Impact of a Proactive Approach to Improve End-of-Life Care in a Medical ICU*

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Study objectives: To assess the impact of a proactive case finding approach to end-of-life care for critically ill patients experiencing global cerebral ischemia (GCI) after cardiopulmonary resuscitation and multiple organ system failure (MOSF) in comparison to historical control subjects.

Design: Comparative study of retrospective and prospective cohorts.

Setting: Medical ICU of a university hospital.

Interventions: Patterns of end-of-life care for patients with MOSF and GCI obtained through a retrospective chart review were compared to proactive case finding facilitated by the inpatient palliative care service. Interventions included identification of patient’s advance directives or preferences about end-of-life care, if any; assistance with discussion of the prognosis and treatment options with patients or their surrogates; and implementation of palliative care strategies when treatment goals changed to a focus on comfort measures.

Results: Although our retrospective data demonstrated a high percentage of do-not-resuscitate decisions for the patients under investigation, a considerable time lag elapsed between identification of the poor prognosis and the establishment of end-of-life treatment goals (4.7 ± 2.4 days and 3.5 ± 0.5 days for patients with MOSF and GCI, respectively [mean ± SE]). The proactive case finding approach decreased hospital length of stay (mean, 20.6 ± 4.1 days vs 15.1 ± 2.5 days and 8.6 ± 1.6 days vs 4.7 ± 0.6 days for MOSF and GCI patients, respectively; p = 0.063 and < 0.001, respectively). More importantly, a proactive palliative care intervention decreased the time between identification of the poor prognosis and the establishment of comfort care goals (7.3 ± 2.9 days vs 2.2 ± 0.8 days and 6.3 ± 1.2 days vs 3.5 ± 0.4 days for MOSF and GCI patients, respectively; p < 0.05 for both), decreased the time dying patients with MOSF remained in the ICU, and reduced the use of nonbeneficial resources, thus reducing the cost of care.

Conclusions: Proactive interventions from a palliative care consultant within this subset of patients decreased the use of nonbeneficial resources and avoided protracted dying.

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Key words: anoxic encephalopathy; critical care; multiple organ system failure; palliative care

Abbreviations: APACHE = acute physiology and chronic health evaluation; CMO = comfort measures only; DNR = do not resuscitate; GCI = global cerebral ischemia; LOS = length of stay; MICU = medical ICU; MOSF = multiple organ system failure; SUPPORT = Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment; TISS = Therapeutic Intervention Scoring System

Decision to forgo life-sustaining treatment are among the most challenging that patients, their surrogates, and clinicians face. Patterns of end-of-life care in ICUs have considerable variability within the United States and Canada. Variability seems to be multifactorial; and, although age, abnormal mental status, malignancy, or cardiac arrest are conditions more frequently associated with do-not-resuscitate (DNR) orders, no clear clinical predictors for having a DNR order have yet been identified.

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Some argue that the best method to improve ICU care at the end of life is to define the goals of care in advance of ICU admission. However, this strategy is limited by the fact that pre-ICU communications about preferences for cardiopulmonary resuscitation and prolonged mechanical ventilation are uncommon among seriously ill hospitalized adults. Moreover, even when the patient or surrogate wishes are known, clinicians may not abide by those prestated preferences. This strategy further assumes that reliable predictors for successful ICU outcomes exist, when it remains difficult to predict with certainty who will die, thus highlighting the importance of end-of-life care competence among ICU clinicians.

Although approaches to making improvements in hospital care of the dying have been proposed, the most extensive study to understand the prognosis and preferences for outcomes and risks of treatments (Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment [SUPPORT]) presented an unattractive picture of the care of seriously ill or dying persons. The SUPPORT trial led their principle investigators to conclude that perhaps more creative interventions and more proactive measures might be needed to improve the quality of end-of-life care for critically ill patients. Positive patient and institutional outcomes through consultation with an inpatient palliative care program and proactive ethics consultation for high-risk ICU populations offer promising approaches to improve decision making and communications and to reduce ICU length of stay (LOS) for dying patients.

