



# INTERPROFESSIONAL TEAM COLLABORATION AND WORK ENVIRONMENT HEALTH IN 68 US INTENSIVE CARE UNITS

By Brenda T. Pun, DNP, RN, Jin Jun, PhD, RN, Alai Tan, PhD, Diane Byrum, MSN, RN, Lorraine Mion, PhD, RN, Eduard E. Vasilevskis, MD, MPH, E. Wesley Ely, MD, MPH, and Michele Balas, PhD, RN, CCRN-K

**Background** Safe, reliable, high-quality critical care delivery depends upon interprofessional teamwork.

**Objective** To describe perceptions of intensive care unit (ICU) teamwork and healthy work environments and evaluate whether perceptions vary by profession.

**Methods** In August 2015, Assessment of Interprofessional Team Collaboration Scale (AITCS) and the American Association of Critical-Care Nurses Healthy Work Environment Assessment Tool (HWEAT) surveys were distributed to all interprofessional members at the 68 ICUs participating in the ICU Liberation Collaborative. Overall scores range from 1 (needs improvement) to 5 (excellent).

**Results** Most of the 3586 surveys completed were from registered nurses (51.2%), followed by respiratory therapists (17.8%), attending physicians (10.5%), rehabilitation therapists (8.3%), pharmacists (4.9%), nursing assistants (3.1%), and physician trainees (4.1%). Overall, respondents rated teamwork and work environment health favorably (mean [SD] scores: AITCS, 3.92 [0.64]; HWEAT, 3.45 [0.79]). The highest-rated AITCS domain was "partnership/shared decision-making" (mean [SD], 4.00 [0.63]); lowest, "coordination" (3.67 [0.80]). The highest-scoring HWEAT standard was "effective decision-making" (mean [SD], 3.60 [0.79]); lowest, "meaningful recognition" (3.30 [0.92]). Compared with attending physicians (mean [SD] scores: AITCS, 3.99 [0.54]; HWEAT, 3.48 [0.70]), AITCS scores were lower for registered nurses (3.91 [0.62]), respiratory therapists (3.86 [0.76]), rehabilitation therapists (3.84 [0.65]), and pharmacists (3.83 [0.55]), and HWEAT scores were lower for respiratory therapists (3.38 [0.86]) (all  $P \leq .05$ ).

**Conclusions** Teamwork and work environment health were rated by ICU team members as good but not excellent. Care coordination and meaningful recognition can be improved. (*American Journal of Critical Care*. 2022; 31:443-451)

**CE** 1.0 Hour

This article has been designated for CE contact hour(s). See more CE information at the end of this article.

**VIDEO ONLINE**

©2022 American Association of Critical-Care Nurses  
doi:<https://doi.org/10.4037/ajcc2022546>

**T**eamwork and a healthy work environment are especially important in intensive care units (ICUs), where over 4 million patients are admitted and 500 000 patients die each year in the United States.<sup>1-3</sup> In addition to the high mortality rate, more medical errors and complications can occur in ICUs than in other units. Studies have shown that ICUs with low levels of team coordination, communication, and support have poorer guideline implementation, ICU protocol use, patient outcomes, and staff satisfaction.<sup>4-7</sup>

Similarly, compared with unhealthy work environments, healthy work environments are associated with better workplace interpersonal relationships, job performance, productivity, and patient safety and quality indicators.<sup>8-13</sup> Quality patient care and staff well-being also depend on the foundation of strong teams working in healthy environments.

The importance of teams was recognized as early as 1978 by the World Health Organization.<sup>14</sup> One of the key characteristics of an effective team is cohesive teamwork, which is often measured as interprofessional collaboration, cooperation, coordination, communication, and partnership.<sup>15</sup> In 2005 the American Association of Critical-Care Nurses (AACN) issued healthy work environment standards that included 6 domains: skilled communication, true collaboration, effective decision-making, appropriate staffing,

meaningful recognition, and authentic leadership.<sup>13</sup> The purpose of this strategic initiative was to further understand the factors associated with patient outcomes and professional nursing practice from the perspective of nurses.<sup>16</sup> Improvement in these standards is associated with improved patient outcomes (decreased mortality and decreased readmissions) and nurse outcomes (improved job satisfaction and decreased burnout and emotional exhaustion).<sup>13</sup> Cultivating healthy work environments may be more important than ever given the incredible physical, emotional, and mental tolls that the COVID-19 pandemic has taken on ICU staff.

The core ICU team usually consists of staff members in multiple professions, such as nurses, physicians, respiratory therapists, pharmacists, rehabilitation therapists, and nursing assistants, working in close proximity and tight coordination with one another.<sup>17,18</sup> Because research shows that good team dynamics are foundational for successful implementation of evidence-based practices and guidelines,<sup>19-21</sup> it is important to understand the current ICU teamwork climate. Although studies have examined teamwork in the ICU, they have focused on a small team or a single profession.<sup>22,23</sup> It is important to understand the perceptions of the whole team, not just 1 member of the team. The aim of this project was to describe perceptions of ICU teamwork and healthy work environments and evaluate whether those perceptions vary by profession.

