ORIGINAL ARTICLE

# Epidemiologic Study of In-Hospital Cardiopulmonary Resuscitation in the Elderly

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## ABSTRACT

### BACKGROUND

It is unknown whether the rate of survival after in-hospital cardiopulmonary resuscitation (CPR) is improving and which characteristics of patients and hospitals predict survival.

### METHODS

We examined fee-for-service Medicare data from 1992 through 2005 to identify beneficiaries 65 years of age or older who underwent CPR in U.S. hospitals. We examined temporal trends in the incidence of CPR and the rate of survival after CPR, as well as patient- and hospital-level predictors of survival to discharge.

### RESULTS

We identified 433,985 patients who underwent in-hospital CPR; 18.3% of these patients (95% confidence interval [CI], 18.2 to 18.5) survived to discharge. The rate of survival did not change substantially during the period from 1992 through 2005. The overall incidence of CPR was 2.73 events per 1000 admissions; the incidence was higher among black and other nonwhite patients. The proportion of patients undergoing in-hospital CPR before death increased over time and was higher for nonwhite patients. The survival rate was lower among patients who were men, were older, had more coexisting illnesses, or were admitted from a skilled-nursing facility. The adjusted odds of survival for black patients were 23.6% lower than those for similar white patients (95% CI, 21.2 to 25.9). The association between race and survival was partially explained by hospital effects: black patients were more likely to undergo CPR in hospitals that have lower rates of post-CPR survival. Among patients surviving in-hospital CPR, the proportion of patients discharged home rather than to a health care facility decreased over time.

### CONCLUSIONS

Survival after in-hospital CPR did not improve from 1992 through 2005. The proportion of in-hospital deaths preceded by CPR increased, whereas the proportion of survivors discharged home after undergoing CPR decreased. Black race was associated with higher rates of CPR but lower rates of survival after CPR.

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Cardiopulmonary resuscitation (CPR) evolved from a specific intervention applied in limited clinical situations to the default response to cardiac arrest in or out of the hospital, an evolution accompanied by a dramatic decline in survival rates after CPR.[1-3] Subsequently, innovations allowing rapid out-of-hospital CPR resulted in improved outcomes in the out-of-hospital setting.[4,5] However, it is unclear whether advances in CPR or in care after cardiac arrest have improved outcomes after in-hospital arrest.

Reported rates of survival to discharge after in-hospital CPR vary from 7% to 26%.[6-8] The largest study to date, which included 14,720 CPR events from the National Registry of CardioPulmonary Resuscitation, showed that 17% of patients survived to discharge.[9] Associations between age and survival after CPR remain unclear, with conflicting results from previous studies.[6,10,11] Black race may be associated with lower survival after in-hospital or out-of-hospital CPR and may be associated with delayed defibrillation.[12-14]

We conducted an epidemiologic study of in-hospital CPR in older adults in the United States from 1992 through 2005. We analyzed trends in incidence, survival to hospital discharge, proportion of in-hospital deaths preceded by CPR, discharge destination among survivors, and patient and hospital characteristics associated with survival.

## METHODS

### DATA SOURCES AND STUDY POPULATION

We analyzed all Medicare Provider Analysis and Review (MedPAR) hospital claims from 1992 through 2005 to identify beneficiaries 65 years of age or older for whom a claim for payment had been made for in-hospital CPR, defined as the presence of either of the following two procedure codes in the *International Classification of Diseases, Ninth Revision* (ICD-9): 99.60 (cardiopulmonary resuscitation, not otherwise specified) or 99.63 (closed chest cardiac massage). We restricted analyses to patients who received Medicare through the Old-Age and Survivors Insurance program and excluded those who received Social Security Disability Income. We excluded patients who were coenrolled in a health maintenance organization (HMO), because such patients may have had incomplete CPR claims data, which would have introduced bias. The exclusion of coenrollees in HMOs is common when MedPAR claims are used to assess health care services.[15,16] For patients with more than one CPR event, we analyzed only the first occurrence.