To date, most of the literature about end-of-life care in the ICU focuses on the whole ICU population, and little information exists about disease-specific care at the end of life. Conditions such as multiple organ system failure (MOSF) occurs in approximately 14% of the patients admitted to an ICU; and, although the presence of three organs failing simultaneously occurs less frequently, it is nearly always a fatal condition. However, despite the associated poor prognosis, the majority of these patients are treated aggressively until their death. Similarly, patients with persistent coma after cardiopulmonary resuscitation are frequently treated aggressively in ICU despite a dim prognosis for functional neurologic recovery. It would seem that based on the poor prognosis for recovery among these subgroups of patients, a compassionate approach focusing on comfort is more appropriate than protracted, aggressive ICU support. We studied the impact of a proactive case finding approach to end-of-life care for hopelessly ill patients experiencing severe global cerebral ischemia (GCI) after cardiopulmonary resuscitation and advanced MOSF in comparison to historical control subjects.

Materials and Methods

The Human Investigation Committee of Wayne State University approved the study protocol. The study consisted of two cohorts. A retrospective cohort, which served as a historical control group, obtained by chart analysis of patients with GCI after cardiac arrest or MOSF admitted to the Detroit Receiving Hospital medical ICU (MICU), and a prospective cohort consisting of the same patient populations subjected to proactive palliative care interventions. Since the prospective phase was conducted as a continuous quality improvement project, did not change routine practice, and involved collection of data without compromising patient confidentiality, informed consent was waived by the Human Investigation Committee.

Study Population

GCI: Patients with cerebral ischemia after cardiac arrest with any of the following physical findings: 24 h after cardiac arrest were included in the study: coma, absent pupillary and/or corneal reflexes, posturing or absent response to deep painful stimuli, and tonic-clonic seizures or myoclonic jerks attributed to cerebral ischemia. Patients were excluded if they were < 18 years old, were receiving barbiturates or neuromuscular blocking agents, or had clinical criteria for brain death. MOSF: MOSF was defined according to the classic criteria of Knaus et al. and patients were included in the study when they had three or more organ systems simultaneously in failure for 3 days.

Study Design

Retrospective Cohort: Patients with GCI were identified by the medical record coding system using the words ICU and cardiac arrest. The medical records were then reviewed, and subjects with GCI meeting inclusion criteria were included in the study. Patients with MOSF were identified by MICU discharge diagnosis-related groups for organ failures. The diagnosis-related group was only used as a filter to identify potential study subjects. Once identified, the charts were reviewed and the medical records of patients discharged from the MICU with three or more organs in failure were selected for subsequent analysis.

Proactive Palliative Care: During the period of July 1, 1999, to June 30, 2000, members of the palliative care service of Detroit Receiving Hospital (M.L.C. and J.A.G.) screened the MICU census daily for any patient meeting the study criteria with the following aims: (1) early involvement of the palliative care service in the process of communicating prognostic news to the family; (2) assistance in identifying patient’s advance directives or preferences for end-of-life care, if any; (3) assistance with discussion of the prognosis and treatment options with patients or their surrogates; (4) implementation of palliative care strategies when goals changed to “comfort measures only” (CMO); and (5) provision of consultating and education to the primary team regarding palliative care strategies. The MICU team at Detroit Receiving Hospital is comprised of a faculty intensivist who rotates every 2 weeks, and two fellows in critical care and four residents in internal medicine who rotate every month. A clinical pharmacist, a respiratory therapist, and a clinical dietician are also part of the ICU team. The palliative care service consists of a dedicated nurse practitioner and two rotating physicians (an internist and an intensivist) with interest and training in end-of-life care.

