Assessment of Clinical Palliative Care Trigger Status vs Actual Needs Among Critically Ill Patients and Their Family Members

Christopher E. Cox, MD, MPH; Deepshikha Charan Ashana, MD, MBA, MS; Krista L. Haines, DO; David Casarett, MD; Maren K. Olsen, PhD; Alice Parish, MSPH; Yasmin Ali O’Keefe, MD; Mashael Al-Hegelan, MD; Robert W. Harrison, MD; Colleen Naglee, MD; Jason N. Katz, MD, MS; Allie Frear, BS; Elias H. Pratt, MD; Jessie Gu, MD; Isaretta L. Riley, MD, MPH; Shirley Otis-Green, MSW, MA; Kimberly S. Johnson, MD; Sharron L. Docherty, RN, PhD

Abstract

IMPORTANCE Palliative care consultations in intensive care units (ICUs) are increasingly prompted by clinical characteristics associated with mortality or resource utilization. However, it is not known whether these triggers reflect actual palliative care needs.

OBJECTIVE To compare unmet needs by clinical palliative care trigger status (present vs absent).

DESIGN, SETTING, AND PARTICIPANTS This prospective cohort study was conducted in 6 adult medical and surgical ICUs in academic and community hospitals in North Carolina between January 2019 and September 2020. Participants were consecutive patients receiving mechanical ventilation and their family members.

EXPOSURE Presence of any of 9 common clinical palliative care triggers.

MAIN OUTCOMES AND MEASURES The primary outcome was the Needs at the End-of-Life Screening Tool (NEST) score (range, 0-130, with higher scores reflecting greater need), which was completed after 3 days of ICU care. Trigger status performance in identifying serious need (NEST score ≥30) was assessed using sensitivity, specificity, positive and negative likelihood ratios, and C statistics.

RESULTS Surveys were completed by 257 of 360 family members of patients (71.4% of the potentially eligible patient-family member dyads approached) with a median age of 54.0 years (IQR, 44-62 years); 197 family members (76.7%) were female, and 83 (32.3%) were Black. The median age of patients was 58.0 years (IQR, 46-68 years); 126 patients (49.0%) were female, and 88 (33.5%) were Black. There was no difference in median NEST score between participants with a trigger present (45%) and those with a trigger absent (55%) (21.0; IQR, 12.0-37.0 vs 22.5; IQR, 12.0-39.0; P = .52). Trigger presence was associated with poor sensitivity (45%; 95% CI, 34%-55%), specificity (55%; 95% CI, 48%-63%), positive likelihood ratio (1.0; 95% CI, 0.7-1.3), negative likelihood ratio (1.0; 95% CI, 0.8-1.2), and C statistic (0.50; 95% CI, 0.44-0.57).

CONCLUSIONS AND RELEVANCE In this cohort study, clinical palliative care trigger status was not associated with palliative care needs and no better than chance at identifying the most serious needs, which raises questions about an increasingly common clinical practice. Focusing care delivery on directly measured needs may represent a more person-centered alternative.
Introduction

Critical illness is deeply challenging for the millions of persons who experience it in intensive care units (ICUs) each year. Patients often experience serious symptoms as well as depersonalized death in this technology-focused setting. Their family members commonly report severe stress, decisional conflict related to goals of care for their loved ones, and feeling unsupported in a complex environment staffed by multiple clinicians.

Palliative care is a core attribute of high-quality ICU care because it aims to improve or maintain quality of life and alleviate symptoms by addressing unmet needs of those with serious illness. However, ICU-based palliative care is highly variable because there is no consensus on how to identify those most likely to benefit, deliver the appropriate level of primary or specialist palliative care, or measure its association with person-centered outcomes. Although the consultative model of specialist palliative care has dominated practice for decades, intensivists order these consultations infrequently and often late in the course of a patient’s stay in an ICU. To increase the presence of palliative care specialists in ICUs, professional societies and experts have recommended protocols that trigger specialist consultation based on clinical characteristics associated with death or resource utilization, such as advanced cancer or cardiac arrest.

Although trigger status-based protocols have been increasingly implemented in a variety of clinical settings by health care systems worldwide, it is not known whether such clinical and resource utilization triggers are acceptable proxy measures of palliative care needs such as symptoms, decisional conflict, spiritual concerns, or misalignment of values and treatments. An additional concern about these protocols is the dramatic imbalance between the enormous number of persons with a trigger criterion present—more than 2 million patients treated in ICUs each year—and the fewer than 7600 palliative care specialists in the US. Because this resource of palliative care is operationally scarce and geographically inconsistent, it is critical that palliative care specialists be appropriately matched with those patients and family members most likely to benefit and optimally integrated with the primary care teams caring for them in both outpatient and inpatient settings.

The primary aim of this prospective cohort study was to test the hypothesis that higher levels of family member-reported palliative care needs would be observed among those whose critically ill loved ones met a clinical palliative care trigger compared with those who did not meet such a trigger. We also assessed the performance characteristics of the presence of a clinical palliative care trigger for identifying the most serious needs.

Methods

Study Design, Setting, and Participants

We conducted an observational cohort study of 257 dyads (1 patient in an ICU and 1 family member of each patient) in 6 adult medical and surgical ICUs in 1 academic hospital and 1 large community hospital in the Duke University Health System between January 2019 and September 2020. The study was approved by Duke University Institutional Review Board. All participants or their legal representatives provided written informed consent. We followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

To construct a cohort of seriously ill persons, we included consecutive patients 18 years or older who received mechanical ventilation for 48 hours or longer. Exclusion criteria were the presence of decisional capacity, given our focus on surrogate decision makers; clinician expectation of death within 24 hours; imminent plan for comfort care; imprisonment; and lack of an available family member. Previous palliative care consultation during the admission was not a criterion for exclusion. We enrolled 1 adult family member per patient who self-identified as the individual most involved in the patient’s care. Family members were excluded if they lacked sufficient English fluency to
complete study surveys. We aimed to obtain informed consent after 2 to 3 full days of ICU care to allow time for the completion of an ICU team-led family meeting.24

Data Collection and Outcomes
Family members completed electronic surveys through secure weblinks automatically emailed or sent by SMS text from the study web-based survey data system (REDCap; Vanderbilt University) at the time of consent.25 Clinical data were abstracted manually by study staff from the electronic medical records.

