ORIGINAL ARTICLE

Randomized Trial of Communication Facilitators to Reduce Family Distress and Intensity of End-of-Life Care

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Abstract

Rationale: Communication with family of critically ill patients is often poor and associated with family distress.

Objectives: To determine if an intensive care unit (ICU) communication facilitator reduces family distress and intensity of end-of-life care.

Methods: We conducted a randomized trial at two hospitals. Eligible patients had a predicted mortality greater than or equal to 30% and a surrogate decision maker. Facilitators supported communication between clinicians and families, adapted communication to family needs, and mediated conflict.

Measurements and Main Results: Outcomes included depression, anxiety, and post-traumatic stress disorder (PTSD) among family 3 and 6 months after ICU and resource use. We identified 488 eligible patients and randomized 168. Of 352 eligible family members, 268 participated (76%). Family follow-up at 3 and 6 months ranged from 42 to 47%. The intervention was associated with decreased depressive symptoms at 6 months ($P = 0.017$), but there were no significant differences in psychological symptoms at 3 months or anxiety or PTSD at 6 months. The intervention was not associated with ICU mortality (25% control vs. 21% intervention; $P = 0.615$) but decreased ICU costs among all patients (per patient: \$75,850 control, \$51,060 intervention; $P = 0.042$) and particularly among decedents (\$98,220 control, \$22,690 intervention; $P = 0.028$). Among decedents, the intervention reduced ICU and hospital length of stay (28.5 vs. 7.7 d and 31.8 vs. 8.0 d, respectively; $P < 0.001$).

Conclusions: Communication facilitators may be associated with decreased family depressive symptoms at 6 months, but we found no significant difference at 3 months or in anxiety or PTSD. The intervention reduced costs and length of stay, especially among decedents. This is the first study to find a reduction in intensity of end-of-life care with similar or improved family distress.

Clinical trial registered with www.clinicaltrials.gov (NCT 00720200).

Keywords: palliative care; critical care; communication; family; randomized trial

At a Glance Commentary

Scientific Knowledge on the Subject: Communication with the family of critically ill patients is often poor, and poor communication is associated with family distress and increased intensity of care at the end of life.

What This Study Adds to the Field: This randomized trial of an intensive care unit communication facilitator is the first study to suggest that a communication intervention is associated with a reduction in intensity of end-of-life care and similar or improved family distress.

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The intensive care unit (ICU), with high mortality, represents an important setting for high-quality communication about goals of care and implementation of palliative care (1–3). Even for patients who survive the ICU, palliative care issues are often salient for patients and their family (4). Several prior trials have provided "proof of concept" by showing that ICU interventions designed to improve clinician-family communication can improve quality of care. For example, a randomized trial evaluated routine ethics consultation for patients "in whom value-related treatment conflicts arose" (5). By focusing on improving communication and addressing ethical dilemmas, these consultations reduced the number of days patients spent in the ICU before death. Another randomized trial showed that, among ICU patients expected to die within a few days, a proactive family conference and bereavement pamphlet resulted in improvements in family symptoms of depression, anxiety, and post-traumatic stress disorder (PTSD) at 3 months (6). Additional studies, both before-after and randomized trials, suggest benefit with ethics or palliative care consultation in the ICU (7–9).

In combination, these studies suggest interventions using an interprofessional team to improve communication with families can improve patient care and family outcomes (10). However, precise mechanisms for improving communication are unclear, and limitations exist in access to enough ethicists or palliative care specialists to provide this service for all who would benefit (11). In addition, some studies designed to integrate palliative care or improve communication with family members of critically ill patients have not shown improvement, raising questions about the efficacy of such interventions (12–14). Importantly, no study to date has shown both reduced intensity of end-of-life care and improved family outcomes.

We evaluated an intervention designed to improve goals-of-care discussions and palliative care in the ICU by improving communication between the ICU team and families of critically ill patients. This interprofessional intervention was a nurse or social worker trained to improve communication between the ICU team and the family by acting as a communication facilitator or navigator. We hypothesized that the intervention would reduce family members' psychological symptoms 3 and 6 months after the intervention and, for the subset of patients who died in the ICU, reduce ICU and hospital length of stay and costs of care.

