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Epidemiology of Death in the Pediatric Intensive Care Unit at Five U.S. Teaching Hospitals

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Abstract

Objective—To determine the epidemiology of death in pediatric intensive care units (PICUs) at 5 geographically diverse teaching hospitals across the United States.

Design, Setting, and Patients—In the PICUs of five teaching hospitals across the United States, we prospectively identified 192 consecutive patients who died prior to PICU discharge. Each site enrolled between 24 and 50 patients. Each PICU had similar organizational and staffing structures.

Interventions—None

Measurements and Main Results—The overall mortality rate was 2.39% (range 1.85% to 3.38%). 133 (70%) patients died following the withholding or withdrawal of life-sustaining treatments, 30 (16%) were diagnosed as brain dead, and 26 (14%) died following an unsuccessful resuscitation attempt. Fifty-seven percent of all deaths occurred within the first week of admission; these patients, who were more likely to have new onset illnesses or injuries, included the majority of those who died following unsuccessful CPR attempts or brain death diagnoses. Patients who died beyond one week length-of-stay in the PICU were more likely to have pre-existing diagnoses, to be technology dependent prior to admission, and to have died following the withdrawal of life-sustaining treatment. Only 64% of the patients who died following the withholding or withdrawing of life support had a formal DNR order in place at the time of their death.

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Conclusions—The mode of death in the PICU is proportionally similar to that reported over the past two decades, while the mortality rate has nearly halved. Death is largely characterized by two fairly distinct profiles that are associated with whether death occurs within or beyond one week length-of-stay. Decisions not to resuscitate are often made in the absence of a formal DNR order. These data have implications for future quality improvement initiatives, especially around palliative care, end-of-life decision making, and organ donation.

Keywords

Pediatric; death and dying; end-of-life care; PICU; DNR; brain death

INTRODUCTION

Decision-making at the end of life for infants and children is among the most difficult experiences families will ever encounter, and is among the most important and profound professional responsibilities for the clinicians who care for them. Previous literature has documented the overall mortality rate in pediatric intensive care units (PICUs) at U. S. teaching hospitals at around 5 percent, well below that in adult critical care(1). Published data reveal that more than half of all pediatric hospital deaths involve care in the PICU (2, 3).

In-depth study of end-of-life care in the PICU setting, however, remains relatively understudied in comparison to other aspects of pediatric critical care medicine. Ten years ago the Institute of Medicine issued its report entitled, *When Children Die: Improving Palliative and End-of-Life Care for Children*. This report found that “systematic data [on palliative and end-of-life care for children] are not available.” Furthermore, the report issued an urgent call for research, particularly “descriptive data—epidemiologic, clinical, and organizational—to guide the provision, funding and evaluation of palliative, end-of-life, and bereavement care for children and families (4).” Investigators have responded to this call with a number of studies focused upon the impact of children with complex chronic conditions on ICU care and the utilization of palliative care services, but prospective multi-institutional studies have been limited. Thus, before designing intervention studies to improve PICU end-of-life care, additional rigorous and timely investigation of actual practice is needed.

We undertook this prospective cohort study to determine the epidemiology of death in PICUs at 5 geographically distinct, tertiary care, teaching hospitals across the United States, examining the relationship between decisions on life-sustaining treatments and the duration of PICU length of stay, and assessing the association between those decisions and hospital, geographic and decedent characteristics.

PATIENTS AND METHODS

Study Population

Data were collected in the PICUs of five teaching hospitals located in the Northwest, West, Midwest, Mid-Atlantic and Northeast regions of the United States. In four institutions, data

collection about every patient who died prior to PICU discharge began on January 1, 2010 and concluded when 50 deaths had occurred or by December 31, 2010. In a fifth institution, data were collected on the 24 deaths that occurred during an accrual period that ran from October 1, 2010 through March 31, 2011. To facilitate computation of comparable mortality rates, each PICU reported the number of admissions and the number of patients who died prior to PICU discharge in 2010.

Each PICU had similar organizational and staffing structures that included rotating pediatric residents, pediatric critical care fellows, dedicated pediatric critical care nurses and respiratory therapists, and board certified pediatric critical care attending physicians who were responsible for all admissions, discharges, and end-of-life decision-making and care, working collaboratively with the patient's primary care physicians, specialists, and palliative care teams. Hospitals were coded for the purpose of anonymity and study patients were numbered consecutively to assure confidentiality. Institutional review boards at each institution and the coordinating center approved all study procedures.