Family-Reported Measures
The primary outcome was the Needs at the End-of-Life Screening Tool (NEST).26,27 The NEST had been previously adapted to the ICU setting in a series of validation studies that included item derivation, formal cognitive testing with ICU family members, comparison with standard symptom and communication instruments including those used in this study, and evaluation of responsiveness.25 The 13-item NEST (score range, 0 [no need] to 130 [highest need]) assesses needs in all 8 domains of palliative care quality, including structure and processes, physical symptoms, psychological symptoms, social support, spiritual and cultural aspects of care, end-of-life care, and ethical aspects of care.28

Secondary outcomes included family report of goal-concordant care, a dichotomous outcome that compares actual with preferred treatment (yes indicates that actual treatment provided is identical to preferred treatment; no indicates that actual treatment differs from preferred treatment),29 and the Quality of Communication scale summary item (score range, 0 [worst] to 10 [best]).30 We quantified depression symptoms using the 9-item Patient Health Questionnaire (PHQ-9; score range, 0 [lowest] to 27 [highest]),31 anxiety symptoms with the Generalized Anxiety Disorder 7-item scale (GAD-7; score range, 0 [lowest] to 21 [highest]),32 and posttraumatic stress disorder symptoms with the Posttraumatic Stress Syndrome inventory (PTSS; score range, 10 [lowest] to 70 [highest]).33 We administered the Interpersonal Processes of Care instrument’s patient-centered decision-making, eliciting concerns, and racial and economic discrimination domains (domain score range, 0 [worst] to 5 [best]).34 We administered Likert-scaled items to measure participants’ relationship with the ICU attending physician, expectation for patient survival, and financial distress.35

Clinical Variables
The primary exposure was any of 9 clinical triggers for palliative care consultation present within the first 48 hours of ICU admission. These clinical triggers, addressing both acute and chronic processes and described in a body of research spanning decades,11,15,19,20,36 included cardiac arrest; advanced cancer; dementia; critical acute neurologic condition; residence in a long-term acute care facility, skilled nursing facility, or inpatient rehabilitation facility; 3 or more limitations in baseline activities of daily living; 2 or more hospital admissions or 1 or more ICU admissions within 3 months; and worsening organ dysfunction (ie, increase between 24 and 48 hours after ICU admission in Sepsis-related Organ Failure Assessment score)37; details can be found in eTable 1 in the Supplement. We also recorded insurance status, comorbidities, diagnoses, Acute Physiology and Chronic Health Evaluation II illness severity scores,38 code status, receipt of palliative care consultation, length of stay, and discharge disposition. Race, ethnicity, and gender were self-reported by participants.

Statistical Analysis
Power calculations to test the primary hypothesis were based on a 1-sided test with a type I error of .025.39 Using an SD of 15 for the NEST,25 a comparison of 100 dyads with triggers present with 100 dyads with triggers absent was estimated to provide 80% power to identify a difference in NEST score less than 6 points (half the range of a single item).
We compared characteristics and outcomes by trigger status using Wilcoxon rank sum, χ², Kruskal-Wallis, or Fisher exact tests as appropriate. The performance of trigger status for identifying serious need was calculated from a 2 × 2 table using sensitivity, specificity, positive and negative predictive values, accuracy, positive and negative likelihood ratios, and C statistics (details in eTable 2 in the Supplement). Previous use of the NEST defined threshold scores for each item (range, ≥3 to ≥6; mean, ≥5). Therefore, serious need was defined as a total NEST score of 30 or higher, reflecting 3 possible scenarios of clinical significance that could prompt clinician concern: an average item score above the threshold of 5 or greater in a majority of domains, extremely high needs (NEST score, 8-10) in a few of the 8 palliative care quality domains sampled, or moderate needs (NEST score, 3-5) for nearly all domains. We also examined NEST score ranges from 10 to 50 in sensitivity analyses.

## Results

### Patient and Family Member Characteristics

Among 1179 consecutive patients screened, 360 potentially eligible patient-family member dyads were approached for enrollment; 262 (72.7%) provided informed consent at a mean (SD) of 4.8 (4.3) days after ICU admission, and 257 dyads (71.4%; 514 participants) had complete data for inclusion in analyses. Patients were generally middle-aged; the median age of participants was 58 years (IQR, 46-68 years). Of the 257 patients in the cohort, 131 (51.0%) were men; 86 (33.5%) self-identified as Black or African American, and 147 (57.2%) self-identified as White. Care was provided for 148 patients (57.6%) in medical ICUs and for 109 patients (42.4%) in surgical ICUs (Table 1). Of the 257 family members in the dyads, 197 (76.7%) were female; 114 (44.4%) were the spouse or partner of the patient; and 124 (48.6%) had received at least some college education. Although it was not a criterion for study exclusion, no dyad had received a palliative care consultation at the time of survey completion.

### Palliative Care Trigger Status Results

#### Clinical Characteristics

A clinical trigger was present for 115 patients (44.7%); triggers included worsening organ dysfunction in 55 patients (47.8%), severe acute neurologic condition in 26 (22.6%), limitations in 3 or more activities of daily living in 24 (20.9%), cardiac arrest in 24 (20.9%), advanced cancer in 22 (19.1%), 1 or more recent ICU admissions in 22 (19.1%), 2 or more hospital admissions in 20 (17.4%), admission from a facility in 18 (15.7%), and dementia in 3 (2.6%). Compared with patients for whom triggers were absent, those with triggers present were older (median age, 62 years; IQR, 52.0-69.0 years vs 54.5 years; IQR, 42.9-67.0 years), although they were otherwise similar in sociodemographic and clinical characteristics.

