Evaluation of screening criteria for palliative care consultation in the MICU: a multihospital analysis

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ABSTRACT

Background There are currently no comprehensive studies in critical care settings that have set out to examine the association of palliative care screening criteria with multiple, adverse patient outcomes.

Methods A 7-item palliative care screen was developed from consensus reports. Medical intensive care unit (MICU) nurses at four hospitals screened patients upon admission during a 16-week period. Outcomes included percentage of patients screened and their percentage with consultations ordered. Patient screen scores were compared with mortality, hospice discharge and length of stay (LOS).

Results During the period, 1071 patients were admitted to MICUs, of which, 59.3% were screened; 35.3% of patients screened positive. Patients with positive screens (n=225) were more likely to have a consult ordered (33.6% vs 3.4%; p<0.001), and likelihood of consult increased with higher screen scores. Patients with positive screens had significantly longer hospital and MICU LOS (p<0.001), and had increased risk of inpatient mortality (p<0.001) and hospice discharge (p<0.001). Criteria of 'admission from a skilled nursing facility' and 'readmission to the ICU' were significant predictors of LOS; 'cancer,' 'post cardiac arrest,' and 'team perceived need' were predictors of the composite variable of mortality/hospice discharge. 'End-stage dementia' and 'intracranial bleed' were not predictive of adverse outcomes.

Conclusions Decisions on the appropriateness for palliative care consultation in the MICU can be aided using a trigger screen. We recommend the use of this screen be considered in the MICU with the suggested revisions. Additional studies are needed to determine if the use of the trigger screen is associated with improved clinical outcomes.

INTRODUCTION

Providing palliative care to patients and families in the intensive care unit (ICU) is an urgent priority due to communication challenges, high rates of death or subsequent severe chronic illness, uncontrolled symptoms, and needs for psycho-social-spiritual support for patients, families and staff.[1] The escalating costs of care associated with rising usage of medical intensive care units (MICU) and mechanical ventilation at the end of life continue to raise the stakes.[2] Palliative care (PC) consultations in the ICU have been shown to help patients and families make better decisions, relieve distressing symptoms, and lower costs by ensuring that care provided is likely to be beneficial and wanted.[3 4] Such consultations can only be provided to select patients and are not intended for all those seen in the ICU. Nelson and colleagues suggested patient groups who may be appropriate for a palliative care intervention[5]; these groups included those at highest risk for mortality, patients dependent on institutional care, those using critical care resources without benefit, or those with long lengths of stay (LOS) in the ICU or hospital. An advisory board on palliative care in the ICU published a report paper stating that palliative care needs will require an approach that uses primary palliative care delivered by ICU-based clinicians and subspecialty palliative care consultations for those at the highest risk of adverse outcomes.[6]

The identification of the highest-risk patients in the MICU and their referral to subspecialty palliative care consultation, has been the subject of multiple studies and consensus reviews from critical care and palliative care experts.[1 6] Trigger tools or checklists have been recommended for use on admission to the MICU and in follow-up daily rounds.[6] Few studies have examined the impact of systematic screens that trigger palliative care consultation. All are single

hospital studies, and none demonstrate a robust analysis of the linkage of screening criteria to multiple outcomes.

In a single hospital study, Sihra, Harris and O'Reardon screened 273 patients using the following criteria: (1) age 70+ years with at least two comorbidities; (2) stage IV cancer; (3) mechanical ventilation for at least 7 days; (4) exceeding expected LOS by more than 50%.[7] Though the number of positive screens was not reported, their screen, plus a phone intervention greatly increased the rate of palliative care consultations in the MICU and surgical ICU compared to the prior year.

Norton and others demonstrated support for their PC screening criteria in their prospective pre/poststudy of MICU patients.[8] Patients were screened within 72 h of admission to the MICU. Positive screens met at least one of six criteria: (1) hospital stay >10 days; (2) age 80 + years plus two or more comorbidities; (3) stage IV malignancy; (4) status postcardiac arrest; (5) intracerebral haemorrhage with ventilation; or (6) other. Patients with a positive screen (n=191; 26% of MICU admissions) had a high hospital mortality rate (58%). However, the mortality rate of patients with a negative screen was not reported, limiting the interpretation of the results. Furthermore, the primary purpose of their study was not to analyse their screening criteria; rather, it was to examine the effect of a proactive care intervention, which they found to be associated with significantly shorter MICU LOS.

Though these studies collectively suggest that screening for subgroups of patients improve consultation rates, there are no comprehensive studies examining the association of screening criteria with the multiple, adverse outcomes that palliative care addresses. In a recent review, Nelson and colleagues examined which screening triggers for palliative care have been used in critical care settings.[6] They categorised screening criteria used in nine previous studies into the following domains: symptom distress, family distress, poor prognosis for survival or acceptable recovery, and intensive usage of healthcare resources, noting that no study was conducted with the intention to determine if the criteria were associated with adverse patient outcomes.