Our primary outcome was survival to hospital discharge. Potential predictors included age, sex, race, chronic coexisting illness, median income for the ZIP Code of the patient's residence, admission from a skilled nursing facility, hospital size, metropolitan or nonmetropolitan location of the hospital, and whether the hospital was a teaching hospital affiliated with a medical school. We also examined the influence of individual hospitals on survival. Race in Medicare data is self-reported by the patients at the time of enrollment. Because a designation of race other than black or white in Medicare data may be inaccurate, we categorized race as white, black, or other.[17] We used the Deyo–Charlson score to assess the burden of chronic illness. This score ranges from 0 to 33, with higher scores indicating a higher burden. The score was categorized as 0, 1, 2, or 3 or more and was included in the regression models as a grouped-linear variable; this score does not measure type or severity of acute illness.[18] We used regional median household income from 1999 U.S. Census data according to the patient's ZIP Code to assess socioeconomic status. We examined hospital identity with the use of Medicare provider numbers and used data from the Centers for Medicare and Medicaid Services (CMS) to determine hospital characteristics, such as number of beds and teaching status. We classified the location of hospitals as metropolitan or nonmetropolitan with the use of the hospital ZIP Code and the Rural–Urban Commuting Area Codes, version 2.0.[19] The 22 discharge destination codes used by MedPAR were reduced to "home," "another hospital," "skilled nursing facility," or "hospice" and were used to estimate functional status at discharge.

The institutional review boards of the University of Washington and the CMS approved this study. The funding organizations had no role in the design and conduct of the study; in collection, management, analysis, or interpretation of the data; or in preparation, review, or approval of the manuscript. The manuscript was reviewed by the CMS Division of Privacy Compliance Data Development with the sole purpose of ensuring the protection of beneficiary privacy.

**Table 1. Percentage of Patients Who Underwent In-Hospital Cardiopulmonary Resuscitation (CPR) and Survived to Hospital Discharge, According to Patient and Hospital Characteristics.**

| Variable | In-Hospital CPR (N=433,985) | Survival to Hospital Discharge* |
|---|---|---|
| | *number (percent)* | *percent (95% CI)* |
| **Patient characteristics** | | |
| Sex | | |
| Male | 219,377 (50.5) | 17.5 (17.3–17.6) |
| Female | 214,608 (49.5) | 19.2 (19.1–19.4) |
| Age (yr) | | |
| 65–69 | 63,299 (14.6) | 22.2 (21.9–22.6) |
| 70–74 | 84,353 (19.4) | 20.9 (20.6–21.1) |
| 75–79 | 98,263 (22.6) | 19.1 (18.9–19.3) |
| 80–84 | 91,471 (21.1) | 17.0 (16.8–17.3) |
| 85–89 | 62,530 (14.4) | 15.1 (14.8–15.4) |
| ≥90 | 34,069 (7.9) | 12.2 (11.9–12.6) |
| Race† | | |
| White | 352,173 (81.1) | 19.2 (19.1–19.3) |
| Black | 59,682 (13.8) | 14.3 (14.0–14.6) |
| Other | 22,130 (5.1) | 15.9 (15.4–16.4) |
| Deyo–Charlson score‡ | | |
| 0 | 77,349 (17.8) | 18.7 (18.5–19.0) |
| 1 | 145,627 (33.6) | 19.1 (18.9–19.3) |
| 2 | 116,401 (26.8) | 18.9 (18.7–19.2) |
| ≥3 | 94,608 (21.8) | 16.1 (15.8–16.3) |
| Admitted from a skilled nursing facility | | |
| Yes | 10,924 (2.5) | 11.5 (10.9–12.1) |
| No | 423,061 (97.5) | 18.5 (18.4–18.6) |
| ZIP Code median annual income | | |
| <$15,000 | 10,626 (2.5) | 13.3 (12.7–14.0) |
| $15,000–$29,999 | 87,164 (20.1) | 17.9 (17.7–18.2) |
| $30,000–$44,999 | 178,536 (41.1) | 19.1 (19.0–19.3) |
| $45,000–$59,999 | 70,429 (16.2) | 18.4 (18.1–18.7) |
| $60,000–$74,999 | 22,083 (5.1) | 18.3 (17.8–18.8) |
| ≥$75,000 | 15,458 (3.6) | 17.6 (17.0–18.2) |
| No data | 49,489 (11.4) | 17.4 (17.1–17.7) |
| **Diagnosis§** | | |
| Myocardial infarction | | |
| Yes | 92,986 (21.4) | 20.4 (20.1–20.7) |
| No | 340,999 (78.6) | 17.8 (17.7–17.9) |
| Congestive heart failure | | |
| Yes | 168,515 (38.8) | 20.4 (20.2–20.6) |
| No | 265,470 (61.2) | 17.1 (16.9–17.2) |
| Stroke | | |
| Yes | 38,121 (8.8) | 18.2 (17.8–18.5) |
| No | 395,864 (91.2) | 18.4 (18.2–18.5) |

