days. Table 3 depicts the number of patients who experi-
enced specific complications. Nineteen patients died, and 10 patients had the single most common complication, respiratory failure requiring ventilator support.

Quality of Physicians’ Predictions of Complications

A calibration curve of the physicians’ judgments of the probability of death or severe complications vs actual rates, death or complications, appears in Figure 2. The calibration curve was positioned far below and to the right of the 45° line of perfect calibration. This indicated that the physicians severely overestimated the probability of death or complications regardless of whether their probability estimates were low or high. For example, of the 74 patients who the physicians judged to have the highest probability of death or severe complications (91 to 100%), only 14 patients (19%) died or experienced severe complications (p < 0.001). Furthermore, of the 19 patients that the physicians judged to be in the next highest probability decile (81 to 90%), only 2 patients (11%) died or experienced severe complications (p < 0.001).

The area under the ROC curve for the physicians’ probability judgments was 0.715. This suggests that their judgments had a modest ability to discriminate patients who would die or have severe complications develop from those who would not. Thus, were the average physician to evaluate two randomly chosen patients, one who would go on to have a complication and one who would not, the chances that the physician would judge the correct patient to have a higher probability of death or severe complications was only 0.715.

When we repeated these analyses stratified by hospital, we found that calibration curves both for the less-experienced physicians at the university and the VA hospitals, and for the more-experienced physicians at the community hospital, showed severe overestimation of the probability of death or severe complications. We also found that the area under the ROC curve of the judgments made by the physicians at the first two hospitals, 0.72, was numerically although not statistically significantly larger than the

<table>
<thead>
<tr>
<th>Table 1—Patient Characteristics (n = 1,032)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
</tr>
<tr>
<td>Female gender</td>
</tr>
<tr>
<td>Education &lt; 12 yr</td>
</tr>
<tr>
<td>Black race</td>
</tr>
<tr>
<td>Rest/mild exertional dyspnea</td>
</tr>
<tr>
<td>Orthopnea</td>
</tr>
<tr>
<td>Paroxysmal nocturnal dyspnea</td>
</tr>
<tr>
<td>Frank pulmonary edema by examination or radiograph</td>
</tr>
<tr>
<td>Receiving diuretic before ED visit</td>
</tr>
<tr>
<td>Receiving ACE inhibitor before ED visit</td>
</tr>
<tr>
<td>Hypertension before ED visit</td>
</tr>
<tr>
<td>ICU admission in last year</td>
</tr>
<tr>
<td>Valvular heart disease before ED visit</td>
</tr>
<tr>
<td>Angina, CAGB, PTCA, or MI before ED visit</td>
</tr>
<tr>
<td>PTCA before ED visit</td>
</tr>
<tr>
<td>MI before ED visit</td>
</tr>
<tr>
<td>Hospitalized for heart in last year</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Systolic BP</td>
</tr>
<tr>
<td>Heart rate</td>
</tr>
<tr>
<td>Respiratory rate</td>
</tr>
</tbody>
</table>

*Data are presented as No. (%) or mean ± SD. ACE = angiotensin-converting enzyme; CAGB = coronary artery bypass grafting; PTCA = percutaneous transluminal coronary angioplasty.

<table>
<thead>
<tr>
<th>Table 2—Characteristics of the Physicians Caring for Patients at the Time of Enrollment*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
</tr>
<tr>
<td>Female gender</td>
</tr>
<tr>
<td>PGY 1</td>
</tr>
<tr>
<td>PGY 2–PGY 5</td>
</tr>
<tr>
<td>PGY ≥ 6 (attending)</td>
</tr>
</tbody>
</table>

*Data are presented as No. of patients seen (% of patients seen). PGY = postgraduate year.
area under the curve of the judgments of the physicians at the community hospital, 0.62.

Comparison of Predicted and Actual Complication Rates Across Triage Destination

Table 4 shows the triage decisions made for the study patients, and relates them both to the physicians’ predictions of death or severe complications, and to actual rates of death or severe complications. We excluded 20 patients from this analysis for whom we were unable to ascertain the triage decision. One third of patients were sent home from the ED. Of the 672 patients admitted, approximately half were admitted to the floor, a third were admitted to an ICU, and a sixth were admitted to telemetry beds.

The higher the physician’s prediction of death or severe complications for a particular patient, the more likely was the physician to send the patient to a more intense care setting. For patients sent to an ICU, physicians on average judged the probability of death or severe complications to be higher (mean probability, 56.2%) than that for patients sent to a telemetry unit (mean probability, 34.1%). This average judgment was in turn higher than that for patients sent to a hospital ward (mean probability, 29.8%), which was in turn higher than that for patients sent home (mean probability, 17.9%, p < 0.001 for overall differences in probability judgment).