Methods

Trial Design

This study is a parallel-group randomized trial of a "communication-facilitator" intervention, designed to improve communication between clinicians and families for patients who are critically ill. A description of the trial design was published previously and registered at ClinicalTrials.gov (NCT00720200) (15). Patients were randomly assigned to either the intervention or usual care. Communication facilitators assisted families of patients by providing communication support during the ICU stay. The primary outcome was a measure of family members' symptoms of depression; secondary outcomes included symptoms of anxiety and PTSD. Symptoms were assessed 3 and 6 months after the patient died in, or was discharged from, the ICU. Secondary outcomes also included ICU and hospital length of stay and costs, both overall and stratified by mortality status. To characterize mechanisms of the intervention on length of stay, we also examined ICU and hospital mortality and proportion of patients with life-support withdrawal and time to withdrawal of life support.

Study Setting and Randomization

Subjects were identified from ICUs in two hospitals: an academic level-one trauma center and a community-based hospital. Recruitment occurred from five ICUs in these hospitals that included a range of physician staffing models from "closed" ICU with intensivist physicians to "open" ICU with optional intensivist consultation; nurse staffing ratios ranged from 1:1 to 1:3. Patients were randomly assigned to intervention or control in a 1:1 ratio. Randomization was stratified by hospital in block sizes of six, with results provided to study staff in sealed, opaque, consecutively numbered envelopes.

Participant Eligibility and Recruitment

Eligibility criteria allowed us to identify patients with approximately 30% hospital mortality. Study staff screened ICU census daily for ICU patients meeting the following criteria: (*1*) in ICU for more than 24 hours; (*2*) age greater than 18 years; (*3*) mechanically ventilated at enrollment; (*4*) Sequential Organ Failure Assessment (SOFA) score greater than or equal to six or diagnostic criteria predicting a greater than or equal to 30% risk of hospital mortality (16, 17); (*5*) legal surrogate decision maker to consent for patient participation; and (*6*) a family member able to come to the hospital. Eligibility criteria for family members included age greater than 18 and able to complete consent process and questionnaires in English. Eligibility criteria were changed during the trial to improve recruitment: the required SOFA score was lowered from greater than or equal to 10 to greater than or equal to six. Institutional review board approval was obtained from both sites.

Description of the Intervention

The intervention, described previously (15), used a communication facilitator to increase families' and clinicians' self-efficacy expectations about communication in the ICU. It included the following: (*1*) interviews by facilitators with family to understand the family's concerns, needs, and communication characteristics; (*2*) meetings by facilitators with physicians, nurses, or other clinicians offering brief summary of family concerns, needs, and communication characteristics; (*3*) provision of communication and emotional support adapted to the family member's attachment style (*see* Table E1 in the online supplement); (*4*) facilitator participation in family conferences; and (*5*) 24-hour follow-up with the family after discharge to acute care.

Training the Facilitators

The facilitators, a nurse and social worker, received training in the following: (*1*) existing evidence in the conduct of clinician-family communication in the ICU; (*2*) understanding of attachment styles, consequences of each style for interpersonal relationships, and communication approaches most appropriate for each style (*see* Table E1); and (*3*) six steps of mediation (preparation; mediator opening; presentation of the case; information gathering and exchange; development and evaluation of options; and resolution). Investigators expert in each component led a 2-day training that

included didactics and role-playing. Facilitators demonstrated mastery of required skills as assessed qualitatively by investigators. After training, facilitators met with investigators quarterly to review cases and confirm fidelity.

Outcomes

Psychological symptoms. We chose measures of psychological symptoms based on their validity and reliability and their direct relationship to diagnostic criteria in *Diagnostics and Statistical Manual of Mental Disorders-IV*. However, we used these measures not to identify clinical psychiatric illness, but rather as a marker of the burden of psychological stress associated with having a critically ill family member. We used previously validated measures of symptoms of depression (Patient Health Questionnaire [PHQ]-9), anxiety (Generalized Anxiety Disorder-7), and PTSD (PTSD Checklist Civilian Version [PCL]). Family symptoms of depression, measured by the PHQ-9, was the primary outcome. *A priori*, we selected the adjusted PHQ-9 score at both 3 and 6 months as the primary outcome: adjusted because we were not confident randomization would adequately control for baseline differences in this small clustered trial and at both 3 and 6 months because we did not have the preliminary data to select one time-point. The PHQ-9 is well validated (18–20). A minimal clinically important difference (MCID) is defined as five points (19, 21–25). For further details on these measures, *see* the online supplement. The PHQ-9 and Generalized Anxiety Disorder-7 were administered at baseline, 3 months, and 6 months. The PCL was administered at 3 and 6 months.

Length of stay. ICU length of stay for decedents has been shown to be a responsive measure for communication interventions in the ICU (8, 26, 27).

