
Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

# A Retrospective Analysis of the Impact of the Coronavirus Disease 2019 Pandemic on Health Care Workers in a Tertiary Hospital in Turkey

**Authors:** Berkant Öztürk, MD, Sema Öztürk, MD, Ahmet Çağlar, MD, İlker Kaçer, MD, Muhammet Hacımustafaoğlu, MD, and Kemal Öztürk, MD, Aksaray, Turkey
**Section Editors:** Pat Clutter, MEd, BSN, RN, CEN, FAEN, Nancy Mannion, DNP, RN, CEN, FAEN

**Contribution to Emergency Nursing Practice**

- This article contributes to the clinical findings of coronavirus disease 2019–infected health care personnel and the effectiveness of hydroxychloroquine use.
- All health care personnel must be trained on the correct use of personal protective equipment at regular intervals, particularly paraprofessional support personnel, such as secretaries or technical staff.
- Our results showed no evidence that the use of prophylactic hydroxychloroquine was effective against severe acute respiratory syndrome coronavirus 2 transmission. Joint pain, weakness, and anosomia were the most common symptoms among health care personnel infected with severe acute respiratory syncdrome caronavirus 2, or SARS-CoV-2.

Berkant Öztürk is Emergency Medicine Physician, Department of Emergency Medicine, Aksaray University Training and Research Hospital, Aksaray, Turkey. **ORCID identifier:** https://orcid.org/0000-0002-6645-7287. **Twitter** identifier: https://twitter.com/@tctberkant

Sema Öztürk is Emergency Medicine Physician, Department of Emergency Medicine, Aksaray University Training and Research Hospital, Aksaray, Turkey. **ORCID identifier:** https://orcid.org/0000-0001-8337-1533. **Twitter** identifier: https://twitter.com/@sozturk67921065

Ahmet Çağlar is Emergency Medicine Physician, Department of Emergency Medicine, Aksaray University Training and Research Hospital, Aksaray, Turkey. **ORCID identifier:** https://orcid.org/0000-0002-0161-1167. **Twitter** identifier: https://twitter.com/@cglrahmet

İlker Kaçer is Emergency Medicine Physician, Department of Emergency Medicine, Aksaray University Training and Research Hospital, Aksaray, Turkey. **ORCID identifier:** https://orcid.org/0000-0002-9653-7958

Muhammet Hacimustafaoğlu is Emergency Medicine Physician, Department of Emergency Medicine, Aksaray University Training and Research Hospital, Aksaray, Turkey. **ORCID identifier:** https://orcid.org/0000-0001-6368-6853. **Twitter** identifier: https://twitter.com/@drmuhammeth

Kemal Öztürk is Emergency Medicine Physician, Department of Emergency Medicine, Aksaray University Training and Research Hospital, Aksaray, Turkey. **ORCID identifier:** https://orcid.org/0000-0001-7555-4209

For correspondence, write: Berkant Öztürk, MD;
E-mail: drberkantozturk@windowslive.com

J Emerg Nurs 2021;47:948–954.
Available online 29 March 2021
0099-1767



https://doi.org/10.1016/j.jen.2021.03.013

## Abstract

**Introduction:** Several vaccines have been developed and approved for use against severe acute respiratory syndrome coronavirus-2; however, the use of personal protective equipment remains important owing to the lack of effective specific treatment and whole community immunity. Hydroxychloroquine sulfate was a treatment option in the early days of the pandemic; however, it was subsequently removed owing to a lack of evidence as an effective treatment.

We aimed to evaluate the testing and infection characteristics of coronavirus disease 2019 among health care personnel and determine the effectiveness of prophylactic hydroxychloroquine sulfate use to prevent transmission.

**Methods:** This retrospective observational study was conducted between May 1 and September 30, 2020. The health care personnel included in the study were physicians, nurses, and paraprofessional support personnel. The health records of health care personnel who had been tested for severe acute respiratory syndrome coronavirus-2 using polymerase chain reaction were retrospectively analyzed.

**Results:** In total, 508 health care personnel were included in the study. A total of 152 (29.9%) health care personnel were diagnosed with coronavirus disease 2019. The positive polymerase chain reaction rate was 80.3% (n = 122). A comparison

of infected and uninfected health care personnel showed a difference in age and occupation and no difference in sex, working area, and prophylactic hydroxychloroquine sulfate use.