## Methods

### Design and Overview

This cross-sectional survey study used data collected during the Society of Critical Care Medicine's ICU Liberation Collaborative. The collaborative was a quality improvement initiative from 2015 to 2017 that involved 68 ICUs across the United States and Puerto Rico and focused on improving unitwide adoption of the ABCDEF bundle, which includes pain assessment and management, spontaneous awakening and breathing trials, analgesia and sedative choice, delirium assessment and management, early exercise and mobility, and family engagement and empowerment. The diverse group included ICUs from academic, community, and Veterans

### About the Authors

**Brenda T. Pun** is director of data quality at the Critical Illness, Brain Dysfunction, and Survivorship Center, Vanderbilt University Medical Center, Nashville, Tennessee. **Jin Jun** is an assistant professor, Center for Healthy Aging, Self-Management and Complex Care, The Ohio State University College of Nursing, Columbus. **Alai Tan** is a research professor, Center for Research and Health Analytics, The Ohio State University College of Nursing, Columbus. **Diane Byrum** is a quality implementation consultant at Innovative Solutions for Healthcare Education, LLC, Charlotte, North Carolina. **Lorraine Mion** is a research professor, Center for Healthy Aging, Self-Management and Complex Care, The Ohio State University College of Nursing, Columbus. **Eduard E. Vasilevskis** is an associate professor, Division of General Internal Medicine and Public Health, Section of Hospital Medicine; the Center for Health Services Research; the Center for Quality Aging; and the Center for Clinical Quality and Implementation Research, Vanderbilt University Medical Center, and staff physician at the Tennessee Valley Veterans Affairs Geriatric Research Education and Clinical Center, Nashville, Tennessee. **E. Wesley Ely** is a professor at the Critical Illness, Brain Dysfunction, and Survivorship Center, Vanderbilt University Medical Center, and at the Tennessee Valley Veterans Affairs Geriatric Research Education and Clinical Center, Nashville, Tennessee. **Michele Balas** is associate dean of research and Dorothy Hodges Olson Distinguished Professor of Nursing at the University of Nebraska Medical Center College of Nursing, Omaha.

**Corresponding author:** Brenda T. Pun, DNP, RN, Critical Illness, Brain Dysfunction, and Survivorship Center, Vanderbilt University Medical Center, 2525 West End Ave, Nashville, TN 37203 (email: [brenda.pun@vumc.org](mailto:brenda.pun@vumc.org)).

Administration hospitals. Throughout the course of the collaborative, participating ICU leadership teams engaged in a variety of activities, including didactic training on the science behind the bundle elements, interactive teamwork training, monthly colearning calls, coaching sessions, peer resource sharing, and yearly regional meetings where they presented local results. Additional details about the collaborative and the primary outcome results are described elsewhere.<sup>17,24</sup> The data in this manuscript were collected from staff members of ICUs participating in the collaborative before they underwent any unitwide training or implementation work starting in August 2015. Each participating site distributed the teamwork and healthy work environment surveys to all interprofessional staff members working in the unit. The Vanderbilt University institutional review board reviewed and approved this study under 45 CFR §46.104(d)(4) for exempt review. Similarly, each site obtained applicable permissions from local regulatory/ethics boards before collecting data. The collaborative used Research Electronic Data Capture (REDCap), a secure, web-based application for validated data entry, transmission, and storage.<sup>25</sup>

### Participants

Each site participating in the ICU Liberation Collaborative was instructed to distribute the surveys to all interprofessional members of the ICU team either electronically or on paper. Responses to surveys distributed on paper were entered electronically by an ICU Liberation team lead. Each site determined the best method for local survey distribution. Because of the variable nature of large-scale survey distribution, an overall response rate could not be calculated.

### Teamwork Survey Tools

Teamwork was measured with 2 existing valid and reliable instruments: the Assessment of Interprofessional Team Collaboration Scale (AITCS) and the AACN Healthy Work Environment Assessment Tool (HWEAT). The AITCS is a 37-item survey designed to evaluate 3 domains of teamwork: partnership/shared decision-making, cooperation, and coordination/collaboration.<sup>26</sup> Each item is preceded by the stem "When we work as a team, all my team members are..." and is rated using a 5-option response scale (5, always; 4, most of the time; 3, some of the time; 2, occasionally; and 1, never). The AITCS was developed by Orchard et al<sup>26</sup> and reviewed and revised by a team of interprofessional education experts for clarity, comprehensiveness, and content validity. Field testing of this revised version found good

internal consistency reliability (0.98 for the total scale and 0.80 to 0.97 for the 3 subscales) and construct validity (factor analysis revealed 3 factors that explain 61% of variance).<sup>26</sup> Overall AITCS scores translate to "excellent" (scores of 4.00-5.00), "good" (scores of 3.00-3.99), or "needs improvement" (scores of 1.00-2.99).

The HWEAT is an 18-item survey designed to evaluate teamwork and work environment health, developed by the AACN to assess the 6 standards for establishing and sustaining a healthy work environment (skilled communication, true collaboration, effective decision-making, appropriate staffing, meaningful recognition, and authentic leadership).<sup>13</sup> The AACN created this tool with an expert panel to align with the Institute of Medicine core competencies recommended for health care professionals and the 9 provisions in the American Nurses Association Code of Ethics.<sup>13</sup> Respondents evaluate each item in regard to their current work environment. The answer choices are "strongly disagree," "disagree," "neutral," "agree," and "strongly agree." The AACN reports that the original scale was evaluated for face validity with 2 separate groups of 250 respondents. Both groups' results demonstrated high reliability, with Cronbach  $\alpha$  scores of 0.90 or better.<sup>27</sup> The scale has been revised since this original work. Connor and colleagues<sup>28</sup> performed further validity and reliability testing on the current version with a diverse group of more than 1000 professionals (eg, nurses, physicians, social workers, therapists, clinical assistants, patient service associates, and administrators). In that study the HWEAT demonstrated good reliability and validity (Spearman correlation coefficients, 0.50-0.68) and internal consistency (Cronbach  $\alpha$ : overall, 0.77; range for standards, 0.77-0.81). Additionally, the study reported moderate to strong correlation of the HWEAT and the Agency for Healthcare Research and Quality's Hospital Survey on Patient Safety Culture, indicating convergent validity. Overall HWEAT scores translate to "excellent" (scores of 4.00-5.00), "good" (scores of 3.00-3.99), or "needs improvement" (scores of 1.00-2.99).<sup>28</sup>

### Statistical Analysis

Descriptive statistics were used to summarize survey respondent characteristics. We compared the survey respondents' AITCS and HWEAT total and

Quality patient care and staff well-being depend on the foundation of strong teams working in healthy environments.

