

The Effect of Patient Age on Perceived Resuscitation Outcomes by Practitioners

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Abstract

Background: When health care practitioners assist patients with decisions about advance directives, the risks and benefits of resuscitation options are often discussed. Whether practitioners have accurate perceptions about in-hospital resuscitation success rates is not known, nor is the effect of patient age on these perceptions. Age on its own has not been definitively associated with decreased inpatient survival after resuscitation. The goal of this study was to compare perceived resuscitation success rates with the actual observed rates at our hospital and to assess the effect of patient age on the perceived rates.

Methods: A survey-based observational study of on-duty hospital-based faculty, internal medicine resident physicians, and critical care nurses was performed over a week-long recruitment period to estimate their perception of in-hospital resuscitation success rates for patients of different ages. The survey response rate was 100%.

Results: Patient survival to hospital discharge following in-hospital resuscitation during a three-year period at New Hanover Regional Medical Center was 29.22% for patients < 70 years old and 20.13% for patients ≥ 70. The perceived in-hospital resuscitation success rates were 38.76% for patients < 70 and 21.24% for patients ≥ 70. This corresponds to a statistically significant overestimation of resuscitation success rates for patients < 70 years old ($p < 0.001$), although predictions were fairly accurate for patients ≥ 70. When posed with one of two clinical scenarios where the only different variable was patient age, participants were statistically more likely to predict success for the younger patient. Subgroup analysis showed general agreement in the estimates between the three major types of practitioners, and factors such as length of experience in their current position and time since their last Advanced Cardiac Life Support (ACLS) recertification course did not have a significant impact on these perceptions.

Conclusions: Practitioners may overestimate resuscitation success rates in patients younger than 70. Disseminating information about ACLS success rates to clinicians, and what factors affect or do not affect these rates, seems essential.

Keywords: resuscitation; survival; critical care; code status

Hospital-based health care practitioners often have to inform patients and their families about prognosis and the risks and benefits associated with procedures and other interventions. Due to the high acuity of illness in hospitalized patients, information about the likelihood of survival from providing cardiopulmonary resuscitation to a patient during unanticipated arrest may be discussed by practitioners to guide patients and their families through decisions about which treatments are ultimately desired (i.e., determining “code status”). This is particularly true when the patient has not previously considered such choices or completed a living will or other advance directives paperwork. Decisions made by patients and their families

about code status are complex and often based on more than physician-provided information, with personal or religious beliefs also playing an important role.¹ Data presented by the health care practitioner, particularly when that practitioner believes that resuscitation efforts may be futile, can also play an important role in the choices made.² In addition, it has been suggested that overly optimistic views of success rates may lead to futile resuscitation attempts or may give families a false sense of optimism.³ Whether discussions by the practitioner about code status are based on accurate outcomes evidence is unclear.

Previous studies have examined the resuscitation outcome beliefs of multidisciplinary residents and attendings

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at large, urban, university-based medical centers, some of which included medical students.³⁻⁵ These studies suggest that such practitioner groups are generally not accurate at predicting survival after a cardiopulmonary arrest and that accuracy does not seem to be related to level of training or experience. Of note, emergency medicine (EM) residents had more accurate estimates than non-EM residents (including internal medicine, family medicine, pediatrics, and other specialties) in one small study.³ Whether hospital-based practitioners in an academic community medical center setting have accurate perceptions about in-hospital resuscitation success rates is unclear as this has not been specifically examined.

Additionally, factors that influence practitioner estimations of resuscitation success have not been well-studied. In one publication, residents and attendings were surveyed on resuscitation success rates for various medical diagnoses and were asked whether these perceptions affected their own desire for such interventions—which they did not.⁶ A previous meta-analysis suggested that there are in fact several factors that are associated with decreased patient survival to discharge after resuscitation, including patient functional status and certain underlying medical illnesses.⁷ Although the studies that examined the association of patient age and resuscitation survival had conflicting results, age as a continuous variable predicting survival from resuscitation was not one of the factors that reached statistical significance in the meta-analysis. Despite the lack of clear evidence that age itself predicts resuscitation survival, do-not-resuscitate (DNR) orders have been shown to be assigned more often to older patients, even when adjusting for factors such as underlying illness or functional impairment.⁸ Additionally, the likelihood that resuscitation may be used in a seriously ill hospitalized patient is higher if the patient is younger.⁹

Given the results of studies that have been published on factors influencing survival from resuscitation and on practitioner beliefs about resuscitation outcomes, we developed a study to investigate how patient age affected practitioners' perceptions of outcomes. Specifically, our study aimed to determine the accuracy of perceptions of hospital-based practitioners about inpatient cardiopulmonary resuscitation success rates (resulting in an eventual discharge for the patient) and how the age of a patient influenced those perceptions. Our hypothesis was that practitioners would predict greater resuscitation success rates in younger patients and lower rates in older patients.