In order to improve allocation of palliative care consultations to MICU patients with highest need, we performed a quality improvement initiative to evaluate the impact of a 7-item trigger screen applied to admissions at MICUs of four affiliated teaching hospitals. This project assessed whether overall screen scores and individual item scores were associated with the outcomes of mortality, LOS in the ICU or hospital, or hospice discharge.

METHODS

We conducted a quality improvement project in four teaching hospitals owned by Vanguard Health Systems (Nashville, Tennessee, USA) in the Detroit metropolitan area. The initiative, named ICU-PAL, was a collaboration between the critical care teams and the palliative care consultation services at each hospital. The ICUs followed a 'closed' model of operation, where board-certified intensivists were responsible for managing patient care. Each PC consultation service consisted of one physician and/or one to two nurse practitioners. Nursing, social workers and chaplains were enlisted on an as-needed basis. Three of the hospitals were located in the inner city, and one hospital was located in a suburban setting.

Participating hospitals implemented the intervention during a 16-week period, with the first hospital beginning 15 October 2012 and the final hospital concluding 7 April 2013. Patient information was abstracted by project assistants from electronic medical records (EMR).

Screen development and scoring

During the second quarter of 2012, a literature search was conducted to assemble a screening tool to use in the ICUs. A set of screen items, risk factors for palliative care need, were selected based on the previous work of Weissman and Meier,[9] and Nelson *et al*.[1] See table 1 for screen items and sources. Items were selected based on brevity and ease of application. Age was not included as a screen item to avoid the perception of age discrimination.

After receiving approval from the Vanguard Health System Palliative Care Council, a national group of PC experts, a seven-item screen was implemented across the four MICUs. During the first few weeks of implementation, the initial screen received tailoring so as to be as specific as possible for the MICU and to conform to the critical care physicians' preferences. A copy of this final screen can be found in online supplementary appendix A.

Screening procedure

Critical care nurses were instructed to screen each patient upon admission to the ICU, using a manual (paper) version of the screen. They were asked to mark every factor that was positive. A palliative care nurse educator provided palliative care education, including specific instructions on how to complete the screen. If a patient screened positive, ICU nurses were instructed to notify the intensivist of the screen status and inform him or her that a palliative care consultation was indicated. This commonly occurred during interdisciplinary team rounds. At that point, the intensivist made the decision on whether or not to order a PC consult. Depending on local practice patterns, consults were ordered with or without seeking the advice of the patients' attending physician.

Outcome measures

In order to evaluate the impact of the screen, we examined several variables. To determine adherence

Table 1 Palliative care screen items

Risk factors for serious illness	Screen item name	Source	Percentage present in positive screens* (n=225) (%)
Admitted from skilled nursing facility (SNF), LTAC, vent LTC, or home care with private duty nursing with ADL dependencies	SNF	[1 9]	45
ESD, ALS, Parkinson's and MS	ESD	[1]	18
Large ICH with anoxic encephalopathy, or on ventilator	ICH	[1 9]	15
Advanced or metastatic cancer (CA)	CA	[1 9]	16
Admitted to ICU postcardiac or respiratory arrest with neurological compromise (postarrest)	Post-arrest	[1 9]	25
Admitted to ICU with hospital LOS >5 days, or ICU readmission with same diagnosis within 30 days	Re-admit	[1] (modified: >10 days in hospital before ICU)	30
Team-perceived PC need-based on poor prognosis and complex care; for example, considering dialysis, trach or PEG	Perceived need	[1 9]	45

*Screens were considered positive if at least one item was positive.
ADL, activities of daily living; ALS, amyotrophic lateral sclerosis; ESD, end-stage dementia; ICU, intensive care unit; ICH, intracranial haemorrhage; LOS, length of stay; LTAC, long-term acute care; MS, multiple sclerosis; PC, palliative care; PEG, percutaneous endoscopic gastrostomy; trach, tracheotomy; SNF, skilled nursing facilities; vent LTC, long-term care with ventilator.

and impact of screening, we measured the percentage of MICU admissions screened, the percentage who scored positive, and the percentage of patients with positive and negative screens referred for formal palliative care consultation. Patient variables included the following: age, gender, race, hospital and ICU LOS, screen scores, inpatient hospital mortality, hospice discharge status, and (if applicable) date of PC consult order and PC consult. If the patient was positive for at least one risk factor, the screen was considered positive, and two or more risk factors were considered strongly positive; otherwise, the screen was considered negative. LOS was calculated by subtracting the admission date from the discharge date; if the patient was discharged on the same day as admission, it was assigned a 1-day stay. MICU teams were given feedback on their project compliance on a weekly basis by research staff, and by email to the Medical and Nursing Directors of each MICU.

