Supplementary Online Content


eMethods

eTable 1. Definitions of Preexisting Conditions

eTable 2. Sensitivity Analyses for Alternative Definitions of Neurologic Outcome at Hospital Discharge

eFigure. Sensitivity Analysis to Assess the Impact of an Unmeasured Confounder

eTable 3. Characteristics of the Study Population in the Matched Subgroup of Pulseless Patients

eTable 4. Characteristics of the Study Population in the Matched Subgroup of Patients with a Pulse at the Beginning of the Event

eReferences

The supplementary material has been provided by the authors to give readers additional information about their work.

© 2016 American Medical Association. All rights reserved.
Cox Proportional Hazards Model

The propensity score was calculated using a non-parsimonious multivariable Cox proportional hazards model. The outcome for the Cox model was documented time to successful intubation during cardiac arrest. If a patient was not intubated, they were censored at the time chest compressions were terminated (with or without return of circulation). Included covariates were: gender, age group, illness category, pre-existing conditions, location of the arrest, time of week, time of day, whether the cardiac arrest was witnessed and/or monitored, type of hospital, hospital teaching status, and year of the arrest (treated as a categorical variable).

Given that some patients were not pulseless at the beginning of the event, we categorized the “rhythm” into four categories: “pulse with any rhythm”, “pulseless with a nonshockable rhythm”, “pulseless with a shockable rhythm”, and “pulseless with an unknown rhythm” and included this variable as a time-varying covariate in the Cox model. The propensity score for each patient was then derived from the Cox model as the hazard component (i.e. the linear predictor) from the model. Ties were handled with the exact method and the proportional hazard assumption was tested by including an interaction between each variable and the natural logarithm of time. The proportional hazards assumption was determined to be met if the p-value from the interaction was > 0.01. A few variables did not meet the proportional hazards assumption (admission diagnosis, arrest location, type of hospital, and year of the cardiac arrest). As a sensitivity analysis, we applied the Cox model excluding these variables and instead included them in the modified Poisson regression model. There was no meaningful difference between these results and those where the variables were included in the Cox model.
and these variables were therefore included in the Cox model for the remainder of the analyses.

Multiple Imputations

We performed multiple imputations assuming that the data was “missing at random”. Data were missing or inconsistent on at least one variable for 537 patients (19%). In order to account for this, missing values for intubation, covariates and the outcomes (survival, ROSC, and neurological outcome) were imputed using the fully conditional specification method and a total of 10 data sets were created. The fully conditional specification method is a semi-parametric and flexible approach to missing data that uses a number of chained equations to impute data on a variable-by-variable basis. The approach has been found to be superior or equal to techniques using joint modelling such as modelling under the multivariate normal model. Time to intubation during cardiac arrest, time to pulselessness, and time to the end of resuscitation were imputed using Poisson distributions for all of the 10 datasets. We then performed the propensity score matching and modified Poisson regression on each of these 10 data sets and combined the results using SAS “proc mianalyze”. In this analysis, we only accounted for the matching and not hospital-level clustering or the resampled controls.

Sensitivity analysis to estimate the potential impact of an unmeasured confounder

To estimate the potential impact of an unmeasured confounder, we used the method as described by Lin et al. We made the following assumptions: 1) only one unmeasured confounder was present (or a combination of confounders that can be described as one), 2) the
unmeasured confounder is binary, 3) the unmeasured confounder is independent of measured confounders (a relatively unrealistic assumption that would likely overestimate the impact of the unmeasured confounder), 4) the exposure (intubation) is not an effect modifier for the unmeasured confounder’s effect on outcome, and 5) an adjusted risk ratio of 1.20 (i.e. an relative increase in survival of 20% with intubation) was considered a clinically meaningful positive association. The adjusted RR (RR*) taking into account the measured confounder was determined by the following equation:

\[ RR^* = RR \frac{RR_{zy} \cdot P_z|x=1 + (1 - P_z|x=1)}{RR_{zy} \cdot P_z|x=0 + (1 - P_z|x=0)} \]

Terminology:

Unmeasured confounder = z
Exposure (intubation) = x
Outcome (mortality) = y
RR = Obtained risk ratio from the adjusted analysis (i.e. 0.89 for survival)
RR* = Risk ratio adjusted for the unmeasured confounder
P_{z|x=0} = Prevalence of the unmeasured confounder in the unexposed
P_{z|x=1} = Prevalence of the unmeasured confounder in the exposed
RR_{xz} = The risk ratio for the unmeasured confounder in exposed compared to unexposed
(i.e. P_{z|x=1} / P_{z|x=0}) (i.e. a \(RR_{xy} > 1\) indicates that the unmeasured confounder is more common in the exposed group)
RR_{zy} = The risk ratio for mortality in those without the unmeasured confounder compared to those with the unmeasured confounder (i.e. a \(RR_{zy} > 1\) indicates that the unmeasured confounder is associated with increased mortality)
The impact of the unmeasured confounder is determined by the following:

1) The prevalence of the unmeasured confounder in the unexposed (i.e. those not intubated)

2) The association between the unmeasured confounder and the exposure expressed as a RR (e.g. a RR = 2 indicates that the unmeasured confounder is twice as common in those intubated compared to those not intubated)

3) The association between the unmeasured confounder and mortality, independent of the measured confounders, expressed as a RR (e.g. a RR = 3 indicates that mortality was 3 times as high in those with the unmeasured confounder compared to those without the unmeasured confounder)

We independently varied these 3 parameters to assess their influence on the RR* and present the results in graphical form. We only assessed characteristics of the unmeasured confounder that would make the RR increase (i.e. lead to a null association or a positive association between intubation and survival).

*Sensitivity analysis using traditional propensity score analysis*

For this analysis, the propensity score was calculated using a non-parsimonious logistic regression model with the dependent variable being intubation during the cardiac arrest (irrespective of the timing). All variables included in the original analysis (Table 1) were included. Initial rhythm was included as a non-time dependent variable (i.e. only the rhythm at the beginning of the event was included). Patients were then matched 1:1 on the propensity score.
score using a nearest neighbor-matching algorithm with a maximum caliber of 0.01 of the propensity score. No resampling was performed.
<table>
<thead>
<tr>
<th><strong>eTable 1. Definitions of Preexisting Conditions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heart failure prior to this admission</strong></td>
</tr>
<tr>
<td><strong>Heart failure this admission</strong></td>
</tr>
<tr>
<td><strong>Hypotension</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Respiratory insufficiency</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Hepatic insufficiency</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Renal insufficiency</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
eTable 1. Definitions of Preexisting Conditions (continued)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Metabolic/electrolyte abnormality</strong></td>
<td>Evidence of metabolic/electrolyte abnormality within 4 hours up to the time of the event, defined by any of the following:</td>
</tr>
<tr>
<td></td>
<td>• Pediatric:</td>
</tr>
<tr>
<td></td>
<td>o Sodium &lt; 125 or &gt; 150 mEq/L</td>
</tr>
<tr>
<td></td>
<td>o Potassium &lt; 2.5 or &gt; 6 mEq/L</td>
</tr>
<tr>
<td></td>
<td>o pH &lt; 7.3 or &gt; 7.5, arterial</td>
</tr>
<tr>
<td></td>
<td>o Lactate &gt; 2.5 mmol/L</td>
</tr>
<tr>
<td></td>
<td>o Blood glucose &lt; 60 mg/dL</td>
</tr>
<tr>
<td></td>
<td>• Newborn/Neonate:</td>
</tr>
<tr>
<td></td>
<td>o Acidosis (pH &lt; 7.2 arterial, venous or capillary)</td>
</tr>
<tr>
<td></td>
<td>o Ionized Calcium &lt; 1 mmol/L or &lt; 4 mg/dL</td>
</tr>
<tr>
<td></td>
<td>o Glucose &lt; 40 mg/dL</td>
</tr>
<tr>
<td></td>
<td>o Sodium &lt; 125 mEq/L</td>
</tr>
<tr>
<td></td>
<td>o Magnesium &gt; 4 mEq/L</td>
</tr>
<tr>
<td></td>
<td>o Potassium &gt; 6.5 mEq/L</td>
</tr>
<tr>
<td><strong>Acute non-stroke central nervous system event</strong></td>
<td>Evidence of decreased mental status, delirium, or coma not due to acute stroke within 4 hours up to time of the event</td>
</tr>
<tr>
<td><strong>Baseline depression in central nervous system</strong></td>
<td>Evidence of a motor, cognitive, or functional baseline deficit (at time of system entry)</td>
</tr>
<tr>
<td><strong>Metastatic/hematologic malignancy</strong></td>
<td>Any solid tissue malignancy with evidence of metastasis, or any blood borne malignancy</td>
</tr>
<tr>
<td><strong>Pneumonia</strong></td>
<td>Documented diagnosis of active pneumonia, where antibiotics have not yet been started or the pneumonia is still being treated with antibiotics</td>
</tr>
<tr>
<td><strong>Septicemia</strong></td>
<td>Bloodstream infection where antibiotics have not yet been started or the infection is still being treated with antibiotics. Documentation of &quot;presumed sepsis&quot; without confirmatory positive blood cultures, does not constitute sepsica</td>
</tr>
</tbody>
</table>