Definitions of End-of-Life Care

We defined 3 mutually exclusive modes of treatment at the time of death in the PICU: unsuccessful cardiopulmonary resuscitation (CPR); brain death; and the withholding or withdrawal of life-sustaining treatment. Cardiopulmonary resuscitation was defined as a death despite administration of resuscitation procedures and medications, that is, unsuccessful CPR. Brain death was defined as a formal determination of brain death in accord with institutional criteria. Withholding treatment was defined as not initiating or not increasing a life-sustaining intervention and withdrawal of treatment was defined as discontinuing a life-sustaining intervention that was already in place in anticipation of death.

Chart Abstraction and Data

The research coordinator at each PICU (generally RNs trained in medical record abstraction) reviewed decedents' medical records using a standardized protocol. Patient demographic characteristics included age, gender, race, religious affiliation, ICU admission diagnosis, technological dependence prior to PICU admission (mechanical ventilation via BiPAP device or tracheostomy, or nutritional support via a surgically placed feeding tube), whether the patient had a surgical procedure within the 72 hours prior to death, and all orders relating to life-sustaining treatments, including resuscitation procedures, nutrition and hydration, airway management and ventilation, pharmacologic support of the circulation, and extracorporeal cardiorespiratory support.

Data Coordination

Educational Development Center Inc., Newton, Massachusetts, served as the Data Coordination Center for this study. Coordinators finalized definitions, data forms, and procedures (including a manual) for the study, and then met with the research coordinators from each hospital to review all study protocols and procedures, to describe inclusion and exclusion criteria, and to provide formal training on medical record abstraction. To improve validity and consistency, concurrent audit and feedback were conducted throughout the study, but no formal inter-rater reliability was completed.

Statistical Analyses

Continuous variables were expressed as means \pm SD or as medians and interquartile ranges if their distribution was skewed. Pearson's chi-square test was used to assess associations between categorical variables. Analysis of variance or Kruskal-Wallis analysis of variance was used to compare continuous variables across groups, as appropriate. All statistical tests were two-tailed.

RESULTS

In 2010, there were 9516 consecutive admissions at the 5 hospital PICUs and a total of 227 deaths, for an overall mortality rate of 2.39% (range 1.85% to 3.38%). During the enrollment period, 192 patients died prior to PICU discharge. As specified by the study protocol, no hospital contributed more than 50 consecutive deaths to the analysis. No patients who died during the enrollment period were excluded.

Patient Characteristics

Characteristics of the 192 decedents are summarized in Table 1. Fifty-five percent of all deaths were males, the median age was 2.0 years, and one-third were less than one year of age, while the oldest quartile ranged from 11 to 39 years. Eight decedents (4%) were young adults (21 years of age or older) who required treatment in the PICU due to the pediatric nature of their illnesses. Nearly two thirds of all deaths occurred in the context of chronic or pre-existing diagnoses. 15% of decedents were dependent for nutritional support on surgically placed feeding tubes and 6% were ventilator dependent via BiPAP or a tracheostomy prior to admission to the PICU. One in six of all deaths were preceded by surgical procedures in the last 72 hours of life. Table 2 shows the diagnoses at the time of death for each of the five participating hospitals.

Time to Death, Nature of Death, and Decision Making

As reported in Table 3, the median length of stay in the PICU prior to death was 5.7 days, with the lowest quartile surviving less than 1.5 days, and the longest quartile surviving for 20 to 439 days. Forty-three percent of all deaths occurred after 7 or more days in the PICU. For the nature of death, 133 patients (70%) died followed the withholding or withdrawal of life-sustaining treatments, 30 patients (16%) were diagnosed as brain dead, and 26 patients (14%) died following an unsuccessful attempt at resuscitation. Of those who died following the withholding or withdrawing of life support, only 64% had a formal DNR order in place at the time of their death. Of these, those who died within the first seven days of ICU care were significantly ($p=0.035$) less likely to have a DNR order in place (56%) than those who died after a longer ICU stay (73%). These trends were consistent across all of the sites.