Materials and Methods

Study Site

New Hanover Regional Medical Center (NHRMC) is a 628-bed community-based teaching hospital affiliated with the University of North Carolina at Chapel Hill School of Medicine. It is a Level II trauma center and a regional referral

hospital for seven counties in southeastern North Carolina. The hospital houses four intensive care units (ICUs) with 69 total ICU patient beds. When a rapid response sequence is called at our hospital, it is most often attended by an intensive care attending physician, the on-call internal medicine residents, and critical care nurses. The involved hospital-based physician is also frequently present. All five general internal medicine attending faculty at our residency program are based full-time in the inpatient setting (hospitalists), and there are eight full-time intensive care attendings based at our hospital. Our internal medicine residency program has NHRMC as its sole inpatient teaching site and trains a total of 23 residents: eight at the post-graduate year one level (PGY-1), seven residents each at the PGY-2 and PGY-3 levels, and one PGY-4 chief medical resident.

Actual Hospital Survival Data

Data used for this analysis were NHRMC records compiled as part of a registry for all in-hospital cardiopulmonary arrests. The data include patient outcomes and eventual dispositions, in accordance with accreditation guidelines for medical centers. Data on hospital survival rates for all hospital inpatients (medical floor and ICU) who had experienced a cardiopulmonary arrest at NHRMC during the years 2005-2007 was obtained from the medical records office. Only data from adults ages 18 and over were used in this analysis. Resuscitation survival was defined in our study as when a hospital inpatient suffered a cardiopulmonary arrest and was eventually discharged from the hospital.

Survey Participants

In our institution, as in many others, it is the residents and attending physicians in internal medicine, pulmonary-critical care physicians, and critical care nurses who are the practitioners most likely to be providing ongoing care to critically ill patients in the inpatient setting. Therefore, they are most likely to be involved with counseling patients and their families about advance directives choices and resuscitation outcomes. This same group of practitioners was also more likely to attend rapid-response calls or cardiopulmonary arrests for patients in the ICU and on the inpatient ward services. Therefore, we focused our study on these specific caregivers.

Participants for this study were recruited over a one-week period and were eligible to participate if they were on-duty at the hospital during that week. During the recruitment period, 68 health care practitioners from NHRMC were eligible for the study. This included a total of 30 physicians, nine of whom were faculty attending physicians in internal medicine (n=4) or pulmonary-critical care (n=5) and 21 of whom were resident physicians in internal medicine (PGY-1 = 7; PGY-2 = 6; PGY-3 = 7; PGY-4 = 1). These physicians represented the entire faculty and resident members of the internal medicine residency program who were not also investigators in the study (Dr. Snyder and Dr. Loschner), with

the exception of three pulmonary-critical care physicians who were unavailable during the study's participant recruitment phase. Additionally, participants included all 38 registered nurses in the medical-surgical critical care units who were available during the week-long participant recruitment. All eligible candidates were approached by a study investigator during the week-long recruitment, and all candidates agreed to participate and complete the survey, resulting in a 100% response rate.

All study participants had completed ACLS certification between 2006 and 2008, with an average length of time since that training of 1.33 years. Health care practitioners at NHRMC are trained in ACLS with a certification or recertification course by an American Heart Association (AHA) instructor, using the AHA training materials.¹⁰ Attendings in our study averaged 8.5 years in their positions, residents averaged 1.8 years in their positions, and registered nurses had an average 9.6 years in their positions. This study received approval from the NHRMC Institutional Review Board.

Survey Instrument

A survey instrument was developed to assess health care practitioners' perceptions of in-hospital resuscitation outcomes (see Figure 1, page 202). The instrument consists of open-ended questions asking respondents to estimate the success rates for in-hospital resuscitation efforts, leading to an eventual discharge from the hospital, in all hospitalized patients both greater and less than 70 years of age. Participants also received a brief, hypothetical description of either a 58-year-old or 85-year-old patient with a known history of chronic kidney disease, who is admitted for community-acquired pneumonia and suffers a cardiopulmonary arrest on a general medical telemetry floor. The respondent is asked whether or not they believe the likely success rate for resuscitation, leading to an eventual hospital discharge for the patient, is $\geq 30\%$ (answered 'yes' or 'no'). This last question was developed to more closely examine how the age of the patient in question, isolated from other contributing factors, played a role in a practitioner's estimate of resuscitation success. These two ages were chosen indiscriminately as one was less than 70 years old and the other was greater, and we had chosen 70 years old as the split point for our analysis to divide 'younger' and 'older' patients. This split point is the same as that used in other resuscitation studies, such as the one by Ebell and colleagues.⁷ The 30% success rate was chosen based on average estimates of resuscitation survival by non-emergency medicine residents in a small, similarly sized study about resuscitation predictions.³