*CPAP denotes continuous positive airway pressure and BiPAP bilevel positive airway pressure*
SUPPLEMENTAL RESULTS

eTable 2. Sensitivity Analyses for Alternative Definitions of Neurologic Outcome at Hospital Discharge\(^a\)

<table>
<thead>
<tr>
<th>Favorable Neurologic Outcome</th>
<th>Unadjusted</th>
<th></th>
<th>Propensity matched cohort</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RR (95%CI)(^b)</td>
<td>p-value</td>
<td>RR (95%CI)(^b)</td>
</tr>
<tr>
<td>No intubation</td>
<td>293/550</td>
<td>(53%)</td>
<td>385/1310 (29%)</td>
<td>0.55 (0.49, 0.62)</td>
</tr>
<tr>
<td>Intubation</td>
<td>266/972</td>
<td>(27%)</td>
<td>229/981 (23%)</td>
<td>0.85 (0.75, 0.97)</td>
</tr>
<tr>
<td>PCPC of 1 or 2, or no increase in PCPC from baseline</td>
<td>289/562 (51%)</td>
<td>362/1318 (27%)</td>
<td>0.53 (0.47, 0.53)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>PCPC of 1, 2, or 3</td>
<td>307/559 (55%)</td>
<td>395/1310 (30%)</td>
<td>0.55 (0.49, 0.61)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

\(^a\) PCPC = pediatric cerebral performance category

\(^b\) Intubation compared to no intubation
eFigure. Sensitivity Analysis to Assess the Impact of an Unmeasured Confounder

Please see eMethods for description of the terminology and methods. The three parameters that defined the unmeasured confounder were varied independently to assess the impact of a potential unmeasured confounder on the association between intubation and survival. The x-axis represents the association between the unmeasured confounder and mortality and the y-axis is the RR between intubation and survival when adjusting for the unmeasured confounder. Each figure represents a different unmeasured confounder/exposure association and the lines represent different prevalence of the unmeasured confounder in the unexposed group.