**Table 1**  
**Characteristics of survey respondents**

Characteristic	No. (%) of respondents <sup>a</sup> (N = 3586)
Age, median (IQR), y	37.0 (30.0-47.0)
Sex	
Male	909 (25.3)
Female	2151 (60.0)
Unknown	526 (14.7)
Years in practice, median (IQR)	8.0 (4.0-18.0)
Years worked in critical care, median (IQR)	6.0 (2.5-15.0)
Years worked in that intensive care unit, median (IQR)	4.0 (1.5-10.0)
Shift <sup>b</sup>	
Day	2591 (72.3)
Evening	410 (11.4)
Night	1280 (35.7)
Employment	
Full time	3052 (85.1)
Part time	386 (10.8)
Other/unknown	148 (4.1)
Professional group	
Registered nurse	1835 (51.2)
Role <sup>b,c</sup>	
Bedside nurse	1672 (91.1)
Manager/assistant manager	85 (4.6)
Clinical nurse specialist	22 (1.2)
Nurse practitioner	3 (0.2)
Nurse educator	45 (2.5)
Other	85 (4.6)
Nursing assistant	110 (3.1)
Physician	527 (14.7)
Role <sup>d</sup>	
Attending physician	375 (71.2)
Trainee (resident or fellow)	146 (27.7)
Unknown	6 (1.1)
Respiratory therapist	639 (17.8)
Rehabilitation therapist	298 (8.3)
Pharmacist	177 (4.9)

<sup>a</sup> Unless otherwise indicated in the first column.  
<sup>b</sup> Multiple selections are allowed.  
<sup>c</sup> Percentages are calculated from total number of registered nurses.  
<sup>d</sup> Percentages are calculated from total number of physicians.

subscale scores across professional groups using analysis of variance, with “attending physician” as the reference for between-group comparisons. All tests were 2-sided, with an  $\alpha$  level of .05. We used SAS statistical software, version 9.4 (SAS Institute) for all statistical analyses.

## Results

### Survey Respondent Characteristics

Of the original 4594 respondents, 750 answered less than 90% of the questions on both the AITCS survey and the HWEAT assessment. Those respondents were excluded from analysis. This analysis focused on the professional groups that commonly participate in ICU daily rounds, perform the bulk of ICU

treatment decision-making, and/or participate in direct patient care and management: nurses, nursing assistants, physicians, respiratory therapists, rehabilitation therapists, and pharmacists. Another 258 respondents were excluded because their profession was either not in this list or was unknown. The final analysis included 3586 respondents.

The respondents had a median age of 37 years, and 60.0% were female. Respondents had been working in the ICU setting for a median of 4 years (Table 1). The largest professional group represented was registered nurses, followed by respiratory therapists, physicians, rehabilitation therapists, and pharmacists.

### AITCS

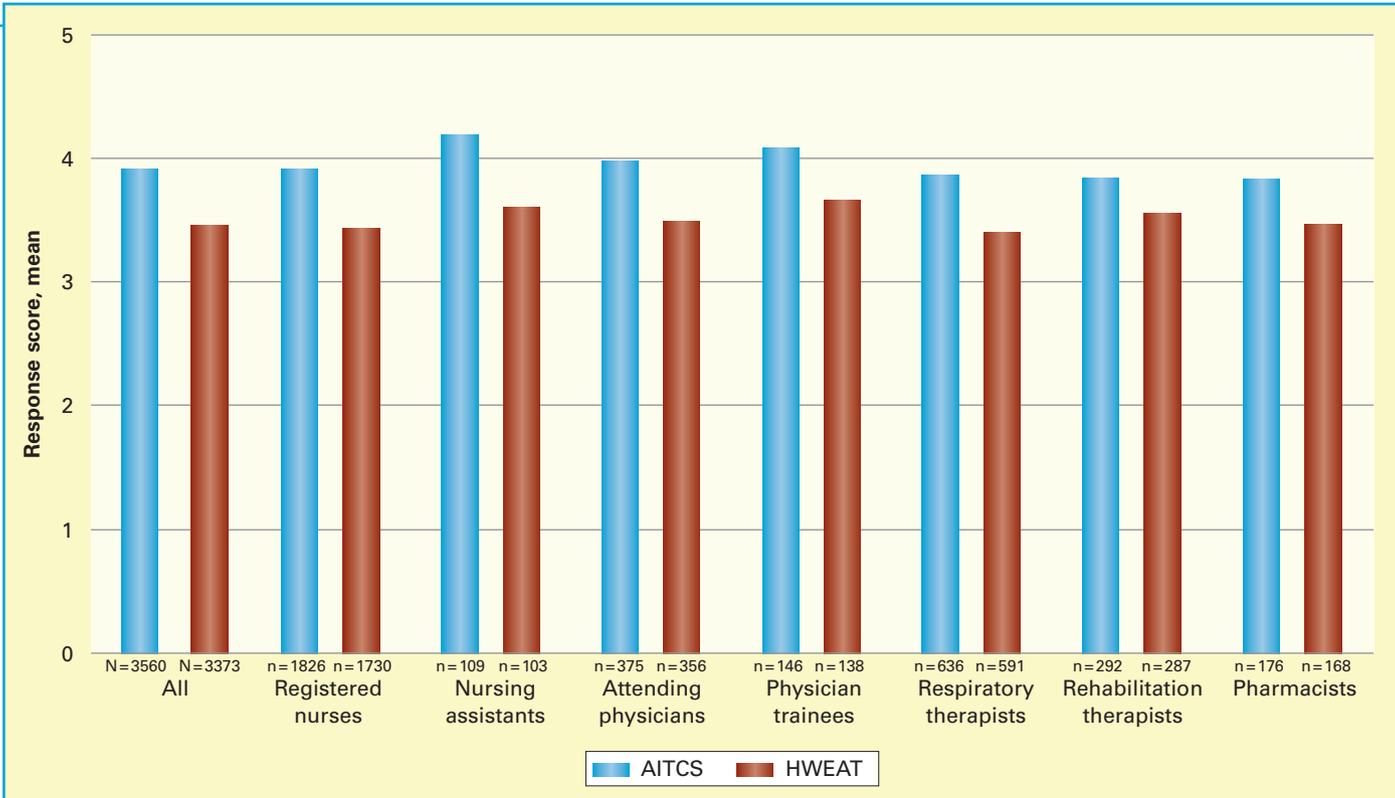
The mean (SD) score for all respondents for the AITCS was 3.92 (0.64) (see Figure). The domain “partnership/shared decision-making” was rated highest (mean [SD], 4.00 [0.63]), followed by “cooperation” (3.93 [0.68]) and “coordination” (3.67 [0.80]).

