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## Perception of interdisciplinary collaboration between ICU nurses and resident physicians during the COVID-19 pandemic

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### ABSTRACT

Multidisciplinary collaboration is the hallmark of quality critical care. Prior studies have shown that nurses and physicians have different perceptions on communication and collaboration in the ICU. The Covid-19 pandemic has served to both strain and strengthen relationships between nurses and resident physicians in the ICU. This study used a survey-based approach sought to identify the similarities and differences between perception of collaboration between ICU nurses and resident physicians taking care of patients during the pandemic, and to identify whether they felt that the pandemic impacted the collaborative spirit of critical care. Although findings from this study suggest that overall residents and nurses perceive collaboration similarly, the COVID-19 pandemic may be differentially affecting the interdisciplinary dynamics of the ICU.

### 1. Introduction

Interdisciplinary coordination of care is a prerequisite for the functionality of the intensive care unit. Numerous studies have demonstrated that poor collaboration and communication lead to adverse patient outcomes and higher healthcare costs, and addressing deficits in communication has direct clinical and financial benefits.<sup>1-4</sup>

The academic intensive unit care team is at minimum composed of an attending physician, trainee physicians, and a registered nurse, as well as additional staff such as respiratory therapists, nursing assistants, and physical, occupational, and speech therapists. In academic settings in particular, residents play a central role in providing direct patient care. Prior work has suggested that different disciplines in the ICU have varying perceptions on ICU team function,<sup>5</sup> and that effective teamwork and collaboration have also been correlated with higher job satisfaction among nurses, lower job turnover rates, and a well-mediated stress response to ethically challenging situations.<sup>6-8</sup>

The COVID-19 pandemic, with a sharp rise in patient volumes, acuity, and stressors outside the hospital environment, may have posed a significant strain on the interpersonal relationships between ICU clinicians. In an effort to assess the extent to which the pandemic affected these relationships, we conducted a cross-sectional survey, using previously validated tools, to assess the perception of the ICU team by

resident physicians and ICU nurses, as well as their perception of the impact of the pandemic on interdisciplinary collaboration.

### 2. Methods

This was a single-center, survey-based study of resident physicians and medical ICU (MICU) nurses at Cedars-Sinai Medical Center (CSMC). CSMC is an urban, academic teaching hospital and the largest single hospital facility in Southern California with over 960 beds, with the largest ICU capacity, and is a key referral destination for critically ill patients with COVID-19 from all over Southern California during the pandemic. The medical ICU teams, which took care of the vast majority of these patients, is staffed by a faculty intensivist, a critical care fellow, and several internal medicine residents as a closed unit. The residents were the target physicians surveyed. The ICU nurses surveyed were staff nurses (not visiting or traveling nurses) employed by CSMC. The standard rounding practice in these units is with daily interdisciplinary rounds attended by physicians, nurses, respiratory therapists, and their trainees. All of the clinicians surveyed spent time taking care of patients in the COVID-19 ICU between January 2020 and June 2021.

The survey used in this study has previously been described by Adler-Milstein<sup>5</sup>. In brief, it is a combination survey which contains an assessment of team diagnostics (team boundedness, interdependence,

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and stability) using the 8-item scale from the Team Diagnostic Survey as described by Wageman,<sup>9</sup> communication quality (openness, accuracy, timeliness, and satisfaction) as described by Shortell,<sup>10</sup> coordination (team planning, collaboration, and appropriate execution of decisions) as described by Schippers's 8-item planning scale and 5-item action-after-planning scale<sup>11</sup> and job satisfaction and autonomy using a version of the Job Diagnostic Survey as described by Hackman.<sup>12</sup> Responses were on a 1–7 Likert scale (from strongly disagree to strongly agree). In addition, the survey asked respondents whether they felt that the COVID-19 pandemic has adversely affected interdisciplinary collaboration in the ICU, and provided an open-ended opportunity to comment. There were 67 items overall in the survey, of which 12 were demographics questions.

The survey was sent to ICU nurses and internal medicine residents in June 2021 as an anonymous, voluntary and uncompensated survey, with data collected on the Survio platform (Survio, Brno, Czech Republic) through August 2021. Nurses and residents were selected because of their heavy involvement in caring for patients with COVID-19 and anecdotally-reported concerns of professional conflict between these groups. There were 12 nurses and 13 resident physician respondents. The study was approved by the CSMC Institutional Review Board.