#### Trigger Status and Outcomes

There was no difference in either the median total NEST score (21.0; IQR, 12.0-37.0 vs 22.5; IQR, 12.0-39.0; P = .52) or the prevalence of serious overall needs (ie, total NEST score ≥30; 38 individuals [33.0%] vs 49 [34.5%]; P = .81; Table 2; eFigure in the Supplement) between family members of patients with triggers present and absent, respectively. The groups did not differ in the frequency of family-reported goal-concordant care (90 individuals [78.3%] vs 109 [76.8%]; P = .78), communication quality (9.0; IQR, 8.0-10.0 vs 9.0; IQR, 8.0-10.0; P > .99), or psychological distress symptoms (all P > .32 for PHQ-9 [6.0; IQR, 3.0-12.0 vs 5.0; IQR, 3.0-10.0], GAD-7 [6.0; IQR, 3.0-11.0 vs 6.0; IQR, 2.0-10.0], and PTSS [17.0; IQR, 13.0-26.0 vs 18.5; IQR, 13.0-28.0]), although the family members of patients with triggers present more frequently rated the quality of their relationship with the ICU physician favorably (107 individuals [93.0%] vs 121 [84.3%]; P = .049) and less frequently believed patient survival was likely (57 individuals [49.6%] vs 91 [64.1%]; P = .02). Length of stay was...
Table 1. Patient and Family Member Characteristics and Outcomes by Palliative Care Trigger Status

| Characteristic                          | Patients | | | Family members | | |
|----------------------------------------|----------|----------|----------|----------------|----------|----------|
|                                        | No. (%)  | Trigger absent | Trigger present | Total (N = 257) | P value  | Trigger absent | Trigger present | Total (N = 257) | P value  |
| Age, median (IQR), y                   |          |          |          |          |          |          |          |          |          |
|                                        | 54.5 (42.9-67.0) | 62.0 (52.0-69.0) | 58.0 (46.0-68.0) | .007a | 54.0 (44.0-62.0) | 53.0 (43.0-62.0) | 54.0 (44.0-62.0) | .72a |
| Gender                                 |          |          |          |          |          |          |          |          |          |
| Male                                   | 74 (52.1) | 57 (49.6) | 131 (51.0) |          |          | 35 (24.6) | 24 (20.9) | 59 (23.0) |          |
| Female                                 | 68 (47.9) | 58 (50.4) | 126 (49.0) | .69b | 107 (75.4) | 90 (78.3) | 197 (76.7) | .45c |
| Transgender                            | 0         | 0         | 0         |          |          | 0         | 1 (0.9)  | 1 (0.4)  |          |
| Race                                   |          |          |          |          |          |          |          |          |          |
| American Indian or Alaska Native       | 3 (2.1)  | 3 (2.6)  | 6 (2.3)  |          |          | 2 (1.4)  | 3 (2.6)  | 5 (1.9)  |          |
| Asian                                  | 3 (2.1)  | 2 (1.7)  | 5 (1.9)  |          |          | 3 (2.1)  | 3 (2.6)  | 6 (2.3)  |          |
| Black or African American              | 48 (33.8) | 38 (33.0) | 86 (33.5) |          |          | 44 (31.0) | 39 (33.9) | 83 (32.3) |          |
| Native Hawaiian or Pacific Islander    | 0         | 0         | 0         |          | .58c | 1 (0.7)  | 0         | 1 (0.4)  | .96c |
| White                                  | 78 (54.9) | 69 (60.0) | 147 (57.2) |          |          | 87 (61.3) | 67 (58.3) | 154 (59.9) |          |
| Othera                                 | 10 (7.0)  | 3 (2.6)  | 13 (5.1) |          |          | 4 (2.8)  | 2 (1.7)  | 6 (2.3)  |          |
| >1 Race                                | 0         | 0         | 0         |          |          | 1 (0.7)  | 0         | 2 (0.8)  |          |
| Not reported                           | 0         | 0         | 0         |          |          | 5 (3.5)  | 5 (4.3)  | 10 (3.9) |          |
| Hispanic or Latinx ethnicity           | 4 (2.8)  | 2 (1.7)  | 6 (2.3)  | .69c | 6 (4.2)  | 2 (1.7)  | 8 (3.1)  | .30c |
| Insurance status                       |          |          |          |          |          |          |          |          |          |
| Commercial                             | 60 (42.3) | 36 (31.3) | 96 (37.4) |          |          | NA       | NA       | NA       |          |
| Medicare                               | 42 (29.6) | 52 (45.2) | 94 (36.6) |          |          | NA       | NA       | NA       |          |
| Medicaid                               | 23 (16.2) | 20 (17.4) | 43 (16.7) | .05c | NA       | NA       | NA       | NA       |          |
| None                                   | 13 (9.2)  | 4 (3.5)  | 17 (6.6) |          |          | NA       | NA       | NA       |          |
| Other                                  | 4 (2.8)  | 3 (2.6)  | 7 (2.7)  |          |          | NA       | NA       | NA       |          |
| Patient is spouse or partner           | NA       | NA       | NA       |          |          | 69 (48.6) | 45 (39.1) | 114 (44.4) | .13b |
| Employed                               | NA       | NA       | NA       |          |          | 97 (68.3) | 79 (68.7) | 176 (68.5) | .95b |
| Some college or less                   | NA       | NA       | NA       |          |          | 66 (46.8) | 58 (50.9) | 124 (48.6) | .52b |
| Financial distressa                    | NA       | NA       | NA       |          |          | 72 (50.7) | 56 (48.7) | 128 (49.8) | .75b |
| Outcome                                |          |          |          |          |          |          |          |          |          |
| ICU                                     |          |          |          |          |          |          |          |          |          |
| Medical                                | 58 (40.8) | 37 (32.2) | 95 (37.0) |          |          | NA       | NA       | NA       |          |
| Neurologic                             | 23 (16.2) | 34 (29.6) | 57 (22.2) |          |          | NA       | NA       | NA       |          |
| Surgical                               | 29 (20.4) | 20 (17.4) | 49 (19.1) |          |          | NA       | NA       | NA       |          |
| Cardiac                                | 16 (11.3) | 17 (14.8) | 33 (12.8) |          |          | NA       | NA       | NA       |          |
| Medical-surgical community             | 13 (9.2)  | 7 (6.1)  | 20 (7.8) |          |          | NA       | NA       | NA       |          |
| Cardiothoracic surgery                 | 3 (2.1)  | 0         | 3 (1.2)  |          |          | NA       | NA       | NA       |          |
| ICU admission source                   |          |          |          |          |          |          |          |          |          |
| Transfer from outside hospital         | 68 (47.9) | 50 (43.5) | 118 (45.9) |          | .20a | NA       | NA       | NA       |          |
| Emergency department                   | 50 (35.2) | 52 (45.2) | 102 (39.7) |          |          | NA       | NA       | NA       |          |
| Postoperative                          | 16 (11.3) | 6 (5.2)  | 22 (8.6) |          |          | NA       | NA       | NA       |          |
| Hospital unit                          | 8 (5.6)  | 7 (6.1)  | 15 (5.8) |          |          | NA       | NA       | NA       |          |
| ICU admission diagnosis                 |          |          |          |          |          |          |          |          |          |
| Acute respiratory failure              | 60 (42.3) | 31 (27.0) | 91 (35.4) |          |          | NA       | NA       | NA       |          |
| Acute neurologic event or altered mental status | 28 (19.7) | 34 (29.6) | 62 (24.1) |          |          | NA       | NA       | NA       |          |
| Shock                                  | 23 (16.2) | 31 (27.0) | 54 (21.0) |          | .03b | NA       | NA       | NA       |          |
| Trauma or postoperative care           | 28 (19.7) | 15 (3.0)  | 43 (16.7) |          |          | NA       | NA       | NA       |          |
| Renal failure                          | 2 (1.4)  | 2 (1.7)  | 4 (1.6)  |          |          | NA       | NA       | NA       |          |
| Liver failure                          | 1 (0.7)  | 2 (1.7)  | 3 (1.2)  |          |          | NA       | NA       | NA       |          |
| APACHE II score, median (IQR), U       | 22.0 (17.0-27.0) | 23.0 (20.0-29.0) | 22.0 (18.0-28.0) | .03a | NA       | NA       | NA       |          |