Costs of care. Total ICU and hospital costs were obtained from administrative financial databases providing indirect and direct costs and including all facility and professional fees, with the exception of physician fees. In these hospitals, physician fees are not generated similarly and were therefore excluded. All costs were converted to thousands of dollars, adjusted for inflation and compared at the 2013 U.S. dollars. Average daily costs were calculated by dividing total costs by length of stay. Although costs of care track closely with length of stay, this cost accounting allowed us to assess costs and length of stay separately (28, 29).

Data Collection

Family members were provided a baseline survey at the enrollment visit that was conducted in-person; the survey assessed attachment styles and baseline depression and anxiety. Follow-up surveys assessing depression, anxiety, and PTSD were mailed to family members' homes 3 and 6 months after the patient's death or ICU discharge.

Analyses

The patient was the unit of randomization, with randomization group the primary predictor. For analysis of family reported outcomes, we used clustered regression models (family members clustered under patients) and included all family members who met inclusion criteria (completion of a baseline questionnaire within 2 wk and a follow-up questionnaire within 60 d of distribution) and who had complete data on the outcome, its value at baseline, and any variables confounding the association between intervention and outcome. We used tobit regression for depression and anxiety outcomes (because of floor effects), robust linear regression for PTSD and costs, logistic regression for hospital mortality, and Cox regression for length of stay. All estimation used restricted maximum likelihood. This was a "complete case" analysis. To assess for potential effect of missing data, we evaluated all 325 family members using full information maximum likelihood (FIML) estimation models and these results gave similar findings (*see* Table E2). FIML is a method for missing-data handling using all available data points (30). Finally, although our *a priori* approach was to adjust for baseline characteristics, we also conducted secondary analyses without baseline data and our results were comparable (data not shown). Regression models were run with Mplus software (http://www.statmodel.com/).

We tested for confounding only if unadjusted associations between the intervention and outcome had P less than or equal to 0.20. Confounders were defined based on a change of greater than or equal to 10% in the coefficient for randomization, compared with baseline models. Potential confounders included patient sex, age, SOFA score at enrollment, length of hospital stay, mortality status, and hospital; family member's sex, age, racial/ethnic status, education, legal next of kin status, length of acquaintance with patient, relationship to patient (spouse, parent, or child), and baseline health status. We also assessed associations for interaction between randomization status and patient mortality and report these findings when the interaction term was significant. Significant findings were defined as P less than or equal to 0.05.

Given the loss to follow-up, we also examined whether baseline scores of depression and anxiety were associated with loss to follow-up at 3 or 6 months. These variables showed no association with loss to follow-up (*see* Table E3).

We based our sample size on the PHQ-9 using the following: (*1*) an intraclass correlation coefficient of 0.44, (*2*) average cluster size of three family members per patient, (*3*) effect size of 0.20 to be powered to detect small changes less than the PHQ-9 MCID (19, 23), (*4*) alpha of 0.05, and (*5*) power of 0.80. These parameters suggested a total of 350 family members (175 per group) would enable us to identify family members who benefitted from the intervention. Sample-size calculations were completed with Optimal Design (http://sitemaker.umich.edu/group-based/optimal_design_software).

Results

From November 24, 2008, to October 27, 2013, we screened 2,209 ICU patients for eligibility, of which 1,721 did not meet inclusion criteria (Figure 1). Family members for 488 patients were approached for participation with 160 family members refusing participation, 138 not meeting family eligibility requirements, 20 experiencing patient death before consent, and 170 enrolled; two family members withdrew before randomization. The family member participation rate was 76% (268 of 352). The 168 randomized patients had 268 family members who participated, with 51% (n = 137) associated with control patients (n = 86) and 49% (n = 131) associated with intervention patients (n = 82). Table 1 shows baseline characteristics for patients and family members. As part of the intervention, the

