Respiratory Distress in Hospitalized Non-Mechanically Ventilated COVID-19 Adults: A Retrospective Multicenter Cohort Study

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Abstract

Background: COVID-19 typically presents with respiratory symptoms which may progress with severe disease. There are standard guidelines for managing respiratory distress (e.g., opioids, anxiolytics) and palliative care teams are well versed in managing these symptoms. Aim: Determine the extent to which hospitalized COVID-19 patients with moderate respiratory distress received medications or palliative consultation for symptom management and if these interventions had any association with outcomes. Design: Retrospective chart review for hospitalized COVID-19+ patients from March 2-April 30, 2020. Setting: Large integrated health system in the New York Metropolitan area. Patients: 312 adult patients hospitalized with COVID-19 with an order for a non-rebreather mask and meeting criteria for moderate respiratory distress on the Respiratory Distress Observation Scale: concurrent respiratory rate ≥30 and heart rate ≥110 at any point during hospitalization. Patients receiving mechanical ventilation or intensive care were excluded. Results: Most COVID-19 patients experiencing moderate respiratory distress did not receive medications or palliative consultation for symptom management. Patients who received medications were predominantly white, older, and had a Do-Not-Resuscitate order. Patients who received a palliative consultation were more likely to be older, female, and white, with a Do-Not-Resuscitate order. Mortality was similar between those receiving medication and those who did not. Conclusion: Medications and palliative expertise for symptom management were underused for patients with moderate respiratory distress due to COVID-19. Education and triggers may help providers to identify moderate respiratory distress and consider symptomatic treatment and palliative consultation when appropriate.

Keywords
coronavirus, COVID-19, palliative care, dyspnea, symptom management

Background

The novel coronavirus (COVID-19) was first detected in late 2019 and quickly escalated to a global pandemic causing devastating morbidity and mortality.1-2 Since the beginning of 2021, over 500,000 people have died from COVID-19 in the United States alone, overwhelming hospitals and health systems across the country.4

Throughout the first wave of the pandemic, many articles described the symptomatic needs and course of disease for patients diagnosed with COVID-19.5-6 Dyspnea is one of the most common presenting symptoms, along with cough and fever. Some studies reported dyspnea in up to 71% of all COVID-19 cases, and in 88-91% of cases requiring mechanical ventilation.6,7 The proportion of COVID-19 patients experiencing dyspnea may be even higher due to underreporting with patient sedation, delirium, agitation, altered mental status, or innate cognitive changes associated with the end of life.7-9

While no specific tools have been recommended to assess dyspnea burden in patients hospitalized with COVID-19, the Respiratory Distress Observation Scale (RDOS) is a validated tool commonly used by palliative care experts. This instrument can be easily used to objectively assess dyspnea in all patients, even those with impaired communication.9,10

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Respiratory symptoms of patients hospitalized with COVID-19 can for the most part be managed conservatively. Standard of care includes oxygen supplementation and hydration. Some experts have recommended a symptom-driven approach, such as antipyretics, anxiolytics, antipsychotics, and opioids as additional treatments. In general, opioids are a common and effective treatment to relieve dyspnea in patients with advanced respiratory illness regardless of underlying etiology. Despite concern over the perceived potential to hasten death in patients with advanced illness, and observations that orders for opioids are a marker of end-of-life, the use of opioids for management of dyspnea has not been associated with a significant decrease in time to death. Additionally, prescribing practices remain uneven and there are notable disparities for Black and Hispanic patients in the face of solid evidence that use of opioids in the context of advanced illness is effective.

Even prior to the COVID-19 pandemic, dyspnea was under diagnosed and undertreated among patients hospitalized in the intensive care unit (ICU). The COVID-19 pandemic has dramatically increased the number of patients experiencing dyspnea while simultaneously hindering the ability of physicians to appropriately assess and treat it, due to both sheer numbers of cases admitted over a short time span and reduced clinician-patient interactions related to isolation precautions and need for personal protective equipment. This study seeks to examine the extent to which moderate respiratory distress in patients hospitalized with COVID-19 was treated with opioids and/or anxiolytics or palliative care input.