**Table 1. (Continued.)**

| Variable | In-Hospital CPR (N=433,985) *number (percent)* | Survival to Hospital Discharge* *percent (95% CI)* |
|---|---|---|
| Diabetes mellitus | | |
| Yes | 78,840 (18.2) | 17.3 (17.0–17.6) |
| No | 355,145 (81.8) | 18.6 (18.5–18.7) |
| Chronic obstructive pulmonary disease | | |
| Yes | 116,997 (27.0) | 18.9 (18.6–19.1) |
| No | 316,988 (73.0) | 18.2 (18.0–18.3) |
| **Hospital characteristics** | | |
| Location | | |
| Metropolitan | 345,808 (79.7) | 18.0 (17.9–18.1) |
| Nonmetropolitan | 73,397 (16.9) | 21.1 (20.9–21.5) |
| Unknown | 14,780 (3.4) | 12.6 (12.0–13.1) |
| Teaching status | | |
| Teaching hospital | 144,385 (33.3) | 17.4 (17.2–17.6) |
| Nonteaching hospital | 288,774 (66.5) | 18.8 (18.6–18.9) |
| Unknown | 826 (0.2) | 26.3 (23.3–29.3) |
| No. of beds | | |
| <250 | 165,514 (38.1) | 19.6 (19.4–19.8) |
| 250–449 | 142,462 (32.8) | 17.7 (17.5–17.9) |
| ≥450 | 125,183 (28.9) | 17.3 (17.1–17.5) |
| Unknown | 826 (0.2) | 26.3 (23.3–29.3) |

* P<0.001 for all between-category differences except stroke, for which P=0.32 (by the chi-square test).
† Information on race was obtained from Medicare data and is based on self-reporting by patients at the time of enrollment.
‡ The Deyo–Charlson score ranges from 0 to 33, with higher scores indicating a higher burden of chronic illness.
§ Diagnoses were for the hospitalization during which CPR was performed.

### STATISTICAL ANALYSIS

We evaluated between-group differences and trends in survival and incidence with the use of the chi-square test and adjusted trends with the use of the likelihood-ratio test. We excluded 55,665 patients (12.8%) from bivariate and multivariable analyses for whom values for one or more variables of interest were missing; for 40,885 of these patients, only data on income were missing. Bivariate analyses of the association of survival with patient and hospital characteristics were performed by logistic regression with the use of empirical standard-error estimates to account for correlation between multiple observations within hospitals. Variables with a statistically significant association (P<0.05) were included in multivariable models. Using logistic regression with empirical standard-error estimates, we created one multivariable model that included all significant patient and hospital characteristics. In order to investigate the association between individual hospitals and differences in survival rates according to race, we created a second multivariable model that included patient factors and individual hospital identifiers. We used Stata software, version 10.0, and SAS software, version 9.1, for statistical analyses.

## RESULTS

We identified 433,985 beneficiaries who underwent in-hospital CPR, of whom 18.3% survived to discharge (95% confidence interval, 18.2 to 18.5). The survival rate was lower for patients who were men, were older, were of black or other nonwhite race, were admitted from a skilled nursing facility, had a Deyo–Charlson score of 3 or greater, or received care in a metropolitan or teaching hospital (Table 1). Patients who received a diagnosis of myocardial infarction or congestive heart fail-

ure during the hospitalization in which CPR was administered had a slightly higher survival rate. There was no significant change in survival over time, either on crude analysis (P=0.57) (Fig. 1) or after adjustment for diagnosis (P=0.86).

There were 158,730,366 hospital admissions among eligible beneficiaries, for a cumulative incidence of in-hospital CPR of 2.73 events per 1000 admissions. This incidence did not change substantially during the period from 1992 through 2005 (Fig. 2). Small variations resulted in a clinically insignificant but statistically significant positive linear trend for the study period (P<0.001). The incidence of CPR differed according to race: there were 2.53 deliveries of CPR per 1000 admissions among white patients, 4.35 deliveries per 1000 admissions among black patients, and 3.85 deliveries per 1000 admissions among persons of other races.