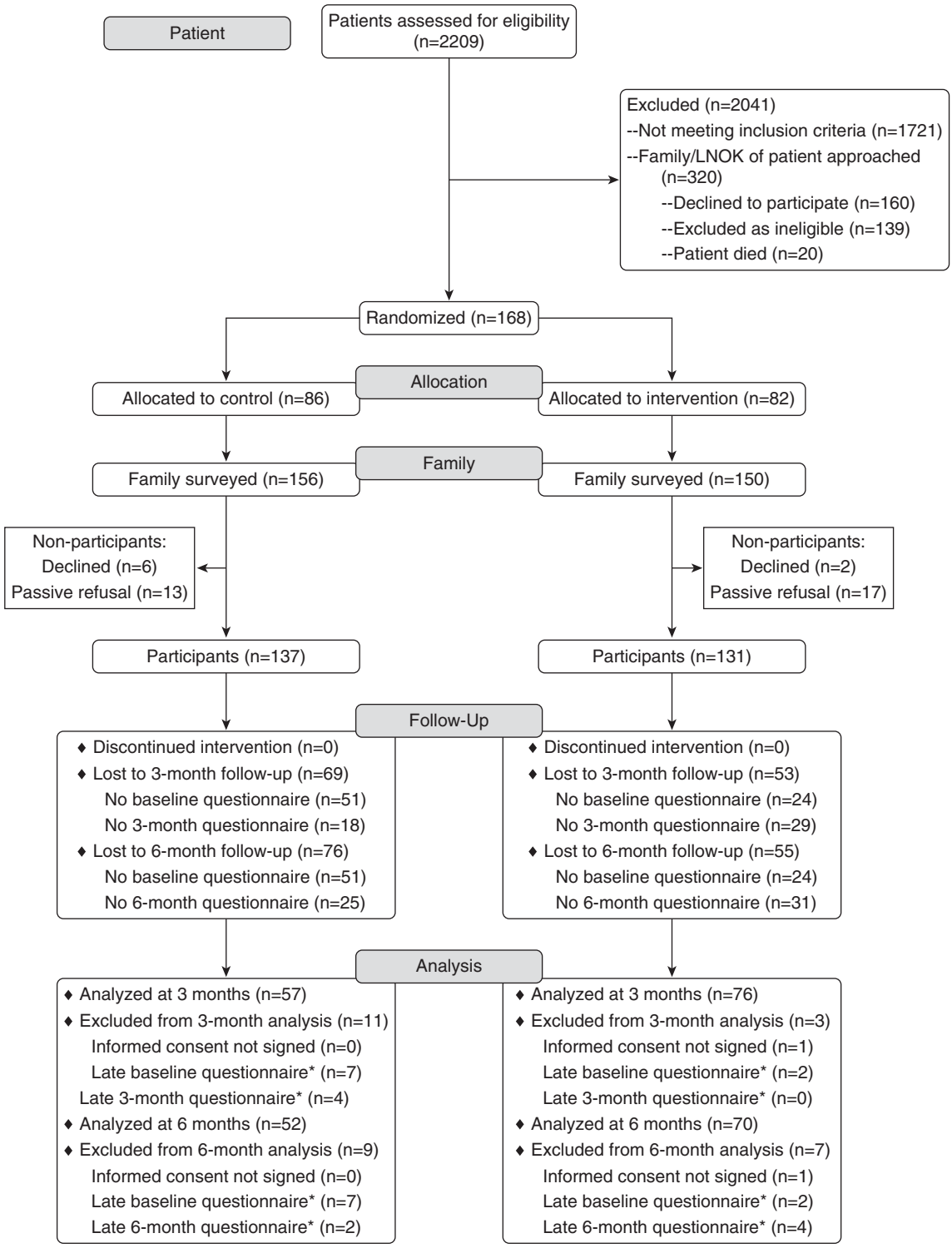

Figure 1. Flow diagram of patient and family sample development. *Baseline data were too late if the questionnaire was completed more than 14 days after distribution; follow-up data were too late if the questionnaire was completed more than 60 days after distribution. LNOK = legal next of kin.

facilitators had an average of 9.4 contacts with family members per family (SD, 6.5) and spent an average of 267 minutes with family members per family (SD, 211).

Depression

For the assessment of depression at 3 months, 118 respondents had valid data on all variables (including six confounders). Among these 118 family members, mean unadjusted scores on depression increased by 0.76 points between baseline and 3-month follow-up (4.88–5.64) in the control group,

