# THE INFLUENCE OF THE PROBABILITY OF SURVIVAL ON PATIENTS' PREFERENCES REGARDING CARDIOPULMONARY RESUSCITATION

DONALD J. MURPHY, M.D., DAVID BURROWS, M.D., SARA SANTILLI, R.N., M.S.N., ANNE W. KEMP, M.S.W., SCOTT TENNER, M.D., M.P.H., BARBARA KRELING, AND JOAN TENO, M.D., M.S.

**Abstract** *Background.* Studies suggest that a majority of elderly patients would want to undergo cardiopulmonary resuscitation (CPR) if they had a cardiac arrest. Yet few studies have examined their preferences after clinicians have informed them about the outcomes of CPR.

*Methods.* To study older patients' preferences regarding CPR, we interviewed as many ambulatory patients as possible in one geriatrics practice in Denver from August 1, 1991, through July 31, 1992.

*Results.* A total of 371 patients at least 60 years of age were eligible; 287 completed the interview (mean age, 77 years; range, 60 to 99). When asked about their wishes if they had cardiac arrest during an acute illness, 41 percent opted for CPR before learning the probability of survival to discharge. After learning the probability of survival (10 to 17 percent), 22 percent opted for CPR. Only 6 percent of patients 86 years of age or older opted for CPR under these conditions. When asked about a chronic illness in which the life expectancy was less than one year, 11 percent of the 287 patients opted for CPR before learning the probability of survival to discharge. After learning the probability of survival (0 to 5 percent), 5 percent said they would want CPR.

*Conclusions.* Older patients readily understand prognostic information, which influences their preferences with respect to CPR. Most do not want to undergo CPR once a clinician explains the probability of survival after the procedure. (N Engl J Med 1994;330:545-9.)

CARDIOPULMONARY resuscitation (CPR) is controversial for patients near death. The appropriateness of CPR depends on three main factors: the outcome, the cost, and the patient's preference. Several recent studies have reported outcomes among elderly patients who have undergone CPR. Ambulatory elderly patients have a 10 percent chance of surviving to discharge after out-of-hospital CPR in cities with good emergency medical systems.[1,2] A recent study suggests that carefully selected elderly patients (i.e., those with primary cardiac diseases) have an up to 39 percent chance of surviving to discharge after CPR is performed in the hospital.[3] Depending on the severity of their illness, chronically ill elderly patients have a very poor chance of surviving to discharge after CPR (less than 5 percent).[4-8]

Although we are unaware of any studies of the cost effectiveness of CPR, estimates suggest that the marginal cost-effectiveness ratio is very high when the probability of survival is low.[9-11]

Several investigators have reported on older patients' preferences with respect to CPR. Empirical research based on standardized surveys shows that the majority of elderly patients desire to undergo CPR in the event of a cardiac arrest. Some studies have indicated that 73 to 90 percent of elderly outpatients would want CPR, given their current state of health.[12-15] Only one study indicated that a small minority (less than 10 percent) would want CPR.[16] From 43 to 88 percent of hospitalized elderly patients opt for CPR.[17-19] A recent study found that 84 percent of frail patients in an acute care geriatric-medicine unit favored the use of CPR in their own cases.[20] Approximately one third of nursing home residents (or their surrogates) chose CPR.[21,22] When patients consider whether they would want to undergo CPR if they had a serious disability, such as coma or a terminal illness, 20 to 45 percent opt for CPR.[12-14,19,23-26]

The percentage of elderly patients in these studies who say they would want to undergo CPR is much higher than our impression of what we would find in our geriatrics practice. These differences may be accounted for by bias on the part of the interviewer, by differences in the patients' knowledge about prognosis,[27,28] or by both factors.

Our goal was to study the effect of these factors on older patients' preferences regarding CPR. First, we wanted to determine patients' preferences when they were elicited by clinicians instead of researchers. Second, we wanted to determine the effect of prognostic information on patients' preferences with respect to CPR.

## METHODS

We developed a questionnaire based on a pilot study of 80 older patients (age range, 66 to 93 years) who lived in a retirement community in Washington, D.C. After revising the questionnaire, we made an attempt to interview all ambulatory patients in the geriatrics practice of one of us in Denver from August 1, 1991, through July 31, 1992. This practice is part of a large, hospital-based geriatrics clinic in downtown Denver.

The interviewers were the geriatrician, a geriatric nurse practitioner, and 11 medical residents who were supervised by the geriatrician.

We conducted the interviews as part of a general discussion of advance directives for health care. If time allowed, we discussed advance directives (and conducted the interview) at the end of a routine office visit in which we addressed other medical problems. Otherwise, we scheduled a return visit to focus on advance directives.