Table 4 characterizes the length of the PICU stay prior to death by the nature of death and DNR status. The median length of stay for those who died following the withdrawing or withholding of life-sustaining treatments was 5.4 and 4.4 days longer than those died after failed resuscitation and diagnosis of brain death, respectively. Only 20% of patients diagnosed as brain dead, and 33% of those who died following failed resuscitation attempts,

had a length of stay of 7 days or more in the PICU. Patients who died with a DNR order in place had a median length of stay of 9.2 days versus 2.1 days for those without a DNR order.

Table 5 summarizes the relationships between a PICU stay of 7 or more days, decisions to implement a DNR order, and decisions to withhold or withdraw life-sustaining treatments and hospital site and patient characteristics. We found no significant associations of hospital site, patient gender, and surgery within the last 72 hours with a PICU stay for 7 or more days, decisions to implement DNR orders, or decisions to withhold or withdraw life-sustaining treatments. Similarly, length of stay, decisions to implement DNR orders, and decisions to withhold or withdraw life-sustaining treatments were not associated with patient age. However, patients admitted to the PICU with new diagnoses and patients who were not technologically dependent when admitted were significantly less likely to have PICU stay of 7 or more days, DNR orders in place at the end of life, or to have life-sustaining treatment withheld or withdrawn.

We examined the association of both race/ethnicity and religious affiliation with length of PICU stay, DNR status, and decisions to have life support withheld or withdrawn. We found that, with the exception of Asians, Caucasians were more likely to have a DNR order than other non-whites or those whose race was not documented ($p = .047$), and also showed a corresponding trend toward having life support withheld or withdrawn. Similarly, we found significant differences in the use of DNR orders among those with different religious affiliations ($p = .017$), with corresponding trends in decisions about the withdrawal of life-sustaining treatments. These associations between religious affiliation and DNR status and the likelihood of a decision to have life support withheld or withdrawn in this cohort are tempered by the lack of documentation about religious preference in 43 of the 192 decedents (22%) and the small number of decedents in several religious categories.

DISCUSSION

Across a geographically diverse sample of 5 U.S. teaching hospitals we found that the proportion of patients dying in 2010 in PICUs following either unsuccessful cardiopulmonary resuscitation attempts, diagnoses of brain death, or the withholding or withdrawal of life-sustaining treatment has remained similar to that reported over the past several decades (5-12). However, the overall mortality rate has nearly halved (5, 10).

The causes of the decrease in mortality that we observed are likely multifactorial. On one hand, there is evidence that the quality of pediatric ICU care is improving over time (13). On the other hand, decreasing mortality could also be explained by more permissive admission criteria, with the admission of less severely ill children essentially diluting the mortality rate. Another possible explanation is that children who previously died in the hospital are now dying at home, thereby reducing the mortality rate in the ICU. For example, Feudtner and colleagues found that the percentage of older children and young adults with complex chronic conditions who died at home in Washington State more than doubled from 1980 to 1998, increasing from 21% to 43% (14). This finding was confirmed in a more recent nationwide study from 1989 to 2003, which found that among patients with complex chronic conditions, the percentage of individuals dying at home increased significantly each year

(15). Racial and socioeconomic factors seem to play a role as well; patients from less affluent neighborhoods (14) as well as black and Hispanic patients (15) were less likely to die at home. Finally, a recent study from the United Kingdom found that children who were discharged from the ICU to palliative care services were more likely to die in the community (home or hospice) than those who were not referred to palliative care at the time of discharge (16).

Our findings reveal two fairly distinct profiles of death in the PICU, with one picture emerging for those who died within 7 days of admission and another for those who died following a longer length of stay. Those who died later tended to have pre-existing diagnoses, were more likely to have DNR orders, and were more likely to have life support withheld or withdrawn. These findings correlate well with data showing that children with complex chronic conditions who die in hospitals are more likely to be mechanically ventilated and also to die after a longer period of mechanical ventilation, with the number of complex chronic conditions correlating with the length of time on mechanical ventilation before death (17).

Why do children admitted with pre-existing conditions tend to die later than those who only have acute life-threatening conditions? Again, the explanation is likely multifactorial. It may be that those with acute injuries are more severely ill, and die despite all efforts to keep them alive; whereas those with pre-existing diagnoses can be supported with life-sustaining therapies, with their deaths following deliberate decisions to allow them to die. This explanation fits with our findings that those who died early tended to be previously healthy and died following full attempts at resuscitation, whereas those who died late tended to have pre-existing diagnoses, DNR orders, and died in the context of withdrawal of life support.

