BRIEF REPORT

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A Multi-Hospital Survey of Current Practices for Supporting Recovery From Sepsis

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OBJECTIVES: Sepsis survivors are at increased risk for morbidity and functional impairment. There are recommended practices to support recovery after sepsis, but it is unclear how often they are implemented. We sought to assess the current use of recovery-based practices across hospitals.

DESIGN: Electronic survey assessing the use of best practices for recovery from COVID-related and non-COVID-related sepsis. Questions included four-point Likert responses of "never" to "always/nearly always."

SETTING: Twenty-six veterans affairs hospitals with the highest ($n = 13$) and lowest ($n = 13$) risk-adjusted 90-day sepsis survival.

SUBJECTS: Inpatient and outpatient clinician leaders.

INTERVENTIONS: None.

MEASUREMENTS AND MAIN RESULTS: For each domain, we calculated the proportion of "always/nearly always" responses and mean Likert scores. We assessed for differences by hospital survival, COVID versus non-COVID sepsis, and sepsis case volume. Across eight domains of care, the proportion "always/nearly always" responses ranged from: 80.7% (social support) and 69.8% (medication management) to 22.5% (physical recovery and adaptation) and 0.0% (emotional support). Higher-survival hospitals more often performed screening for new symptoms/limitations (49.2% vs 35.1% "always/nearly always," $p = 0.02$) compared with lower-survival hospitals. There was no difference in "always/nearly always" responses for COVID-related versus non-COVID-related sepsis, but small differences in mean Likert score in four domains: care coordination (3.34 vs 3.48, $p = 0.01$), medication management (3.59 vs 3.65, $p = 0.04$), screening for new symptoms/limitations (3.13 vs 3.20, $p = 0.02$), and anticipatory guidance and education (2.97 vs 2.84, $p < 0.001$). Lower case volume hospitals more often performed care coordination (72.7% vs 43.8% "always/nearly always," $p = 0.02$), screening for new symptoms/limitations (60.6% vs 35.8%, $p < 0.001$), and social support (100% vs 74.2%, $p = 0.01$).

CONCLUSIONS: Our findings show variable adoption of practices for sepsis recovery. Future work is needed to understand why some practice domains are employed more frequently than others, and how to facilitate practice implementation, particularly within rarely adopted domains such as emotional support.

KEY WORDS: recovery-based practices; patient and family support; sepsis; transitions of care

Sepsis is a leading cause of hospitalization in the United States, and patients who survive sepsis experience an increased risk for morbidity and mortality. Common impairments postsepsis include new or worsened functional decline, cognitive impairment, and mental health issues, limiting return to work and decreasing quality of life (1). As many as 40% of sepsis survivors are rehospitalized and one-third die in the year following sepsis hospitalization (1). Awareness of postsepsis morbidity has increased due to the COVID pandemic.

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KEY POINTS

Question: How often are recovery-based practices for survivors of sepsis implemented across hospitals?

Findings: Across eight domains of practice, consistent ("always/nearly always") implementation ranged from 80.7% (social support) and 69.8% (medication management) to 22.5% (physical recovery and adaptation) and 0.0% (emotional support). Higher-survival hospitals more often "always/nearly always" performed screening for new symptoms and limitations vs lower-survival hospitals. There were no differences in practices used "always/nearly always" for patients with COVID-related vs non-COVID sepsis. Lower-volume hospitals more often performed care coordination, screening for new symptoms/limitations, and social support.

Meaning: Our findings show variable adoption of best practices for sepsis recovery.

The 2021 Surviving Sepsis Campaign Guidelines now include recommendations on best practices to support recovery after sepsis (2). These practices span eight domains: care coordination, medication management, screening for new symptoms and limitations, anticipatory guidance and education, physical recovery and adaptation, emotional support, social support, and care alignment. However, it is unclear how often these practices are implemented. In this study, we sought to examine the use of recovery-based practices to support survivors of sepsis across a diverse set of veterans affairs (VAs) hospitals.

METHODS

Setting

The VA is the largest integrated health system in the United States. It provides comprehensive inpatient and outpatient services and uses an integrated electronic health record, so is well-suited to study and improve recovery-based practices spanning the hospital-to-outpatient continuum. We surveyed inpatient and outpatient clinical leaders at 26 VA facilities about recovery-based practices to support sepsis survivors. This study was approved by the Ann Arbor VA institutional review board with a waiver of documentation of informed consent.