**Discussion:** Protective measures in low-risk areas of our hospital require improvements. All health care personnel should be trained on personal protective equipment use. There was no evidence to support the effectiveness of prophylactic hydroxychloroquine sulfate against severe acute respiratory syndrome coronavirus-2 transmission.

**Key words:** Coronavirus disease 2019; Health care personnel; Hydroxychloroquine sulfate; Personal protective equipment; Severe acute respiratory syndrome coronavirus 2

## Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) continues to show worldwide impact. To date, approximately 86 million people have been infected and more than 1.5 million have died.[1,2] In Turkey, 2.3 million people have been infected and the total number of deaths has reached 22 450.[3] The rapidly increasing number of patients in critical condition or dying has caused a significant challenge to public health. Mortality rates are correlated with countries' health care resources. In addition, the invasive ventilator and intensive care unit resources are inadequate.[4]

It is important to protect health care personnel (HCP) from the risk of infection to ensure continuity of effective health care. The World Health Organization (WHO) recommends the use of personal protective equipment (PPE) for HCP at high risk owing to their interaction with patients with coronavirus disease 2019 (COVID-19).[5] Several vaccines have been recently developed for use against SARS-CoV-2; however, the use of PPE and precautions against transmission remain important owing to the lack of effective specific treatments and whole community immunity.[6-9]

The potential efficacy of hydroxychloroquine sulfate (HCQ) against SARS-CoV-2 was demonstrated in vitro after the first severe acute respiratory syndrome epidemic in 2005.[10] It was included in treatment algorithm in the early days of the 2020 pandemic; however, there was no evidence for its efficacy in the treatment of COVID-19 and it was subsequently removed from use.[11-15] Additional studies have investigated the efficacy of HCQ use before exposure to SARS-CoV-2, and during the pandemic, we became aware that some HCP working in our hospital had used HCQ as prophylaxis.[16-18]

This study's primary focus was to evaluate the testing and infection characteristics of COVID-19 among HCP. In addition, we sought to determine the effectiveness of prophylactic HCQ use in the prevention of transmission.

## Methods

### DESIGN

This retrospective observational study was performed between May 1 and September 30, 2020 in a tertiary academic hospital. The study was conducted in compliance with the Declaration of Helsinki and approved by the regional ethics committee (2020/03-47).

### SETTING AND INFECTION PREVENTION MEASURES

The setting was the only hospital in our city within which COVID-19 patients are hospitalized. During the study process, the mean daily admission to the emergency department with COVID-19 symptoms was 352. In total, 1957 patients with COVID-19 pneumonia were hospitalized in 5 months. Our hospital continued to provide routine health care, in addition to COVID-19 care, during the pandemic. The working areas in the hospital were divided into 2 groups according to high and low COVID-19 transmission risk. High-risk areas were defined as the emergency department, COVID-19 suspected emergency department, COVID-19 isolation wards, and COVID-19 intensive care units. The low-risk areas were defined as the outpatient clinics, administrative divisions, information technology clerical, technical clerical, and other areas where routine hospital operations continued. HCP with no chronic disease worked in the high-risk areas of the hospital; working shifts were limited to 4 hours in these areas. A disposable mask (1200 N95/FFP2 NR; ERA, İstanbul, Turkey), goggles (Pulsafe LG20 Goggle; Bacou-Dalloz Company, Paris, France), isolation gowns (Safetouch TP63 5/6 classic disposable protective coverall; Safetouch Ltd, Istanbul, Turkey), and nonsterile gloves were routinely used during the care of patients who were suspected or confirmed to have COVID-19 in high-risk areas. Furthermore, all PPE was used for 1 shift in high-risk areas. After each shift, the goggles were routinely sterilized, and all other PPE was disposed of. Surgical masks and nonsterile gloves were used in low-risk areas.

### PARTICIPANTS

Of the 1830 HCP working in our hospital, 523 were tested for SARS-CoV-2 by oropharyngeal/nasal swabs and polymerase chain reaction (PCR) between May 1 and September 30, 2020. Fifteen HCP were excluded because of missing data; therefore, 508 HCP were included in the final analysis. Informed consent was obtained from each HCP.