Our study categorized deaths into those associated with either the withholding or withdrawing of life-sustaining treatment, unsuccessful resuscitation, or brain death. Some previous studies have attempted to differentiate between cases involving either the withholding or the withdrawing of life sustaining treatment (12). While this approach may appear to be a useful way to understand the dying process in more detail, we rejected this categorization because there are no reliable means to differentiate between withholding and withdrawing. At the most simplistic level, the distinction is irreducibly arbitrary (e.g., is terminating dialysis on a patient *withdrawing* the patient from a series of treatments or *withholding* the next and subsequent treatments?). Many cases involve combinations of both descriptions, as in a child with a DNR order (withholding) who dies following termination of ventilator support (withdrawing). In other words, the way in which limitations of treatment are perceived and described depends heavily upon how the clinicians view the decisions within the context of particular cases and their own institutional cultures. Our study was therefore designed to avoid the risk that separately categorizing withholding from withdrawing could perpetuate false distinctions or misleading conclusions.

This being said, fine grained and nuanced distinctions between the different ways that life sustaining treatments may be withheld or withdrawn are both extremely interesting and important. In our view, however, meaningful distinctions are best explored through

qualitative analysis of individual cases, using narrative and thematic methodology to explore the subtle distinctions involved (18).

An unexpected finding from our investigation was that only 64% of the patients who died following the withholding or withdrawing of life support had a formal DNR order in place at the time of their death. Among those who died in the first seven days of their ICU stay, only 56% had a DNR order. Both of these trends were consistent across all of the sites. A common assumption is that unless a patient has a formal DNR order in place, resuscitation must be performed, which if true would imply that all of these PICUs were out of compliance with standard practice.

In our view, however, it is likely that this finding requires a more nuanced interpretation. In the context of withdrawal of mechanical ventilation, for example, families generally understand that the withdrawal of respiratory support will result in death from respiratory failure. In this context, discussions about chest compressions and advanced cardiac resuscitation may seem distracting, or even irrelevant. The fact that CPR will not be performed is, in effect, implied by the decision to withdraw ventilator support. Indeed, it may be that experienced clinicians deliberately forego discussion of DNR status in this context, particularly since it becomes irrelevant to decisions about the overall goals of care.

In situations where ventilators, pressors, or other forms of life-sustaining treatment are withdrawn in anticipation of the patient's rapid demise, the entire team caring for the patient should be aware of the plan and the likely outcome, and formal documentation of DNR status is less important. For patients who are not expected to die quickly, however, documentation of DNR status can be crucially important, so that caregivers who may not have been involved in detailed discussions with the family, but who may nevertheless be called to the bedside at the time of cardiac arrest, will have a clear and unambiguous understanding of the plan of care. This explanation would be consistent with our finding that those who died more rapidly were less likely to have formal documentation of DNR status than those who survived for longer periods of time.

Our findings also reinforce the advantages of avoiding the term DNR altogether in preference to alternative language, such as "allow natural death." By capturing the intention to focus on the patient's comfort and not the use of life-sustaining treatments, language such as "allow natural death" can accurately describe and convey the overall plan of care to others without the need to explicitly focus on the use of CPR (19).

Our findings also have relevance for organ donation. The fact that the mortality rate in the PICU has nearly halved in the past two decades is, of course, good news; but it also inherently has the consequences of limiting the pool of available organs for donation. In addition, some have expressed concern that the number of organs available from brain-dead donors has decreased because decisions to withdraw life support are being made earlier, before a diagnosis of brain death can be established. Our data, however, does not support this concern, since we found that the proportion of all PICU deaths from brain death has remained stable over the past two decades.

Over the last several years, efforts to compensate for the fall in brain-dead donors have focused on increasing the number of organs obtained from patients after the withdrawal of life support in accordance with Donation after Circulatory Determination of Death (DCDD) protocols (20). This approach has been controversial in pediatric intensive care medicine (21, 22), but two studies have shown that this approach could have a small but significant impact on organ procurement, with one study reporting 7 donors out of 110 children (6.3%) who died following the withdrawal of mechanical ventilation (23), and another indicating that approximately 5.5% of all PICU decedents could be DCDD donors (24). Based on these estimates, the absolute number of potential organ DCDD donors is relatively small (using these estimates, our study would predict approximately 11 potential donors from these five hospitals over the study period). Nevertheless, these are potentially significant in comparative terms, since in Pleacher's study the 7 DCDD donors accounted for 37% of all organ donors during the study period (23).