Statistical analysis

We computed each patient's screen score by summing the number of risk factors endorsed. Demographic differences between patients with positive and negative screens were examined with a t test and χ^2 test. Analysis of variance (ANOVA) and Tukey's posthoc tests were used to determine differences in LOS between patients with different screen scores (0, 1, or 2 or more risk factors positive). χ^2 Testing was used to compare screen scores on dichotomous outcomes of mortality and hospice discharge. Zero-truncated negative binomial regression analyses were performed to determine which of the individual screen items best predicted the outcomes of hospital and ICU LOS. Logistic regression was used for predicting mortality and discharge to hospice. Collinearity diagnostics were run to determine if any of the risk factors had overlapping variances. We used IBM SPSS Statistics V.20 for all analyses except the zero-truncated negative binomial regression, for which Stata V.12 was used.

RESULTS

The overall project sample comprised 636 patients screened. These accounted for 59.3% of patients admitted to the MICU during the project period (n=1071). Figure 1 shows the flow of the patient sample from admission to discharge for the total of those screened. The mean age of patients screened was 61.1 years (SD 17.5). The screened patients were 51.0% female and 61.8% African–American, 27.0% Caucasian, 8.0% Hispanic, 5.0% Asian, 5.0% American–Indian, and 9.2% other. Table 2 shows a comparison of age, gender and race of those who screened positive and those that screened negative. Age was significantly different, but gender and race were similar.

The most frequent diagnosis of the screened patients was sepsis, which accounted for 19.8% (n=126) of the 636 MICU patients. Other common diagnoses included: pulmonary oedema (7.7%, n=49), tracheostomy (4.6%, n=29), diabetes (4.1%, n=26), respiratory system diagnosis with ventilator support (3.3%, n=21), stroke (3.0%, n=19), acute myocardial infarction with stenting (3.0%, n=19), poisoning of medicinal agents (2.5%, n=16), heart failure (2.3%, n=15), and chronic obstructive pulmonary disease (2.0%, n=13). Ninety-six other diagnoses accounted for the remaining 44.0% (n=280) of patients; a small number (4.4%, n=23) had missing data. Regarding interventions, 43.1% (n=274) were ventilated and 9.7% (n=62) underwent haemodialysis. Of those who were ventilated, 38.3% (n=105) were ventilated for longer than 96 h; 23.4% (n=149) received vasopressors.

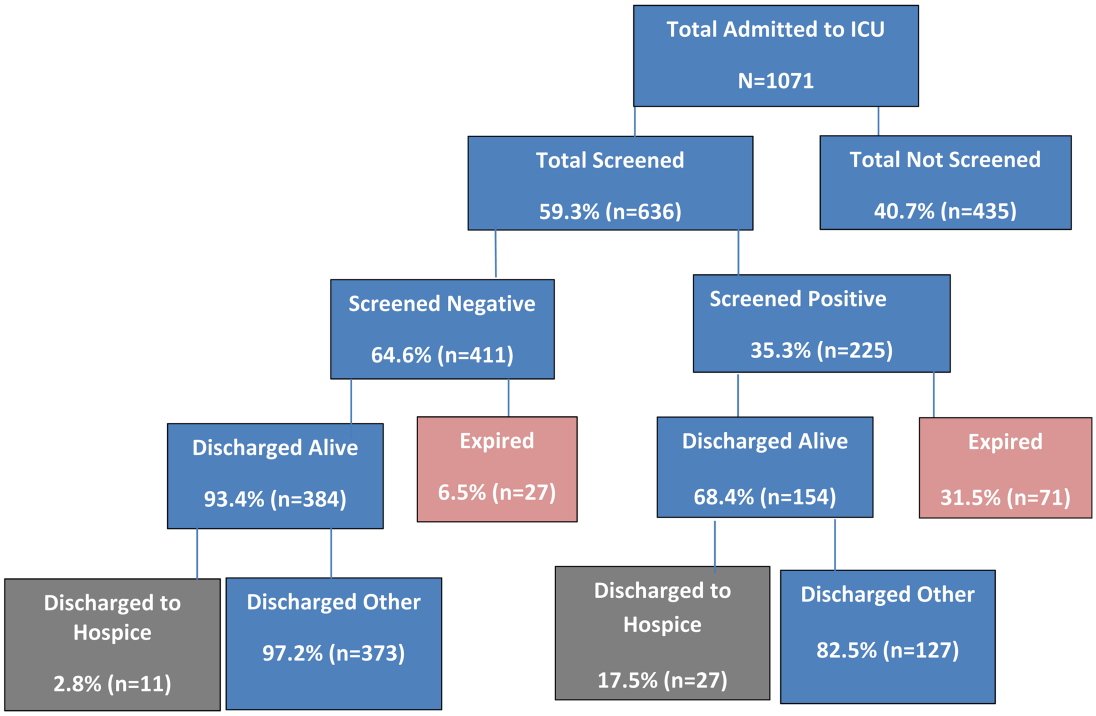

Figure 1 Course of patient in the four participating medical intensive care units during the study period. Patient screen status and subsequent disposition. Patients were considered screened positive if they had at least one palliative care risk factor. Expired: died prior to hospital discharge.