Table 1. Characteristics of Study Participants

	Control Group		Intervention Group	
	Valid (*n*)	Statistic	Valid (*n*)	Statistic
Patients	86		82	
Female, n (%)	86	33 (38.4)	82	27 (32.9)
Age, mean (SD)	86	55.3 (18.8)	82	52.1 (17.2)
Hispanic, n (%)	10	1 (10.0)	12	2 (16.7)
Race, n (%)	78		71	
White		66 (84.6)		58 (81.7)
African American		4 (5.1)		8 (11.3)
Asian		5 (6.4)		3 (4.2)
Native American		2 (2.6)		1 (1.4)
Native Hawaiian		1 (1.3)		0 (0.0)
Other or mixed race		0 (0.0)		1 (1.4)
Racial/ethnic minority, n (%)	79	13 (16.5)	73	15 (20.5)
SOFA score, mean (SD)	83	9.9 (2.9)	81	9.8 (3.4)
DNR in place at time of ICU admit, n (%)	79	1 (1.3)	74	2 (2.7)
Died during or immediately after ICU stay, n (%)	86	25 (29.1)	82	21 (25.6)
Family members	137		131	
Female, n (%)	137	96 (70.1)	131	93 (71.0)
Age, mean (SD)	105	52.4 (14.2)	121	49.5 (12.0)
Hispanic, n (%)	109	5 (4.6)	119	5 (4.2)
Race, n (%)	109		121	
White		90 (82.6)		105 (86.8)
African American		4 (3.7)		7 (5.8)
Asian		4 (3.7)		1 (0.8)
Native American		6 (5.5)		3 (2.5)
Native Hawaiian		1 (0.9)		0 (0.0)
Other or mixed race		4 (3.7)		5 (4.1)
Racial/ethnic minority, n (%)	109	23 (21.1)	122	19 (15.6)
Education, n (%)	109		122	
Eighth grade or less		1 (0.9)		1 (0.8)
Some high school		3 (2.8)		3 (2.5)
High school diploma or equivalent		25 (22.9)		19 (15.6)
Trade school or some college		40 (36.7)		48 (39.3)
Undergraduate degree		22 (20.2)		32 (26.2)
Post-college education		18 (16.5)		19 (15.6)
Legal next of kin, n (%)	136	79 (58.1)	129	86 (66.7)
Relationship to patient, n (%)	137		131	
Spouse/partner		39 (28.5)		39 (29.8)
Child of patient		40 (29.2)		33 (25.2)
Sibling		15 (10.9)		16 (12.2)
Parent of patient		25 (18.2)		27 (20.6)
Other relative		15 (10.9)		12 (9.2)
Friend		2 (1.5)		4 (3.1)
Other relationship		1 (0.7)		0 (0.0)
Years acquainted with patient, mean (SD)	106	36.0 (16.4)	121	30.4 (14.5)

Definition of abbreviations: DNR = do not resuscitate; ICU = intensive care unit; SOFA = Sequential Organ Failure Assessment.

whereas they decreased by 1.96 points (6.61–4.66) in the intervention group ($P = 0.096$) (Table 2). Adjusted depression scores were lower for family members randomized to the intervention, but the between-group difference was not statistically significant.

For the assessment of depression at 6 months, 115 family members had complete data, (including seven confounders). For these 115 respondents, unadjusted depression scores decreased over the 6-month period in both control and intervention groups: 0.42 points (5.55–5.13) for control; and 2.42 points (6.01–3.59) for intervention. Adjusted depression scores were significantly lower for the intervention group than for the control group ($P = 0.017$) (Table 2).

Based on the MCID in the depression severity scale (five points), Figure 2 shows the percentage of family members with an MCID decrease, change less than MCID, or an MCID increase at 3 and 6 months.

Anxiety

For 127 family members with 3-month anxiety outcomes, a model that adjusted only for baseline score showed no association with intervention ($P = 0.502$). Raw scores on anxiety in both groups decreased over the 3-month period, averaging 1.45 points for control (5.37 baseline and 3.91 follow-up) and 1.99 for intervention (5.92 baseline and 3.93 follow-up).

For 117 family members with 6-month anxiety outcomes, a model adjusted only for the baseline score also showed no association with intervention ($P = 0.430$). Average decrease in unadjusted anxiety scores was 1.60 (5.54 baseline and 3.94

Table 2. Association of Intervention with Family-assessed Outcomes*

Outcome	Control Mean†	Intervention Mean†	Family (*n*)	Patient (*n*)	b‡	*P* Value	95% CI
PHQ-9 score							
3 mo§	4.9	3.1	118	83	−1.786	0.096	−3.891 to 0.318
6 mo‖	4.7	2.4	115	85	−2.365	0.017	−4.305 to −0.425
GAD-7 score							
3 mo¶	3.0	2.3	127	90	−0.742	0.502	−2.911 to 1.427
6 mo¶	2.7	1.8	117	86	−0.890	0.430	−3.100 to 1.320
PCL score							
3 mo**	31.6	29.8	126	90	−1.768	0.478	−6.658 to 3.121
6 mo††	30.6	27.1	114	84	−3.515	0.056	−7.124 to 0.095

Definition of abbreviations: CI = confidence interval; GAD = Generalized Anxiety Disorder; PCL = PTSD Checklist–Civilian Version; PHQ = Patient Health Questionnaire; PTSD = post-traumatic stress disorder; SOFA = Sequential Organ Failure Assessment.

*Predictors for each model included randomization group (control or intervention), the baseline score on the outcome variable (if assessed), and any confounders of the intervention effect. If the *P* value for the coefficient in the model with adjustment for baseline score only was >0.20, the search and adjustment for additional confounders was omitted.