Subdimension scores were collected for each category and their means were assessed for statistical significance using *t* tests. Significant differences were corrected for familywise error using the Bonferroni correction. Data analysis was done using Microsoft Excel (Microsoft, Redmond, WA).

### 3. Results

Fourteen nurses and 13 resident physicians responded to the survey. Nurse respondents were predominantly female, under 40 years old, with most under 10 years of ICU experience; they were evenly split between day and night shift workers. Resident responders were nearly balanced in sex, all under 35 years old, with about half of responders in their PGY-1 year (one respondent declined to state his year of training) (Table 1).

There were no significant differences found for any subdimensions of the questionnaire (Table 2). The lowest score among both groups was noted to be in the area of team stability, with residents' mean scores slightly lower. Residents felt somewhat less autonomous than did nurses. The highest scores were reached in the topic of team interdependence and satisfaction with communication, among both groups. Both groups felt moderately satisfied with their jobs. Communication was regarded as open and accurate by both groups. Scores for execution of the team plan were somewhat lower for both groups.

There were greater differences in nurse and resident perception of the COVID-19 pandemic's impact on interdisciplinary communication. The majority of ICU nurses (71.4%) indicated that they did feel an adverse impact on interdisciplinary collaboration in the ICU, and only 7.1% felt uncertain or conflicted. In contrast, most residents (46.2%) felt uncertain or conflicted about the adverse impact of the pandemic, with 38.5% feeling that it did not have an impact and only 15.4% feeling that it did adversely affect collaboration in the ICU (*p* = 0.015, not significant with Bonferroni correction).

A part of the survey asked for open-ended comments from respondents regarding their thoughts about the impact of COVID-19 on interdisciplinary collaboration. Comments from nursing staff that addressed collaboration carried some praise for interdisciplinary collaboration, i.e., "I think we work even better as a team because we have been through so much together," but many comments focused on the negative impact of the physical distance created by residents having to round and work at a separate open space outside of the ICU, rather than in the ICU among the nurses. These comments included such as "the team seems disjointed," "some residents aren't willing to come to bedside when nurses are asking them to evaluate the patient," and "there's a disconnect at times." Resident comments were split between

**Table 1**  
Demographics of study participants.

	Nurses (n,%)	Resident Physicians (n,%)
Total	14	13
Age		
25-29	4 (28.6)	11 (84.6)
30-34	5 (35.7)	2 (15.4)
35-39	1 (7.1)	0
40-44	0	0
45-49	1 (7.1)	0
50-54	1 (7.1)	0
55-59	2 (14.3)	0
Sex		
Female	10 (71.4)	6 (46.2)
Male	2 (14.3)	7 (53.8)
Race		
Asian/Pacific Islander	4 (28.6)	5 (38.5)
African American/Black	0	0
Caucasian/White	1 (7.1)	7 (53.8)
Multiracial	3 (21.4)	1 (7.7)
Other/Decline to state	6 (42.9)	0
Ethnicity		
Hispanic	4 (28.6)	0
Non-Hispanic	6 (42.9)	12 (92.3)
Decline to state	4 (28.6)	1 (7.7)
Nurses' ICU experience		
0-4	4 (28.6)	
5-9	6 (42.9)	
10-14	0	
15-19	1 (7.1)	
20-24	1 (7.1)	
25+	2 (14.3)	
CCRN certification		
Yes	11 (78.6)	
No	3 (21.4)	
Day vs Night Shift		
Day	7 (50)	
Night	7 (50)	
Physician training level		
PGY-1		7 (58.3)
PGY-2		2 (16.7)
PGY-3		3 (25)

**Table 2**  
Subdimension scores of perception of collaboration (1 = strongly disagree; 7 = strongly agree).

Subdimension	Nurse Mean (SD)	Physician Mean (SD)	p-value
Team is bounded	4.19 (0.69)	4.9 (0.74)	0.29
Team is interdependent	6.55 (0.36)	6.12 (0.38)	0.24
Team is stable	3.71 (0.2)	2.77 (0.44)	0.11
Communication is open	5.7 (0.23)	5.9 (0.22)	0.32
Communication is accurate	5.07 (0.5)	5.07 (0.5)	0.11
Satisfaction with communication	6.04 (0.15)	6.15 (0.1)	0.47
Team works collaboratively	5.24 (0.37)	5.48 (0.2)	0.13
Team plans its work	5.39 (0.47)	5.49 (0.37)	0.93
Team takes agreed-upon action after planning	4.34 (0.88)	4.89 (1.1)	0.41
My work is autonomous	4.57 (0.81)	3.92 (0.87)	0.52
I am satisfied with my job	5.3 (0.97)	5.71 (0.91)	0.44
The patient care team works together	5.3 (0.96)	5.71 (1.03)	0.8

those who acknowledged the issue: "we need to make more of an effort to spent time within the unit itself," "it was much harder to communicate plans," and "disconnected communication," and those who noted the strain of the volume on the residents themselves as a group ("stressed and stretched thin," "affected team morale," "caused us to be less focused and organized.) There was no obvious correlation between the year of training and the type of comments.