Proactive Interventions

GCI: On the day of MICU admission, patients were identified for study inclusion. As part of routine clinical care for patients...
after cardiac arrest, an EEG was ordered on the morning of the second day and families or surrogates were informed of the probability of a poor prognosis based on the duration of cardiopulmonary resuscitation and the physical findings. \(^{20-24}\) On the second MICU day, a family meeting was convened and changes in the patient’s medical condition were communicated, and their understanding of the previous discussion was ascertained and clarified as needed. On the third MICU day, the poor prognosis was confirmed with the MICU team based on physical findings and EEG report before that daily family meeting. Based on prognosis, a change of treatment goals to a focus on comfort-oriented care was recommended, and ventilator withdrawal was discussed as an option. On subsequent MICU days, meetings were held if the family was still undecided or unwilling to accept the recommended treatment goals. When treatment goals were changed to CMO, the palliative care service remained involved to facilitate implementation of palliative care interventions, facilitate withdrawal of support if indicated, and to move the patient from the ICU if death was not imminent.

MOSF: Once patients were identified and included in the study, members of the palliative care service were updated by the primary MICU team about the family or surrogate understanding of disease severity and anticipated outcome. Subsequent daily family meetings were held to confirm the poor prognosis and recommend a change in treatment goals to CMO. As with the patients with GCI, if goals changed to CMO the palliative care service remained involved in the patient’s terminal care.

Data Collection

Age, gender, APACHE (acute physiology and chronic health evaluation) II score\(^{25}\) and Therapeutic Intervention Scoring System (TISS)\(^{26}\) values on admission to the MICU were recorded. In addition, TISS points 24 h before and after a change in DNR status, hospital and MICU LOS, frequency and goals of DNR orders, time from admission or development of MOSF to a change in DNR status and from a DNR status to death were recorded. Daily resource use in dollars was calculated from TISS points assigning $300 per point that adjusts to $350 for inflation.\(^{27,28}\) To ensure accuracy of data abstraction, the data collection protocol and data collectors remained the same throughout the study. DNR goals were classified as “withhold” if one or more life-sustaining measures were to be withheld from the patient’s treatment plan, or as CMO if the emphasis of ongoing treatment was the patient’s comfort and/or withdrawal of life support.

Statistical Analysis

Summary values are expressed as percentage, mean ± SE, and median and range. Unpaired Student t test was used when comparing variables between groups, and paired Student t test was used for intragroup comparisons. Fisher exact test was used to compare frequency of DNR orders between groups. Probability values (two-tailed) of < 0.05 were considered statistically significant. Statistical calculations were performed using SPSS for Windows (version 9.0; SPSS, Chicago, IL) software.

Results

There were 1,972 admissions to the Detroit Receiving Hospital MICU during the period of July 1, 1998, to June 30, 1999. Four hundred four medical records were identified by the medical records searching method previously described. After careful review of the identified charts, 18 patients with CGI and 22 patients with MOSF met inclusion criteria and were included in the retrospective analysis. The proactive cohort consisted of 20 patients with GCI and 21 patients with MOSF enrolled prospectively after screening 1,651 patients admitted to the same MICU during the period of July 1, 1999, to June 30, 2000. Patient age, APACHE II score, and hospital and MICU LOS are shown in Table 1. Two patients with GCI in the retrospective cohort were discharged from the hospital to a subacute ventilator facility in persistent coma, whereas all patients with GCI enrolled prospectively died in the hospital. In-hospital mortality was 100% for patients with MOSF regardless of study cohort. The proactive end-of-life intervention significantly reduced hospital and MICU LOS in the GCI group compared to historical control subjects. During the proactive phase, patients with MOSF had a similar MICU LOS; and, although it did not reach statistical significance, hospital LOS was about 5 days shorter than those patients included in the retrospective analysis.