Methods
Assessment Tool
The RDOS incorporates 8 variables including heart and respiratory rate, restlessness, paradoxical breathing pattern, use of accessory muscles, grunting at the end expiration, nasal flaring, and look of fear. Each variable is scored from 0 to 2 with added values ranging from 0 to 16. Respiratory distress is rated as follows: ≤3 mild, 4 to 6 moderate, and ≥7 severe distress. Understanding the retrospective nature of our study and the need to rely on data gathering through electronic medical records only objective data related to heart and respiratory rate were collected. However, in order to increase the accuracy of our assessment tool, we only included those patients with moderate respiratory distress that had and order for a non-rebreather mask (NRM), which we used as a factor for high oxygen requirements and at risk for dyspnea.

Study Sample
Adult (≥18 years old) patients admitted to one of 14 hospitals in a large integrated health system in the New York Metropolitan area with COVID-19 between March 2 and April 30, 2020 meeting criteria for moderate respiratory distress and who were prescribed for an NRM. Moderate respiratory distress was defined by the Respiratory Distress Observation Scale of concurrent respiratory rate (RR) ≥30 and heart rate (HR) ≥110. When the timestamps for RR ≥30 and HR ≥110 did not develop at the same time, the timestamp of the second metric developed was used as the timestamp for onset of respiratory distress. Those who received mechanical ventilation during the course of hospitalization were excluded. The study was approved by the institutional IRB and the COVID-19 Research Consortium.

Data Elements
Demographic characteristics included gender, age, race (White, African American/Black, Asian, Other/ Multiracial), Hispanic/Latino ethnicity). Medication variables included orders for at least one medication typically used for respiratory distress management: hydromorphone, morphine, oxycodone, or lorazepam. Orders for fentanyl and midazolam were not included as these are commonly used for sedation in the ICU setting. Orders for a palliative care consult were noted, and reasons for consult categorized as need for symptom management, goals of care (GOC) conversation, or both. Other study variables included documented do-not-resuscitate (DNR) orders, timing of DNR order (e.g. early DNR indicates DNR order in ER or within 24 hours of admission), and discharge disposition (deceased, discharged).

Timestamps were pulled for variables and outcomes of interest, including first concurrent RR ≥30 and HR ≥110, first dose of any medication for symptom management, and palliative care consult. Among patients that received any medication for symptom management, time difference from respiratory distress to first medication was computed by subtracting respiratory distress timestamp from first medication timestamp. For patients that received their first medication after palliative care consult, time from palliative care consult to first medication was computed by subtracting palliative care consult timestamp from first medication timestamp. Among patients that received a medication and later died, time from first medication to death was computed by subtracting first medication timestamp from death timestamp.

Statistical Analysis
Descriptive statistics were performed to assess the bivariate association between orders for medications for symptom management and/or palliative care consult with demographic and medical variables, e.g. gender, age, race, ethnicity, DNR status, and discharge disposition. Continuous variables were compared across groups using the two-sample t-test, and transformations were applied as needed to meet the assumptions for the validity of the two-sample t-test. Age as an ordinal variable was compared across groups using the Mann Whitney U test, and all other categorical variables were compared across groups using the Chi-Square test or Fisher’s Exact test, as appropriate. All analyses were conducted using SAS Studio Version 3.8 (SAS Institute Inc, Cary, NC).
Table 3 describes hospital disposition of the (109) patients that received any medication for symptom management, palliative consultation, or both. The median time from moderate respiratory distress to first medication (for any patient receiving medication after consult) was 9 hours (IQR: 2, 20). Of 45 patients that received both medication and a palliative care consult, 19 (42%) received medication before palliative care consult and 26 (58%) received medication after palliative care consult. Time from moderate respiratory distress documentation to first medication did not differ significantly by palliative care consult vs. none. Of those that received a medication and expired during their hospitalization, the median time from first medication to death was 26 hours (IQR: 14, 88). Time from first medication to death did not differ significantly by whether the patient had a palliative care consult: 24 hours (IQR: 14.5, 85.5) for those that received a palliative care consult vs. 33 hours (IQR: 14, 91) for those that did not receive a palliative care consult (p = 0.38).

Discussion

Main Findings

This study provides an overview on use of pharmacologic management and palliative consultation for moderate respiratory distress in hospitalized COVID-19 patients during the first surge of the pandemic. All patients included for analysis met the Respiratory Distress Observation Scale criteria for moderate respiratory distress of concurrent heart rate ≥110 and respiratory rate ≥30. Medications for routinely managing such symptoms (e.g. hydromorphone, lorazepam, morphine, oxycodone) were only ordered for 38.5% of cases. Palliative care expertise, though able to help with managing this distressful symptom, was requested for only 25% of cases. Although all 283 patients included for analysis were experiencing moderate respiratory distress, 61% did not receive any symptom management. Those who did were more likely to be white, older, and had a DNR order in place. Of the 174 patients who did not receive medication for symptom management, 34% died during their hospitalization. Though it can be argued that survivors may have had their respiratory distress addressed by means other than opioids or benzodiazepines, it may be more difficult to support that hypothesis for those that died and did not receive any of these medications.