(continued)
**Table 1. Patient and Family Member Characteristics and Outcomes by Palliative Care Trigger Status (continued)**

| Patients | Family members |
|----------|----------------|
| Trigger absent (n = 142) | Trigger absent (n = 142) | Trigger present (n = 115) | Total (N = 257) | P value | Trigger absent (n = 142) | Trigger present (n = 115) | Total (N = 257) | P value |
| Chronic medical comorbidities, median (IQR), No. | 1.0 (0.0-2.0) | 2.0 (1.0-3.0) | 1.0 (1.0-3.0) | .01* | NA | NA | NA | NA |
| Multisystem organ failure that worsened >48 h from ICU admission | NA | 55 (47.8) | 55 (21.4) | NA | NA | NA | NA | NA |
| Severe acute neurologic condition | NA | 26 (22.6) | 26 (10.1) | NA | NA | NA | NA | NA |
| ≥3 Limitations in activities of daily living | NA | 24 (20.9) | 24 (9.3) | NA | NA | NA | NA | NA |
| Cardiac arrest | NA | 24 (20.9) | 24 (9.3) | NA | NA | NA | NA | NA |
| Advanced cancer | NA | 22 (19.1) | 22 (8.6) | NA | NA | NA | NA | NA |
| ≥1 ICU admission within 3 mo | NA | 22 (19.1) | 22 (8.6) | NA | NA | NA | NA | NA |
| ≥2 Hospital admissions within 3 mo | NA | 20 (17.4) | 20 (7.8) | NA | NA | NA | NA | NA |
| Admitted from post-acute care facility | NA | 18 (15.7) | 18 (7.0) | NA | NA | NA | NA | NA |
| Dementia | NA | 3 (2.6) | 3 (1.2) | NA | NA | NA | NA | NA |
| Total triggers present, median (IQR), No. | NA | 2.0 (1.0-2.0) | 0.0 (0.0-1.0) | NA | NA | NA | NA | NA |
| Mechanical ventilation, median (IQR), d | 9.6 (5.2-17.8) | 10.1 (6.0-14.4) | 9.9 (5.6-16.5) | .99* | NA | NA | NA | NA |
| ICU stay duration, median (IQR), d | 11.5 (6.0-21.0) | 12.0 (5.0-20.0) | 12.0 (6.0-20.0) | .60* | NA | NA | NA | NA |
| Hospital stay duration, median (IQR), d | 26.0 (16.0-41.0) | 25.0 (12.0-38.0) | 26.0 (14.0-41.0) | .28* | NA | NA | NA | NA |
| Palliative care consultation | 12 (8.5) | 26 (22.6) | 38 (14.8) | .002* | NA | NA | NA | NA |
| Code status during hospitalization | | | | | | | | |
| Full code throughout | 102 (71.8) | 61 (53.0) | 163 (63.4) | .002* | NA | NA | NA | NA |
| Full code to DNAR | 37 (26.1) | 48 (41.7) | 85 (33.1) | NA | NA | NA | NA | NA |
| DNAR throughout | 1 (0.7) | 6 (5.2) | 7 (2.7) | NA | NA | NA | NA | NA |
| DNAR to full code | 2 (1.4) | 0 | 2 (0.8) | NA | NA | NA | NA | NA |
| Discharge disposition | | | | | | | | |
| Home, independent | 37 (26.1) | 10 (8.7) | 47 (18.3) | <.001* | NA | NA | NA | NA |
| Home with paid health care services | 26 (18.3) | 5 (4.3) | 31 (12.1) | NA | NA | NA | NA | NA |
| Post-acute care facility | 44 (30.9) | 49 (42.6) | 93 (36.2) | NA | NA | NA | NA | NA |
| Transfer to other hospital | 1 (0.7) | 2 (1.7) | 3 (1.2) | NA | NA | NA | NA | NA |
| Hospice | 6 (4.2) | 8 (7.0) | 14 (5.5) | NA | NA | NA | NA | NA |
| Died | 28 (19.7) | 41 (35.7) | 69 (26.8) | NA | NA | NA | NA | NA |

Abbreviations: APACHE II, Acute Physiology and Chronic Health Evaluation Illness Severity Score; DNAR, do not attempt resuscitation; ICU, intensive care unit; NA, not applicable.

*a* Wilcoxon rank sum test.

*b* *χ²* Test.

*f* Fisher exact test.

d Other was provided as an alternative if the rest of the choices were deemed not appropriate by the participant.

Having little money left after paying bills, having to cut back to pay bills, or having difficulty paying bills no matter what.

Inpatient rehabilitation facility, skilled nursing facility, or long-term acute care facility.

No patient-family dyad had an active palliative care consult at the time of study enrollment; all consultations occurred after enrollment.

Home or inpatient.

similar by trigger status in the ICU (12.0; IQR, 5.0-20.0 vs 11.5; IQR 6.0-21.0; P = .60) and hospital (25.0; IQR, 12.0-38.0 vs 26.0; IQR, 16.0-43.0; P = .28).