Project compliance and results

Most patients who had positive screens scored positive on items 1 or 7 (64.9%), regarding skilled nursing facilities (SNF) and perceived need, respectively. Figure 2 shows the percentage of patients screened, percentage of positive screens, and the percentage of positive screens in which a palliative care consult was ordered overall and in each hospital. Screening efficiency (percent of admissions screened) varied across hospitals, from 46% to 82%.

Across hospitals, the rate of patients with positive screens was between 30% and 43% (mean: 35.3%). Of those patients with positive screens (n=225), 33.6% had a PC consult ordered, in comparison with only 3.4% of patients with a negative screen. Further, patients were more likely to receive a PC consult if they had a higher screen score (16.8% for patients with one risk factor; 43.2% for those with two or more risk factors). Average PC consult order time from ICU admission was similar across the four hospitals, ranging from 2.0days to 3.8 days (mean: 1.2; SD: 2.3), and an overall range of 0–18 days.

As not all patients with positive screens were selected for a palliative care consult, the clinical judgment of the intensivists played an important but unmeasured role in patient selection for consultation. Nonetheless, patients with positive screens with PC consultation (n=69) and without (n=156), were similar on mean age (69 years vs 67 years), gender (51% vs 46% male), and race (63% African–American and 27% Caucasian, vs 71% African–American and 17% Caucasian), respectively.

Table 2 Demographics

Characteristic	Patients screened positive (n=225)	Patients screened negative (n=411)	p Value	Difference (95% CI)
Mean age (SD)	67.7 years (15.7)	57.5 years (17.3)	<0.001*	10.2 years
Gender %			0.699	
Male	112 (49.8)	198 (48.2)		1.6 (−6.5% to 9.7%)
Female	113 (50.2)	213 (51.8)		−1.6 (−6.5% to 9.7%)
Race %			0.307	
African–American	148 (65.5)	245 (59.6)		5.9 (−0.2.0% to 13.5%)
Caucasian	54 (23.9)	118 (28.7)		−4.8 (−11.7 to 2.5%)
Other	24 (10.6)	48 (11.7)		−1.1 (−5.9% to 4.4%)

*Statistically significant.

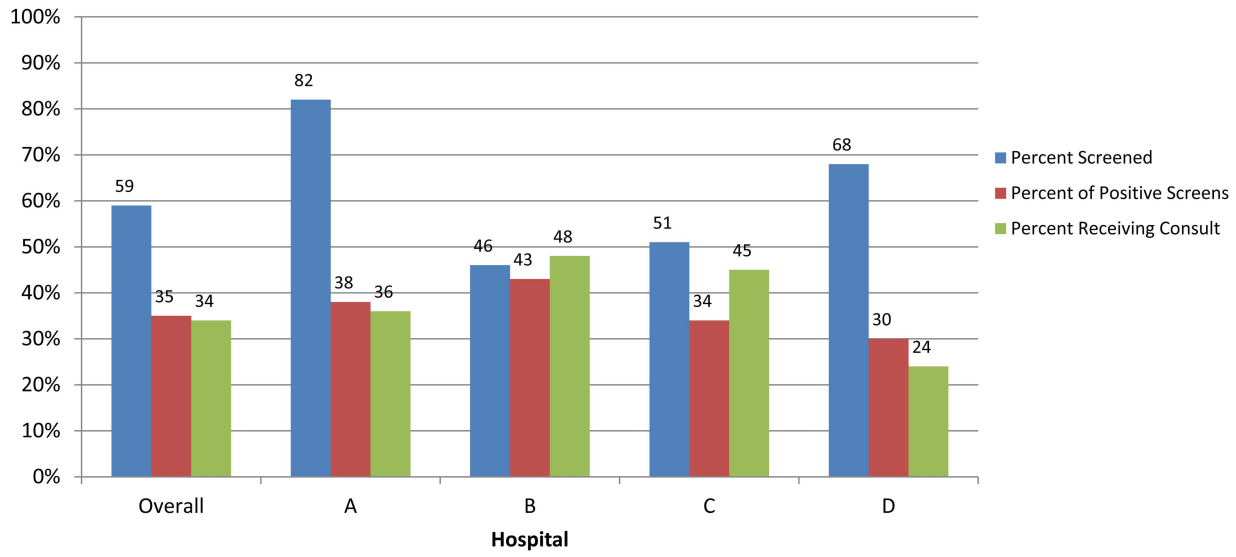

Figure 2 Percentage positive screens is the number of patients with at least one palliative care risk factor divided by all patients screened; percentage receiving a consult is of patients with a positive screen for palliative care.