Patients that did receive a palliative care consult were more likely to be older, female, white patients with a DNR order in place. Palliative consultations were more likely to be called for goals of care discussions, particularly for patients who already had advanced directives in place. Although patients were more likely to have their respiratory symptoms addressed when the palliative team was involved, patients who were consulted for GOEC conversations were still experiencing moderate respiratory distress. The results suggest that the primary medical teams were either not recognizing and/or not addressing respiratory distress. It could be that providers were concerned that pharmacologic treatment of symptoms might tip the
balance toward mortality and so were reluctant to administer these treatments. Although patients prescribed medications with no palliative consult did not have a statistically significant longer time to mortality than those who received a palliative care consult, this may have been due to the relatively low numbers of patients (36 hours vs. 24 hours, p = 0.33). The primary managing team may have recognized an end-of-life scenario in some cases and so were more likely to provide pharmacologic comfort, and this is support by a similar time interval between first documentation of respiratory distress and medication administration. Palliative care consults typically occurred late in the patient’s hospital course, suggesting that some of these patients may have experienced more prolonged respiratory distress with the same final outcome.

The results of this study suggest opportunities for health systems to provide education and consistently identify and manage moderate respiratory distress in patients, both within and outside the context of COVID-19. The lack of symptom management for the majority of patients with respiratory distress and the time lag between onset of respiratory distress and first medication

Table 1. Association Between Demographic/Clinical Characteristics and Any Medication Use.

| Variable                                      | Overall (N = 283) | Any medication use (n = 109) | No medication use (n = 174) | P-value |
|-----------------------------------------------|-------------------|-----------------------------|-----------------------------|---------|
| Gender, n (%)                                 | 0.7984            |                             |                             |         |
| Female                                        | 109 (38.5)        | 43 (39.5)                   | 66 (37.9)                   |         |
| Male                                          | 174 (61.5)        | 66 (60.6)                   | 108 (62.1)                  |         |
| Age, median (IQR)                             | 74.0 (60.0, 85.0) | 81.0 (72.0, 89.0)           | 68.0 (53.0, 80.0)           | <0.0001 |
| Age category, n (%)                           | <0.0001           |                             |                             |         |
| 18-34                                         | 11 (3.9)          | 3 (2.8)                     | 8 (4.6)                     |         |
| 35-49                                         | 27 (9.5)          | 5 (4.6)                     | 22 (12.6)                   |         |
| 50-64                                         | 49 (17.3)         | 8 (7.3)                     | 41 (23.6)                   |         |
| 65-79                                         | 87 (30.7)         | 32 (29.4)                   | 55 (31.6)                   |         |
| 80+                                           | 109 (38.5)        | 61 (56.0)                   | 48 (26.7)                   |         |
| Race, n (%)                                   | 0.0005            |                             |                             |         |
| White                                         | 130 (45.9)        | 67 (61.5)                   | 63 (36.2)                   |         |
| African American/ Black                       | 55 (19.4)         | 14 (12.8)                   | 41 (23.6)                   |         |
| Asian                                         | 32 (11.3)         | 8 (7.3)                     | 24 (13.8)                   |         |
| Other/ Multiracial                            | 66 (23.3)         | 20 (18.4)                   | 46 (26.4)                   |         |
| Ethnicity, n (%)                              | 0.2967            |                             |                             |         |
| Hispanic/ Latino                              | 50 (17.7)         | 16 (14.7)                   | 34 (19.5)                   |         |
| Non-Hispanic/ Latino                          | 233 (82.3)        | 93 (85.3)                   | 140 (80.5)                  |         |
| DNR order, n (%)                              | <0.0001           |                             |                             |         |
| Yes                                           | 161 (56.9)        | 94 (86.2)                   | 67 (38.5)                   |         |
| No                                            | 122 (43.1)        | 15 (13.8)                   | 107 (61.5)                  |         |
| Early DNR order, n (%)                        | <0.0001           |                             |                             |         |
| Yes                                           | 102 (36.0)        | 63 (57.8)                   | 39 (20.2, 22.4)             |         |
| No                                            | 181 (64.0)        | 46 (42.2)                   | 135 (74.6, 77.6)            |         |
| Hydromorphone, n (%)                          | —                 |                             |                             |         |
| Yes                                           | 39 (13.8)         |                             |                             |         |
| No                                            | 244 (86.2)        |                             |                             |         |
| Lorazepam, n (%)                              | —                 |                             |                             |         |
| Yes                                           | 35 (12.4)         |                             |                             |         |
| No                                            | 248 (87.6)        |                             |                             |         |
| Morphine, n (%)                               | —                 |                             |                             |         |
| Yes                                           | 68 (24.0)         |                             |                             |         |
| No                                            | 215 (76.0)        |                             |                             |         |
| Oxycodone, n (%)                              | —                 |                             |                             |         |
| Yes                                           | 3 (1.1)           |                             |                             |         |
| No                                            | 280 (98.9)        |                             |                             |         |
| Discharge disposition, n (%)                  | <0.0001           |                             |                             |         |
| Discharged                                    | 134 (47.4)        | 19 (17.4)                   | 115 (66.1)                  |         |
| Deceased                                      | 149 (52.7)        | 90 (82.6)                   | 59 (33.9)                   |         |
| Palliative care consult, n (%)                | <0.0001           |                             |                             |         |
| Yes                                           | 73 (25.8)         | 45 (41.3)                   | 28 (16.1)                   |         |
| No                                            | 210 (74.2)        | 64 (58.7)                   | 146 (83.9)                  |         |
| Reason for palliative care consult (N = 73), n (%) | 0.0439           |                             |                             |         |
| GOC/ACP                                       | 47 (64.4)         | 24 (53.3)                   | 23 (82.1)                   |         |
| Symptoms                                      | 16 (21.9)         | 13 (28.9)                   | 3 (10.7)                    |         |
| GOC and symptoms                              | 10 (13.7)         | 8 (17.8)                    | 2 (7.1)                     |         |