**Performance Characteristics of Trigger Status for Identifying Serious Needs**

The presence of a clinical trigger demonstrated low sensitivity (44.7%; 95% CI, 34.1%-55.3%), specificity (55.2%; 95% CI, 47.8%-62.7%), positive predictive value (33.0%; 95% CI, 24.5%-41.6%),
negative predictive value (66.9%; 95% CI, 59.2%-74.6%), and accuracy (51.8%; 95% CI, 45.6%-57.9%) (Figure). Positive likelihood ratios (1.0; 95% CI, 0.7-1.3) and negative likelihood ratios (1.0; 95% CI, 0.8-1.2) suggested that the presence of a trigger did not change the likelihood of serious need. The C statistic (0.50; 95% CI, 0.44-0.57) showed that trigger status was no better than chance at distinguishing dyads with and without serious needs (eTable 3 in the Supplement). Sensitivity analyses revealed little difference in a wide range of NEST scores.

**Association of Needs With Other, Person-Centered Measures**

Overall, 87 family members (33.9%) had a serious total burden of needs (ie, total NEST score ≥30), and 200 (77.8%) had at least 1 serious individual need (Table 2). NEST scores were significantly associated with quality of communication ($r = -0.66$; $P < .001$), quality of relationship with the ICU physician (median NEST score, 15.0; IQR, 8.0-24.0 for excellent; 28.0; IQR, 19.0-42.5 for good; 45.0;

---

**Table 2. Family Member Outcomes by Trigger Status**

| Outcome | Outcome by trigger status | No. (%) | P value |
|---------|---------------------------|---------|---------|
|         | Trigger absent (n = 142)  |         |         |
|         | Trigger present (n = 115) |         |         |
| NEST total score, median (IQR) | 22.5 (12.0-39.0) | 21.0 (12.0-37.0) | 22.0 (12.0-37.0) | .52 |
| Serious overall needs* | 49 (34.5) | 38 (33.0) | 87 (33.9) | .81 |
| ≥1 Serious need | 107 (75.4) | 93 (80.9) | 200 (77.8) | .29 |
| ≥1 Need of any severity* | 139 (97.9) | 113 (98.3) | 252 (98.1) | .83 |
| Goal-concordant care present | 109 (76.8) | 90 (78.3) | 199 (77.4) | .78 |
| Quality of communication, median (IQR), U | 9.0 (8.0-10.0) | 9.0 (8.0-10.0) | 9.0 (8.0-10.0) | .99 |
| Expected patient survival rated as almost certain | 91 (64.1) | 57 (49.6) | 148 (57.6) | .02 |
| PHQ-9 score, median (IQR) | 5.0 (3.0-10.0) | 6.0 (3.0-12.0) | 6.0 (3.0-11.0) | .38 |
| GAD-7 score, median (IQR) | 6.0 (2.0-11.0) | 6.0 (3.0-11.0) | 6.0 (3.0-11.0) | .34 |
| PTSS score, median (IQR) | 18.5 (13.0-28.0) | 17.0 (13.0-26.0) | 18.0 (13.0-27.0) | .32 |
| Interpersonal Processes of Care score, median (IQR) | | | |
| Concern domain | 5.0 (4.7-5.0) | 5.0 (4.3-5.0) | 5.0 (4.5-5.0) | .32 |
| Decision-making domain | 4.5 (3.5-5.0) | 4.3 (3.5-5.0) | 4.5 (3.5-5.0) | .79 |
| Discrimination domain | 1.0 (1.0-1.0) | 1.0 (1.0-1.0) | 1.0 (1.0-1.0) | .47 |

---

**Figure. Performance Characteristics of the Presence of Clinical Palliative Care Trigger Characteristics for Identifying Serious Needs**

Performance characteristics of the presence of a clinical trigger characteristic are shown across a range of definitions for high levels of need based on Needs at the End-of-Life Screening Tool. PHQ-9, 9-item Patient Health Questionnaire; PTSS, Posttraumatic Stress Syndrome inventory.

* Wilcoxon rank sum test.

b NEST total score of 30 or higher.

χ² Test.

d At least 1 NEST item score of 5 or higher.

* At least 1 NEST item score higher than 0.
IQR, 30.0-55.0 for acceptable; and 79.0; IQR, 61.0-95.0 for poor; \( P < .001 \), psychological distress symptoms (PHQ-9, \( r = 0.19; P = .002 \); GAD-7, \( r = 0.19; P = .003 \); PTSS, \( r = 0.19; P = .002 \)), and patient-centeredness scores (eliciting concerns domain \( r = −0.45; P < .001 \); decision-making domain, \( r = −0.59; P < .001 \); racial and economic discrimination domain, \( r = −0.13; P = .04 \)) (eTable 4 in the Supplement).

**Discussion**

In what we believe is the first comparison of clinical palliative care trigger status with self-reported palliative care needs in an ICU setting, we found that needs did not differ based on the presence or absence of clinical triggers. Furthermore, the presence of a clinical trigger was no better than chance at identifying those with the most serious needs not associated with any patient- and family-centered measure tested and not associated with differences in length of stay. These results may be useful for the development of future models of person-centered ICU-based palliative care delivery.

**Relevance to Past Work**

Our findings add to work from Kelley and Bollens-Lunc,\(^{40}\) which demonstrated the limitations of administrative database–derived proxy measures of need such as functional dependence or weight loss to screen for palliative care specialist eligibility, and from Wegier et al.,\(^{41}\) which derived a predictive model for 1-year mortality among inpatients not in the ICU with a threshold value associated with an elevated symptom score. They complement the finding by Creutzfeld et al\(^{42}\) that no clinical patient characteristics were associated with neurologic ICU physicians’ perceptions of patient and family member needs. The present study also reinforces past concerns about the disease-centeredness of clinical triggers by demonstrating that neither clinical triggers nor clinical or sociodemographic characteristics were associated with the presence, type, or severity of palliative care needs or with several person-centered outcomes.\(^{15,18,19,43}\)

**Relevance to Contemporary Care**

There is broad agreement that palliative care is most appropriate for those with significant needs, present among 33.9\% of participants in this study. However, few methodologies are accepted for either identifying ideal recipients or delivering care within the constraints of palliative care specialists’ small workforce size and geographic inconsistence and intensivists’ limited primary palliative care knowledge.\(^{44}\) The patchwork of dissonant approaches that has evolved from this uncertainty likely contributes to the significant practice variability observed within nations, regions, and hospitals.\(^{45-47}\) This study’s key finding that clinical markers of prognosis and resource utilization may have serious limitations as palliative care screening tools in ICU settings challenges an increasingly popular health care trend that was intended to better standardize care.\(^{19}\)