Among hospital deaths, 4.2% were preceded by in-hospital CPR; the rate differed according to race (3.9% for white patients, 6.6% for black patients, and 5.8% for patients of other races). Furthermore, the proportion of hospital deaths that occurred among patients who had undergone in-hospital CPR increased by approximately 37% during the study period, from 3.8% in 1992 to 5.2% in 2005 (P<0.001); the increase occurred among patients of all racial categories (Fig. 2). Similar patterns emerged when deaths occurring among patients who had undergone in-hospital CPR were evaluated as a proportion of in-hospital or out-of-hospital deaths (data not shown).

The proportion of survivors discharged home decreased during the study (Fig. 3), whereas the proportion of patients discharged to a hospice increased after 1997, when this designation was added to the database. Both of these trends were significant (P<0.001).

All patient and hospital characteristics except patient income were significantly associated with survival in bivariate analyses (P<0.001) and were included in the multivariable models. The differences between the unadjusted analyses and the first multivariable model, which included patient and hospital characteristics (Table 2), were minimal, except that the association between teaching status of the hospital and survival reversed in direction and was no longer significant in the adjusted analysis. The odds of survival were significantly lower for black and other nonwhite patients than for white patients. In the second multivariable model, which included indicator variables for individual hospitals, the association between black race and lower odds of survival remained strong but was slightly attenuated (Table 2), and the variability in survivorship among patients in different hospitals was significant (P<0.001). The multivariable models were rerun with the inclusion of patients for whom income data were missing, with no substantial differences in the results (data not shown).

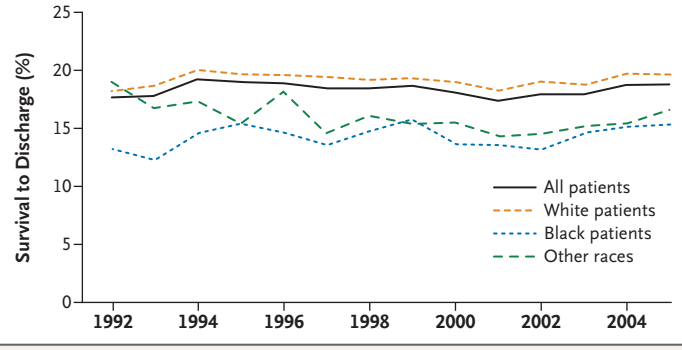


**Figure 1. Survival to Hospital Discharge after In-Hospital CPR, According to Year and Race.**

Survival is poorer for black and other nonwhite patients (P<0.001). There is no significant change in overall survival from 1992 to 2005 (P=0.57 with the use of the likelihood-ratio test).

## DISCUSSION

We found that 18.3% of patients in this cohort of Medicare beneficiaries who underwent in-hospital CPR survived to hospital discharge. Since our analysis was limited to older adults, it is surprising that survival was slightly higher than that seen in the National Registry of CardioPulmonary Resuscitation study involving nearly 15,000 cardiac arrests in patients of all ages (17%).[9] The over-representation of large, urban, academic hospitals in the National Registry of CardioPulmonary Resuscitation may result in over-representation of patients with more severe illness.

There are numerous possible explanations for our finding of no increase in the rate of survival after in-hospital CPR from 1992 through 2005. One possibility is that attempts to enhance the delivery of CPR have not improved outcomes after inpatient cardiopulmonary arrest. Changes in the delivery of CPR in the out-of-hospital setting that contribute to improved survival, including widespread CPR by bystanders, the occurrence of car-

diac arrest in the presence of emergency-response crews, assistance by telephone dispatchers in the delivery of CPR, and the use of automated external defibrillators, do not have analogues in the in-hospital setting.[20,21] Another possibility is that there have been changes over time in the severity of illness, the underlying cause of cardiac arrest, or the initial arrest rhythm of patients with cardiac arrest. Although all patients who require CPR have severe acute illness by virtue of needing CPR, there may be differences in the type or severity of the acute illness leading to CPR that could influence outcomes. Perhaps declining cardiovascular mortality and morbidity, coupled with the increasing incidence of critical illnesses such as severe sepsis, have led to a decrease in the proportion of patients whose initial rhythm at the time of cardiac arrest is either ventricular fibrillation or ventricular tachycardia, both of which are associated with higher survival than are rhythms such as asystole and pulseless electrical activity.[9,22-24] Therefore, a static survival rate could occur if the delivery of CPR has improved and the improvements have been offset by an increase in the proportion of patients with nonsurvivable primary illnesses who undergo CPR.