Palliative care screen evaluation

Given the distribution in screen scores described above, we converted the scale of responses for univariate analysis from 0 to 7 to three categories: zero, one and two or more risk factors. Figure 3 shows the hospital and ICU mean LOS for patients stratified by screen score. There was a statistically significant increase in LOS in the hospital and ICU as patients' risk factors (screen score) increased, $F(2632)=10.7$, $p<0.001$ and $F(2632)=11.5$, $p<0.001$, respectively. Follow-up analyses using Tukey's posthoc test showed a significant increase in hospital LOS between zero and one risk factor (3.8 days; 95% CI 1.4 to 6.2), and zero and two or more risk factors (3.6 days; 95% CI: 1.3 to 5.9). Additionally, there was a significant increase in ICU LOS between zero and two or more risk factors (2.7 days; 95% CI 1.4 to 4.0).

Figures 4 and 5 show significant increases in inpatient hospital mortality, $\chi^2(2)=76.1$, $p<0.001$, and hospice discharge, $\chi^2(2)=27.2$, $p<0.001$, in those with positive screens compared to those with negative screens. Further analyses indicated a significant difference in inpatient hospital mortality between zero and one risk factor, $\chi^2(1)=32.6$, $p<0.001$, and between zero and two risk factors, $\chi^2(1)=74.2$, $p<0.001$. Patients with two or more risk factors had a higher inpatient mortality rate than with one risk factor, $\chi^2(1)=3.4$, $p=0.064$. Additional analyses indicated a significant difference in

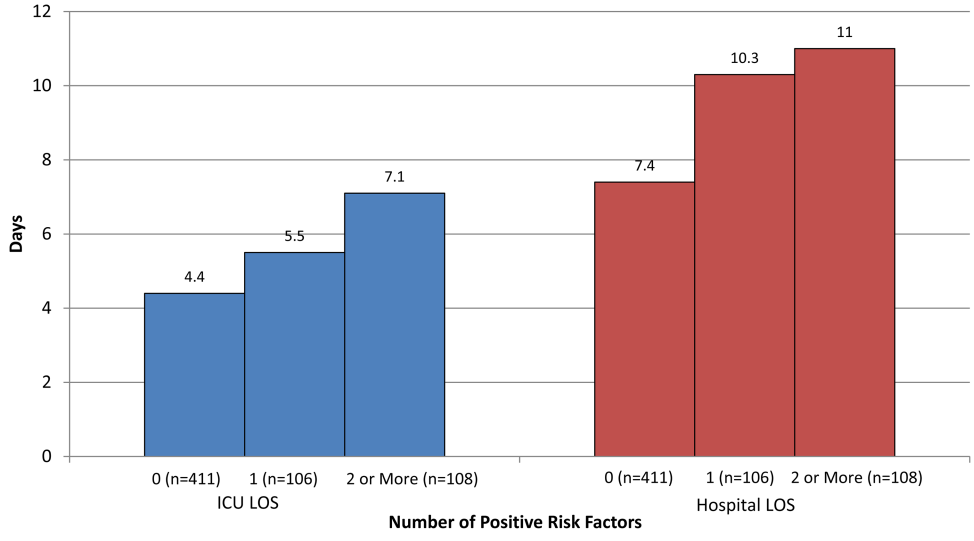

Figure 3 Mean length of stay (LOS) for each patient group classified as having zero, 1, or 2 or more risk factors. With increasing screen scores, the mean LOS increased across all risk scores in the intensive care unit (ICU) and the overall hospital LOS. ICU LOS: $F(2632)=11.5$, $p<0.001$; hospital LOS: $F(2632)=10.7$, $p<0.001$.