Goals at the time DNR orders were implemented are illustrated in Figure 1. All patients in the proactive cohort, regardless of diagnostic group, had a DNR order in comparison to 85% of patients with GCI and 91% of patients with MOSF analyzed retrospectively (p < 0.05 for both). Comfort mea-

<table>
<thead>
<tr>
<th>Variables</th>
<th>Retrospective</th>
<th>Prospective</th>
<th>p Value</th>
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<tbody>
<tr>
<td>MOSF</td>
<td>(n = 22)</td>
<td>(n = 21)</td>
<td>0.832</td>
</tr>
<tr>
<td>Age, yr</td>
<td>55.0 ± 2.9; 56.5 (45)</td>
<td>52.6 ± 3.4; 51.0 (54)</td>
<td>0.032</td>
</tr>
<tr>
<td>APACHE II score</td>
<td>31.9 ± 1.9; 30.5 (38)</td>
<td>27.1 ± 1.2; 27.0 (17)</td>
<td>0.063</td>
</tr>
<tr>
<td>Hospital LOS, d</td>
<td>20.6 ± 4.1; 13.5 (65)</td>
<td>15.1 ± 2.5; 12.0 (49)</td>
<td>0.735</td>
</tr>
<tr>
<td>MICU LOS, d</td>
<td>10.7 ± 2.2; 7.0 (45)</td>
<td>10.4 ± 1.6; 7.0 (26)</td>
<td>0.201</td>
</tr>
<tr>
<td>GCI</td>
<td>(n = 18)</td>
<td>(n = 20)</td>
<td>0.365</td>
</tr>
<tr>
<td>Age, yr</td>
<td>63.6 ± 4.3; 63.5 (65)</td>
<td>58.5 ± 2.8; 59.5 (49)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>APACHE II score</td>
<td>32.9 ± 1.5; 34.5 (21)</td>
<td>40.2 ± 1.9; 38.0 (26)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hospital LOS, d</td>
<td>8.6 ± 1.6; 6.0 (22)</td>
<td>4.7 ± 0.6; 5.0 (11.5)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>MICU LOS, d</td>
<td>7.1 ± 1.4; 5.0 (22)</td>
<td>3.7 ± 0.4; 4.0 (6.5)</td>
<td>&lt; 0.001</td>
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*Data are presented as mean ± SE, median (range).
sures were chosen as the DNR goal twice more frequently than a DNR goal to withhold resuscitation during the proactive trial. Most of the patients who had an initial DNR order to withhold resuscitation and other therapies had a subsequent change in the DNR goals to CMO or withdrawal of life-sustaining interventions. For patients who had a change in the goal of the DNR order, the time elapsed between first and second order was comparable in both retrospective and prospective cohorts (3.2 days).

The timing of changes in treatment goals for both study groups is shown in Table 2. The time interval between ICU admission and DNR orders was similar in patients with MOSF; however, the time elapsed between development of MOSF and DNR orders was significantly reduced by the proactive palliative care interventions, more so when the change in treatment goals implicated comfort measures. In addition, a 3-day reduction from development of MOSF to death was seen in patients during proactive interventions. The time between ICU admission and DNR order did not reach statistical significance between study cohorts in patients with GCI; however, the lack of difference could simply be due to small sample size. Establishment of CMO as DNR goals occurred nearly 3 days earlier with the palliative care intervention in both study arms.

Change in the use of resources and daily cost of care after establishing DNR goals is illustrated in Table 3. Composite TISS points before the first DNR order were 26.2 ± 1.5 points and 31.2 ± 1.2 points for patients with GCI and patients with MOSF, respectively. As previously reported, a DNR order consisting of withholding life-sustaining interventions did not alter intensity of care as evidenced by a subtle decrease in TISS points. However, a significant decrease in TISS points and estimated costs were apparent when treatment goals changed to CMO.