Age, sex, occupation (physicians, nurses, and paraprofessional support personnel), working area (high/low risk), the reason for PCR testing (suspected contact, screening, presence of COVID-19 symptoms), COVID-19-related symptoms (fever, sore throat, anosmia, shortness of breath, cough, joint pain, fatigue), use of prophylactic HCQ, side effects if HCQ was used, PCR result, chest computed tomography (CT) result, hospitalization, and treatment regime for COVID-19 were retrospectively analyzed. HCP with a positive PCR test were classified as being infected with COVID-19. In addition, HCP with a positive chest CT for COVID-19 or those with COVID-19–related symptoms, even with a negative PCR test, were classified as being infected with COVID-19.

### DATA ANALYSIS

The data were analyzed using SPSS version 22.0 (SPSS Inc, Chicago, IL). Visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov test) were used to determine the distribution normality. The descriptive statistics were expressed as mean (SD) for normally distributed variables. The categorical data were expressed as n (%). For the intergroup comparisons, a *t* test was used to compare the normally distributed data (age), and Pearson's chi-square or Fisher exact test was used to compare the categorical variables. All analyses were 2-tailed. A *P* value of $< .05$ was considered statistically significant.

## Results

A total of 508 HCP were included in the study. The mean age was 35.89, SD = 8.2 years, and most of the HCP (n = 328, 64.6%) were female. Nurses were the largest proportion of HCP (n = 310, 61%), followed by paraprofessional support personnel (n = 102, 20.1%), and physicians (n = 96, 18.9%). In total, 307 (60.4%) HCP were working in high-risk areas, and 152 (29.9%) were diagnosed with COVID-19. The positive PCR rate was 80.3% (n = 122). The number of HCP using HCQ before any suspected contact was 40 (7.9%), and 1 participant reported HCQ-related side effects (arrhythmia). All demographic data are shown in Table 1.

TABLE 1
**Characteristics of health care personnel tested for COVID-19 using PCR**

| Variables | Number | % |
|---|---|---|
| Age, y, (*mean*) (*SD*) | (35.89) | (8.2) |
| Sex | | |
| Male | 180 | 35.4 |
| Female | 328 | 64.6 |
| Occupation | | |
| Nurses | 310 | 61 |
| Paraprofessional support personnel | 102 | 20.1 |
| Physicians | 96 | 18.9 |
| Working area | | |
| High risk for COVID-19 transmission | 307 | 60.4 |
| Low risk for COVID-19 transmission | 201 | 39.6 |
| The reason for PCR | | |
| Suspected contact | 309 | 60.8 |
| Screening | 109 | 21.5 |
| Presence of COVID-19 symptoms | 90 | 17.7 |
| Prophylactic HCQ use | 40 | 7.9 |
| Diagnosis of COVID-19 | 152 | 29.9 |

Data are presented as number (%) except age.
HCP, health care personnel; HCQ, hydroxychloroquine sulfate; PCR, polymerase chain reaction; COVID-19, coronavirus disease 2019.

HCP who had been diagnosed with COVID-19 were significantly younger than HCP who had not been diagnosed with COVID-19 (33.97, SD = 8.45, t = 3.47 $P = .001$). A total of 84 (55.3%) nurses, 43 (28.3) paraprofessional support personnel, and 25 (16.4%) physicians had been diagnosed with COVID-19. The paraprofessional support personnel were diagnosed significantly more than nurses and physicians ($\chi^2 = 9.15$, $P = .01$). Most of the HCP diagnosed with COVID-19 (n = 84, 55.3%) were working in high-risk areas. Among the HCP who had used prophylactic HCQ, 15 (40%) had been diagnosed with COVID-19 and 25 (60%) had not. There was no significant difference in sex, working area, and prophylactic HCQ medication between diagnosed and undiagnosed HCP. The intergroup comparisons are summarized in Table 2.