Abbreviations: IQR: Interquartile Range; DNR: Do Not Resuscitate; GOC: Goals of Care; ACP: Advance Care Planning.
provides a window of opportunity for improving patient care. As healthcare becomes more automated and technology-oriented, a respiratory distress trigger may be an effective tool to alert healthcare providers to patient needs, especially if a patient is unable to communicate directly or patient-provider interactions are limited by a highly infectious condition such as COVID-19. The goal is to highlight “blind spots,” address biases and reduce disparities in provision of symptom management medication. These triggers may be particularly important in the context of COVID-19 or similar crises where the healthcare system is stretched far beyond usual capacity.

**Limitations**

There were a number of study limitations. First, due to the exponential increase in patient admissions during this time period, traditional medical floors were transitioned into make-shift ICUs. Despite extensive checking and cleaning of data, we cannot entirely rule out the possibility that some patients in this dataset received ICU level care during the course of their hospitalization. Additionally, this analysis could only use data indicating that medications were ordered but cannot confirm at what point they were actually administered or the reason for administration. For example, while we believe that all opioids prescribed were for management of respiratory distress, there is the possibility that some may have been prescribed for pain management. Similarly, we are unable to incorporate the prescription of bronchodilators for respiratory distress, as the use of these medications was reduced in the first stages of the COVID-19 pandemic over concerns of aerosolization.21 Second, the rapid surge of patients requiring hospitalization led health systems to bring in redeployed physicians who may not