A potential limitation of our study relates to the heterogeneity of practice patterns and policies across the five PICUs. For example, many PICUs have different policies for transferring patients from the ICU to the general ward (particularly oncology patients) for end-of-life care. PICUs differ in how they distribute patients <1 year of age between the PICU and the NICU. PICUs also differ in the availability and utilization of ethics and palliative care expertise. Many of these differences reflect the culture of the various units and are difficult to objectively assess and measure, and in any case would have been impractical to stratify across five institutions based upon these distinctions. So while these factors are certainly a limitation to interpreting the data, we would argue that by strategically choosing five geographically diverse PICUs, all located in teaching hospitals with the same general staffing model (i.e., they were all closed units), and all with sufficient volume to meet our enrollment needs, our study was well-designed to yield reasonably generalizable data about the epidemiology of death in PICUs in the United States.

In addition to this concern, our sample size may have limited our ability to detect an association between end-of-life decisions and certain hospital or decedent characteristics. Furthermore, transferability of our findings to non-teaching or smaller community hospitals and countries other than the United States may be limited since all of the participating PICUs in the study were from U.S. academic teaching hospitals.

CONCLUSIONS

Amongst nearly 200 consecutive deaths in PICUs at 5 U.S. teaching hospitals, the mode of death remains proportionally similar to that reported in the past several decades. However, the mortality rate in PICUs has nearly halved. Death in the PICU follows two differing profiles based on length of hospitalization. Those dying within the first 7 days tend to have new onset illnesses or injuries and are more likely to die following unsuccessful cardiopulmonary resuscitation or the diagnosis of brain death. Those dying later in the PICU stay are more likely to have pre-existing diagnoses, to be technology dependent prior to admission, and more likely to die following the withdrawal of life-sustaining treatment. These findings have implications for future quality improvement initiatives, especially around palliative care, end-of-life decision making, and organ donation.

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Abbreviations

PICU	pediatric intensive care unit
DNR	do not resuscitate

TABLE 1
Characteristics of Decedents

Characteristic	Distribution
Total N	192
Hospital	
A—n (%)	24 (13%)
B—n (%)	50 (26%)
C—n (%)	44 (23%)
D—n (%)	25 (13%)
E—n (%)	49 (26%)
Age	
Median age (25 th , 75 th percentile)	2.0 (0, 11)
Less than 1 year—n (%)	66 (34%)
21 year or greater—n (%)	8 (4%)
Gender	
Male-n (%)	105 (55%)
Female-n (%)	87 (45%)
Ethnicity and race	
Caucasian—n (%)	93 (48%)
African-American—n (%)	30 (16%)
Hispanic—n (%)	32 (17%)
Asian—n (%)	8 (4%)
Other—n (%)	11 (6%)
Not documented—n (%)	18 (9%)
Religious Affiliation	
Protestant—n (%)	27 (14%)
Catholic—n (%)	44 (23%)
Christian—n (%)	29 (15%)
Jewish—n (%)	7 (4%)
Muslim—n (%)	4 (2%)
Other—n (%)	3 (2%)
No preference—n (%)	35 (18%)
Not documented—n (%)	43 (22%)
Diagnosis	
Pre-existing—n (%)	120 (63%)
New—n (%)	71 (37%)
Not documented—n (%)	1 (.5%)
Technology dependence prior to ICU admission	
Mechanical ventilation only—n (%)	3 (2%)
Device-dependent nutrition support only—n (%)	21 (11%)
Mechanical ventilation and device-dependent nutrition support—n (%)	7 (4%)
None—n (%)	161 (84%)

Characteristic	Distribution
Surgery in the last 72 hours of life	
Yes—n (%)	30 (16%)
No—n (%)	161 (84%)
Not documented—n (%)	1 (.5%)