Of the HCP who had been diagnosed with COVID-19, 62 (40.8%) were asymptomatic. The most common symptom was joint pain (n = 48, 31.6%), followed by weakness (n = 33, 21.7%) and anosmia (n = 32, 21.1%). The PCR result was a false negative in 30 (19.7%) HCP. COVID-19 was confirmed in these participants by symptoms related to COVID-19; 2 of these showed positive COVID-19 on the chest CT. A total of 5 (3.3%) HCP

TABLE 2
**Comparison of infected and uninfected healthcare professionals**

| Demographic characteristic | Infected HCPs | | Uninfected HCPs | | | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | *t* value | *P* value |
| Age | 33.97 | 8.45 | 36.71 | 8.01 | 3.47 | .001 |
| | N | % | N | % | $\chi^2$ value | *P* value |
| Sex | | | | | 0.03 | .86 |
| Male | 53 | 34.9 | 127 | 35.7 | | |
| Female | 99 | 65.1 | 229 | 64.3 | | |
| Occupation | | | | | 9.15 | .01[†] |
| Nurses | 84 | 55.3 | 226 | 63.5 | | |
| Paraprofessional personnel | 43 | 28.3 | 59 | 16.6 | | |
| Physicians | 24 | 16.6 | 71 | 19.9 | | |
| Working area | | | | | 2.24 | .12 |
| High risk for COVID-19 transmission | 84 | 55.3 | 223 | 62.6 | | |
| Low risk for COVID-19 transmission | 68 | 44.7 | 133 | 37.4 | | |
| Prophylactic HCQ use | | | | | 1.19 | .28 |
| Yes | 15 | 9.9 | 25 | 7 | | |
| No | 137 | 90.1 | 331 | 93 | | |

HCP, health care personnel; HCQ, hydroxychloroquine; COVID-19, coronavirus disease 2019; PCR, polymerase chain reaction.
[†] In post-hoc analysis, statistically significant difference for paraprofessional support personnel ($P < .05$).

had a positive chest CT for COVID-19. Three of these were hospitalized. Acetylsalicylic acid and enoxaparin, in addition to HCQ, favipiravir, and paracetamol, were administered to the 2 discharged HCP. Plasma and predniSONE were added to this treatment for the 3 hospitalized HCP. Two of the 3 hospitalized HCP required noninvasive mechanical ventilation and were placed in the prone position. Hypoxia worsened, and 1 HCP who had used HCQ as prophylaxis required intubation. This HCP was extubated on the 4th day of hospitalization, fully recovered on the 13th day, and discharged on the 14th day. The characteristics of the HCP diagnosed with COVID-19 are summarized in Table 3.

## Discussion

We evaluated the testing and infection characteristics of 508 HCP who had been tested for SARS-CoV-2 using PCR. Over the 5-month study period, 152 HCP were diagnosed with COVID-19. A false-negative PCR result was found in 30 HCP. Most of those infected with COVID-19 were asymptomatic and recovered with outpatient treatment. One HCP developed respiratory failure and required intubation. There was no evidence to support that prophylactic HCQ medication was effective against SARS-CoV-2 transmission.

SARS-CoV-2 spreads person-to-person through direct contact or indirectly through contact with contaminated surfaces.[19] HCP working in the emergency department, isolation services, and intensive care units where aerosol-generating procedures, such as noninvasive ventilation and tracheal intubations, are frequently used are at a high risk for transmission.[20] Enhanced PPE use is recommended for HCP to prevent the risk of infection.[21] Simpler PPE, such as surgical masks alone or in combination with a face shield, is used in areas such as outpatient clinics where the risk is relatively lower and routine hospital operation continues.[4] The risk of transmission to HCP has increased as the number and required health care of cases has increased; however, the rate of infected HCP decreases with appropriate PPE use, pandemic design within hospitals, and community protective measures. At the beginning of the pandemic, in January 2020, the rate of infected HCP was reported as 29% among hospitalized patients in Wuhan.[22] In Italy, there were 15 314 cases of COVID-19 infections among HCP by April 2020, which accounted for 11% of all confirmed cases.[23] Chou et al[24] have reported that the COVID-19 infection rate among HCP from various countries ranged from 1.9% to 12.6% in the third update of their review in August 2020. In the absence of official data, medical society research has shown that 29 865 HCP have been infected, which corresponds to 11.5% of all confirmed cases by September 17, 2020 in Turkey.[25] The total