However, regardless of the patients’ destinations, the predicted complication rates were consistently much higher than the actual complication rates, although patients triaged to increasingly intense care settings experienced increasingly higher rates of complications (home, 0.6%; wards, 3.5%; telemetry, 3.8%; ICU, 9.4%; p < 0.001 for overall differences in rates). None of the 20 patients for whom we could not ascertain the triage destination had complications.

The physicians’ judgments of the probability of death or severe complications were moderately good at discriminating among patients who they admitted or did not admit to an ICU (ROC curve area, 0.76). When we repeated this analysis after stratification by hospital, we found that the probability judgments made by the physicians at the university and VA hospitals were again moderately good at discriminating among these decisions (ROC curve area, 0.78). However, the probability judgments made by the physicians at the community hospital attending were not related to their triage decisions (ROC curve area, 0.49).

Discussion

We found that the physicians who made triage decisions for patients with acute CHF frequently and substantially overestimated the probability that individual patients would die or have a severe complication that would require care usually available in the ICU to maintain life. We found substantial overestimation regardless of whether we stratified patients by the physicians’ probability estimates, or by triage destination.

Furthermore, we found that physicians had only a modest ability to discriminate among patients who would die or have a severe complication from those who would not. The area under the ROC curve derived from the physicians’ judgments of the probability of death or severe complications was only 0.715.

Our results are in accord with those of other studies of physicians’ prognostic judgment. These have shown that physicians had difficulty making prognostic judgments in other settings.26–28 We also have previously shown that our study physicians were overly pessimistic about their patients’ probabilities of medium-term survival.22

There is one obvious explanation why the physi-
Physicians had difficulty discriminating patients at high vs low risk of death or severe complications. They had little relevant evidence from published studies on which to base their judgments. We do not know of any validated models available in 1992 designed to predict the risk of short-term death or severe complications for patients with CHF using data available at the time the ICU triage decision had to be made. At best, Katz et al\textsuperscript{18} enrolled only 108 patients with pulmonary edema who had been admitted to the hospital. Since 1992, two relevant studies have appeared. However, neither distinguished early complications whose prediction would be relevant to the ICU triage decisions from later ones.\textsuperscript{29,30}

In the absence of guidance from the clinical research literature, clinicians could only have based judgments on “clinical intuition.” However, clinical intuition may be fallible.

Intuitive probability judgments may be adversely affected by the inappropriate use of “cognitive heuristics,” rules of thumb which are generally helpful, but may prove misleading in specific instances. One example is the “availability heuristic,” ie, judging the probability of an outcome according to how easily one remembers (or how “available” are the memories of) patients who had the outcome.\textsuperscript{31} Thus it is possible that some physicians overestimated the probability of death or severe complications because they had vivid memories of a few patients with CHF who died or had severe complications develop. Another example is the “representativeness heuristic,” ie, judging the probability of an outcome according to a patients’ resemblance to a “classic” or stereotypical patient who had the outcome.\textsuperscript{32} Thus, some physicians may have overestimated the probability of death or severe complications for patients whom they believed resembled stereotypical patients who would suffer these outcomes, even in the absence of evidence that clinical characteristics of such stereotypical patients predicted the likelihood of death or severe complications.

Intuitive judgments may also be adversely affected by “cognitive biases.” One such bias could be termed “hanging crepe,” ie, overestimating the probability of bad outcomes to avoid unpleasant surprise were these outcomes to occur.\textsuperscript{21}

In our study, physicians who managed patients with acute CHF in the ED decided to hospitalize about two thirds of them, and to send about half of those hospitalized to an ICU or telemetry bed. The rate of triage to intensive care was similar to that found in studies of hospitalized patients with CHF from the 1970s, when ICUs were first being built (47\% for patients with pulmonary edema)\textsuperscript{34} and from the 1990s (41\%).\textsuperscript{21} Our study appears to be unique because it also related physicians’ decisions to their judgments of the outcomes most relevant to the triage decision for individual patients. In particular, we found that triage decisions were strongly correlated with physicians’ judgments of the short-term probability that individual patients would die or have a severe complication. Thus, the physicians seemed to be acting rationally, and in accord with guidelines that suggested that the triage decision for a patient not in extremis should depend the probability that the patient would soon have a complication develop that would require treatment available only in an ICU to maintain life.