Compared with total mean (SD) AITCS scores of attending physicians, those of physician trainees were similar, those of nursing assistants were significantly higher, and those of respondents from all other professional groups were modestly but significantly lower. The lowest mean score was from pharmacists (Table 2).

### HWEAT

The mean (SD) HWEAT score for all respondents was 3.45 (0.79). There was little variance among the domains. The 2 highest mean (SD) scores among all respondents were for “effective decision-making” (3.60 [0.79]) and “authentic leadership” (3.51 [0.85]), and the 2 lowest scores were for “true collaboration” (3.38 [0.87]) and “meaningful recognition” (3.30 [0.92]).

For HWEAT total scores by profession, respiratory therapists were the only group with a significantly (although minimally) different rating from attending physicians (Table 3). There was little variance among the 6 domains. Compared with attending physicians, physician trainees rated the following domains significantly higher: “skilled communication,” “true collaboration,” “effective decision-making,” “appropriate staffing,” and “authentic leadership.” All other ratings that were significantly different from those of attending physicians were lower. Registered nurses rated “appropriate staffing” lowest among all professional groups, significantly lower than attending physicians. Respiratory therapists rated the following domains significantly lower than attending physicians: “skilled communication,” “true collaboration,” and



**Figure** Teamwork and healthy work environment survey responses by profession. Overall scores translate to “excellent” (4.00-5.00), “good” (3.00-3.99), or “needs improvement” (1.00-2.99).

Abbreviations: AITCS, Assessment of Interprofessional Team Collaboration Scale; HWEAT, Healthy Work Environment Assessment Tool.

“meaningful recognition.” Pharmacists also rated “meaningful recognition” significantly lower than attending physicians.

**Discussion**

Finding ways to improve the health of the ICU work environment and the ICU team is more important than ever before. The COVID-19 pandemic has placed considerable strain on ICU care teams as they have faced overwhelming patient volumes, incredibly sick and difficult-to-treat patients, fears of contracting and spreading the disease, staffing shortages, mental health struggles, and burnout.<sup>29,30</sup> This study contributes to pre-pandemic benchmarks to guide the medical community through the rebuilding process. Our report of a representative sample of more than 3500 staff members from 68 ICUs across the United States is the largest interprofessional study to date to report on both teamwork and healthy work environment in ICUs. Similar to previous reports,<sup>10</sup> we found that although respondents rated overall teamwork and work environment health as good, the ratings were not optimal, indicating room for improvement in all domains of both measurements. “Coordination” was reported to be the weakest teamwork

domain, whereas “true collaboration” and “meaningful recognition” were the lowest of the healthy work environment standards. Focused efforts to improve coordination and collaboration and to find meaningful ways to recognize the efforts of teammates may facilitate the growth needed to move from “good” to “excellent” for ICU teams.

Our data provide the opportunity to explore how various ICU professionals might perceive teamwork and work environments differently. Although members of nearly all professions rated their perceptions of teamwork and work environment similarly, physicians (attending physicians and trainees) rated their overall impression of teamwork significantly higher than did members of other professions. This finding was echoed in other studies in which physicians consistently rated teamwork and their units’ teamwork climate higher than did nurses and nursing assistants.<sup>28,31,32</sup> Nurses often cited difficulties in speaking up and the fact that their input or disagreement was not well received

Coordination was the weakest ranked area of teamwork by the various members of the interprofessional team.

**Table 2****Assessment of Interprofessional Team Collaboration Scale (AITCS) survey response scores by professional group (N=3560)**

Scale	Score, <sup>a</sup> mean (SD)	P <sup>b</sup>
<b>AITCS, total</b>		
Attending physician	3.99 (0.54)	Reference
Physician trainee (fellow/resident)	4.08 (0.48)	.18
Registered nurse	3.91 (0.62)	.02
Nursing assistant	4.18 (0.59)	.006
Respiratory therapist	3.86 (0.76)	.002
Rehabilitation therapist	3.84 (0.65)	.002
Pharmacist	3.83 (0.55)	.004
<b>Partnership/shared decision-making</b>		
Attending physician	4.11 (0.53)	Reference
Physician trainee (fellow/resident)	4.16 (0.47)	.48
Registered nurse	3.99 (0.61)	<.001
Nursing assistant	4.24 (0.55)	.07
Respiratory therapist	3.93 (0.76)	<.001
Rehabilitation therapist	3.92 (0.65)	<.001
Pharmacist	3.91 (0.57)	<.001
<b>Cooperation</b>		
Attending physician	4.05 (0.56)	Reference
Physician trainee (fellow/resident)	4.10 (0.50)	.41
Registered nurse	3.92 (0.67)	<.001
Nursing assistant	4.19 (0.69)	.06
Respiratory therapist	3.86 (0.81)	<.001
Rehabilitation therapist	3.89 (0.64)	.002
Pharmacist	3.89 (0.57)	.01
<b>Coordination</b>		
Attending physician	3.58 (0.76)	Reference
Physician trainee (fellow/resident)	3.82 (0.69)	.002
Registered nurse	3.68 (0.78)	.03
Nursing assistant	4.03 (0.79)	<.001
Respiratory therapist	3.68 (0.89)	.06
Rehabilitation therapist	3.55 (0.85)	.65
Pharmacist	3.51 (0.75)	.34

<sup>a</sup> Scores translate to "excellent" (4.00-5.00), "good" (3.00-3.99), or "needs improvement" (1.00-2.99).