†Means for the PCL score at 3 months are observed means. All other means were estimated after adjustment for all confounders, based on the intercept and intervention effect from a model in which all adjustment variables were centered on their mean values. As a result, the adjusted estimates represent the means for a family member who represented the "average" respondent, with respect to the adjustment variables.

‡Estimated effect of the intervention on the outcome. Estimates were based on clustered tobit regression models (with the outcome defined as censored from below) for PHQ and GAD outcomes, and on clustered linear regression for the PCL outcomes. All models used a restricted maximum likelihood estimator.

§Adjustment variables were the patient's SOFA score at study enrollment, and mortality status at hospital discharge; and the family member's age, legal next of kin status, length of acquaintance with the patient, and baseline report of end-of-life treatment discussion with the patient.

‖Adjustment variables were the patient's age at study enrollment and mortality status at hospital discharge; and the family member's age, length of acquaintance with patient, and relationship to patient (dummy indicators for spouse, parent, and child).

¶Adjusted for baseline GAD score.

**Single-predictor model without adjustments.

††Adjustment variables were the patient's age at study enrollment and mortality status at hospital discharge; and the family member's baseline PHQ score, age, years of acquaintance with the patient, and relationship to the patient (dummy indicators for parent and child).

follow-up) for control and 2.30 (5.58 baseline and 3.28 follow-up) for intervention.

Post-traumatic Stress Symptoms

For 126 family members with a valid PCL score at 3 months, the intervention was not associated with lower PCL scores ($P = 0.478$) (Table 2). The average PCL score at 3-month follow-up was 31.57 for control and 29.81 for intervention.

There were 114 family members with complete data at 6 months on the PCL score (including seven confounders). The mean unadjusted PCL score at 6 months was 30.52 for control and 27.09 for intervention. After adjustment for confounders, the intervention effect at 6 months fell just short of statistical significance ($P = 0.056$).

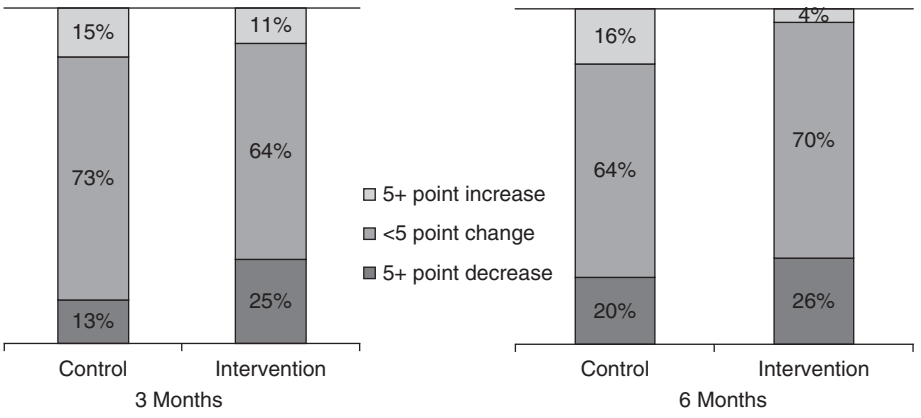

Figure 2. Proportion of family members with a minimal clinically important change in symptoms of depression between baseline and 3- or 6-month follow-up.

Mortality and Withdrawal of Life Support

Unadjusted mortality was not statistically different between groups: 29% control versus 26% for ICU mortality ($P = 0.615$); 37% control versus 27% intervention for hospital mortality ($P = 0.201$) (Table 3). Of 48 patients who died in the hospital, 36 (75%) had life-sustaining treatments withdrawn before death; this did not differ significantly between groups (71.4% control vs. 80.0% intervention; $P = 0.737$). Time to withdrawal of life-sustaining treatments was significantly longer for control (16.5 d) than intervention (7.2 d; $P = 0.001$).

Length of Stay

There was significant interaction between randomization group and mortality status in the associations with ICU length of stay ($P = 0.001$). Among decedents, patients in the intervention group had significantly shorter ICU stays than the control group ($P = 0.001$) (Table 3), whereas among survivors the difference between groups was nonsignificant ($P = 0.589$).