The survey also collected data on the respondent's position in the

hospital, the number of years in that position, and their most recent ACLS certification date. Although a large number of factors may have an effect on a practitioner's perception of resuscitation success rates, we wanted to assess if such practitioner attributes influenced the accuracy of perceived resuscitation outcomes outside of patient characteristics. Data on the duration of time since the practitioner's most recent ACLS training and certification/recertification was collected and analyzed to assess if practitioners more recently trained in ACLS felt more confident that their resuscitation efforts would be successful.

Procedure

Participants were randomly assigned to one of two patient age conditions (58 years or 85 years) by their position in the hospital (i.e., attending, resident, or nurse) so that each position would have an equal number of participants in each age condition. Flip-of-the-coin determined whether the participant received the questionnaire describing a 58-year-old or 85-year-old. All other aspects and questions on the measure were identical. Participants were recruited during their hospital shift by a study investigator and asked to participate in the study. Once informed consent was obtained, the participant was asked to complete the written questionnaire and return it anonymously to the researchers. As previously reported, our response rate was 100%.

Statistical Analysis

Actual hospital survival data were obtained as previously described and classified by age group (under 70 and 70 or over). Chi square analysis was performed to ascertain if actual differences existed between the two age groups. Once a difference was established, the actual survival rates were compared with the perceived rates as reported by the participants in this study. Survey data were first analyzed descriptively to calculate the survey respondents' perception of in-hospital resuscitation success by age group. Related samples t-tests were performed to test the hypothesis that younger patients would have greater perceived resuscitation success rates and older patients would have lower perceived rates. These t-tests were also used to compare the perceived differences in success rates for both age groups with the actual observed hospital rates. Once perceived differences in the groups due to age were established, univariate analyses

Table 1.
Perceived Versus Actual Rates of Survival for In-Hospital Resuscitation by Age Group

Age Group	Perceived	Actual	Difference
Less than 70 years	38.76%	29.22%	9.54%*
70 years and older	21.24%	20.13%	1.11%
Overall			8.43%*

* $p < 0.001$.

Figure 1.
Survey Instrument

Form
V 9-12

Cardiopulmonary Resuscitation Survey

Please check your appropriate title:

☐ Resident

Please circle current postgraduate year: I II III IV

☐ Attending Physician, Pulmonary-Critical Care (Intensivist)

☐ Attending Physician, Internal Medicine

☐ Intensive Care RN

Number of years in current position_____

Date of most recent ACLS re/certification_____

Perceived in-hospital CPR success rate, leading to hospital discharge

for hospitalized patients greater than 70 years of age_____%

for hospitalized patients less than 70 years of age_____%

A 58-year-old male with known history of chronic kidney disease is admitted for community acquired pneumonia, suffers a cardiopulmonary arrest on a general medical telemetry floor. I believe the likely success for CPR leading to hospital discharge for this patient is $\geq 30\%$

YES ☐

NO ☐

of other demographic variables were investigated (i.e., number of years in current position, type of professional, and years since ACLS certification) to determine if these variables affected perceived rates of success. Lastly, the final question of the survey was analyzed with a chi-square analysis to determine if age had an impact on outcome.

Results

Hospital Survival Data

Actual hospital survival rates for resuscitated inpatients for cardiopulmonary arrest were collected at NHRMC during the years 2005-2007. For adults 70 years and older who had suffered a cardiopulmonary arrest, 64 were alive and discharged and 254 had died. Of the 318 total patients in this age group, this yielded a 20.13% survival rate. For adults less than 70 years of age during this same three-year period, 109 were alive and discharged while 264 had died. Of the 373 total patients in this age group, this yielded a 29.22% hospital survival rate. The overall survival rate for all patients, regardless of age, was 25.04%. A chi-square analysis indicated a significant difference ($p < 0.01$) between age groups (under 70, and 70 and over). Patients in the 70 years and older group in our hospital were more likely to not survive resuscitation efforts than patients in the under 70 group. These actual survival rates were then compared with the perceived rates as reported by the participants in this study.