<sup>b</sup> Unadjusted *P* value.

to be barriers to teamwork.<sup>33</sup> Furthermore, physicians and nurses conceptualize teamwork differently. When asked what teamwork meant for them, nurses emphasized the level of trust and respect and the willingness to help,<sup>33</sup> whereas physicians focused on specific roles and having a common direction of work.<sup>34</sup> These findings suggest that the traditional hierarchy embedded within health care influences each profession differently. For example, hierarchical structures that shift power toward physicians have been associated with differences in attitudes and understanding of roles and responsibilities.<sup>35</sup> This finding underscores the continued need for specific training focused on interprofessional communication and leadership in our professional schools and within our hospital systems. This type of training can be found in programs like the ICU Liberation Collaborative<sup>24</sup> and the

comprehensive unit-based safety program<sup>36,37</sup> in which implementation science and teamwork training are integrated to facilitate the successful adoption of evidence-based best practices.

To our knowledge, our research is the first to demonstrate that differences in the perception of teamwork extend to other members of the interprofessional team and are not limited to nurses and physicians. Staff members who regularly consult about specific interventions for patients (rehabilitation therapists, respiratory therapists, and pharmacists) generally had the lowest scores in both surveys. The nature of these roles may contribute to these staff members' perception of poor coordination and collaboration seen in the overall results. Staff members working more often at the bedside may feel more cohesion and connection, whereas staff members who provide consultation for multiple patients intermittently depending upon clinical needs, and perhaps on different units, tend to feel less connected to the team. This situation highlights the need to find more effective ways to include these teammates in decision-making and information distribution. Connor et al<sup>28</sup> suggested that these types of discrepancies show that interprofessional differences need to be explored when planning implementation and improvement initiatives. Including these teammates in interprofessional rounds or rapid rounds (huddles) could help staff members synchronize plans, help teammates feel more involved in decision-making and planning, and improve patient care coordination. Additionally, to correct this perception mismatch, it may be helpful for physicians (especially those serving as team leads of interprofessional rounds) to proactively check in with other team members and be regularly involved in quality improvement efforts to identify and successfully eliminate barriers.

Although registered nurses rated nearly everything higher than these other allied health teammates, nurses rated 1 area particularly low: appropriate staffing. This finding agrees with numerous reports in which nurses cited inadequate staffing as a barrier to both patient care and job satisfaction.<sup>10,11,38</sup> The need for more nurses has been well established for the past decade<sup>39</sup> and the COVID-19 pandemic appears to have exacerbated the issue. In September 2021, the American Nurses Association sent a letter to the US Department of Health and Human Services highlighting the staffing shortages that became worse since the pandemic began and declared that this severe shortage "will have long-term repercussions for the profession, the entire health care delivery system, and ultimately, on the health of the nation."<sup>29</sup>

The American Nurses Association presented policy suggestions to improve nurses' well-being and mental health, improve retention, remove practice and training barriers, and provide appropriate compensation.<sup>29</sup> These suggestions are in line with recent recommendations for stress management strategies for nursing staff and nurse leadership, transparency in communication, and organizational focus on nurses' well-being.<sup>13,40-42</sup>

Critically ill patients need complex care that requires staff members of multiple professions to work in collaboration. For example, teamwork is foundational to the success of the ABCDEF bundle, a mainstay of ICU best practices that requires team members to work in close coordination throughout the day as patients progress through breathing trials (respiratory therapists), sedation vacation trials (bedside nurses), and progressive mobility interventions (rehabilitation therapists), all while balancing medications and treatments for keeping their pain controlled and their sedation minimal (pharmacists).<sup>4,18</sup> Although this bundle has been shown to improve patient outcomes and lower costs,<sup>21,24,43,44</sup> adherence suffers partly because of the dependence on an inter-professional approach to team management and good handoffs.<sup>24,45,46</sup> The rates of bundle use have dropped dramatically during the COVID-19 pandemic, showing that bundle adherence is a prime area for quality improvement.<sup>47,48</sup> Lack of coordination among team members, poor communication, and/or unhealthy team dynamics and work environments are powerful barriers to the coordinated care practices in the ABCDEF bundle.<sup>46,49</sup> The data from this study of teamwork and healthy work environment perceptions can help drive future research aimed at improving teamwork, which in turn improves patient care (ABCDEF bundle adherence) and patient outcomes.