#### 4. Discussion

In contrast to previously-published literature, this cross-sectional survey-based study of ICU nurses and internal medicine residents working in the ICU suggests that the overall perception of interdisciplinary collaboration is very similar, a finding which may be impacted by the change in the ICU environment related to the COVID-19 pandemic.

Differences in perception of collaboration and issues affecting the team environment between ICU nurses and physicians have been previously described in cross-sectional surveys.<sup>5,13</sup> Previous studies have noted that the intrinsic difference in work structure for nurses and residents has contributed to barriers in collaboration; for example, most ICU nurses are dedicated specialists who work exclusively in critical care settings, and thus bring a wealth of experience which is unmatched by most early trainees.<sup>14</sup> They also are a consistent team, as contrasted with the constant rotation of residents through the ICU service, and because their interaction with patients and their families is generally more involved during the course of their shift they may perceive themselves as the primary point of information exchange.<sup>5,14</sup> On the other hand, residents usually serve as the first point of contact with consultants and may be following the patient over a longer period of time, which may lead them to the perception that they are in greater control of the overall clinical picture,<sup>5</sup> but simultaneously their lack of experience may lead to greater anxiety and lower perception of autonomy and satisfaction in time of crisis.<sup>15</sup> All of these perceptions and sentiments are valid, and balancing them is critical to ensuring collaborative care.

Interdisciplinary team dynamics are inherently difficult to study, and the challenges which have been previously identified have varied somewhat depending on the type of survey used and the focus of the project. Nonetheless, some themes are constant. The first of these is that a collaborative atmosphere is consistently correlated with higher job satisfaction, improvement in patient care, and enhanced education among all groups.<sup>14-16</sup> The second is that difficulties in communication are a major, but actionable, barrier to a collaborative environment.<sup>1,17,18</sup> The third is that physicians tend to rate collaboration and communication quality more highly than do nurses.<sup>13,19</sup>

In this study, we assessed team dynamics during the time of the Covid-19 pandemic. This is an important context because of the profound changes that accompanied the ICU structure, and the specific aspects of each component of the questionnaire deserve further comment.

Team interdependence was rated highly by both nurses and physicians, a finding which is recognizable since the care for critically ill patients with Covid-19 required multiple clinicians to work together to achieve practical medical treatments (e.g., multiple people were required to prone a patient), but also to develop novel approaches to less scientific problems (e.g., successful use of video-conferencing between patients and their families using a stable and secure platform required involvement of nurses, physicians, and information technology support staff) and conduct research (e.g., increased collection of research samples and need to obtain informed consent necessitated far more research staff in the ICU than is usually present). This interdependence was both influenced by, and contributed to, the observation that many students and trainees lobbied to continue their clinical rotations during the pandemic out of a sense of obligation.<sup>20,21</sup> Team stability, on the other hand, was rated more poorly by both groups. In prior studies, team stability was regarded lower by nurses than resident physicians, in part because of the shift structures of both groups.<sup>5</sup> It is interesting that there was a trend, in this survey, for residents to perceive the team as less stable. This may be due in part to the shift in nurse staffing during Covid surges; even in the relatively well-staffed environment of the CSMC ICU, the dramatic rise in patient volume required the hiring of a very large number of travel ICU nurses - a trend demonstrated across the United States, which in some cases saw a >1000% change in number of ICU nurse jobs during surges.<sup>22</sup> In some cases, physicians who had not

routinely been visible in the ICU became members of ICU teams.<sup>23</sup> The influx of new faces likely contributed to both staff nurses' and resident physicians' sense of team instability.