Selection of Hospitals

We identified hospitals with the highest and lowest risk-adjusted sepsis survival during 2017–2020. Sepsis hospitalizations were identified based on electronic health record evidence of infection and acute organ dysfunction similar to the Centers for Disease Control and Prevention Adult Sepsis Event surveillance criteria (3, 4). We then fit mixed-effect logistic regression models predicting 90-day mortality, with a random effect for each facility, and adjustment for patient covariates, as in prior work (5, 6). Hospitals were ranked on adjusted 90-day mortality to identify $n = 13$ highest-survival and $n = 13$ lowest-survival facilities for survey completion.

Physician Participant Recruitment

We emailed the Chiefs of Staff at each hospital and asked them to nominate an inpatient and outpatient clinical leader (e.g., Chief of Hospitalist Medicine, Ambulatory Care Director) to complete the survey. We then invited the nominated clinical leaders via email to complete the online survey in Research Electronic Data Capture. No compensation was provided for survey completion because we anticipated surveys would be completed during respondents' VA tour of duty. Surveys were administered on a rolling basis from April 13, 2022 to September 8, 2022.

Electronic Survey

The survey assessed 27 practices for sepsis recovery across eight domains: care coordination, medication management, screening for new symptoms and limitations, anticipatory guidance and education; physical recovery and adaptation; emotional support, social support, and care alignment (**Table 1**, survey in **Supplement**, http://links.lww.com/CCX/B199). These practices were selected based on literature review and content expertise (1, 2, 7). Responses used a four-point Likert scale: "never," "rarely," "sometimes," and "always/nearly always." Respondents were asked about their perceptions of care for COVID-related vs non-COVID-related sepsis separately. Finally, there were questions about the presence of follow-up clinics and protocolized discharge plans.

Analysis

We present survey responses using descriptive statistics and evaluated differences in care provided 1) by higher- versus lower-survival hospitals, 2) for COVID-related versus non-COVID-related sepsis, and 3) by higher- versus lover-volume hospitals (≥ 500 vs < 500 sepsis hospitalizations annually). For each comparison, we used two approaches to test for differences. First, we calculated the pooled proportion of "always/nearly always" responses by practice and by domain and used *z*-tests (unpaired data) and McNemar's test with Edwards correction (paired data) to test for differences. Second, we assigned points to the Likert scale (e.g., "never" = 1, "always/nearly always" = 4), compared mean scores by practice and by domain, and used Wilcoxon rank-sum tests (unpaired data) and Wilcoxon signed rank tests (paired data) to test for differences. Data management and analysis were completed in SAS Enterprise Guide 8.3 (SAS Institute Inc., Cary, NC). Figures were produced in R version 4.1.2. We used p value less than 0.05 for significance throughout.

RESULTS

At least one leader completed the survey for all 26 hospitals. Twenty-five hospitals (96.2%) completed an inpatient provider survey, and 16 (61.5%) completed the outpatient survey. Yearly sepsis hospitalizations ranged from 128 to 2,912, with 26.9% having fewer than 500. Ninety-day risk-adjusted sepsis mortality ranged from 18.2% (95% CI, 17.9%–18.5%) to 24.9% (95% CI, 24.6%–25.1%).

Across the eight survey domains, the proportion of "always/nearly always" responses ranged from: 80.7% (social support) and 69.8% (medication management) to 22.4% (physical recovery and adaptation) and 0.0% (emotional support). The individual practices with the highest proportion of "always/nearly always" were "patients referred to social work or Veterans' assistance programs if needed" (85.7%) and "patients counseled regarding changes to their medication regimen at hospital discharge" (79.1%). The mean Likert score ranged from 3.77 (social support) to 1.86 (emotional support).

Compared to lower-survival hospitals, higher-survival hospitals more often screened for new symptoms and limitations (49.2% vs 35.1% "always/nearly always," $p = 0.02$) (**Fig. 1*A***). However, there was no difference ($p > 0.05$) in the mean Likert score for any of the eight domains assessed, nor for any of the 27 individual practices (**Table 1**).

Comparing practices for patients with COVID-related versus non-COVID sepsis, there were no significant differences in "always/nearly always" across any of the eight domains ($p > 0.05$ for all comparisons) (**Fig. 1*B***). However, there were statistically significant (albeit small) differences in mean Likert scale responses in four domains: care coordination (3.34 vs 3.48, $p = 0.01$), medication management (3.59 vs 3.65, $p = 0.04$), screening for new symptoms and limitations (3.13 vs 3.20, $p = 0.02$), and anticipatory guidance and education (2.97 vs 2.84, $p < 0.001$).