The palliative care service was consulted in only 27% of patients with GCI and 32% of patients with MOSF included in the retrospective cohort. Since patients with a consultation had no statistically significant difference in any of the studied variables with the rest of the control patients who did not have a consultation for either of the two diagnosis, and the proactive approach

![Figure 1. Goals of care for DNR orders. Solid bars = retrospective cohorts; dashed bars = prospective cohorts. Data in parenthesis indicate No. of patients.](image)

**Table 2—Time Elapsed From Hospital Admission or Development of MOSF Until First Change in Treatment Goals, DNR Orders, and Discharge for Both Groups**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Retrospective</th>
<th>Prospective</th>
<th>p Value</th>
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<tbody>
<tr>
<td>MOSF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOS, admission to DNR, d</td>
<td>9.0 ± 2.3; 5.5 [47] (n = 20)</td>
<td>8.6 ± 1.4; 6 [21] (n = 21)</td>
<td>0.635</td>
</tr>
<tr>
<td>LOS, MOSF to DNR, d</td>
<td>4.7 ± 2.4; 5.5 [45] (n = 19)</td>
<td>1.5 ± 0.6; 1.0 [14] (n = 20)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>LOS, MOSF to CMO, d</td>
<td>7.3 ± 2.9; 3.0 [44] (n = 15)</td>
<td>2.2 ± 0.8; 1.0 [14] (n = 15)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>LOS, MOSF to death, d</td>
<td>5.8 ± 2.1; 3.0 [45] (n = 22)</td>
<td>2.1 ± 0.7; 1.0 [14] (n = 20)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>GCI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOS, hospital admission to DNR, d</td>
<td>3.5 ± 0.5; 3.5 [8] (n = 16)</td>
<td>2.8 ± 0.4; 3.0 [6] (n = 20)</td>
<td>0.063</td>
</tr>
<tr>
<td>LOS, hospital admission to CMO, d</td>
<td>6.3 ± 1.2; 5.0 [13] (n = 12)</td>
<td>3.5 ± 0.4; 3.6 [6] (n = 20)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>LOS, DNR to death, d†</td>
<td>3.1 ± 1.0; 2 [12] (n = 16)</td>
<td>2.2 ± 0.4; 2.0 [12] (n = 20)</td>
<td>0.256</td>
</tr>
</tbody>
</table>

*Data are presented as mean ± SE; median [range].
†Two patients were discharged to a nursing home in the retrospective groups.
was not part of the palliative care intervention during the time retrospective data were collected, the group was combined to simplify statistical analysis.

**Discussion**

Outcome measures for evaluating end-of-life care of patients with diagnoses known to have a poor outcome such as GCI after cardiac arrest and persistent MOSF are scarce. In spite of a well-established palliative care practice at our institution, the program was underutilized by the MICU team, in that the palliative care consultants saw only approximately 30% of the study patients, as demonstrated by the retrospective data analysis. However, our data shows that a dedicated team proactively implementing palliative care consultation in this subgroup of critically ill patients, decreases hospital length of stay, and more importantly, shifts goals of care to comfort much earlier in the disease process.

Even though our sample is relatively small, the incidence of severe MOSF, as defined in our study, is comparable to other reports. In addition, the similar number of patients enrolled retrospectively and prospectively diminishes the possibility of selection bias, which could otherwise be raised as a limitation in a before/after study. In spite of less available data evaluating the incidence of CGI after cardiac arrest in a general MICU, the comparable number of patients with CGI in both study phases make us believe that the above is true for this subset of patients too.

Although our retrospective data demonstrates that the percentage of designated DNR patients is higher than previously described, a considerable time lag elapsed between the identification of the patients prognosis and designation of DNR. Furthermore, judging by the type and frequency of DNR orders observed in the retrospective cohort, there was more ease in establishing goals to withhold resuscitation and other interventions than for establishing goals directed at comfort measures only. In spite of a population that has a nearly always fatal outcome, such as patients with severe GCI after cardiopulmonary resuscitation and prolonged MOSF, physicians were likely to consider withdrawing treatment from these patients only later in the course of the illness. Delayed recognition of the poor prognosis by clinicians and/or patient surrogates opposing to recommendations to change treatment goals could potentially explain the above.