### Limitations

This study has several limitations. First, the cross-sectional nature of our analysis limits any inferences about the teamwork dynamic. Teamwork is elusive and difficult to capture, and changes in schedules and staffing patterns make analyzing teamwork even more difficult. Therefore, our data may not fully capture team dynamics. However, our nationally representative sample provides an overview of the general perception of teamwork among a diverse group of professionals. Second, our study used a convenience sample in which distribution practices may have varied by site, potentially reducing the generalizability of the results. More research that includes a large interprofessional sample is needed to further

**Table 3**  
Healthy Work Environment Assessment Tool (HWEAT) survey response scores by professional group (N=3373)

Scale	Score, <sup>a</sup> mean (SD)	P <sup>b</sup>
<b>HWEAT, total</b>		
Attending physician	3.48 (0.70)	Reference
Physician trainee (fellow/resident)	3.66 (0.63)	.23
Registered nurse	3.43 (0.83)	.23
Nursing assistant	3.60 (0.88)	.21
Respiratory therapist	3.38 (0.86)	.05
Rehabilitation therapist	3.51 (0.66)	.69
Pharmacist	3.46 (0.61)	.80
<b>Skilled communication</b>		
Attending physician	3.50 (0.77)	Reference
Physician trainee (fellow/resident)	3.74 (0.68)	.007
Registered nurse	3.43 (0.92)	.18
Nursing assistant	3.57 (0.93)	.47
Respiratory therapist	3.37 (0.92)	.03
Rehabilitation therapist	3.57 (0.72)	.36
Pharmacist	3.49 (0.67)	.86
<b>True collaboration</b>		
Attending physician	3.42 (0.81)	Reference
Physician trainee (fellow/resident)	3.59 (0.68)	.05
Registered nurse	3.37 (0.89)	.25
Nursing assistant	3.55 (0.96)	.18
Respiratory therapist	3.29 (0.97)	.03
Rehabilitation therapist	3.37 (0.75)	.47
Pharmacist	3.46 (0.69)	.69
<b>Effective decision-making</b>		
Attending physician	3.59 (0.73)	Reference
Physician trainee (fellow/resident)	3.70 (0.71)	.02
Registered nurse	3.59 (0.81)	.95
Nursing assistant	3.75 (0.86)	.07
Respiratory therapist	3.55 (0.86)	.52
Rehabilitation therapist	3.63 (0.66)	.48
Pharmacist	3.66 (0.62)	.33
<b>Appropriate staffing</b>		
Attending physician	3.49 (0.79)	Reference
Physician trainee (fellow/resident)	3.70 (0.71)	.02
Registered nurse	3.38 (0.93)	.03
Nursing assistant	3.61 (0.98)	.23
Respiratory therapist	3.41 (0.92)	.17
Rehabilitation therapist	3.57 (0.75)	.27
Pharmacist	3.45 (0.73)	.62
<b>Meaningful recognition</b>		
Attending physician	3.35 (0.79)	Reference
Physician trainee (fellow/resident)	3.47 (0.72)	.19
Registered nurse	3.33 (0.96)	.67
Nursing assistant	3.44 (0.98)	.38
Respiratory therapist	3.17 (0.99)	.003
Rehabilitation therapist	3.29 (0.79)	.35
Pharmacist	3.18 (0.76)	.04
<b>Authentic leadership</b>		
Attending physician	3.54 (0.76)	Reference
Physician trainee (fellow/resident)	3.71 (0.71)	.05
Registered nurse	3.47 (0.89)	.12
Nursing assistant	3.64 (0.92)	.28
Respiratory therapist	3.46 (0.88)	.13
Rehabilitation therapist	3.63 (0.70)	.21
Pharmacist	3.55 (0.71)	.90

<sup>a</sup> Scores translate to "excellent" (4.00-5.00), "good" (3.00-3.99), or "needs improvement" (1.00-2.99).

<sup>b</sup> Unadjusted P value.

guide our understanding of teamwork in the ICU setting. Third, the measures of teamwork used in the study do not capture a unit's deeply embedded micro-organizational culture. Organizational culture is a set of underlying beliefs and assumptions that guides the behaviors of team members. Each professional group (eg, physicians or nurses) may be governed by a different culture. Last, the survey was voluntary and thus may not capture nonresponders' perceptions of teamwork.

## Conclusion

Teamwork is essential to providing safe and effective care, and staff members thrive and patient care excels in a healthy work environment. However, in this study, all team members (physicians, nurses, nursing assistants, respiratory therapists, rehabilitation therapists, and pharmacists) rated teamwork and the work environment as good, but none rated them as excellent, indicating that the way teams function in the critical care area can be improved. Teams may

benefit from specific strategies to increase coordination and collaboration (like care bundles such as the ABCDEF bundle). Intentional involvement of all stakeholders of the interprofessional team in implementation projects ensures that members have a say in design and execution. It is important for ICU and hospital leaders to give special attention to efforts to provide continuous improvement to the work environment.

## ACKNOWLEDGMENTS

We would like to acknowledge the invaluable contributions of the ICU Liberation Collaborative participants, faculty, and Society of Critical Care Medicine staff partners.

## FINANCIAL DISCLOSURES

Funding for the ICU Liberation Collaborative was provided by the Gordon and Betty Moore Foundation and the Society of Critical Care Medicine. The National Heart, Lung, and Blood Institute provided grant support for this analysis (National Institutes of Health: R01 HL146781-01). The National Center for Advancing Translational Sciences provided grant support for REDCap (National Institutes of Health: UL1 TR000445).

## SEE ALSO

For more about healthy work environments, visit the *Advanced Critical Care* website, [www.aacnconline.org](http://www.aacnconline.org), and read the article by Blake et al, "A Hospital's Roadmap for Improving Nursing Excellence Using AACN's Healthy Work Environment Standards" (Summer 2022).