© 2016 American Medical Association. All rights reserved.
When the line intersects with the bottom dashed line (“No association”) this reflects an unmeasured confounder that could be masking a null association and when the line intersects with the top dashed line (“Positive association”) this reflects an unmeasured confounder that could be masking a positive association. For example, if the unmeasured confounder has a prevalence of 30% (green line) in the unexposed group and a prevalence of 45% in the exposed group (i.e. an unmeasured confounder/exposure association of RR = 1.5 [top left graph]), and there was a very strong association between the unmeasured confounder and mortality (for example, a RR = 5), adjusting for this unmeasured confounder would not lead to a positive association between intubation and survival. If the unmeasured confounder was much more common in the exposed group (e.g. 60% in the exposed compared to 20% in the unexposed, bottom left figure, purple line) the association between the unmeasured confounder and mortality would have to a equal to a RR of approximately 2 to mask a positive association between intubation and survival.
<table>
<thead>
<tr>
<th>Demographics</th>
<th>No intubation (n = 853)</th>
<th>Intubation (n = 853)</th>
<th>p-value</th>
<th>Standardized difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>351 (41)</td>
<td>361 (42)</td>
<td>0.024</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>502 (59)</td>
<td>492 (58)</td>
<td>-0.024</td>
<td></td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neonate (&lt; 1 month)</td>
<td>184 (22)</td>
<td>185 (22)</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Infant (1 month up to 1 year)</td>
<td>217 (25)</td>
<td>203 (24)</td>
<td>-0.038</td>
<td></td>
</tr>
<tr>
<td>Child (1 year to 12 years)</td>
<td>294 (34)</td>
<td>302 (35)</td>
<td>0.020</td>
<td></td>
</tr>
<tr>
<td>Adolescent (&gt; 12 years)</td>
<td>158 (19)</td>
<td>163 (19)</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td><strong>Illness Category</strong></td>
<td></td>
<td></td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Medical cardiac</td>
<td>177 (21)</td>
<td>182 (21)</td>
<td>0.014</td>
<td></td>
</tr>
<tr>
<td>Medical non-cardiac</td>
<td>399 (47)</td>
<td>397 (47)</td>
<td>-0.005</td>
<td></td>
</tr>
<tr>
<td>Surgical cardiac</td>
<td>125 (15)</td>
<td>122 (14)</td>
<td>-0.010</td>
<td></td>
</tr>
<tr>
<td>Surgical non-cardiac</td>
<td>86 (10)</td>
<td>90 (11)</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Newborn</td>
<td>66 (8)</td>
<td>62 (7)</td>
<td>-0.018</td>
<td></td>
</tr>
<tr>
<td><strong>Pre-Existing Conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart failure prior to this admission</td>
<td>84 (10)</td>
<td>85 (10)</td>
<td>0.93</td>
<td>-0.019</td>
</tr>
<tr>
<td>Heart failure this admission</td>
<td>93 (11)</td>
<td>88 (10)</td>
<td>0.70</td>
<td>0.004</td>
</tr>
<tr>
<td>Hypotension</td>
<td>165 (19)</td>
<td>151 (18)</td>
<td>0.38</td>
<td>-0.042</td>
</tr>
<tr>
<td>Respiratory insufficiency</td>
<td>365 (43)</td>
<td>349 (41)</td>
<td>0.44</td>
<td>-0.038</td>
</tr>
<tr>
<td>Hepatic insufficiency</td>
<td>17 (2)</td>
<td>26 (3)</td>
<td>0.17</td>
<td>0.067</td>
</tr>
<tr>
<td>Renal insufficiency</td>
<td>69 (8)</td>
<td>75 (9)</td>
<td>0.59</td>
<td>-0.046</td>
</tr>
<tr>
<td>Metabolic or electrolyte abnormality</td>
<td>114 (13)</td>
<td>101 (12)</td>
<td>0.34</td>
<td>-0.046</td>
</tr>
<tr>
<td>Acute non-stroke CNS event</td>
<td>50 (6)</td>
<td>40 (5)</td>
<td>0.28</td>
<td>-0.053</td>
</tr>
<tr>
<td>Baseline depression in CNS function</td>
<td>142 (17)</td>
<td>140 (16)</td>
<td>0.90</td>
<td>-0.006</td>
</tr>
<tr>
<td>Metastatic or hematologic malignancy</td>
<td>55 (6)</td>
<td>54 (6)</td>
<td>0.92</td>
<td>-0.005</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>59 (7)</td>
<td>57 (7)</td>
<td>0.85</td>
<td>-0.009</td>
</tr>
<tr>
<td>Septicemia</td>
<td>91 (11)</td>
<td>92 (11)</td>