There was also significant interaction between randomization group and hospital

Table 3. Association of Intervention with Processes of Care: Patient Mortality and Length of Stay*

Outcome	Valid (*n*)	Control†	Intervention†	b‡	95% CI	*P* Value
Patient mortality, %						
In ICU	168	29	26	−0.174	−0.854 to 0.506	0.615
During hospital stay	153	37	27	−0.449	−1.136 to 0.239	0.201
ICU stay, mean d	168	21.4	17.4	0.161	−0.141 to 0.463	0.297
Decedents§	46	28.5	7.7	1.151	0.456 to 1.847	0.001
Survivors	122	19.1	20.0	−0.099	−0.571 to 0.260	0.589
Hospital stay,‖ mean d	153	32.6	24.1	0.545	0.235 to 0.855	0.001
Decedents§	49	31.8	8.0	1.194	0.516 to 1.872	0.001
Survivors	104	32.5	30.6	0.129	−0.253 to 0.511	0.508

Definition of abbreviations: CI = confidence interval; ICU = intensive care unit.
*Predictors for each model included randomization group (control or intervention) and any confounders of the intervention effect. If the *P* value for the coefficient in the unadjusted model was >0.20, the search and adjustment for additional confounders was omitted. The sample for ICU mortality and length of stay included all patients; the sample for hospital mortality and length of stay included patients for whom permission was given for chart abstraction.
†The descriptive statistics (means or percentages) for unadjusted models are the observed values from the sample. For adjusted models, the means were estimated from the intercept and intervention effect in a robust linear regression model in which all confounders were centered on their mean values. As a result, these values represent the estimated means for a patient who represented the "average" patient, with respect to the confounding variables.
‡Estimated effect of the intervention on the outcome. Estimates were based on logistic regression for the patient mortality outcome and on Cox regression for the length-of-stay outcomes. Cox models defined all cases as "failing" at the end of the time period. All models used a restricted maximum likelihood estimator. The slopes in the Cox models for length of stay represent risk for death/discharge; therefore, a positive value indicates greater instantaneous risk for death/discharge among patients in the intervention group and a shorter length of stay.
§Adjusted for patient age.
‖Adjustment variables were the patient's mortality status at hospital discharge, age, and sex.

mortality status for hospital length of stay ($P = 0.006$). Among decedents, patients in the intervention group had significantly shorter hospital stays than control subjects ($P = 0.001$) (Table 3), whereas among survivors the difference between groups was nonsignificant ($P = 0.508$).

Costs

ICU costs. ICU costs were significantly reduced overall in the intervention group ($P = 0.042$) (Table 4). However, there was some evidence of an interaction ($P = 0.054$) between randomization condition and ICU mortality on total ICU costs, with the intervention significantly associated with reduced costs only among patients who died in the ICU ($P = 0.028$). Although partly a function of shorter ICU stays by patients in the intervention group, the cost differential was not entirely explained by shorter stays. Average ICU costs per day were also significantly lower in the intervention group (b = −0.323; $P = 0.010$).

Hospital costs. Total hospital costs were also significantly reduced overall in the intervention group ($P = 0.030$). The intervention interacted significantly with hospital mortality status ($P = 0.030$), with the intervention effect significant only among patients who died in the hospital ($P = 0.006$). There was no intervention effect on average daily hospital costs (b = 0.049; $P = 0.877$).

Discussion

This randomized trial suggests that a communication facilitator may be associated with a reduction in symptoms of depression among family of critically ill patients 6 months after critical illness, but we found no significant difference at 3 months and no significant difference in symptoms of anxiety or PTSD. It is unclear why we might find significant improvements at 6 months but not 3 months; it may be that differences at 6 month are true, because 3-month levels of depression showed similar differences that did not achieve statistical significance. However, it is also possible that 6-month differences were spurious, given no change in symptoms of anxiety or PTSD. A prior randomized trial found that an intervention to improve ICU communication was associated with decreased levels of depression, anxiety, and PTSD among family 3 months after a patient died in the ICU (6). Importantly, this prior trial reported much higher levels of anxiety, depression, and PTSD with usual care than our study, which would make it easier to show positive results. Because our findings were consistent among families of patients who died and those who survived, this suggests improved communication can enhance family outcomes regardless of patient outcome.

We also found reductions in ICU and hospital length of stay associated with our intervention. These reductions were significant only among patients who died, suggesting a primary mechanism for reducing length of stay was earlier decisions to withdraw life-sustaining treatments. Importantly, we did not find an increase in mortality in our study, suggesting that these earlier decisions did not result in increased mortality. Although it is not standard to stratify by patient outcome in a randomized trial, we believe this is an important analytic approach supported by findings from prior studies suggesting effect modification by patient mortality status with reduced length of stay among patients who die but no evidence of reductions in length of stay for survivors (5, 27, 31–33). A novel and important finding of this study was the combination of reduced length of stay with decreased or similar symptoms of depression, suggesting that making earlier decisions about withdrawing life support can be done in a way that reduces or at least does not increase the psychological burden of these decisions for families.