The first set of questions addressed the patients' knowledge of CPR. We explained CPR to those who did not have a basic understanding of the procedure. The second set of questions was designed to determine the patients' estimates of the probability of survival after CPR and their preferences regarding the use of CPR if they had a cardiac arrest. We asked about CPR in three different

From the Senior Citizen's Health Center, Presbyterian–St. Luke's Medical Center, Denver (D.J.M., D.B., S.S.), and the Department of Health Care Sciences and the Intensive Care Unit Research Unit, George Washington University Medical Center, Washington, D.C. (A.W.K., S.T., B.K., J.T.). Address reprint requests to Dr. Murphy at the Senior Citizen's Health Center, Presbyterian–St. Luke's Medical Center, 1801 High St., Denver CO 80218.

sets of circumstances: an accident, an acute medical illness, and a chronic illness associated with a life expectancy of less than one year.

In the third set of questions, we used pie charts to determine the probability of survival at which patients would opt for CPR. We began by showing them a pie chart depicting a 50 percent chance of survival after CPR (Fig. 1). We asked them to focus first on the 50 percent who would survive; we explained that the vast majority of the survivors would resume their usual activities and that only a very small minority would require long-term care because of neurologic problems. We then asked them to focus on the 50 percent who would die in the hospital, explaining that many would die within the first 48 hours without ever regaining consciousness. We explained that others would die after regaining consciousness and after a longer hospital course.

After we were confident that the patients understood the 50-50 pie chart, we showed them a chart depicting a 1 percent chance of surviving to leave the hospital. We asked if they would want CPR if this was their chance of surviving. If they said yes, we proceeded to the next series of questions. If they said no, we proceeded to the next pie chart, one depicting a 5 percent chance of surviving to discharge. Subsequent charts depicted increasing chances of surviving to leave the hospital. We continued showing charts until the patients said they would want CPR or until we showed a pie chart depicting 100 percent survival.

The last set of questions was identical to the second set, in which we asked about patients' preferences with respect to CPR in three different sets of circumstances. The difference was that we informed them of the probability of survival after CPR in two of the cases. We explained that the chance of surviving to discharge after CPR for patients with acute medical problems ranged from 10 percent to 17 percent.[1,2,6,8,29,30] In the case of a chronic illness associated with a life expectancy of less than one year, the chance of surviving to discharge ranged from 0 to 5 percent.[4-8]

### Statistical Analysis

We used the Crunch Statistical Package[31] to analyze the data. We analyzed continuous variables with Student's t-test and categorical variables with the chi-square test.

## Results

### Patients

A total of 371 patients at least 60 years of age were eligible; 287 completed the interview (mean age, 77 years; range, 60 to 99). Eighty-four patients were unable to participate for the following reasons: dementia (13 patients), psychiatric problems (8 patients), acute medical problems (20 patients), loss to follow-up (19 patients), an incomplete interview (14 patients), and miscellaneous reasons such as a language barrier (10 patients). Table 1 shows the characteristics of the 287 patients who completed the interview.

### Knowledge of CPR and Experience with Intensive Care

The clinicians judged that 60 percent of the subjects had a reasonable understanding of CPR. Sixteen percent had seen CPR performed, and 23 percent knew of someone who had undergone it. Thirty-nine percent had a close friend or relative who had died in the intensive care unit.

### Estimated Probability of Survival after CPR and Preferences for CPR

Table 2 shows the patients' estimates of the chance of surviving after CPR, the percentage who opted for CPR before learning the true probability of survival to discharge, and the percentage who opted for CPR after learning the true probability. Approximately half the patients who had initially opted for CPR decided not to undergo CPR when they learned the probability of survival.

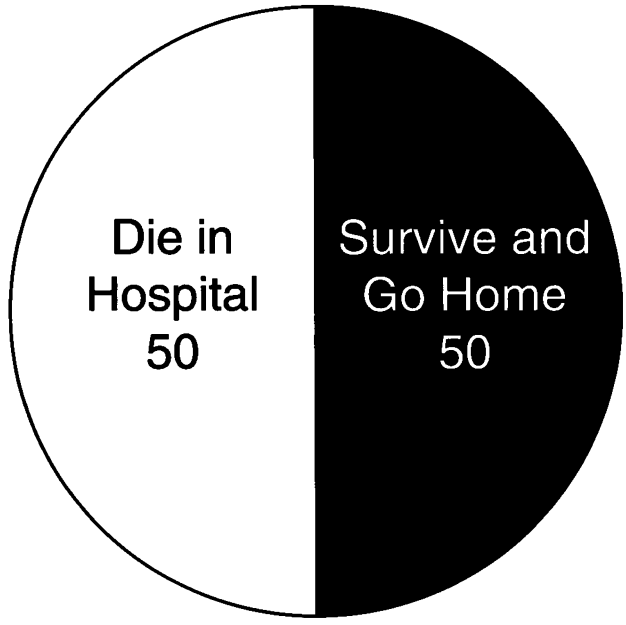


Figure 1. Pie Chart Showing 50 Percent Survival after CPR. This pie chart and similar charts showing different survival rates were used in the interviews with patients to elicit their preferences with respect to the use of CPR.