<td>0.94</td>
<td>0.004</td>
</tr>
<tr>
<td><strong>Location and Time of the Arrest</strong></td>
<td></td>
<td></td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency department</td>
<td>234 (27)</td>
<td>228 (27)</td>
<td>-0.016</td>
<td></td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>292 (34)</td>
<td>309 (36)</td>
<td>0.042</td>
<td></td>
</tr>
<tr>
<td>Floor without telemetry</td>
<td>158 (19)</td>
<td>156 (18)</td>
<td>0.042</td>
<td></td>
</tr>
<tr>
<td>Floor with telemetry or step-down unit</td>
<td>59 (7)</td>
<td>51 (6)</td>
<td>-0.038</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>110 (13)</td>
<td>109 (13)</td>
<td>-0.004</td>
<td></td>
</tr>
<tr>
<td><strong>Time of week</strong></td>
<td></td>
<td></td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Weekend</td>
<td>255 (30)</td>
<td>260 (30)</td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>598 (70)</td>
<td>593 (70)</td>
<td>-0.013</td>
<td></td>
</tr>
<tr>
<td><strong>Time of day</strong></td>
<td></td>
<td></td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>Nighttime</td>
<td>240 (28)</td>
<td>244 (29)</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td>Daytime</td>
<td>613 (72)</td>
<td>609 (71)</td>
<td>-0.010</td>
<td></td>
</tr>
<tr>
<td>Characteristic of the Arrest</td>
<td>No intubation (n = 853)</td>
<td>Intubation (n = 853)</td>
<td>p-value</td>
<td>Standardized difference</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------</td>
<td>----------------------</td>
<td>---------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Witnessed</td>
<td></td>
<td></td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>696 (82)</td>
<td>702 (82)</td>
<td>0.018</td>
<td>0.018</td>
</tr>
<tr>
<td>No</td>
<td>157 (18)</td>
<td>151 (18)</td>
<td></td>
<td>-0.018</td>
</tr>
<tr>
<td>Monitored</td>
<td></td>
<td></td>
<td>&gt;0.99</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>570 (67)</td>
<td>570 (67)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>283 (33)</td>
<td>283 (33)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Initial pulseless rhythm</td>
<td></td>
<td></td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td>Non-shockable</td>
<td>640 (75)</td>
<td>653 (77)</td>
<td>0.036</td>
<td>0.028</td>
</tr>
<tr>
<td>Shockable</td>
<td>88 (10)</td>
<td>81 (10)</td>
<td></td>
<td>-0.028</td>
</tr>
<tr>
<td>Unknown</td>
<td>125 (15)</td>
<td>119 (14)</td>
<td></td>
<td>-0.020</td>
</tr>
<tr>
<td>Hospital Characteristics</td>
<td></td>
<td></td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>Type of hospital</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primarily children</td>
<td>319 (37)</td>
<td>298 (35)</td>
<td>-0.051</td>
<td>0.051</td>
</tr>
<tr>
<td>Primarily adult</td>
<td>534 (63)</td>
<td>555 (65)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching status</td>
<td></td>
<td></td>
<td>0.54</td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>505 (59)</td>
<td>494 (58)</td>
<td>-0.026</td>
<td>0.011</td>
</tr>
<tr>
<td>Minor</td>
<td>233 (27)</td>
<td>237 (28)</td>
<td></td>
<td>0.024</td>
</tr>
<tr>
<td>Non-teaching</td>
<td>115 (13)</td>
<td>122 (14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year of the Arrest</td>
<td></td>
<td></td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td>2000 – 2002</td>
<td>97 (11)</td>
<td>89 (10)</td>
<td>-0.030</td>
<td></td>
</tr>
<tr>
<td>2003 – 2004</td>
<td>122 (14)</td>
<td>131 (15)</td>
<td>0.030</td>
<td></td>
</tr>
<tr>
<td>2005 – 2006</td>
<td>120 (14)</td>
<td>135 (16)</td>
<td>0.049</td>
<td></td>
</tr>
<tr>
<td>2007 – 2008</td>
<td>140 (16)</td>
<td>144 (17)</td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>2009 – 2010</td>
<td>148 (17)</td>
<td>128 (15)</td>
<td>-0.064</td>
<td></td>
</tr>
<tr>
<td>2011 – 2012</td>
<td>119 (14)</td>
<td>117 (14)</td>
<td>-0.007</td>
<td></td>
</tr>
<tr>
<td>2013 – 2014</td>
<td>107 (13)</td>
<td>109 (13)</td>
<td>0.007</td>
<td></td>
</tr>
</tbody>
</table>