However, these decisions resulted in ICU admissions for many patients who did not prove to require treatments that are only readily available in an ICU. The rate of ICU admissions that did not require intensive treatment is similar to that found in other studies.\textsuperscript{35} One possible reason that the physicians admitted so many patients to ICUs who turned out not to require active ICU treatment is that they greatly overestimated the likelihood that these patients would have severe complications that would require treatments only available in an ICU to maintain life. Of course, in the absence of any randomized controlled trials of intensive care, we have no idea of how many such severe complications ICU monitoring may have averted.

Furthermore, a few of the patients the physicians did

<table>
<thead>
<tr>
<th>Initial Triage Destination</th>
<th>Patients, No. (%)</th>
<th>Actual Complications†</th>
<th>Predicted Complications‡</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (%)</td>
<td>CI</td>
<td>%</td>
</tr>
<tr>
<td>ICU</td>
<td>223 (22.0)</td>
<td>21 (9.4)</td>
<td>6.1–14.2</td>
</tr>
<tr>
<td>Telemetry</td>
<td>106 (10.5)</td>
<td>4 (3.8)</td>
<td>1.2–9.9</td>
</tr>
<tr>
<td>Ward</td>
<td>342 (33.8)</td>
<td>14 (4.1)</td>
<td>2.3–6.9</td>
</tr>
<tr>
<td>Home</td>
<td>341 (33.7)</td>
<td>4 (1.2)</td>
<td>0.4–3.2</td>
</tr>
<tr>
<td>All</td>
<td>1,012 (100.0)</td>
<td>43 (4.2)</td>
<td>3.1–5.7</td>
</tr>
</tbody>
</table>

*CI = confidence interval.
†p < 0.001, χ\textsuperscript{2}; degrees of freedom = 3.
‡p = 0.001, analysis of variance; degrees of freedom = 3,10009. Data are missing for 20 patients.
not admit to an ICU did have complications develop for which treatments available only in an ICU are needed to maintain life. One possible reason that physicians failed to admit some patients to an ICU who soon required ICU treatment is that they had difficulty discriminating among patients who would or would not have severe complications develop.

Our findings are subject to several limitations. Our study sampled patients at a university hospital, a VA hospital, and a community hospital in one geographic area. Although many of the physician-participants at the university hospital and the VA hospital were still in training, they were all the physicians who made triage decisions for the study patients. Furthermore, stratified analyses showed that the judgments of the physicians at the university and VA hospitals were more closely related to their decisions, and were of equal or better quality than those of the physicians at the community hospital. It is still possible that our results may not apply to physicians and hospitals in other regions, or to hospitals of different types, although we see no obvious reason why it should not.

We enrolled patients from 1990 to 1992. Since then, there have been many changes in how the EDs in many teaching hospitals are run. In particular, the standards for supervision of house staff have generally become more stringent. However, by 1990, the house staff at the university hospital in our study were already supervised in-house around the clock by ED attending physicians. Furthermore, the scarcity of ICU beds has been an ongoing problem since at least the early 1980s, so it is doubtful that the physicians in our study were less concerned about inappropriate ICU admission than are physicians today. We know of no major innovations in the management of acute CHF since 1992. Therefore, it is likely that our results still apply to the management of acute CHF in the 21st century.

Our study aggregated the judgments of many physicians. Our sample size, although large, was insufficient to assess the judgments and decisions of individual physicians, some of whom saw small numbers of patients. Thus, our results, although they represent the judgments and actions of physicians in the aggregate, may not represent every individual physician in the study. We studied only patients with CHF; therefore, our results may not apply to how physicians manage other acute illnesses. However, CHF is a very common cause of hospital and ICU admission.

**CONCLUSION**

Our study found that physicians in the ED have trouble judging the short-term probability of death or severe complications for patients with acute CHF. Current guidelines suggest that such judgments should strongly influence decisions about admission to intensive care. Furthermore, we found that, after excluding patients who presented *in extremis*, only a few presenting patients died or had severe complications develop within 4 days.

These findings have implications for both physicians and health-care policy makers. First, in the absence of randomized controlled trials of the outcomes of intensive care, optimal triage decision making depends on accurate predictions of the probability that individual patients will have a severe complication develop that requires intensive care. Physicians cannot easily make such predictions based on intuition alone. Large, prospective studies of the predictors of this outcome could enable physicians to make better predictions. Furthermore, it is time to reconsider performing randomized controlled trials of intensive care. Perhaps the fear that patients not randomized to the ICU may be denied efficacious treatment has prevented performance of such trials. Given the findings from our study, however, randomizing selected CHF patients to care of varying intensities within the hospital does not seem unethical.

**REFERENCES**


15 Bion J. Rationing intensive care: preventing illness is better, and cheaper, than cure. BMJ 1995; 310:682–683