**Potential Value of Using Measures of Need in Clinical Care and Research**

Our findings also suggest that knowledge of needs may help to improve the identification of those who could benefit most from palliative care, as well as form the foundation of sensible care models in which primary and specialist providers work collaboratively.\(^{48,49}\) Although we found that needs were not associated with clinical or sociodemographic characteristics, they can be measured simply and inexpensively using automated email or SMS texting systems as was done in this study. Furthermore, need-based systems can permit visualization by severity, type, or class in a smartphone- or computer-based dashboard and activate specific team providers by text or page based on the need class present.\(^{25}\)

Our findings suggest that use of a needs-based system could be beneficial in 4 ways. First, knowledge of needs might help ICU teams connect with patients and family members in a more personalized manner.\(^{50}\) Incorporating standardized measures of need as actionable data points in care could increase the likelihood that they will be recognized and addressed by clinicians who may...
be more habitually focused on mechanical ventilator settings or vasopressor doses, given their prominence in electronic health record systems. This recognition could enhance the consistency of person-centered, humane care in the technology-focused ICU setting.\(^{51,52}\)

Second, the recognition of specific needs could help to more clearly define roles for interprofessional providers and promote the use of adjunctive supportive care interventions, thereby broadening access to palliative care.\(^{49,53}\) Chaplains could be called on to assist those with spiritual needs, ICU nurses and respiratory therapists could address patient comfort needs such as pain or breathlessness, and financial counselors and social workers could address financial stress or social support needs.\(^{54-58}\) Digital interventions, such as adaptive coping mobile apps or decisional support tools, could also be deployed inexpensively to address stress and decisional conflict.

Third, need-based systems could provide a way to integrate palliative care specialists more sensibly and acceptably within ICU care, thus mitigating many ICU clinicians’ concerns about loss of autonomy.\(^{53,59}\) Specialist activation could be focused on the “true positives”—those patients and family members with particularly complex needs at baseline such as needs for decisional support and information, which are most clearly linked to clinician-family interactions in the ICU; specific individual needs of high severity; or demonstration of need that increases over time despite the ICU team’s best efforts. Collaboration could be further enhanced by linking specific needs to team strengths, such as ICU teams’ knowledge of what to expect from critical illness and palliative care specialists’ expertise in symptom management, and by facilitating the prioritization of care to those with the most serious needs.

Fourth, incorporating needs measures in clinical research could help to screen for those patients more likely to demonstrate a response to interventions, highlight novel intervention targets, and add an outcome associated with other, person-centered measures that are directly and temporally relevant to ICU care.\(^{48}\)

**Limitations**

This study has several limitations. Although it was conducted in medical and surgical ICUs among consecutive participants diverse in race and diagnosis, its findings may not be generalizable to other regions and care settings. The time frame of trigger status and need assessment is somewhat arbitrary and involves trade-offs with earlier or later measurement. Although we aimed to assess trigger status and needs relatively early in the ICU course because proactive palliative care is recommended,\(^{60}\) study surveys were, on average, completed after nearly 5 days of ICU care—2 days beyond the recommended time by which a formal family meeting should have been conducted.\(^{24}\) Furthermore, we designed our measurement approach to reflect what hospitals feasibly implement at a uniform time point, rather than to completely replace the need for clinician-prompted palliative care consultations throughout ICU stays. Although there is no criterion standard need assessment or accepted threshold defining serious need, the adapted NEST addresses all core domains of high-quality palliative care and was associated with multiple person-centered measures. Also, a family member-reported measure may be an imperfect proxy for actual patient needs. Our findings on clinical triggers should not be interpreted as casting doubt on the substantial potential benefits of either palliative care specialist consultation or the concept of triggered consultation in general.\(^{9}\)

**Conclusions**

In this cohort study, we found that the presence of clinical palliative care triggers was not associated with higher levels of unmet palliative care need and was no better than chance in identifying the most serious needs. In contrast, needs were associated with person-centered outcomes and could represent a novel foundation for improving palliative care delivery. These findings raise questions about the increasingly common practice of prompting palliative care specialist consultation in ICU settings based on characteristics associated with death or resource utilization.
3. Gentzler ER, Derry H, Ouyang DJ, et al. Underdetection and undertreatment of dyspnea in critically ill patients. Am J Respir Crit Care Med. 2019;199(11):1377-1384. doi:10.1164/rccm.201805-0996OC

4. Wachterman MW, Pilver C, Smith D, Ersek M, Lipsitz SR, Keating NL. Quality of end-of-life care provided to patients with different serious illnesses. JAMA Intern Med. 2016;176(8):1095-1102. doi:10.1001/jamainternmed.2016.1200

5. Teno JM, Claridge BR, Casey V, et al. Family perspectives on end-of-life care at the last place of care. JAMA. 2004;291(1):88-93. doi:10.1001/jama.291.1.88

6. Schenker Y, White DB, Crowley-Matoka M, Dohan D, Tiver GA, Arnold RM. “It hurts to know…and it helps”: exploring how surrogates in the ICU cope with prognostic information. J Palliat Med. 2013;16(3):243-249. doi:10.1089/jpm.2012.0331

7. Cameron J, Chu LM, Matte A, et al; RECOVER Program Investigators (Phase I: towards RECOVER); Canadian Critical Care Trials Group. One-year outcomes in caregivers of critically ill patients. N Engl J Med. 2016;374(19):1831-1841. doi:10.1056/NEJMoai151160

8. Azoulay E, Pochard F, Kentish-Barnes N, et al; FAMIREA Study Group. Risk of post-traumatic stress symptoms in family members of intensive care unit patients. Am J Respir Crit Care Med. 2005;171(9):987-994. doi:10.1164/rccm.200409-1295OC

9. Lanken PN, Terry PB, Delisser HM, et al; ATS End-of-Life Care Task Force. An official American Thoracic Society clinical policy statement: palliative care for patients with respiratory diseases and critical illnesses. Am J Respir Crit Care Med. 2008;177(8):912-927. doi:10.1164/rccm.200605-587ST

10. Kelley AS, Morrison RS. Palliative care for the seriously ill. N Engl J Med. 2015;373(8):747-755. doi:10.1056/NEJMra1404684

11. Aslakson R, Cheng J, Vollweider D, Galusca D, Smith TJ, Pronovost PJ. Evidence-based palliative care in the intensive care unit: a systematic review of interventions. J Palliat Med. 2014;17(2):219-235. doi:10.1089/jpm.2013.0409