The overall cumulative incidence of CPR was 2.73 per 1000 hospital admissions, a rate within the range of 1 to 5 per 1000 reported previously.[25-28] An important finding of this study is that although the incidence of CPR did not change substantially during the study period, the proportion of in-patient deaths preceded by CPR increased. Since the same trend occurred in the proportion of all deaths preceded by CPR, it cannot be explained by an increase in the proportion of deaths occurring in the home or hospice. Although do-not-resuscitate (DNR) orders became more common during the 1980s, our findings suggest either that they have become less common since then or that they have not effectively decreased the frequency of administration of CPR to patients who are unlikely to benefit from resuscitation.[29] Perhaps the increase in the proportion of in-patient deaths preceded by CPR represents a trend toward the administration of CPR to patients who are poorer candidates for resuscitation, which would provide another potential explanation for the observed absence of change in the rate of survival after CPR. The significant increase in the proportion of survivors with discharge destinations other than home may indicate a trend toward poorer neurologic and functional outcomes among patients undergoing CPR who survive to discharge. However, this trend might be confounded by a shortening in the length of inpatient hospitalizations during the study.[30]

The associations of older age, male sex, and a higher burden of chronic illness with poorer survival are not surprising. Our finding that residence in a skilled nursing facility before admission was associated with poorer survival provides further evidence that chronic illness affects outcomes after CPR. Our finding that CPR in a smaller hospital or a nonmetropolitan hospital was associated with greater survival was unex-

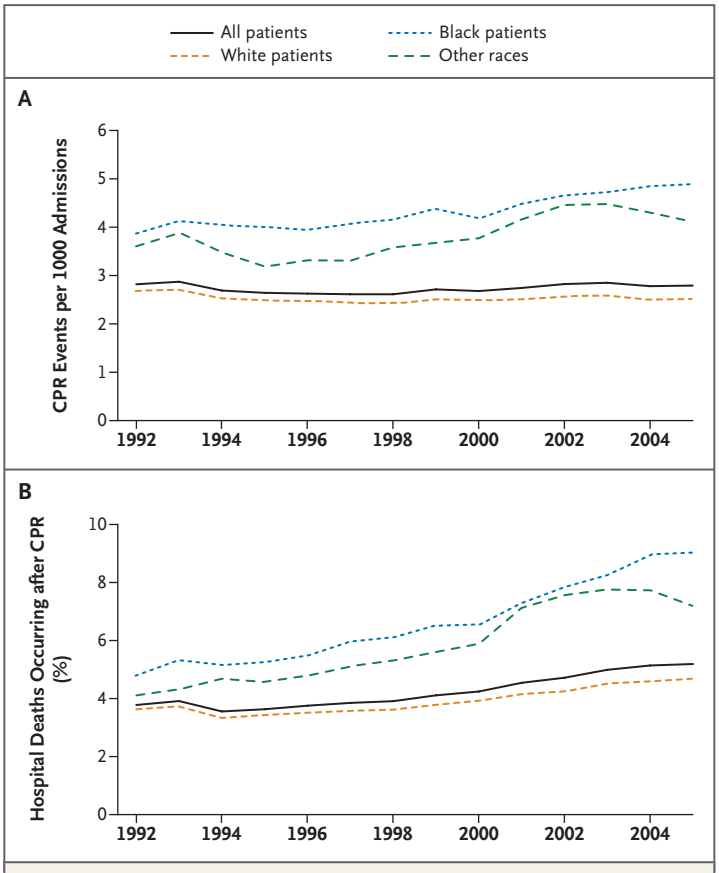


**Figure 2. Trends in the Use of CPR, According to Race.**

Panel A shows the incidence of in-hospital CPR. The incidence is higher for black and other nonwhite patients (P<0.001). There is a clinically insignificant but statistically significant positive linear trend in incidence among all patients from 1992 to 2005 (P<0.001). Panel B shows the percentage of all hospital deaths that occurred among patients who had undergone in-hospital CPR. This percentage increased in the period from 1992 to 2005 and was higher for black and other nonwhite patients (P<0.001). P for linear trend was less than 0.001 for all patients and for each racial group separately.