## REFERENCES

1. Barrett ML, Smith MW, Elixhauser A, Honigman LS, Pines JM. *Utilization of Intensive Care Services, 2011*. Healthcare Cost and Utilization Project statistical brief 185. Agency for Healthcare Research and Quality. December 2014. Accessed January 6, 2022. <https://hcup-us.ahrq.gov/reports/statbriefs/sb185-Hospital-Intensive-Care-Units-2011.jsp>
2. Molina JA, Seow E, Heng BH, Chong WF, Ho B. Outcomes of direct and indirect medical intensive care unit admissions from the emergency department of an acute care hospital: a retrospective cohort study. *BMJ Open*. 2014;4(11):e005553. doi:10.1136/bmjopen-2014-005553
3. Mukhopadhyay A, Tai BC, See KC, et al. Risk factors for hospital and long-term mortality of critically ill elderly patients admitted to an intensive care unit. *Biomed Res Int*. 2014; 2014:960575.
4. Costa DK, Valley TS, Miller MA, et al. ICU team composition and its association with ABCDE implementation in a quality collaborative. *J Crit Care*. 2018;44:1-6.
5. Baggs JG, Schmitt MH, Mushlin AI, et al. Association between nurse-physician collaboration and patient outcomes in three intensive care units. *Crit Care Med*. 1999;27(9):1991-1998.
6. Reader TW, Cuthbertson BH. Teamwork and team training in the ICU: where do the similarities with aviation end? *Crit Care*. 2011;15(6):313.
7. Sinuff T, Eva KW, Meade M, Dodek P, Heyland D, Cook D. Clinical practice guidelines in the intensive care unit: a survey of Canadian clinicians' attitudes. *Can J Anaesth*. 2007; 54(9):728-736.
8. Stalpers D, de Brouwer BJ, Kaljouw MJ, Schuurmans MJ. Associations between characteristics of the nurse work environment and five nurse-sensitive patient outcomes in hospitals: a systematic review of literature. *Int J Nurs Stud*. 2015;52(4):817-835.
9. Wei H, Sewell KA, Woody G, Rose MA. The state of the science of nurse work environments in the United States: a systematic review. *Int J Nurs Sci*. 2018;5(3):287-300.
10. Ulrich B, Barden C, Cassidy L, Varn-Davis N. Critical care nurse work environments 2018: findings and implications. *Crit Care Nurse*. 2019;39(2):67-84.
11. Lasater KB, McHugh MD. Nurse staffing and the work environment linked to readmissions among older adults following elective total hip and knee replacement. *Int J Qual Health Care*. 2016;28(2):253-258.
12. Monroe M, Morse E, Price JM. The relationship between critical care work environment and professional quality of life. *Am J Crit Care*. 2020;29(2):145-149.
13. American Association of Critical-Care Nurses. *AACN Standards for Establishing and Sustaining Healthy Work Environments: A Journey to Excellence*. 2nd ed. American Association of Critical-Care Nurses; 2016. Accessed January 6, 2022. <https://www.aacn.org/~media/aacn-website/nursing-excellence/standards/hwestandards.pdf>
14. World Health Organization, Department of Human Resources for Health. *Framework for Action on Interprofessional Education & Collaborative Practice*. World Health Organization; 2010.
15. Xyrichis A, Ream E. Teamwork: a concept analysis. *J Adv Nurs*. 2008;61(2):232-241.
16. Heath J, Johanson W, Blake N. Healthy work environments: a validation of the literature. *J Nurs Adm*. 2004;34(11):524-530.
17. Barnes-Daly MA, Pun BT, Harmon LA, et al. Improving health care for critically ill patients using an evidence-based collaborative approach to ABCDEF bundle dissemination and implementation. *Worldviews Evid Based Nurs*. 2018;15(3):206-216.
18. Donovan AL, Aldrich JM, Gross AK, et al. Interprofessional care and teamwork in the ICU. *Crit Care Med*. 2018;46(6):980-990.
19. Sinuff T, Cook D, Giacomini M, Heyland D, Dodek P. Facilitating clinician adherence to guidelines in the intensive care unit: a multicenter, qualitative study. *Crit Care Med*. 2007; 35(9):2083-2089.
20. Devlin JW, Skrobik Y, Gélinas C, et al. Clinical practice guidelines for the prevention and management of pain, agitation/sedation, delirium, immobility, and sleep disruption in adult patients in the ICU. *Crit Care Med*. 2018;46(9):e825-e873. doi:10.1097/CCM.00000000000003299
21. Barnes-Daly MA, Phillips G, Ely EW. Improving hospital survival and reducing brain dysfunction at seven California community hospitals: implementing PAD guidelines via the ABCDEF bundle in 6,064 patients. *Crit Care Med*. 2017;45(2):171-178.