**Table 2. Association Between Demographic/Clinical Characteristics and Palliative Care Consult.**

| Variable                  | Palliative care consult (n = 73) | No palliative care consult (n = 210) | P-value |
|---------------------------|----------------------------------|-------------------------------------|---------|
| Gender, n (%)             |                                  |                                     | 0.0277  |
| Female                    | 36 (49.3)                        | 73 (34.8)                           |         |
| Male                      | 37 (50.7)                        | 137 (65.2)                          |         |
| Age, median (IQR)         | 82.0 (73.0, 88.0)                | 70.5 (56.0, 81.0)                   | <0.0001 |
| Age category, n (%)       |                                  |                                     | <0.0001 |
| 18-34                     | 0 (0.0)                          | 11 (5.2)                            |         |
| 35-49                     | 1 (1.4)                          | 26 (12.4)                           |         |
| 50-64                     | 7 (9.6)                          | 42 (20.0)                           |         |
| 65-79                     | 22 (30.1)                        | 65 (31.0)                           |         |
| 80+                       | 43 (58.9)                        | 66 (31.4)                           |         |
| Race, n (%)               |                                  |                                     | 0.0014  |
| White                     | 48 (65.8)                        | 82 (39.1)                           |         |
| African American/ Black   | 9 (12.3)                         | 46 (21.9)                           |         |
| Asian                     | 5 (6.9)                          | 27 (12.9)                           |         |
| Other/ Multiracial        | 11 (15.1)                        | 55 (26.2)                           |         |
| Ethnicity, n (%)          |                                  |                                     | 0.0356  |
| Hispanic/ Latino          | 7 (9.6)                          | 43 (20.5)                           |         |
| Non-Hispanic/ Latino      | 66 (90.4)                        | 167 (79.5)                          |         |
| DNR order, n (%)          |                                  |                                     | <0.0001 |
| Yes                       | 66 (90.4)                        | 95 (45.2)                           |         |
| No                        | 7 (9.6)                          | 115 (54.8)                          |         |
| Early DNR order, n (%)    |                                  |                                     | 0.0025  |
| Yes                       | 37 (50.7)                        | 65 (31.0)                           |         |
| No                        | 36 (49.3)                        | 145 (69.1)                          |         |
| Hydromorphone, n (%)      |                                  |                                     | <0.0001 |
| Yes                       | 22 (30.1)                        | 17 (8.1)                            |         |
| No                        | 51 (69.9)                        | 193 (91.9)                          |         |
| Lorazepam, n (%)          |                                  |                                     | 0.0002  |
| Yes                       | 18 (24.7)                        | 17 (8.1)                            |         |
| No                        | 55 (75.3)                        | 193 (91.9)                          |         |
| Morphine, n (%)           |                                  |                                     | 0.0177  |
| Yes                       | 25 (34.3)                        | 43 (20.5)                           |         |
| No                        | 48 (65.8)                        | 167 (79.5)                          |         |
| Oxycodone, n (%)          |                                  |                                     | 0.5714  |
| Yes                       | 0 (0.0)                          | 3 (1.4)                             |         |
| No                        | 73 (100.0)                       | 207 (98.6)                          |         |
| Discharge disposition, n (%) |                               |                                     | <0.0001 |
| Discharged                | 18 (24.7)                        | 116 (55.2)                          |         |
| Deceased                  | 55 (75.3)                        | 94 (44.8)                           |         |
have been familiar with current standards of respiratory distress symptom management and/or knowledge to consult palliative care. The overwhelming surge of admissions and severity of illness that occurred in the spring of 2020 resulted in an unparalleled increase in palliative care consultation requests. The demand for palliative services was so out of proportion to the usual consult load that the existing teams were unable to see every patient for whom a consult was requested. This mismatch could have affected the results. Finally, we were unable to determine to what extent symptom management may have been affected by limitations of staffing and patient contact precautions. In the early days of the pandemic, assessment and monitoring of dyspnea in this population may have been limited by the need for protective equipment and shortened physical contact between patients and providers in order to protect clinical staff from exposure.

**Conclusion**

This study examined symptom management for moderate respiratory distress associated with COVID-19 in hospitalized patients and the outcomes for these patients. The COVID-19 pandemic has caused overwhelming morbidity and mortality in the United States and around the world. In the beginning of the pandemic, while the disease course and effective therapies were still somewhat unknown, common symptoms would still have been treatable according to best practices. While overall symptom management was underprovided, it did not require additional palliative medicine intervention to be effective. Quality improvement initiatives to rectify such under-treatment might include the use of medical record triggers for respiratory distress, interprofessional education for inpatient care teams, and/or use of validated protocols for addressing respiratory symptoms (e.g. pharmacologic management, option for palliative care consultation).

**Authors' Note**

Tara Liberman, Santiago Lopez, and Edith Burns designed the study. Sima Parikh performed initial chart review. Stephanie Izard analyzed and interpreted the data. Regina Roofeh wrote the first draft of the manuscript. All authors made a substantial contribution to the concept or design of the work, revised it critically for important intellectual content and take public responsibility for appropriate portions of the content. All authors approved the final version of the manuscript to be published.

**Declaration of Conflicting Interests**

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding**

The authors received no financial support for the research, authorship, and/or publication of this article.

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**References**

1. Richardson S, Hirsch JS, Narasimhan M, et al. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. JAMA. 2020;323(20):2052-2059.
2. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72314 cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;323(13):1239-1242.