a CNS: central nervous system. Continuous variables are presented as medians with 1st and 3rd quartiles and categorical variables as counts (frequencies)
b Defined as being born on the current admission
c See supplemental material for definitions
d Including ambulatory/outpatient clinics, diagnostic/interventional areas, operating room, post-anesthesia recovery room, rehabilitation units, same-day surgical areas, and “other”
e Friday 11pm to Monday 7am
f 11:00pm to 6:59am

© 2016 American Medical Association. All rights reserved.
<table>
<thead>
<tr>
<th>Demographics</th>
<th>No intubation (n = 325)</th>
<th>Intubation (n = 325)</th>
<th>p-value</th>
<th>Standardized difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>157 (48)</td>
<td>139 (43)</td>
<td>0.14</td>
<td>-0.111</td>
</tr>
<tr>
<td>Male</td>
<td>168 (52)</td>
<td>186 (57)</td>
<td></td>
<td>0.111</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Neonate (&lt; 1 month)</td>
<td>100 (31)</td>
<td>117 (36)</td>
<td></td>
<td>0.111</td>
</tr>
<tr>
<td>Infant (1 month up to 1 year)</td>
<td>120 (37)</td>
<td>108 (33)</td>
<td></td>
<td>-0.077</td>
</tr>
<tr>
<td>Child (1 year to 12 years)</td>
<td>78 (24)</td>
<td>75 (23)</td>
<td></td>
<td>-0.022</td>
</tr>
<tr>
<td>Adolescent (&gt; 12 years)</td>
<td>27 (8)</td>
<td>25 (8)</td>
<td></td>
<td>-0.023</td>
</tr>
<tr>
<td>Illness Category</td>
<td></td>
<td></td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Medical cardiac</td>
<td>67 (21)</td>
<td>63 (19)</td>
<td></td>
<td>-0.031</td>
</tr>
<tr>
<td>Medical non-cardiac</td>
<td>122 (38)</td>
<td>116 (36)</td>
<td></td>
<td>-0.038</td>
</tr>
<tr>
<td>Surgical cardiac</td>
<td>72 (22)</td>
<td>88 (27)</td>
<td></td>
<td>0.115</td>
</tr>
<tr>
<td>Surgical non-cardiac</td>
<td>35 (11)</td>
<td>24 (7)</td>
<td></td>
<td>-0.118</td>
</tr>
<tr>
<td>Newborn</td>
<td>29 (9)</td>
<td>34 (10)</td>
<td></td>
<td>0.052</td>
</tr>
<tr>
<td>Pre-Existing Conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart failure prior to this admission</td>
<td>24 (7)</td>
<td>29 (9)</td>
<td>0.48</td>
<td>-0.019</td>
</tr>
<tr>
<td>Heart failure this admission</td>
<td>40 (12)</td>
<td>38 (12)</td>
<td>0.82</td>
<td>0.056</td>
</tr>
<tr>
<td>Hypotension</td>
<td>50 (15)</td>
<td>47 (14)</td>
<td>0.74</td>
<td>-0.026</td>
</tr>
<tr>
<td>Respiratory insufficiency</td>
<td>174 (54)</td>
<td>146 (45)</td>
<td>0.02</td>
<td>-0.173</td>
</tr>
<tr>
<td>Hepatic insufficiency</td>
<td>10 (3)</td>
<td>11 (3)</td>
<td>0.82</td>
<td>0.017</td>
</tr>
<tr>
<td>Renal insufficiency</td>
<td>21 (6)</td>
<td>26 (8)</td>
<td>0.45</td>
<td>0.011</td>
</tr>
<tr>
<td>Metabolic or electrolyte abnormality</td>
<td>26 (8)</td>
<td>27 (8)</td>
<td>0.89</td>
<td>0.011</td>
</tr>
<tr>
<td>Acute non-stroke CNS event</td>
<td>5 (2)</td>
<td>5 (2)</td>
<td>&gt;0.99</td>
<td>0.000</td>
</tr>
<tr>
<td>Baseline depression in CNS function</td>
<td>26 (8)</td>
<td>27 (8)</td>
<td>0.89</td>
<td>0.011</td>
</tr>
<tr>
<td>Metastatic or hematologic malignancy</td>
<td>7 (2)</td>
<td>10 (3)</td>
<td>0.47</td>
<td>0.058</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>19 (6)</td>
<td>24 (7)</td>
<td>0.41</td>
<td>0.062</td>
</tr>
<tr>
<td>Septicemia</td>
<td>39 (12)</td>
<td>32 (10)</td>
<td>0.37</td>
<td>-0.069</td>
</tr>
<tr>
<td>Location and Time of the Arrest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>Emergency department</td>
<td>41 (13)</td>
<td>42 (13)</td>
<td></td>
<td>0.009</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>181 (56)</td>
<td>185 (57)</td>
<td></td>
<td>0.025</td>
</tr>
<tr>
<td>Floor without telemetry</td>
<td>40 (12)</td>
<td>32 (10)</td>
<td></td>
<td>-0.079</td>
</tr>
<tr>
<td>Floor with telemetry or step-down unit</td>
<td>9 (3)</td>
<td>8 (2)</td>
<td></td>
<td>-0.019</td>
</tr>
<tr>
<td>Otherd</td>
<td>54 (17)</td>
<td>58 (18)</td>
<td></td>
<td>0.033</td>
</tr>
<tr>
<td>Time of week</td>
<td></td>
<td></td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Weekende</td>
<td>119 (37)</td>
<td>92 (28)</td>
<td></td>
<td>-0.178</td>
</tr>
<tr>
<td>Weekday</td>
<td>206 (63)</td>
<td>233 (72)</td>
<td></td>
<td>0.178</td>
</tr>
</tbody>
</table>