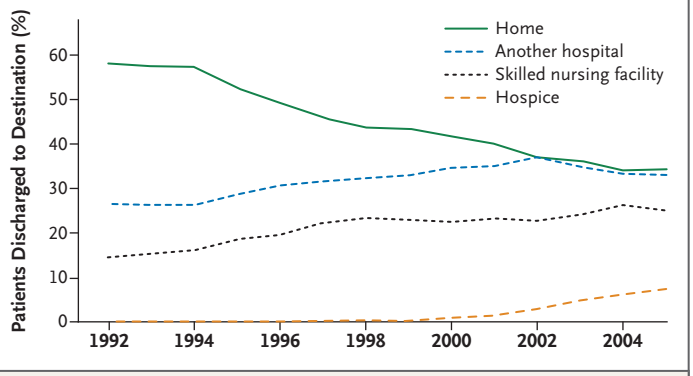


**Figure 3. Trends in the Discharge Destination of Survivors of In-Hospital CPR.**

Patients discharged home include both those with and those without home health or intravenous services. Patients discharged to a skilled nursing facility were covered by Medicare or Medicaid. Patients discharged to another hospital include those discharged to another acute care hospital, an intermediate care facility, a long-term care hospital, a non–acute care bed within the same hospital, or a rehabilitation hospital. Patients discharged to hospice include those discharged to hospice care either at home or at a medical facility; this category was used beginning in 1997. P for linear trend was less than 0.001 for all analyses.

pected, although residual confounding by severity of acute illness is likely, given our inability to assess this factor.

We found a strong association between race and survival, with black and other nonwhite patients having a significantly higher likelihood of undergoing CPR and lower odds of survival. This association did not change after adjustment for patient factors but was slightly attenuated by adjustment for individual hospital, a result suggesting that the difference in survival between white and nonwhite patients may be partially explained by the fact that nonwhite patients were more likely to receive care in hospitals where patients had lower odds of survival after CPR, regardless of their race. Previous studies have shown reduced survival in black patients as compared with patients of other races after either in-hospital or out-of-hospital arrest, and other studies have reported that black race is associated with delayed defibrillation in the hospital.[12-14] The fact that the initial cardiac-arrest rhythm may differ according to race suggests that differences in the biologic features of cardiac arrest, perhaps due to genetic and environmental factors, could partially explain racial differences in survival.[13] It is also possible that the quality of care before, during, and after cardiac arrest is lower for black patients.[31] Finally, recent findings suggest that factors related to hospital systems may affect survival after CPR. For example, variations in survival according to the time of day of administration of CPR were lower in hospitals with more extensive monitoring, a result suggesting that system-level variations in quality of care may help explain hospital differences in survival.[32,33] Such between-hospital differences in systems that facilitate rapid resuscitation may partially explain racial differences in survival.

We found that the incidence of in-hospital CPR was higher and was increasing faster for black patients than for other patients, a result mirroring the higher incidence of out-of-hospital cardiac arrest seen in black patients.[13] This racial difference in the incidence of cardiac arrest may result from a higher burden of chronic illness, as reflected by higher Deyo–Charlson scores, in black patients. The higher incidence and severity of conditions such as cardiovascular disease among black patients may also have a role in this difference.[34] Thus, the increase in the incidence of in-hospital CPR among black patients could partially result from the increasing severity of acute and chronic illness among these patients.

We also found that a higher proportion of black patients who died in the hospital had undergone CPR than had members of other racial groups. This finding is consistent with the evidence that black patients are more likely than patients of other racial groups to receive care of higher intensity, including care in an intensive care unit, at the end of life.[35] Black patients may be more likely to receive care of high intensity because they are less likely to choose DNR status[36-38]; a lower rate of DNR status among blacks could also partially explain the racial differences in the incidence of in-hospital CPR. Much of the racial difference in survival could be accounted for if a higher rate of choosing to be resuscitated results in a higher rate of CPR among patients with a lower likelihood of survival.