12. Kruser JM, Aaby DA, Stevenson DG, et al. Assessment of variability in end-of-life care delivery in intensive care units in the United States. JAMA Netw Open. 2019;2(12):e1917344. doi:10.1001/jamanetworkopen.2019.17344

13. Nelson KE, Wright R, Peeler A, Brockie T, Davidson PM. Sociodemographic disparities in access to hospice and palliative care: an integrative review. J Hosp Palliat Care. 2021;38(11):1378-1390. doi:10.1177/1049909120985419

14. Ashana DC, Umscheid CA, Stephens-Shields AJ, et al. Determining the association between end-of-life care resources and patient outcomes in Pennsylvania ICUs. Crit Care Med. 2019;47(11):1591-1598. doi:10.1097/CCM.0000000000003969

15. Nelson JE, Curtis JR, Mullerkin C, et al; Improving Palliative Care in the ICU (IPAL-ICU) Project Advisory Board. Choosing and using screening criteria for palliative care consultation in the ICU: a report from the Improving Palliative Care in the ICU (IPAL-ICU) Advisory Board. Crit Care Med. 2013;41(10):2318-2327. doi:10.1097/CCM.0b013e31828cf12c

16. Stix B, Wunsch H, Clancy C, Blinderman C, Hua M. Variability in frequency of consultation and needs assessed by palliative care services across multiple specialty ICUs. Intensive Care Med. 2016;42(12):2104-2105. doi:10.1007/s00134-016-4489-y

17. Weissman DE, Meier DE. Identifying patients in need of a palliative care assessment in the hospital setting: a consensus report from the Center to Advance Palliative Care. J Palliat Med. 2011;14(1):17-23. doi:10.1089/jpm.2010.0347

18. Aslakson RA, Curtis JR, Nelson JE. The changing role of palliative care in the ICU. Crit Care Med. 2014;42(11):2418-2428. doi:10.1097/CCM.0000000000000573

19. Kister EA, Stevens E, Scott E, Philipotts LL, Greer JA, Greenwald JL. Triggered palliative care consults: a systematic review of interventions for hospitalized and emergency department patients. J Pain Symptom Manage. 2020;60(2):460-475. doi:10.1016/j.jpainsymman.2020.02.001

20. Hua MS, Li G, Blinderman CD, Wunsch H. Estimates of the need for palliative care consultation across United States intensive care units using a trigger-based model. Am J Respir Crit Care Med. 2014;189(4):428-436. doi:10.1164/rccm.201307-1229OC

21. Zalenski R, Courage C, Edelen A, et al. Evaluation of screening criteria for palliative care consultation in the MICU: a multihospital analysis. BMJ Support Palliat Care. 2014;4(3):254-262. doi:10.1136/bmjspcare-2013-000570

22. Kamal AH, Wolf SP, Troy J, et al. Policy changes key to promoting sustainability and growth of the specialty palliative care workforce. Health Aff (Millwood). 2019;38(6):910-918. doi:10.1377/hlthaff.2019.00018
23. America's Care of Serious Illness: A State-by-State Report Card on Access to Palliative Care in Our Nation's Hospitals. Center to Advance Palliative Care/National Palliative Care Research Center; 2019. Accessed December 6, 2021. https://reportcard.capc.org/wp-content/uploads/2020/05/CAPC_State-by-State-Report-Card_051120.pdf

24. Davidson JE, Aslakson RA, Long AC, et al. Guidelines for family-centered care in the neonatal, pediatric, and adult ICU. Crit Care Med. 2017;45(1):103-128. doi:10.1097/CCM.0000000000002169

25. Cox CE, Jones DM, Reagan W, et al. Palliative care planner: a pilot study to evaluate acceptability and usability of an electronic health records system-integrated, needs-targeted app platform. Ann Am Thorac Soc. 2018;15(1):59-68. doi:10.1513/AnnalsATS.201706-500OC

26. Emanuel LL, Alpert HR, Emanuel EE. Concise screening questions for clinical assessment of terminal care: the needs near the end-of-life care screening tool. J Palliat Med. 2001;4(4):465-474. doi:10.1089/jpm.2001.00637.x

27. Scandrett KG, Reitschuler-Cross EB, Nelson L, et al. Feasibility and effectiveness of the NEST13+ as a screening tool for advanced illness care needs. J Palliat Med. 2010;13(2):161-169. doi:10.1097/jpm.0b013e3181ef5664

28. National Consensus Project for Quality Palliative Care. Clinical practice guidelines for quality palliative care, 4th ed. National Coalition for Hospice and Palliative Care. 2018. Accessed June 10, 2021. https://www.nationalcoalitionhpc.org/wp-content/uploads/2018/10/NCHPC-NCPGuidelines_4thED_web_FINAL.pdf

29. Teno JM, Fisher ES, Hamel MB, Coppola K, Dawson NV. Medical care inconsistent with patients' treatment goals: association with 1-year Medicare resource use and survival. J Am Geriatr Soc. 2002;50(3):496-500. doi:10.1046/j.1532-5415.2002.016009606.x

30. Stoll C, Kapfhammer HP, Rothenhäusler HB, et al. Sensitivity and specificity of a screening test to document traumatic experiences and to diagnose post-traumatic stress disorder in ARDS patients after intensive care treatment. Intensive Care Med. 1999;25(7):697-704. doi:10.1007/s001340050932

31. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606-613. doi:10.1046/j.1525-1497.2001.016009606.x

32. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166(10):1092-1097. doi:10.1001/archinte.166.10.1092

33. Engelberg RA, Downey L, Curtis JR. Psychometric characteristics of a quality of communication questionnaire assessing communication about end-of-life care. J Palliat Med. 2006;9(5):1086-1098. doi:10.1089/jpm.2006.9.1086

34. Scandrett KG, Reitschuler-Cross EB, Nelson L, et al. Feasibility and effectiveness of the NEST13+ as a screening tool for advanced illness care needs. J Palliat Med. 2010;13(2):161-169. doi:10.1097/jpm.0b013e3181ef5664

35. Teno JM, Fisher ES, Hamel MB, Coppola K, Dawson NV. Medical care inconsistent with patients' treatment goals: association with 1-year Medicare resource use and survival. J Am Geriatr Soc. 2002;50(3):496-500. doi:10.1046/j.1532-5415.2002.016009606.x