A proactive palliative care approach significantly decreased the time between identification of MOSF and the establishment of a DNR order. More importantly, this approach decreased the time hopelessly ill patients spent in the ICU before a change in treatment goals to a focus on comfort was decided, compared to the retrospective group. These findings are different from those reported by the SUPPORT trial. Early collaborative interventions after the patient’s prognosis was identified, and involvement throughout the ICU course between the palliative care consultants and intensivists at our institution resulting in timelier decisions about life-sustaining treatment, may explain our positive results.

Although the study was not powered or intended to show a decrease in ICU resources or costs, judging by TISS scores, reduction in intensive care support did not occur when the DNR goals were to withhold resuscitation. This is in contrast to previously published concerns that DNR orders may lead to a diminished level of care. In the retrospective cohort, a reduction in the use of resources (TISS) and costs of care was appreciated when the goals changed to CMO. However, a more substantial and significant reduction was seen with the proactive interventions of the palliative care consultants. This illustrates the usefulness of a palliative care perspective in assisting the ICU staff to recognize which interventions have lost their benefit when the context of care changes to a focus on comfort care only. Interestingly, the increased presence of a proac-

### Table 3—Changes in TISS Points (ΔTISS) and Estimated Costs After First DNR Order (Withhold vs CMO) Was Established for Both Groups

<table>
<thead>
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<tbody>
<tr>
<td>MOSF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔTISS, withhold (TISS points)</td>
<td>1.8 ± 1.3 (n = 16)</td>
<td>4.1 ± 2.2 (n = 14)</td>
<td>0.37</td>
</tr>
<tr>
<td>Spared daily costs, withhold (US$)</td>
<td>634 ± 445</td>
<td>1,444 ± 780</td>
<td>0.84</td>
</tr>
<tr>
<td>ΔTISS, CMO (TISS points)</td>
<td>12.0 ± 5.6 (n = 4)</td>
<td>25.6 ± 2.4 (n = 7)</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Spared daily costs, CMO (US$)</td>
<td>4,200 ± 1,959</td>
<td>8,950 ± 836</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>GCI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔTISS, withhold (TISS points)</td>
<td>3.8 ± 2.0 (n = 11)</td>
<td>4.3 ± 2.3 (n = 8)</td>
<td>0.41</td>
</tr>
<tr>
<td>Spared daily costs, withhold (US$)</td>
<td>1,341 ± 697</td>
<td>1,516 ± 791</td>
<td>0.41</td>
</tr>
<tr>
<td>ΔTISS, CMO (TISS points)</td>
<td>19.4 ± 4.1 (n = 5)</td>
<td>15.4 ± 2.5 (n = 12)</td>
<td>0.34</td>
</tr>
<tr>
<td>Spared daily costs, CMO (US$)</td>
<td>6,790 ± 1,437</td>
<td>5,390 ± 993</td>
<td>0.27</td>
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</table>
tive case finding approach not only increased utilization for the study protocol but also contributed to an increase in consultation about other patients with a poor prognosis who were not in the populations being studied. The increased presence in the ICU also contributes to bridging the educational gap of clinicians and sets grounds for incorporating palliative care into the critical care culture and curriculum.

Potential limitations to our study exist. Our sample is relatively small, temporal changes in a before/after study cannot be controlled, and it is a study conducted in a single institution with unique characteristics, such as the existence of an in-hospital palliative care program; therefore, our results may not be generalizable to other institutions.

In summary, our results suggest that a gap between what needs to be known and practiced, and what is currently demonstrated about end-of-life care in the ICU persists. Until this gap is bridged, the interventions of a proactive palliative care consultant will produce measurable improvements in patient care with regard to early identification of a poor prognosis, facilitation of changing treatment goals to comfort measures only, and implementation of palliative care interventions. These improvements result in a reduction in hospital and ICU length of stay, a reduction in the use of nonbeneficial resources with a concomitant savings in the cost of care.

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