Compared with higher-volume hospitals, lower-volume hospitals more often reported "always/nearly always" performing practices in care coordination (72.7% vs 43.8%, $p = 0.02$), screening for new symptoms and limitations (60.6% vs 35.8%, $p < 0.001$), and social support (100% vs 74.2%, $p = 0.01$). They had higher Likert score means for care coordination (3.73 vs 3.39, $p = 0.02$), screening for new symptoms and limitations (3.53 vs 3.09, $p < 0.001$), anticipatory guidance and education (3.14 vs 2.73, $p = 0.01$), and social support (4.00 vs 3.69, $p = 0.01$).

Four of 26 hospitals (15.4%) reported having a post-COVID clinic, but only 1 (3.8%) had a postcritical illness clinic, $p = 0.13$. Two of the post-COVID clinics were at high-survival hospitals. Seven hospitals (26.9%) had a protocolized discharge plan for patients with COVID versus 2 (7.7%) with protocolized discharge plans for non-COVID sepsis/critical illness, $p = 0.03$.

DISCUSSION

In this study of 26 diverse, purposefully sampled hospitals across the United States, there was variable adoption of practices to support sepsis recovery. Across the eight domains assessed, social support practices were implemented consistently in 80% of hospitals, while no hospital reported consistent use of emotional support services, such as peer support programs. Practices were similar in higher-survival versus lower-survival hospitals, aside from increased screening for new symptoms and limitations in higher-survival hospitals. Practices differed to a small degree for COVID-related versus non-COVID-related sepsis. Care coordination,