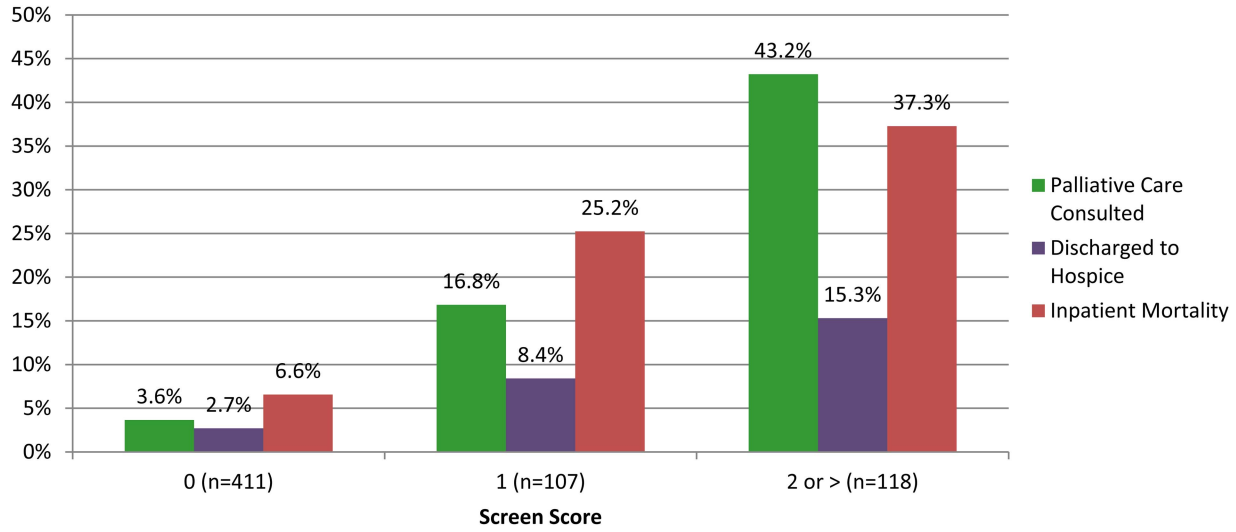

Figure 4 Three major outcomes of percentage of patients with a consult ordered, inpatient mortality, and discharge to hospice by number of risk factors. All three outcomes increased significantly as risk factors increased. Omnibus inpatient mortality: $\chi^2(2)=76.1$, $p<0.001$; zero and one risk factor, $\chi^2(1)=32.6$, $p<0.001$, zero and two risk factors, $\chi^2(1)=74.2$, $p<0.001$. Omnibus hospice discharge: $\chi^2(2)=27.2$, $p<0.001$, zero and one risk factor, $\chi^2(1)=7.80$, $p=0.049$ and between zero and two risk factors, $\chi^2(1)=30.0$, $p<0.001$. Omnibus palliative care consulted: $\chi^2(2)=126.7$, $p<0.001$; between zero and one risk factor: $\chi^2(2)=24.7$, $p<0.001$; between zero and two or more risk factors $\chi^2(1)=131.5$, $p<0.001$; between one and two or more risk factors $\chi^2(1)=18.1$, $p<0.001$.

hospice discharge between zero and one risk factor, $\chi^2(1)=7.80$, $p=0.049$, and between zero and two risk factors, $\chi^2(1)=30.0$, $p<0.001$.

Regression analyses

Three regression equations were formulated. Collinearity diagnostics showed that the seven predictors did not have any problematic correlations with each other. Due to the small number of patients discharged to hospice (n=32), we lacked sufficient power to conduct logistic regression with this as a single outcome; therefore, mortality and discharge to hospice were combined into a composite outcome variable (n=136). Logistic regression was performed to assess how the seven screen items would predict the outcomes of mortality and hospice. The full model containing all predictors was statistically significant, $\chi^2(7)=106.0$, $p<0.001$, and Nagelkerke R^2 was 0.268. Significant predictors were cancer (CA) ($p<0.001$), postarrest ($p=0.006$), and perceived need ($p<0.001$). The most predictive item was CA, and further analyses showed that combined, 63.9% of patients identified as having cancer on the screen died in the hospital (47.2%) or were discharged to hospice (16.7%). The ORs with 95% CIs are displayed in figure 5. Most notable is the OR for CA, 8.78, which indicates patients with this item positive were nearly nine times as likely to be discharged to hospice or die during their hospital stay. Zero-truncated negative binomial regression models were fitted for hospital and ICU LOS individually; each model was significant, $\chi^2(7)=20.36$, $p=0.005$ and $\chi^2(7)30.36$, $p<0.001$, respectively. Significant predictors for longer hospital LOS were SNF ($p=0.038$) and readmit ($p<0.001$). Only readmit was a significant predictor for longer ICU LOS ($p=0.002$), though postarrest ($p=0.063$) and SNF ($p=0.069$) were borderline. End-stage dementia (ESD) had a significant, negative association with ICU LOS ($p=0.025$). The regression results for each outcome are shown in table 3.