Survey Results and Analysis

The answers to survey questions represented an appropriately wide range of responses and the data were normally distributed (by visual inspection of distributions and relatively symmetric box plots). The mean perceived in-hospital resuscitation success rate for patients under 70 was 38.76% (SD=23.51) and the mean perceived in-hospital resuscitation success rate for patients 70 and over was 21.24% (SD=17.14). See Table 1 for a summary of perceived versus actual rates. The results of the related samples t-test indicated different perceived success rates based on patient age. The mean percentage difference score (defined as the perceived rate minus the actual rate) for the under 70 population was 9.54%, and for the 70 and over population was 1.11%. There was a statistically significant difference in the impression of survival rates between the two populations of under 70 years and 70 years and over ($p < 0.001$). In other words, survey participants were significantly more accurate at predicting the survival rates for the 70 and over group than for the under 70 group. Participants, as a whole, overestimated the likelihood a patient under 70 would survive in-hospital resuscitation. The overall mean difference in predicted success rates between the age groups was 8.43 percentage points (when comparing the estimated survival rates of 9.54% and 1.11%).

Although our study sample was small, further analysis was attempted to determine if certain characteristics of the participants correlated with their opinion on patient survival

rates after in-hospital resuscitation. Although there are likely numerous influences on the perception of resuscitation success, three specific variables were chosen for the purposes of this study: number of years on the job, type of professional (attending physicians, registered nurses, and resident physicians), and how recently the participant had been trained in ACLS. Tests of correlation (simple linear regression to test the relationship between years on job and perception of CPR success; univariate ANOVAs for type of professional and ACLS training date) were conducted to analyze each demographic variable, and all results were non-significant. This suggests that, in our study sample, the ability to successfully predict success rates for patients under or over 70 was the same, regardless of the years of job experience, practitioner type, or how recently ACLS certification was completed.

For the final question in the survey, half of the participants were randomly assigned to receive the question based on a patient scenario with a 58-year-old patient and the other half were randomly assigned to receive the same information about an 85-year-old patient. First, cross-tabulation of responses revealed that for the group receiving the 58-year-old, 21 reported likely resuscitation success rates of $\geq 30\%$, while 13 reported likely success rates lower than that. For the group receiving information about the 85-year-old, 6 reported likely resuscitation success rates of $\geq 30\%$, while 28 reported lesser success rates. Chi-square analysis of this data indicated a significant difference in perceived survival between the two patients ($p < 0.001$). Participants receiving the 58-year-old patient question were significantly more likely to indicate a high success rate for resuscitation than those receiving the 85-year-old patient. Thus, age is a primary determinant of perceived survival of in-hospital resuscitation.

Discussion

Rates of success for in-hospital resuscitation at New Hanover Regional Medical Center, resulting in a patient being discharged alive from the hospital, were examined for a three-year period and found to be 29.22% for patients under 70 years of age and 20.13% for patients 70 years old or older (25.04% across all age groups). These rates are slightly higher than those seen in a study of an academic medical system in Canada (13.4-22.4%)¹¹ and in two US reports at the national level (17%¹² and 18.1%¹³) as reported from data in the National Registry of Cardiopulmonary Resuscitation. A meta-analysis by Ebell and colleagues of 41 studies looking at survival data for in-hospital resuscitation suggested that only about 13.4%-14.6% of adult patients survive resuscitation to be discharged from the hospital.⁷ In this meta-analysis, and specifically in the 10 papers meeting the authors' strict inclusion criteria, several factors were associated with decreased survival to discharge. These included a diagnosis of sepsis within the day preceding the arrest; a diagnosis of dementia, cancer,

or metastatic cancer; dependent status of the patient; African American race; and serum creatinine greater than 1.5 mg/dl. In the studies evaluated by Ebell and colleagues that met their minimal inclusion criteria for analysis, patients greater than 70 years of age were less likely to survive to hospital discharge. However, age greater than 70 was not a statistically significant factor in studies meeting their strict inclusion criteria, and age as a continuous variable did not correlate with survival. The slightly higher success rate for resuscitation that was measured in our hospital when compared to other published rates could be related to many factors that were not specifically examined in our research study. It is possible that in the period studied our hospital had a larger proportion of respiratory arrests than cardiac arrests, resulting in higher survival rates. A higher percentage of witnessed versus unwitnessed arrests could have this effect as well. Additionally, we did not control for other factors that may have played an important role, such as patient functional status and comorbid conditions. It is possible that controlling for such factors might have reduced the age effect we observed on our resuscitation outcomes. As we were focused on examining practitioner perceptions of resuscitation success for all cardiopulmonary arrests they were likely to participate in the treatment of, and specifically the effect of patient age on these beliefs, we chose not to analyze data on these other factors. Another potential limitation of our study may be the lack of detail about the medical condition of the patient in the case scenario. By not specifying, for example, the stage of chronic kidney disease for the patient in the survey question, a study participant may have assumed a more severe disease stage for a patient that was older.