TABLE 2

Distribution of Specific Diagnoses at Time of Death for the Five Hospitals

Diagnosis	Hospital A N=23	Hospital B N=34	Hospital C N=36	Hospital D N=21	Hospital E N=39
Respiratory Failure	5 (22%)	8 (24%)	5 (14%)	6 (29%)	7 (18%)
Neurological Condition	2 (9%)	12 (35%)	7 (20%)	4 (19%)	3 (8%)
Hepatic Failure	2 (9%)	0 (0%)	1 (3%)	0 (0%)	4 (10%)
Oncologic Condition	7 (30%)	4 (12%)	7 (19%)	1 (5%)	4 (10%)
Cardiac Condition	0 (0%)	1 (3%)	8 (22%)	0 (0%)	0 (0%)
Pulmonary Hypertension	0 (0%)	0 (0%)	1 (3%)	2 (10%)	1 (3%)
Congenital Condition	1 (4%)	1 (3%)	2 (6%)	3 (14%)	7 (18%)
Multi-Organ Failure	6 (26%)	8 (23%)	5 (14%)	5 (24%)	13 (33%)

$\chi^2 = 59.92$ on 28 degrees of freedom; $P < 0.0001$.

TABLE 3

Length of PICU Stay Prior to Death, Nature of Death, and Use of DNR Order

Characteristic	Distribution
Length of PICU Stay Prior to Death ^a	
Number of Days in the PICU Prior to Death - median (25 th , 75 th percentile)	5.7 (1.5, 19.5)
Stay of Less than 7 Days – n (%)	103 (57%)
Stay of 7 Days or More – n (%)	79 (43%)
Nature of Death ^b	
Died following withhold/withdrawal of life-sustaining treatments – n (%)	133 (70%)
Died after diagnosed brain dead – n (%)	30 (16%)
Died after failed CPR – n (%)	26 (14%)
Use of DNR Order	
No – n (%)	98 (51%)
Yes – n (%)	94 (49%)

^aLength of stay was not documented for 10 decedents, thus the valid n is 182.

^bThe nature of death could not be determined for 3 decedents, thus the valid n is 189.

TABLE 4

Nature of Death and Use of DNR Orders by Length of PICU Stay

Characteristic	n	Median Length of Stay (25, 75 percentile)	Percent Length of Stay 7 Days or More
Nature of Death		p=.01	p=.006
Withhold/withdrawal of life-sustaining treatment	127	7.3 (1.9, 23.3)	50%
Diagnosed brain dead	30	2.9 (1.6, 6.2)	20%
Failed CPR	24	1.9 (.7, 14.9)	33%
DNR Order		p<.001	p<.001
Yes	91	9.2 (3.3, 28.2)	57%
No	91	2.1 (.9, 8.8)	30%

TABLE 5

Relationship of Patient Characteristics with Length of PICU Stay and End-of-Life Decision-Making

Characteristic	Total N	% Length of stay 7 days or more ^a	% DNR order at time of death	% Life support withheld or withdrawn ^b
Total	192	43%	49%	70%
Hospital				
A	24	50%	38%	74%
B	50	30%	48%	66%
C	44	48%	48%	75%
D	25	56%	68%	83%
E	49	44%	47%	63%
Gender				
Male	105	42%	51%	70%
Female	87	45%	46%	71%
Race			p=.05^c	
Caucasian	93	49%	55%	79%
African-Amer.	30	25%	30%	50%
Hispanic	32	42%	47%	69%
Asian	8	63%	88%	75%
Other	11	45%	45%	64%
Not document.	18	38%	39%	67%
Religious Affiliation			p=.02	
Protestant	27	42%	59%	78%
Catholic	44	49%	52%	75%
Christian	29	46%	34%	59%
Jewish	7	71%	71%	71%
Muslim	4	33%	0%	50%
Other	3	33%	100%	67%
no preference	35	55%	60%	79%
not documented	43	24%	37%	63%
Diagnosis		p<.001	p=.003	p=.02
Pre-existing	121	53%	58%	76%
New	71	26%	35%	60%
Tech. dependent		p=.03	p=.007	p=.008
No	161	40%	45%	66%
Yes	31	61%	71%	90%
Surgery 72 hrs.				
No	161	44%	52%	72%
Yes	30	37%	37%	61%

^aLength of Stay could not be calculated for ten decedents.

^bFor three decedents, the nature of death could not be fully characterized (thus n=189).

^cWhen there is a significant ($p < .05$) relationship between a potential outcome (represented in the column) and a decedent characteristic (represented in the row), the p-value for the chisquare test of independence is provided at the top of the % yes cell where the column and row intersect.