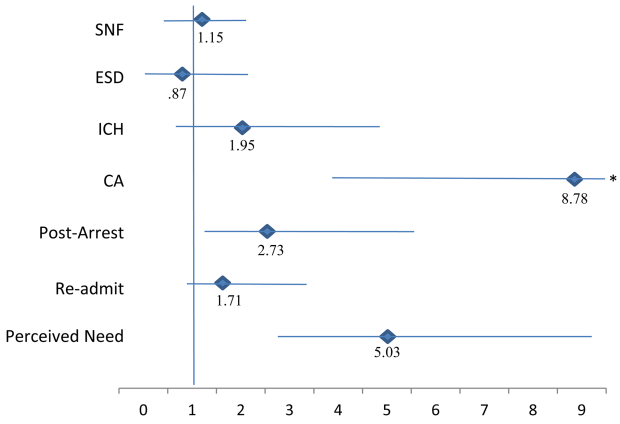

Figure 5 OR values for each of the individual risk factors for the composite outcome of hospital mortality or hospice discharge. Screen item names are defined in table 1. Patients with advanced cancer (CA), perceived need for palliative care, and status postcardiac arrest (postarrest) with anoxic encephalopathy were highly and statistically associated with the composite outcome. *Confidence interval for CA continues to 20.67.

DISCUSSION

The ICU-PAL initiative has provided evidence that systematic screening of MICU admissions with a trigger screen for palliative care consultation is feasible. Screen scores were associated with longer LOS, higher

Table 3 Palliative care screen items regression outcomes

Risk factors for serious illness*	Hospital length of stay		MICU length of stay		Mortality or hospice discharge		
	B (SE) (95% CI)	p Value	B (SE) (95% CI)	p Value	B (SE)	OR (95% CI)	p Value
SNF	**0.28 (0.14) (0.02 to 0.55)**	**0.038**	0.27 (0.15) (−0.02 to 0.57)	0.069	0.14 (0.34)	1.15 (0.60 to 2.23)	0.673
ESD	−0.25 (0.21) (−0.66 to 0.16)	0.225	−0.52 (0.23) (−0.98 to −0.06)	0.025	−0.14 (0.46)	0.87 (0.35 to 2.17)	0.770
ICH	0.17 (0.20) (−0.23 to 0.57)	0.403	0.18 (0.22) (−0.26 to 0.61)	0.423	0.67 (0.45)	1.95 (0.81 to 4.68)	0.135
CA	0.27 (0.19) (−0.11 to 0.65)	0.162	−0.24 (0.23) (−0.68 to 0.20)	0.292	**2.17 (0.44)**	**8.78 (3.73 to 20.67)**	**0.001**
Postarrest	0.02 (0.16) (−0.30 to 0.34)	0.901	0.33 (0.17) (−0.02 to 0.68)	0.063	**1.0 (0.36)**	**2.71 (1.33 to 5.54)**	**0.006**
Readmit	**0.51 (0.14) (0.22 to 0.79)**	**0.001**	**0.51 (0.16) (0.19 to 0.83)**	**0.002**	0.53 (0.35)	1.71 (0.86 to 3.38)	0.127
Perceived need	−0.01 (0.14) (−0.28 to 0.26)	0.953	0.22 (0.15) (−0.07 to 0.51)	0.140	**1.62 (0.31)**	**5.03 (2.72 to 9.29)**	**0.001**

Significant positive predictors are in bold.
*Screen item definitions are shown in table 1.
ESD, end-stage dementia; ICH, intracranial haemorrhage; MICU, medical intensive care unit; SNF, skilled nursing facilities.

mortality, and discharges to hospice services. Patients with a positive screen had a much higher palliative care referral rate (33.3%) than those with a negative screen (2.7%). Further, patients were significantly more likely to receive a PC consult as the screen score increased from 0 to 1, and 2 or more. By identifying palliative care-appropriate patients early in their MICU admission, the benefits of a palliative intervention to the patient and the families might be better attained.[4 8 10–12] This is the first multihospital study to demonstrate that screening of MICU patients using recommended palliative care criteria target patients at risk for complicated stays, as indicated by significantly longer LOS, higher mortality rates, and higher hospice discharge rates. Patients with 2 or more positive risk factors were more likely to have greater need for palliative care interventions, as indicated by the higher adverse outcomes associated with the highest scores.