Once patients understood the probability of surviving to discharge, only 6 percent of those over 85

Table 1. Characteristics of the 287 Patients Who Were Interviewed.

| Characteristic | Value |
|---|---|
| Mean (±SD) age (yr) | 77±7.0 |
| Sex (%) | |
| Female | 65 |
| Male | 35 |
| Race or ethnic group (%) | |
| White | 84 |
| Black | 8 |
| Hispanic | 6 |
| Other | 2 |
| Living alone (%) | 52 |
| Religion (%)* | |
| Protestant | 62 |
| Catholic | 23 |
| Jewish | 2 |
| Other | 9 |
| Agnostic | 3 |
| Education (%)† | |
| Grades 1–8 | 15 |
| Grades 9–12 | 51 |
| College | 29 |
| Graduate school | 5 |
| Income (%) | |
| <$11,000 | 63 |
| $11,000–25,000 | 23 |
| >$25,000 | 14 |

*Percentages do not total 100 because of rounding.
†Only the highest level attained is shown.

Table 2. The 287 Patients' Estimates of the Probability of Survival after CPR and Preferences Regarding CPR.

| Variable | Accident | Acute Illness | Chronic Illness |
|---|---|---|---|
| Patients' estimate of survival rate (mean ±SD) — % | 27±23 | 26±22 | 15±16 |
| Preferred CPR before learning the probability of survival — no. (%) | 132 (46) | 118 (41) | 33 (11) |
| Preferred CPR after learning the probability of survival — no. (%) | — | 63 (22) | 15 (5) |

years of age (2 of 34) said they would want to undergo CPR if they had an acute illness. Only 1 of the 34 patients over 85 years of age (3 percent) said CPR would be desirable in the case of a chronic illness associated with a life expectancy of less than a year.

Table 3 shows the minimal probability of survival to discharge at which our patients said they would want CPR. Only 42 percent said they would want to undergo CPR if the chance of surviving to leave the hospital was less than 50 percent. Twenty-five percent said they would not want CPR even if the chance of surviving was 100 percent.

The patients were consistent in their responses when the two methods of determining their preferences regarding CPR were used (determining a threshold for the survival rate using pie charts and answering a straightforward question). Only 4 percent gave inconsistent responses. The results of these analyses were the same whether the interview was conducted by the geriatrician (as was the case for approximately 50 percent of the interviews) or by the nurse practitioner or a medical resident.

## Discussion

In a busy outpatient geriatrics practice, we found that detailed discussions of CPR with patients were necessary before we could reliably determine their preferences regarding CPR. A recent study by Mower and Baraff indicated that the most compelling directives (that is, those most likely to be followed by doctors) are detailed.[32]

Our study focused on CPR. We believed that patients' preferences would be more valid if they were based on a good understanding of the technique. We used several methods to increase our patients' understanding of CPR.

Table 3. Lowest Probability of Survival at Which Patients (N = 287) Would Prefer to Undergo CPR.

| Survival Rate (%) | No. Opting for CPR (%) |
|---|---|
| 1 | 28 (10) |
| 5–10 | 28 (10) |
| 20–40 | 64 (22) |
| 50 | 72 (25) |
| >60 | 24 (8) |
| Did not want CPR* | 71 (25) |

*These 71 patients did not want to undergo CPR regardless of the survival rate.

First, the interviewers were clinicians. Although the clinicians followed the questionnaire, they could use their clinical skills to clarify concepts and explore inconsistencies in responses. Some might argue that the participation of a clinician introduces bias and that this approach may be less likely than others to elicit patients' true preferences. We believe the effects of such bias were minimal, however, for several reasons. The clinicians deviated from the questionnaire only to clarify matters and explore inconsistencies, not to express their own opinions. The results were the same whether the patients were interviewed by the geriatrician, who had definite views on the use of CPR,[6,9,33] or by a medical resident or the nurse practitioner. Finally, patients make important decisions after considering the advice of clinicians, not in a vacuum. Had the clinicians in this study expressed their own views[34,35] — as they might have if the questionnaire had not been part of the study — fewer patients might have opted for CPR.