Table 4. Association of Intervention with Processes of Care: ICU and Hospital Costs*

Outcome	n†	Patient Means (*Thousands of Dollars*)‡ Control	Intervention	b§	95% CI	*P* Value
ICU costs‖						
All patients¶	151	75.85	51.06	−24.790	−48.680 to −0.901	0.042
Survivors**††	107	66.38	61.29	−5.092	25.097 to 14.912	0.618
Decedents¶**	44	98.22	22.69	−75.530	−142.857 to −8.203	0.028
Average daily ICU costs‖						
All patients‡‡	151	3.38	3.06	−0.323	−0.568 to −0.078	0.010
All hospital costs‖						
All patients¶	152	170.74	123.12	−47.576	−90.484 to −4.669	0.030
Survivors††§§	104	161.76	150.85	−10.901	−51.805 to 30.003	0.601
Decedents¶§§	48	184.97	50.78	−134.190	−230.239 to −38.142	0.006

Definition of abbreviations: CI = confidence interval; ICU = intensive care unit.
*Analyses were based on robust linear regression with restricted maximum likelihood estimation.
†The sample included patients for whom the legal next of kin provided permission for medical record abstraction and for whom data were available on costs and confounders (if the model included confounder adjustment).
‡For unadjusted models, the means are the observed means for the two samples. For adjusted models, means were estimated from the intercept and the slope for the intervention group in a model in which the covariates were centered on their sample means; these estimates, therefore, represent estimates for an "average" patient, with respect to the confounding variables.
§Estimated regression coefficient for the outcome regressed on the patient's randomization group (0 = control, 1 = intervention) with adjustment for any confounders indicated in the row header.
‖Costs were defined in thousands of dollars, adjusted for inflation to 2013 values.
¶Adjusted for patient age.
**Mortality status was assessed at time of ICU discharge.
††Unadjusted model; the *P* value in the unadjusted model did not warrant testing for confounders.
‡‡Unadjusted model; there were no confounders of the association between randomization group and this outcome. There was also no effect modification by mortality status and therefore data shown for all patients.
§§Mortality status was assessed at the time of hospital discharge.

Our study also examined costs of care as a measure of intensity of care. Prior investigators found that ICU costs are tightly correlated with length of stay (34). Interestingly, we found the intervention also had a direct effect on average daily ICU costs, suggesting that the intervention led to a reduction in costs of care beyond that observed by reducing ICU length of stay. This finding did not persist when examining average daily hospital costs, which is not surprising because our intervention did not continue after the ICU and because cost of care is less variable in acute care than the ICU.

Our study has several important limitations. First, our sample size was below our target. Difficulties with recruiting patients with a high severity of illness caused us to modify entry criteria to lower the SOFA score for eligibility (from 10 to 6), and frequent unavailability of family limited enrollment. Second, we had important loss to follow-up for family members. Although the use of FIML to address missing data showed similar results, this remains an important limitation. Importantly, baseline depression and anxiety scores were not associated with loss to follow-up providing some evidence that this limitation did not affect the internal validity of this study. Third, our intervention involved the skill of two facilitators; it is not possible to know if our intervention would be generalizable to others or if our training program is the best approach. Nonetheless, this study demonstrates that an individual trained to facilitate communication between the ICU team and family can enhance family outcomes and reduce costs of end-of-life care. Fourth, it is possible that there could be contamination of the control group during this study, which could bias our results toward the null. Finally, this study took place in two hospitals and may not be generalizable to other sites. These hospitals have participated in quality improvement to enhance palliative care in the ICU, which might enhance the quality of palliative care in "usual care" (12, 35). If true, our results may represent a conservative estimate of the treatment effect.

The ICU represents a location where patients have a high severity of illness, where family members are often placed in the position of surrogate decision making, and where family members have a significant burden of psychological symptoms. A communication facilitator, trained to improve communication between the ICU team and family, may be associated with reduced symptoms of depression for family members 6 months after the ICU, although we did not find significant differences at 3 months and did not find significant differences in symptoms of anxiety or depression. Therefore, we believe the difference in depression at 6 months should be viewed as exploratory. Importantly, the intervention was also associated with reduced length of stay and costs for patients who died, suggesting reduced intensity of end-of-life care was achieved with no changes in or with reduced family distress. Although we do not believe this intervention is ready for widespread implementation, we do believe our results warrant additional study. Future studies are needed to identify the most effective and cost-effective interventions to support families of critically ill patients and reduce the intensity of nonbeneficial care at the end of life. ■

Author disclosures are available with the text of this article at www.atsjournals.org.

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