Communication openness, accuracy, and satisfactoriness, as well as collaboration, planning, and plan execution, was rated by both resident physicians and nurses as moderate-to-high in this study, with no significant difference between the two. This finding deviates somewhat from prior research, which has found that nurses do not perceive communication and collaboration as highly as more senior physicians.<sup>13,24</sup> A potential explanation is in the nature of severe Covid-19 disease; while there has been much debate on the best pharmacological approach to treating these patients, the majority of day-to-day decisions rests heavily on the shoulders of nurses (e.g., proning, sedation adjustment, facilitating communication between patients and their loved ones by means of electronic devices, etc.) As such, two phenomena occurred: first, nurse engagement in rounds increased significantly; and second, because of the homogeneity of patient disease, rounds became fairly structured (e.g., when is the patient due to be proned, what is the sedation goal, etc). Both of these changes has been correlated in the past to enhanced accuracy of communication and quality of collaboration in ICU settings in general, as well as during end-of-life care in the ICU.<sup>25,26</sup> This was partly demonstrated as well in the LEAP study, which suggested that despite lower quality and safety of care during the Covid-19 pandemic, interdisciplinary collaboration was better than before the pandemic, and quite possibly contributed to better outcomes.<sup>23</sup>

It should be also noted that job satisfaction was fairly high among both nurses and resident physicians in this study. Despite the increased physical and psychological burden of an overwhelming number of critically ill patients, survey-based data indicates that the pandemic brought a sense of cohesiveness and purpose, increased recognition of various disciplines, and a flexibility in traditional role changes, a finding which was also previously seen in SARS, MERS, and H1N1 influenza pandemics.<sup>27-30</sup> Furthermore, despite significant rates of job burnout among nurses and physicians during the pandemic,<sup>31-33</sup> multiple studies have found relatively high rates of job satisfaction<sup>34,35</sup> - an observation that in the pre-pandemic context would have been counterintuitive but one that is likely explained by factors such as healthcare workers' sense of ethical obligation, pride of being in the position to help others, and community recognition. More recently, however, there has been an alarming trend in healthcare workers' departure from their jobs<sup>36,37</sup> as these factors are outweighed by societal and economic changes that are only starting to be described.<sup>38</sup>

In this study, nurses felt more than residents did that collaboration was adversely affected by the pandemic, although when adjusted this finding was not significant. There are several possible explanations for this trend. First, due to concerns over social distancing, residents were relocated from working within the ICU to working in the larger lobby space just outside; this had the effect of physically separating the residents from the nurses, which may have contributed to difficulty communicating emergent concerns. Second, because nurses spent much more time in rooms with Covid patients than did residents, along with the increased burden of donning personal protective equipment, there may have been a perception that residents were not assessing patients as thoroughly as they otherwise might. Finally, due to concerns of resident overwork, the traditional model of 2-4 week rotations through the ICU was changed to a much more brief, several-day rotation for each resident, which likely contributed to nurses' perception of reduced team boundedness and consistency.

This study looks in depth at perception of interdisciplinary collaboration among trainee physicians and ICU nurses in an academic ICU during the Covid-19 pandemic and may provide a useful insight into how the ICU culture may have been affected by the pandemic. However, it is not a study without limitations. There are 78 staff nurses in the MICU and 93 total internal medicine residents, and although this survey response rate represents 16% of that total (17.9% of nurses and 14% of residents), data is not available about what percentage of that group

actually worked in the COVID-19 ICU. We estimated the response rate conservatively at 16% based on the total number of employed nurses and residents; this lower response rate is likely related to extended work demands on nurses and residents, as well as survey burnout toward the end of an academic year. This survey also does not provide data on collaboration before the pandemic began, and thus our suggestion that it reflects the impact of the pandemic, rather of the inherent camaraderie of the ICU at the center studied, is inconclusive. Finally, it has the generalizability limitations associated with a small, single-center, voluntary, survey-based study, including the potential for response bias. This findings of this study should thus be regarded as hypothesis-generating and worthy of further investigation.

In conclusion, we found that in the era of the Covid-19 pandemic, there was an increased sense of collaboration, high quality communication, and job satisfaction among both nurses and internal medicine resident physicians in the Covid ICU. Nurses felt somewhat more than resident physicians that the pandemic adversely affected collaboration. We recommend that future research involve expanded in-depth analysis into the challenges of interdisciplinary collaboration in the ICU, particularly as it involves clinicians at different stages of their training.

#### CRediT authorship contribution statement

**Yuri Matusov:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft. **Aliza Matthews:** Conceptualization, Data curation, Methodology, Investigation, Writing – review & editing. **Melissa Rue:** Resources, Validation, Writing – review & editing. **Lorraine Sheffield:** Resources, Validation, Writing – review & editing. **Isabel F. Pedraza:** Supervision, Validation, Writing – review & editing.

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