22. Schmutz JB, Meier LL, Manser T. How effective is teamwork really? The relationship between teamwork and performance in healthcare teams: a systematic review and meta-analysis. *BMJ Open*. 2019;9(9):e028280. doi:10.1136/bmjopen-2018-028280
23. Paradis E, Leslie M, Gropper MA, Aboumatar HJ, Kitto S, Reeves S. Interprofessional care in intensive care settings and the factors that impact it: results from a scoping review of ethnographic studies. *J Crit Care*. 2013;28(6):1062-1067.
24. Pun BT, Balas MC, Barnes-Daly MA, et al. Caring for critically ill patients with the ABCDEF Bundle: results of the ICU Liberation Collaborative in over 15,000 adults. *Crit Care Med*. 2019;47(1):3-14.
25. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42(2):377-381.
26. Orchard CA, King GA, Khalili H, Bezzina MB. Assessment of Interprofessional Team Collaboration Scale (AITCS): development and testing of the instrument. *J Contin Educ Health Prof*. 2012;32(1):58-67.
27. AACN Healthy Work Environment Assessment Tool. American Association of Critical-Care Nurses. Accessed April 15, 2022. <https://www.aacn.org/nursing-excellence/healthy-work-environments/aacn-healthy-work-environment-assessment-tool>
28. Connor JA, Ziniel SI, Porter C, et al. Interprofessional use and validation of the AACN Healthy Work Environment Assessment Tool. *Am J Crit Care*. 2018;27(5):363-371.
29. American Nurses Association. Letter to Secretary Xavier Becerra, Department of Health and Human Services. September 1, 2021. Accessed January 4, 2022. [https://www.nursing-world.org/~4a49e2/globalassets/rss-assets/analettertohhs\\_staffingconcerns\\_final-2021-09-01.pdf](https://www.nursing-world.org/~4a49e2/globalassets/rss-assets/analettertohhs_staffingconcerns_final-2021-09-01.pdf)
30. Moll V, Meissen H, Pappas S, et al. The coronavirus disease 2019 pandemic impacts burnout syndrome differently among multiprofessional critical care clinicians—a longitudinal survey study. *Crit Care Med*. 2022;50(3):440-448.
31. O'Leary KJ, Manojlovich M, Johnson JK, et al. A multisite study of interprofessional teamwork and collaboration on general medical services. *Jt Comm J Qual Patient Saf*. 2020;46(12):667-672.
32. Thomas EJ, Sexton JB, Helmreich RL. Discrepant attitudes about teamwork among critical care nurses and physicians. *Crit Care Med*. 2003;31(3):956-959.
33. Kendall-Gallagher D, Reeves S, Alexanian JA, Kitto S. A nursing perspective of interprofessional work in critical care: findings from a secondary analysis. *J Crit Care*. 2017;38:20-26.
34. Rydenfält C, Borell J, Erlingsdottir G. What do doctors mean when they talk about teamwork? Possible implications for interprofessional care. *J Interprof Care*. 2019;33(6):714-723.
35. Rose L. Interprofessional collaboration in the ICU: how to define? *Nurs Crit Care*. 2011;16(1):5-10.
36. Pronovost P, Weast B, Rosenstein B, et al. Implementing and validating a comprehensive unit-based safety program. *J Patient Safety*. 2005;1(1):33-40.
37. Pronovost PJ, Berenholtz SM, Goeschel C, et al. Improving patient safety in intensive care units in Michigan. *J Crit Care*. 2008;23(2):207-221.
38. Ma C, McHugh MD, Aiken LH. Organization of hospital nursing and 30-day readmissions in Medicare patients undergoing surgery. *Med Care*. 2015;53(1):65-70.
39. Institute of Medicine; Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing. *The Future of Nursing: Leading Change, Advancing Health*. National Academies Press; 2011.
40. Dimino K, Learmonth AE, Fajardo CC. Nurse managers leading the way: reenvisioning stress to maintain healthy work environments. *Crit Care Nurse*. 2021;41(5):52-58.
41. Lake ET, Narva AM, Holland S, et al. Hospital nurses' moral distress and mental health during COVID-19. *J Adv Nurs*. 2022;78(3):799-809.
42. Melnyk BM, Hsieh AP, Tan A, et al. Associations among nurses' mental/physical health, lifestyle behaviors, shift length, and workplace wellness support during COVID-19: important implications for health care systems. *Nurs Adm Q*. 2022;46(1):5-18.
43. Balas MC, Vasilevskis EE, Olsen KM, et al. Effectiveness and safety of the awakening and breathing coordination, delirium monitoring/management, and early exercise/mobility bundle. *Crit Care Med*. 2014;42(5):1024-1036.
44. Hsieh SJ, Otusanya O, Gershengorn HB, et al. Staged implementation of awakening and breathing, coordination, delirium monitoring and management, and early mobilization bundle improves patient outcomes and reduces hospital costs. *Crit Care Med*. 2019;47(7):885-893.
45. Morandi A, Piva S, Ely EW, et al. Worldwide survey of the "assessing pain, both spontaneous awakening and breathing trials, choice of drugs, delirium monitoring/management, early exercise/mobility, and family empowerment" (ABCDEF) bundle. *Crit Care Med*. 2017;45(11):e1111-e1122.
46. Costa DK, White MR, Ginier E, et al. Identifying barriers to delivering the awakening and breathing coordination, delirium, and early exercise/mobility bundle to minimize adverse outcomes for mechanically ventilated patients: a systematic review. *Chest*. 2017;152(2):304-311.
47. Liu K, Nakamura K, Katsukawa H, et al. Implementation of the ABCDEF bundle for critically ill ICU patients during the COVID-19 pandemic: a multi-national 1-day point prevalence study. *Front Med (Lausanne)*. 2021;8:735860.
48. Devlin JW, O'Neal HR Jr, Thomas C, et al. Strategies to optimize ICU liberation (A to F) bundle performance in critically ill adults with coronavirus disease 2019. *Crit Care Explor*. 2020;2(6):e0139. doi:10.1097/CCE.0000000000000139
49. Carrothers KM, Barr J, Spurlock B, Ridgely MS, Damberg CL, Ely EW. Contextual issues influencing implementation and outcomes associated with an integrated approach to managing pain, agitation, and delirium in adult ICUs. *Crit Care Med*. 2013;41(9 Suppl 1):S128-S135.

To purchase electronic or print reprints, contact American Association of Critical-Care Nurses, 27071 Aliso Creek Road, Aliso Viejo, CA 92656. Phone, (800) 899-1712 or (949) 362-2050 (ext 532); fax, (949) 362-2049; email, [reprints@aacn.org](mailto:reprints@aacn.org).

## CE 1.0 Hour Category C

### Notice to CE enrollees:

This article has been designated for CE contact hour(s). The evaluation demonstrates your knowledge of the following objectives:

1. List the common members of the intensive care unit (ICU) interprofessional team.
2. Describe several barriers to teamwork and healthy work environments in ICUs.
3. Identify at least 1 strategy for improving teamwork and/or healthy work environment in the ICU.

To complete the evaluation for CE contact hour(s) for activity A223161, visit <https://aacnjournals.org/ajconline/ce-articles>. No CE fee for AACN members. See CE activity page for expiration date.

The American Association of Critical-Care Nurses is accredited as a provider of nursing continuing professional development by the American Nurses Credentialing Center's Commission on Accreditation, ANCC Provider Number 0012. AACN has been approved as a provider of continuing education in nursing by the California Board of Registered Nursing (CA BRN), CA Provider Number CEP1036, for 1.0 contact hour.