© 2016 American Medical Association. All rights reserved.
**eTable 4. Characteristics of the Study Population in the Matched Subgroup of Patients with a Pulse at the Beginning of the Event (continued)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No intubation (n = 325)</th>
<th>Intubation (n = 325)</th>
<th>p-value</th>
<th>Standardized difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time of day</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nighttime&lt;sup&gt;f&lt;/sup&gt;</td>
<td>77 (24)</td>
<td>80 (25)</td>
<td>0.022</td>
<td>-0.022</td>
</tr>
<tr>
<td>Daytime</td>
<td>248 (76)</td>
<td>245 (75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Characteristic of the Arrest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Witnessed</td>
<td></td>
<td></td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>309 (95)</td>
<td>314 (97)</td>
<td>0.077</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>16 (5)</td>
<td>11 (3)</td>
<td>-0.077</td>
<td></td>
</tr>
<tr>
<td>Monitored</td>
<td></td>
<td></td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>281 (86)</td>
<td>275 (85)</td>
<td>-0.053</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>44 (14)</td>
<td>50 (15)</td>
<td>0.053</td>
<td></td>
</tr>
<tr>
<td>Pulseless</td>
<td></td>
<td></td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>During the event</td>
<td>118 (36)</td>
<td>109 (34)</td>
<td>-0.058</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>207 (64)</td>
<td>216 (67)</td>
<td>0.058</td>
<td></td>
</tr>
<tr>
<td>Initial pulseless rhythm&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
<td></td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>Non-shockable</td>
<td>88 (75)</td>
<td>82 (75)</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>Shockable</td>
<td>11 (9)</td>
<td>10 (9)</td>
<td>-0.005</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>19 (16)</td>
<td>17 (16)</td>
<td>-0.014</td>
<td></td>
</tr>
<tr>
<td><strong>Hospital Characteristics</strong></td>
<td></td>
<td></td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>Type of hospital</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primarily children</td>
<td>145 (45)</td>
<td>153 (47)</td>
<td>0.049</td>
<td></td>
</tr>
<tr>
<td>Primarily adult</td>
<td>180 (55)</td>
<td>172 (53)</td>
<td>-0.049</td>
<td></td>
</tr>
<tr>
<td>Teaching status</td>
<td></td>
<td></td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>199 (61)</td>
<td>197 (61)</td>
<td>-0.013</td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td>98 (30)</td>
<td>93 (29)</td>
<td>-0.034</td>
<td></td>
</tr>
<tr>
<td>Non-teaching</td>
<td>28 (9)</td>
<td>35 (11)</td>
<td>0.073</td>
<td></td>
</tr>
<tr>
<td><strong>Year of the Arrest</strong></td>
<td></td>
<td></td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>2000 – 2002</td>
<td>31 (10)</td>
<td>31 (10)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2003 – 2004</td>
<td>35 (11)</td>
<td>38 (12)</td>
<td>0.029</td>
<td></td>
</tr>
<tr>
<td>2005 – 2006</td>
<td>45 (14)</td>
<td>47 (14)</td>
<td>0.018</td>
<td></td>
</tr>
<tr>
<td>2007 – 2008</td>
<td>37 (11)</td>
<td>44 (14)</td>
<td>0.065</td>
<td></td>
</tr>
<tr>
<td>2009 – 2010</td>
<td>65 (20)</td>
<td>54 (17)</td>
<td>-0.088</td>
<td></td>
</tr>
<tr>
<td>2011 – 2012</td>
<td>68 (21)</td>
<td>57 (18)</td>
<td>-0.086</td>
<td></td>
</tr>
<tr>
<td>2013 – 2014</td>
<td>44 (14)</td>
<td>54 (17)</td>
<td>0.086</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> CNS: central nervous system. Continuous variables are presented as medians with 1<sup>st</sup> and 3<sup>rd</sup> quartiles and categorical variables as counts (frequencies)

<sup>b</sup> Defined as being born on the current admission

<sup>c</sup> See supplemental material for definitions

<sup>d</sup> Including ambulatory/outpatient clinics, diagnostic/interventional areas, operating room, post-anesthesia recovery room, rehabilitation units, same-day surgical areas, and “other”

<sup>e</sup> Friday 11pm to Monday 7am

<sup>f</sup> 11:00pm to 6:59am

© 2016 American Medical Association. All rights reserved.
eREFERENCES