This study has several important limitations. First, our definition of CPR depends on ICD-9 codes. This definition has not been validated in Medicare data, and the specificity and sensitivity of the definition may vary between hospitals. However, our estimates of the incidence of CPR and survival after CPR are similar to those of previous studies and, therefore, support the accuracy of this definition. Furthermore, since it is unlikely that the sensitivity and specificity of the

**Table 2. Multivariable Analyses for Factors Associated with Survival to Discharge.**

| Predictor | Adjusted Odds Ratio (95% CI) | P Value |
|---|---|---|
| **Analysis for patient and hospital factors*** | | |
| Age | 0.97 (0.97–0.97) | <0.001 |
| Male sex | 0.84 (0.82–0.85) | <0.001 |
| Race† | | |
| White | Reference | |
| Black | 0.70 (0.67–0.73) | <0.001 |
| Other | 0.85 (0.82–0.89) | <0.001 |
| Deyo–Charlson score‡ | 0.93 (0.92–0.94) | <0.001 |
| Admission from a skilled nursing facility | 0.60 (0.54–0.67) | <0.001 |
| Nonmetropolitan hospital | 1.13 (1.08–1.18) | 0.001 |
| No. of hospital beds§ | 0.98 (0.96–0.98) | <0.001 |
| Teaching hospital | 1.00 (0.97–1.07) | 0.38 |
| **Analysis with adjustment for hospital where CPR was performed¶** | | |
| Age | 0.97 (0.97–0.97) | <0.001 |
| Male sex | 0.83 (0.82–0.84) | <0.001 |
| Race† | | |
| White | Reference | |
| Black | 0.76 (0.74–0.79) | <0.001 |
| Other | 0.92 (0.88–0.96) | <0.001 |
| Deyo–Charlson score‡ | 0.93 (0.92–0.94) | <0.001 |
| Admission from a skilled nursing facility | 0.69 (0.65–0.74) | <0.001 |

* Multivariable logistic regression was performed with empirical standard-error estimates, after accounting for clustering within the hospital.
† Information on race was obtained from Medicare data and is based on self-reporting by patients at the time of enrollment.
‡ The odds ratio is that seen with an increase from one category of Deyo–Charlson score (0, 1, 2, or 3 or more) to the next. This score ranges from 0 to 33, with higher scores indicating a higher burden of chronic illness.
§ The odds ratio is that seen with an increase of 100 hospital beds.
¶ Logistic regression was used to model survival to discharge, with the inclusion of an indicator variable for each of the 6033 hospitals at which patients underwent CPR.

definition have changed over time, the trends we observed in survival and incidence are probably accurate. Finally, without conducting a detailed, prospective, observational study, validation of our definition of in-hospital CPR from Medicare data would be virtually impossible, because there is no standard with which to compare it. A second limitation is the absence of some potential predictors of survival after CPR in the MedPAR claims data. These include the severity and type of underlying acute illness, initial rhythm during cardiac arrest, location of the patient within the hospital at the time of cardiac arrest, and time to defibrillation. Such features may be particularly important for understanding differences in survival associated with race and hospital. Finally, survival to discharge may not be the most clinically relevant outcome after CPR. The ability to evaluate longer-term outcomes, including the degree of neurologic impairment after CPR, would be valuable.

In summary, we found that the rate of survival to discharge after in-hospital CPR among Medicare beneficiaries 65 years of age or older did not change substantially during the period from 1992 through 2005. The incidence of in-hospital CPR also did not change substantially during this period. Of significant concern is our finding that the proportion of patients who died in the hospital after having previously undergone in-hospital CPR has increased during a time of more education and awareness about the limits

of CPR in patients with advanced chronic illness and life-threatening acute disease.[39] Our finding that survivors of in-hospital CPR are less frequently discharged to home than to a health care facility is also of concern, but this trend may be confounded by a tendency toward shorter hospital stays.

Factors associated with lower odds of survival included older age, male sex, chronic disease burden, and black or other nonwhite race. Some, but not all, of the racial difference in survival appears to be attributable to the hospitals where patients receive care, since black patients more often receive care at hospitals where patients of all races have lower odds of survival after CPR. We also found that the proportion of hospital deaths that were preceded by in-hospital CPR was higher among black patients than among patients of other races. A higher rate of choice of resuscitation by black patients, despite the prognosis, may provide another explanation for racial differences.

This study provides information useful to older patients and their clinicians in their decision about whether to choose to be resuscitated, since the proportion of elderly patients who choose resuscitation is directly related to the probability of survival that is presented to these patients.[40] Our findings also provide a stimulus to understand the association between race and survival, with the goals of not only eliminating racial disparities in the quality of medical care but also understanding factors associated with the incidence of CPR and the rate of survival after CPR for patients of all races.

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