3. Wu C, Chen X, Cai Y, et al. Risk factors associated with acute respiratory distress syndrome and death in patients with coronavirus disease 2019 pneumonia in Wuhan, China. *JAMA Intern Med.* 2020;180(7):934-943.

4. Tompkins L, Smith M, Bosman J, Pietsch B. Entering uncharted territory, the U.S. counts 500,000 covid-related deaths. *The New York Times*. 2021. Published 2021. Accessed February 23, 2021. https://www.nytimes.com/2021/02/22/us/us-covid-deaths-half-a-million.html

5. Lovell N, Maddocks M, Etkind SN, et al. Characteristics, symptom management, and outcomes of 101 patients with COVID-19 referred for hospital palliative care. *J Pain Symptom Manage*. 2020;60(1):e77-e81.

6. Keeley P, Buchanan D, Carolan C, Pivodic L, Tavabie S, Noble S. Symptom burden and clinical profile of COVID-19 deaths: a rapid systematic review and evidence summary. *BMJ Support Palliat Care*. 2020;10(4):381-384.

7. Worsham CM, Banzett RB, Schwartzstein RM. Air hunger and psychological trauma in ventilated patients with COVID-19. An urgent problem. *Ann Am Thorac Soc*. 2020;17(8):926-927.

8. Campbell ML, Templin T, Walch J. A respiratory distress observation scale for patients unable to self-report dyspnea. *J Palliat Med*. 2010;13(3):285-290.

9. Birkholz L, Haney T. Using a dyspnea assessment tool to improve care at the end of life. *J Hosp Palliat Nurs*. 2018;20(3):219-227.

10. Mularski RA, Campbell ML, Asch SM, et al. A review of quality of care evaluation for the palliation of dyspnea. *Am J Respir Crit Care Med*. 2010;181(6):534-538.

11. Fusi-Schmidhauser T, Preston NJ, Keller N, Gamondi C. Conservative management of COVID-19 patients—emergency palliative care in action. *J Pain Symptom Manage*. 2020;60(1):e27-e30.

12. Barnes H, McDonald J, Smallwood N, Manser R. Opioids for the palliation of refractory breathlessness in adults with advanced disease and terminal illness. *Cochrane Database Syst Rev*. 2016;3(3):CD011008.

13. Clemens KE, Quednau I, Klaschik E. Use of oxygen and opioids in the palliation of dyspnea in hypoxic and non-hypoxic palliative care patients: a prospective study. *Support Care Cancer*. 2009;17(4):367-377.

14. Bailey FA, Williams BR, Goode PS, et al. Opioid pain medication orders and administration in the last days of life. *J Pain Symptom Manage*. 2012;44(5):681-691.

15. Wang CL, Lin CY, Huang CC, et al. Do-not-resuscitate status is correlated with the prescribed use of systemic strong opioid analgesics in patients with terminal cancer: an observational study. *Support Care Cancer*. 2019;27(12):4507-4513.

16. Portenoy RK, Sibirceva U, Smout R, et al. Opioid use and survival at the end of life: a survey of a hospice population. *J Pain Symptom Manage*. 2006;32(6):532-540.

17. Abraham DL, Hernandez I, Ayers GT, Pruskowski JA. Association between opioid dose escalation and time to death in a comfort measures only population. *Am J Health Syst Pharm*. 2021;78(3):203-209.

18. Cintron A, Morrison RS. Pain and ethnicity in the United States: a systematic review. *J Palliat Med*. 2006;9(6):1454-1473.

19. Meghani SH, Byun E, Gallagher RM. Time to take stock: a meta-analysis and systematic review of analgesic treatment disparities for pain in the United States. *Pain Med*. 2012;13(2):150-174.

20. Gentzler ER, Derry H, Ouyang DJ, et al. Underdetection and undertreatment of dyspnea in critically ill patients. *Am J Respir Crit Care Med*. 2019;199(11):1377-1384.

21. Benge CD, Barwise JA. Aerosolization of COVID-19 and contamination risks during respiratory treatments. *Fed Pract*. 2020;37(4):160-163.

22. Lopez S, Finuf KD, Marziliano A, Sinvani L, Burns EA. Palliative care consultation in hospitalized patients with COVID-19: a retrospective study of characteristics, outcomes, and unmet needs. *J Pain Symptom Manage*. 2021;62(2):267-276.