36. Cox CE, Carman SS, et al. Effect of a telephone- and web-based coping skill training program compared with an education program for survivors of critical illness and their family members: a randomized clinical trial. Am J Respir Crit Care Med. 2018;197(1):66-78. doi:10.1164/rccm.201704-0720OC

37. Vincent JL, Moreno R, Takala J, et al; Working Group on Sepsis-Related Problems of the European Society of Intensive Care Medicine. The SOFA (Sepsis-related Organ Failure Assessment) score to describe organ dysfunction/failure. Intensive Care Med. 1996;22(7):707-710. doi:10.1007/s001340050932

38. Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Crit Care Med. 1985;13(10):818-829. doi:10.1097/00003146-198510000-00009

39. Pocock SJ. The pros and cons of noninferiority trials. Fundam Clin Pharmacol. 2003;17(4):483-490. doi:10.1046/j.1472-8266.2003.00162.x

40. Kelley AS, Bollens-Lund E. Identifying the population with serious illness: the “denominator” challenge. J Palliat Med. 2018;21(1):57-61. doi:10.1089/jpm.2017.0548

41. Wegier P, Kurahashi A, Saunders S, et al. mHOMR: a prospective observational study of an automated mortality prediction model to identify patients with unmet palliative needs. BMJ Support Palliat Care. 2021;bmjspcare-2020-002870. doi:10.1136/bmjspcare-2020-002870

42. Creutzfeldt CJ, Engelberg RA, Healey L, et al. Palliative care needs in the neuro-ICU. Crit Care Med. 2015;43(8):1677-1684. doi:10.1097/CCM.0000000000001018
43. Greenwald JL, Greer JA, Gace D, et al. Implementing automated triggers to identify hospitalized patients with possible unmet palliative needs: assessing the impact of this systems approach on clinicians. J Palliat Med. 2020;23(11):1500-1506. doi:10.1089/jpm.2020.0161

44. Dy SM, Herr K, Bernacki RE, et al. Methodological research priorities in palliative care and hospice quality measurement. J Pain Symptom Manage. 2016;51(2):155-162. doi:10.1016/j.jpainsymman.2015.10.019

45. Sprung CL, Ricou B, Hartog CS, et al. Changes in end-of-life practices in European intensive care units from 1999 to 2016. JAMA. 2019;322(17):1692-1704. doi:10.1001/jama.2019.14608

46. Hart JL, Harhay MO, Gabler NB, Ratcliffe SJ, Quill CM, Halpern SD. Variability among US intensive care units in managing the care of patients admitted with preexisting limits on life-sustaining therapies. JAMA Intern Med. 2015;175(6):1019-1026. doi:10.1001/jamainternmed.2015.0372

47. Lee JD, Jennenich AL, Engelberg RA, Downey L, Curtis JR, Khandelwal N. Type of intensive care unit matters: variations in palliative care for critically ill patients with chronic, life-limiting illness. J Palliat Med. 2021;24(6):857-864. doi:10.1089/jpm.2020.0412

48. Halpern SD. Toward evidence-based end-of-life care. N Engl J Med. 2015;373(21):2001-2003. doi:10.1056/NEJMp1509664

49. Quill TE, Abernethy AP. Generalist plus specialist palliative care—creating a more sustainable model. N Engl J Med. 2013;368(13):1173-1175. doi:10.1056/NEJMp1215620

50. Turnbull AE, Bosslet GT, Kross EK. Aligning use of intensive care with patient values in the USA: past, present, and future. Lancet Respir Med. 2019;7(7):626-638. doi:10.1016/S2213-2600(19)30087-6

51. Cox CE, Curtis JR. Using technology to create a more humanistic approach to integrating palliative care into the intensive care unit. Am J Respir Crit Care Med. 2016;193(3):242-250. doi:10.1164/rccm.201508-1628CP

52. Angus DC, Truog RD. Toward better ICU use at the end of life. JAMA. 2016;315(3):255-256. doi:10.1001/jama.2015.18681

53. Schenker Y, Arnold R. The next era of palliative care. JAMA. 2015;314(15):1565-1566. doi:10.1001/jama.2015.11217

54. Ernecoff NC, Curiel FA, Buddadhumaruk P, White DB. Health care professionals’ responses to religious or spiritual statements by surrogates during goals-of-care discussions. JAMA Intern Med. 2015;175(10):1662-1669. doi:10.1001/jamainternmed.2015.4124

55. Khandelwal N, Hough CL, Downey L, et al. Prevalence, risk factors, and outcomes of financial stress in survivors of critical illness. Crit Care Med. 2018;46(6):e530-e539. doi:10.1097/CCM.0000000000003076

56. Cook D, Swinton M, Toledo F, et al. Personalizing death in the intensive care unit: the 3 Wishes Project: a mixed-methods study. Ann Intern Med. 2015;163(4):271-279. doi:10.7326/M15-0502

57. White DB, Angus DC, Shields AM, et al; PARTNER Investigators. A randomized trial of a family-support intervention in intensive care units. N Engl J Med. 2018;378(25):2365-2375. doi:10.1056/NEJMoa1802637

58. Curtis JR, Treece PD, Nielsen EL, et al. Randomized trial of communication facilitators to reduce family distress and intensity of end-of-life care. Am J Respir Crit Care Med. 2016;193(2):154-162. doi:10.1164/rccm.201505-09000C

59. Wysham NG, Hua M, Hough CL, et al. Improving ICU-based palliative care delivery: a multicenter, multidisciplinary survey of critical care clinician attitudes and beliefs. Crit Care Med. 2017;45(4):e372-e378. doi:10.1097/CMM.0000000000002099

60. Temel JS, Greer JA, Muzikansky A, et al. Early palliative care for patients with metastatic non-small-cell lung cancer. N Engl J Med. 2010;363(8):733-742. doi:10.1056/NEJMoa1000678

SUPPLEMENT.
eTable 1. Definitions of Clinical Palliative Care Triggers
eTable 2. Performance Characteristics of the Presence of Clinical Palliative Care Triggers for Identifying Serious Unmet Needs: Additional Information on Analytic Approach
eTable 3. Performance Characteristics of the Presence of Clinical Palliative Care Triggers for Identifying Unmet Need
eTable 4. Comparison of Family Member Survey Responses to NEST Scores
eFigure. Percentage of Participants Reporting Any Level of Individual Need by Trigger Status