Second, we used a visual representation of the probability of survival after CPR to increase patients' understanding of the procedure. The pie charts illustrated both mortality and survival rates, thus reducing the possibility of a framing bias (i.e., influencing responses by presenting only mortality or survival rates).[36,37] Almost all the patients were able to understand the charts.

Prognostic information is essential for the accurate preparation of advance directives. The patients in our study and others[27,28] overestimated the likelihood of survival after CPR. This optimistic view of the outcome of CPR may explain why a large percentage of older patients in other studies opted for CPR.[12-15] In our study, half the patients who initially said they wanted CPR changed their minds after they learned the true probability of survival. Miller et al. reported a similar change in preferences when older patients received information about the probability of survival after CPR.[27] On the other hand, Schonwetter et al. found that preferences regarding CPR did not change when elderly veterans considered the probability of survival after the procedure.[12] The "fixed" preferences reported in that study may be unique to elderly veterans. A more recent report from Schonwetter et al.[28] suggests that older patients do change their preferences with respect to CPR after learning about the outcomes of the procedure.

The patients in our study received the same information about the outcomes of CPR as the subjects in previous studies.[27,28] However, the percentage of older patients who opted for CPR after learning the actual probability of survival was much lower in our study (22 percent said they would choose CPR if they had an acute illness) than in others (38 to 40 percent).[27,28] Unlike the previous studies, ours incor-

porated the questionnaire into a routine office visit. The interviewers were the clinicians who took care of the patients. We assume that this format had some influence on our patients' preferences. Furthermore, we believe the preferences expressed in the context of a trusting provider–patient relationship may be more valid than those expressed in anonymous surveys or when the interviewer has no relationship with the subject.

The third method we used to increase patients' understanding of CPR was the detailed description of outcomes. Patients need to know more than the odds of dying or living after undergoing CPR. They wonder what the quality of life might be for survivors of CPR or what kind of death CPR would involve. We believe a description by a clinician is the most effective and efficient way of communicating that information.

The format of our study provided an opportunity for us to clarify many misperceptions. For example, many patients thought that they would "end up like a vegetable" if they survived CPR. We emphasized that the majority of survivors resume their usual daily activities and that only a small minority require long-term care because of neurologic deficits. Similarly, many patients thought that death after CPR would be painful. We emphasized that most people who die after CPR do not regain consciousness and therefore feel no pain during CPR or during subsequent intensive care. Although we did not determine how much this information influenced the patients' preferences, we believe it had some effect.

The patients in this study had little difficulty stating the survival rate at which CPR was acceptable to them. A few wavered between 1 percent and 5 percent, between 10 percent and 20 percent, or between 40 percent and 50 percent. None wavered between rates differing more widely, such as 1 percent and 20 percent or 10 percent and 50 percent. With the exception of two patients who could not grasp the probabilities in the pie charts, all had fairly well defined thresholds for preferring CPR. This pattern indicates that the probability of survival is an important factor in patients' preferences. Although we focused on CPR, we believe a similar approach could be used to help clarify preferences regarding intensive care in general.

Various questionnaires and forms are available to help patients prepare advance directives. The medical directive of Emanuel and Emanuel[38] helps patients consider their wishes in situations with different levels of disability. We agree that scenarios (and, if time allows, stories[39]) are helpful in determining patients' preferences. Other materials can help patients express their opinions about states worse than death.[40] The duration of treatment is another important factor.[18] All these factors are related to prognosis. The variable we studied — the probability of survival — is only one component of a patient's prognosis.

A detailed advance directive, therefore, appears to be one that incorporates different scenarios, takes into account the duration of treatment, and specifies the survival rate below which intensive care is not worth it for that patient. Such a directive may seem cumbersome. Our impression is that clinicians can glean this information in about 10 to 15 minutes of discussion with most older patients. It may take as little as two to five minutes in some cases. Furthermore, we believe that most clinicians can obtain this information — and summarize the salient points in the record — without needing to use a particular questionnaire or form. However, a questionnaire that patients can fill out at home, then discuss with their doctors, would be very useful. Its use might help patients and their doctors overcome one of the most important barriers to completing advance directives — procrastination.[41]

The great majority of the oldest patients (about 94 percent of those over 85 years of age in our practice) do not want CPR when they understand the probability of survival after the procedure. Would the percentages be even higher if patients considered all pertinent factors, including the financial effect of prolonged care on their family and on society?[42-44] On the basis of comments from the patients in our study, we think so.

## Summary

Optimal care for older patients includes advance directives. Standard forms such as living wills and durable powers of attorney may be helpful but are often insufficient. Discussions among the patient, a clinician, and potential surrogate decision makers yield the most valid advance directives. These discussions should include prognostic information. Patients readily understand this information, which influences their preferences regarding CPR. Most older patients do not want CPR once they understand the probability of survival after the procedure.

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