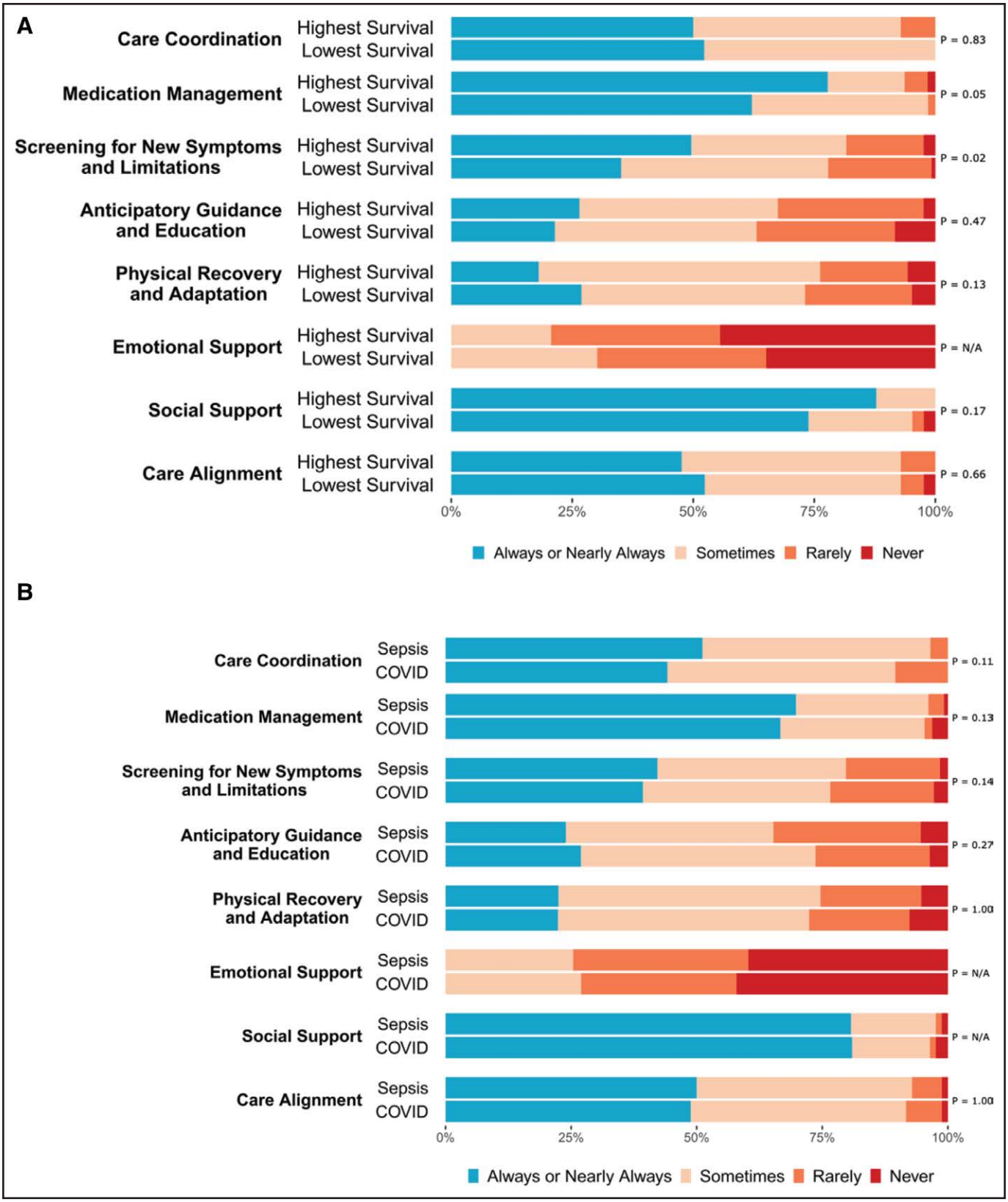

Figure 1. Reported frequency of use of recovery-based practices. Proportion of hospitals reporting frequency of use of each best practice domain. **A**, Grouped by hospitals with the highest risk-adjusted 90-d sepsis survival and those with lowest sepsis survival. **B**, Grouped by responses to questions regarding care of COVID-related sepsis and non-COVID sepsis. p value < 0.05 indicates a significant difference in the proportion of hospitals reporting the use of practices "always/nearly always" within each domain.

TABLE 1.
Survey Responses for Higher- Versus Lower-Survival Hospitals

Survey Question or Domain	Description	High-Survival, Mean	Low-Survival, Mean	*p*	High-Survival Always/Nearly Always, *n* (%)	Low-Survival Always/Nearly Always, *n* (%)	*z*-test *p* value for comparing two proportions
Domain 1	Care coordination	3.43	3.52	0.72	21 (50.0)	23 (52.3)	0.83
Q1.1	Patients seen by primary care within 2 wk of hospital discharge?	3.52	3.55	0.90	11 (52.4)	12 (54.5)	0.89
Q1.2	Recommended follow-up and testing scheduled before hospital discharge?	3.33	3.50	0.56	10 (47.6)	11 (50.0)	0.88
Domain 2	Medication management.	3.70	3.61	0.33	49 (77.8)	41 (62.1)	0.05
Q2.1	Patient discharge medications reviewed by a pharmacist at hospital discharge?	3.67	3.64	0.46	17 (81.0)	15 (68.2)	0.34
Q2.2	Patients counseled regarding changes to their medication regimen at hospital discharge?	3.86	3.68	0.11	19 (90.5)	15 (68.2)	0.07
Q2.3	Patients counseled regarding anticipated need for medication titrations after discharge?	3.57	3.50	0.55	13 (61.9)	11 (50.0)	0.43
Domain 3	Screening for new symptoms and limitations	3.29	3.11	0.36	62 (49.2)	46 (35.1)	0.02
Q3.1	Patients screened for new physical limitations?	3.57	3.14	0.09	13 (61.9)	9 (40.9)	0.17
Q3.2	Patients screened for limitations of activities of daily living?	3.57	3.27	0.26	13 (61.9)	11 (50.0)	0.43
Q3.3	Patients screened for swallowing dysfunction?	2.86	2.95	0.75	5 (23.8)	4 (18.2)	0.65
Q3.4	Patients screened for cognitive impairment?	2.90	2.81	0.72	6 (28.6)	4 (19.0)	0.47
Q3.5	Patients screened for mental health symptoms?	3.10	3.14	0.93	9 (45.0)	7 (31.8)	0.45
Q3.6	Patients screened for need for durable medical equipment?	3.71	3.41	0.10	16 (76.2)	11 (50.0)	0.08

(*Continued*)

TABLE 1. (*Continued*)