Practitioners in our hospital, including attending faculty physicians, medical residents, and critical care nurses, overestimated this success rate if the patient in question was younger than 70 years old. Patients younger than 70 years old are in fact more likely to survive a cardiopulmonary arrest and be discharged from our hospital according to collected data. Practitioners were significantly more accurate at predicting the success rate for patients over 70 years old (21.24% perceived versus 20.13% actual). When participants were randomized to a clinical scenario where the only difference was the age of the patient, the group believed that resuscitative efforts were more likely to be successful in the younger patient. Although we had hypothesized that participants might incorrectly predict lower success rates for older patients undergoing resuscitation, we did not observe this particular form of age bias in our study. Still, the age of the patient in question was the only important criterion affecting practitioner perception of survival rates that was measured in our study. Hence, the potential for unsubstantiated age-based assumptions should be considered when practitioners counsel patients about resuscitation options and the factors that influence them.

Subgroup analysis suggested that there was general agreement in the estimates of resuscitation success rates between the three subgroups of practitioners in our study, and years of experience in current position and length of time since last ACLS recertification did not have a significant impact on these perceptions. Notably, more senior physicians were not overall more accurate than residents or nurses in their predictions. The interpretation of these particular results in our study must be done with caution as such results are limited by the relatively small size of our institution (with a small number of total surveyed participants and a weighting towards more nursing staff survey participants) and hence a reduced statistical power to detect such differences. However, these results raise an interesting point. Our research questions are exploratory in nature, and a more extensive, multisite study looking at these or other practitioner characteristics could be undertaken to look at such variables further.

Previous studies that examined practitioner estimates of resuscitation success have shown that these estimates are generally not accurate at predicting survival after a cardiopulmonary arrest, and that accuracy does not seem to be related to level of training or experience.³⁻⁵ To our knowledge, only one small study has published data on resuscitation outcome prediction and included patient age in the results, although this study did not specifically analyze differences in age-based perceptions among practitioners.³

A patient's decisions about code status and other advance directive choices are complicated and based on multiple factors that may include their personal belief system, including their cultural and spiritual background, as well as information shared with them by their health care practitioners about their health status. For a practitioner to be proficient in having advance directive discussions with patients and their families requires many skills including displaying cultural sensitivity and using effective communication techniques. Additionally, evidence-based counseling about the potential benefits, risks, or even the futility of interventions such as resuscitation may assist a patient and their family in making these difficult decisions.

Many factors have been suggested to affect survivability rates after resuscitation, and patient age is not often one of those factors.⁶ However, patient age may influence whether or not a DNR order is obtained or resuscitation is performed.^{8,9} Hence, the presence of potential age biases by the practitioner need to be considered. Disseminating information about ACLS success rates to clinicians and what factors affect or do not affect these rates seems essential. This is especially true for those practitioners who both provide resuscitative care and counsel patients about advance directive and code status choices. Resuscitation success rate data is available from many sources, including from the National Registry of Cardiopulmonary Resuscitation database,¹⁴ and hospital-specific data is tracked as part of the National Hospital Quality Measures by the Joint

Commission.¹⁵ A current publication from the American Heart Association used to train health care practitioners at our institution for ACLS does not include information about the likelihood of survival for a patient that suffers a cardiopulmonary arrest.¹⁰ Perhaps estimates of survival rates from resuscitation and information on what patient characteristics affect these rates can be incorporated into future editions of the AHA's ACLS training manuals.

In our hospital, patients under 70 years of age are more likely than those over 70 to survive a cardiopulmonary arrest and ultimately be discharged from the hospital. Hospital-based personnel, who often provide resuscitative care to patients and who counsel patients on code status choices, may have the tendency to overestimate the likelihood that a hospital inpatient will survive a cardiopulmonary arrest.

This is particularly true for patients under 70 years of age. In our study, the age of the patient in question seemed to significantly influence a practitioner's perception that a successful resuscitation outcome may be obtained. Practitioner characteristics such as position, years on the job, or time since ACLS training did not affect these perceptions. **NCMJ**

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