Although all seven of the screening criteria used have face validity and historical precedent,[1 3] only five of the criteria predicted the outcomes of hospital and ICU LOS and/or the composite variable of hospital mortality or hospice discharge. End-stage dementia had a significant, negative association with ICU LOS, which means these patients were more likely to have a shorter ICU LOS. The end-stage dementia item did not predict any other outcome, which may reflect the chronic, less acute nature of the patient's illness, compared to those with more severe disease trajectories. However, we nonetheless recommend retention of this item because of the singular opportunity for palliative care interventions to lessen suffering for dementia patients who tend to have low quality of life and high caregiver burden. The other item that did not predict outcomes, item 3, intracranial haemorrhage (ICH), was the least frequently marked criterion (n=34). A review of the charts with this indication showed that nurses often misclassified this criterion, marking it positive for only history of ICH or for patients with altered mental status on a ventilator. Reviewing the CT scan for presence of an ICH is not a standard nursing duty; therefore, we do not recommend retention of item 3 (ICH) in future uses of the screen in the MICU.

Intensivists ordered a PC consult for about one-third of patients who screened positive and almost never ordered a PC consult for patients with a negative screen. There are possible explanations why a PC consult was not requested in two-thirds of the cases who had a positive screen. The screen may have been judged to be a false positive (eg, history of advanced cancer but no active disease present). It was commonly observed that the patient's attending physician did not feel that the patient was in need of, or 'ready' for, palliative care though positive on the screen. Even though a PC consult was not requested for two-thirds of the cases with positive screens, there

may be a significant unmeasured beneficial effect of this tool. The intensivist in those cases may have elected to adopt an 'integrative' palliative care model[1] (ICU clinician providing palliative care) rather than seeking a specialist's help, and the tool may have helped with early identification of those patients.

Adding to the generalisability of the screen, no gender or race biases were observed, as there were no significant differences among those with positive or negative screens for these demographics. Although, as expected, older age was associated with positive screens, it was not included as a palliative care risk factor or indicator for a PC consult. We intentionally focused on functional ability, chronic disease status, and factors that implied an overall poor prognosis to determine the assignment of high versus low risk. Age alone should not be a reason to withhold care if a person can benefit from it.[9] The composition of the diagnoses of the sample may affect generalisability, and it is noteworthy that the most common primary diagnosis was sepsis at nearly 20%.

This screening tool is not meant as a formal prognostic scoring calculator for critically ill patients but, rather, to help with early identification of patients who would benefit from changing focus of care to a palliative approach. Patients targeted with this screening tool are believed to have a poor expected quality of life after critical illness, and are less likely to achieve curative goals of care even with an ICU admission.

Limitations

Due to the quality improvement nature of the project, there was limited investigator control; therefore, we cannot be certain the screens were completed accurately in the ICU. Screen items need to be further refined and validated for their precision. For example, screen item 2 (end-stage dementia) may need to be revised into separate items, such as dementia, multiple sclerosis, and amyotrophic lateral sclerosis, in order to pinpoint the predicative value of each disease. It is important to consider that advanced dementia patients are hospice eligible, and though this criterion did not predict increased LOS or the composite hospice/mortality outcome, there is still a strong, patient care rationale to consult palliative care for patients with advanced dementia.

PC consultation data were not available in the EMR prior to the project implementation, creating an inability to analyse the screens effect on PC consultation rate. The dependence on paper screens as opposed to EMR integration may have affected PC screen access, visibility, and subsequent compliance and referral.

In order for a screen to work most effectively, clinicians must use it appropriately. There appears to be some barriers to the use of the current screen. This is demonstrated by a considerable number of patients who screened positive but did not receive a PC consult. There are many potential causes for this, including, but not limited to, intensivist preference and level of comfort in providing palliative care, perceptions of delegating their patient care to a consultant, or lack of palliative care 'buy in.' We expect and have noticed that some of these perceptions may change with time as the palliative care teams deliver demonstrable benefit, and prove a symbiotic relationship with the ICU team.

CONCLUSION

Decisions to consult subspecialty palliative care in the MICU can be aided using a short trigger screen. Positive screens were highly associated with (1) longer ICU LOS, (2) longer hospital LOS, (3) a higher likelihood of inpatient hospital mortality, and (4) a higher likelihood of being discharged to hospice. Individual screening criteria that were associated with these outcomes included: being admitted from a skilled nursing facility, advanced cancer, postcardiac or respiratory arrest, LOS >5 days or ICU readmission within 30 days, and team-perceived need for PC. We recommend the use of this screen be considered for use in the MICU, with the caveat that our data did not show that the dementia or ICH items were linked to adverse outcomes; however, additional studies are needed to show the screen leads to increased, appropriate palliative care consultation with improved clinical outcomes.

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Contributors RZ, CC and AE contributed to data analysis. AE, DW and JL were responsible for data collection. HK, DK and RZ contributed to overall project design and implementation. RZ, CC, AE, HK and JL contributed to writing the manuscript.

Competing interests None.

Ethics approval Due to the quality improvement classification of the project, the affiliated IRB (Wayne State University's Institutional Review Board) examined the project and deemed it not in need of review or exemption, as the activities of the project do not constitute human subjects research.

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