Survey Responses for Higher- Versus Lower-Survival Hospitals

Survey Question or Domain	Description	High-Survival, Mean	Low-Survival, Mean	*p*	High-Survival Always/Nearly Always, *n* (%)	Low-Survival Always/Nearly Always, *n* (%)	*z*-test *p* value for comparing two proportions
Domain 4	Anticipatory guidance and education	2.92	2.76	0.37	22 (26.2)	18 (21.4)	0.47
Q4.1	Patients/caregivers counseled regarding common challenges and sequelae after sepsis?	2.71	2.48	0.32	3 (14.3)	3 (14.3)	1.00
Q4.2	Patients/caregivers provided written information on challenges and sequelae after sepsis?	2.52	2.14	0.16	2 (9.5)	1 (4.8)	0.55
Q4.3	Patients/caregivers counseled on their inpatient procedures and their potential sequelae?	3.30	3.19	0.64	9 (45.0)	8 (38.1)	0.75
Q4.4	Patients/caregivers counseled regarding return to prior activities?	3.14	3.24	0.79	8 (38.1)	6 (28.6)	0.51
Domain 5	Physical recovery and adaptation	2.89	2.96	0.71	19 (18.1)	28 (26.9)	0.13
Q5.1	Patients counseled regarding physical recovery?	2.90	2.90	1.00	4 (19.0)	4 (19.0)	1.00
Q5.2	Patients provided a structured exercise plan after hospitalization?	2.48	2.43	0.79	2 (9.5)	4 (19.0)	0.38
Q5.3	Patients referred to physical therapy?	3.33	3.38	0.79	8 (38.1)	9 (42.9)	0.75
Q5.4	Patients referred to occupational therapy?	3.14	3.24	0.59	5 (23.8)	7 (33.3)	0.49
Q5.5	Patients referred to pulmonary or cardiac rehabilitation?	2.57	2.80	0.47	0 (0.0)	4 (20.0)	0.03
Domain 6	Emotional support	1.76	1.95	0.43	0 (0.0)	0 (0.0)	–
Q6.1	Patients referred to peer support programs?	1.57	1.90	0.20	0 (0.0)	0 (0.0)	–
Q6.2	Caregivers referred to peer support programs?	1.52	1.90	0.14	0 (0.0)	0 (0.0)	–
Q6.3	Patients referred to whole health programs after hospitalization?	2.19	2.05	0.57	0 (0.0)	0 (0.0)	–

(*Continued*)

TABLE 1. (*Continued*)
Survey Responses for Higher- Versus Lower-Survival Hospitals

Survey Question or Domain	Description	High-Survival, Mean	Low-Survival, Mean	*p*	High-Survival Always/Nearly Always, *n* (%)	Low-Survival Always/Nearly Always, *n* (%)	*z*-test *p* value for comparing two proportions
Domain 7	Social support	3.88	3.67	0.17	36 (85.7)	31 (73.8)	0.17
Q7.1	Patients screened for lack of shelter, food, medication, transportation, or other necessities?	3.85	3.57	0.18	17 (85.0)	14 (66.7)	0.29
Q7.2	Patients referred to social work or veterans assistance programs if needed?	3.90	3.76	0.38	19 (90.5)	17 (81.0)	0.38
Domain 8	Care alignment	3.40	3.43	0.63	20 (47.6)	22 (52.4)	0.66
Q8.1	Goals of care re-assessed during or after hospitalization for sepsis?	3.62	3.48	0.48	13 (61.9)	11 (52.4)	0.53
Q8.2	Patients screened for palliative care referral before hospital discharge?	3.19	3.38	0.26	7 (33.3)	11 (52.4)	0.21

Dashes indicate a *p* value cannot be calculated because the event rate was 0 for both comparators.

screening for new symptoms and limitations, and social support were implemented more often in lower-volume hospitals.

A second finding was that post-COVID clinics and protocolized post-COVID discharge plans were present in a sizeable minority of hospitals, but postsepsis clinics and protocolized discharge plans were rare. We hypothesize this may be due to heightened attention, including among the lay public, to the challenges of recovery from COVID-related sepsis. Media attention has been likewise associated with increased clinical trials for COVID-19 (8).

Our findings are consistent with prior studies evaluating recovery-based care after critical illness. A multinational study in which 86 critical illness survivors and caregivers were interviewed identified gaps in care related to physical recovery and emotional support (9). A retrospective cohort of sepsis survivors (7) found that 62% of patients received medication optimization (vs 68.2% "always/nearly always" in our study), and 58% had documented care alignment discussions (vs 50.0% "always/nearly always"). Watson et al (10) also reported high adoption of medication optimization and limited implementation of sepsis education and mental health evaluation. Our work adds to the growing body of evidence demonstrating variable implementation of best practices for sepsis recovery and newly demonstrates that these gaps in care are seen across hospitals with high and low sepsis survival rates.

There are several limitations to this work. First, it is possible that survey responses may not accurately reflect the ground truth. We targeted clinical leaders to complete the surveys as these individuals are likely to have the best understanding of the care provided by their service, but it is still possible their perceptions do not accurately reflect practice. However, responses varied across the practices suggesting that providers can at least identify relative differences in practices. Furthermore, our findings are consistent with prior literature suggesting lower use of certain practices, such as emotional support. Second, we selected hospitals based on 90-day mortality from sepsis, hypothesizing that higher-survival hospitals may also have better non-mortality outcomes. However, additional investigation is needed to confirm this hypothesis.

Further work is required to understand why some practice domains are employed more frequently than others across all hospitals. The next steps should focus

on determining which practices have the greatest impact on patient-centered outcomes, as well as which patients would benefit most from each of these practices.

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