TABLE 3
**Characteristic of health care personnel diagnosed with COVID-19 (n = 152)**

| Variables | Number | % |
|---|---|---|
| Symptoms | | |
| Asymptomatic | 62 | 40.8 |
| Fever | 12 | 7.9 |
| Sore throat | 5 | 3.3 |
| Anosmia | 32 | 21.1 |
| Shortness of breath | 23 | 15.1 |
| Cough | 8 | 5.3 |
| Joint pain | 48 | 31.6 |
| Weakness | 33 | 21.7 |
| The reason for PCR | | |
| Suspected contact | 60 | 39.5 |
| Screening | 2 | 1.3 |
| Presence of COVID-19 symptoms | 90 | 59.2 |
| Positive PCR | 122 | 80.3 |
| Diagnostic criteria | | |
| Only PCR | 61 | 40.1 |
| Only COVID-19 symptoms | 28 | 18.4 |
| PCR and COVID-19 symptoms | 58 | 38.1 |
| PCR and CT | 1 | 0.65 |
| COVID-19 symptoms and CT | 2 | 1.3 |
| PCR and COVID-19 symptoms and CT | 2 | 1.3 |
| Positive chest CT for COVID-19 pneumonia | 5 | 3.3 |
| Hospitalization for COVID-19 | 3 | 2 |
| Treatment | | |
| Favipiravir and HCQ | 147 | 96.7 |
| Favipiravir, HCQ, paracetamol, acetylsalicylic acid, and enoxaparin | 2 | 1.3 |
| Favipiravir, HCQ, paracetamol, acetylsalicylic acid, enoxaparin, predniSONE, and plasma | 3 | 2 |

Data are presented as number (%).
HCQ, hydroxychloroquine sulfate; COVID-19, coronavirus disease 2019; PCR, polymerase chain reaction; CT, computed tomography.

number of confirmed cases and the infected HCP rate in our city are unknown owing to a lack of official data. However, during the study period, 1957 patients have been hospitalized and only 3 (0.15%) were HCP. This rate seems low when compared with the literature, which may be related to the consistent use of PPE and working conditions in the hospital. For example, shorter working hours reduces viral load exposure, which means a better prognosis in COVID-19.[26]

Nosocomial transmission has been recognized as an important amplifier in the epidemics of SARS in 2003 and Middle East respiratory syndrome in 2012.[27] However, some studies have reported that this is not valid during the SARS-CoV-2 pandemic. Hunter et al[28] have reported that the infection rates of patient- and nonpatient-facing HCP were similar, and nosocomial transmission from patients to staff is not an important factor. The observations from China, where personnel screening tests are widely applied, are similar.[20] In this study, we found no significant difference in the number of COVID-19 diagnoses between high- and low-risk areas, in line with the literature. This result provides important information regarding SARS-CoV-2 transmission measures in a hospital. Low infection rates in high-risk working areas are associated with transmission prevention protocols and PPE use that is sufficient to prevent transmission. By contrast, the high infection rates in low-risk working areas may be due to low personnel compliance with PPE use. PPE use is included in the standard training curriculum of physicians and nurses in medical faculties; however, paraprofessional support personnel, such as secretaries or technical staff, were not trained on how to use PPE at this facility. The results of our study confirmed this lack of training; paraprofessional support personnel had a greater likelihood of being infected with COVID-19. We concluded that training on the correct use of PPE should be repeatedly conducted for all HCP working in the field, as recommended by WHO. This is particularly important for paraprofessional support personnel because the benefits of such training are lost within 6 months.[5,29] In addition, screening testing is not being performed on the people who have no COVID-19 symptoms and suspicious contact in many countries. Therefore, many SARS-CoV-2 carriers remain undetected, and HCP working in low-risk areas who use simpler PPE face a higher risk of contracting the disease.

COVID-19 infections are commonly asymptomatic or show mild symptoms.[30] However, this infection can be life-threatening by causing severe respiratory failure, acute ischemic stroke, or myocardial involvement.[31,32] It is often more severe in the elderly and individuals with comorbidities.[33,34] In line with previous studies, most HCP were asymptomatic in this study. No life-threatening complications were observed, except in 1 case requiring respiratory support. At the beginning of the pandemic, fever and dyspnea were the main symptoms of COVID-19 in Wuhan, China.[20,35] However, after the spread of SARS-CoV-2 worldwide, joint pain and weakness are observed as the main viral symptoms.[35,36] In addition, gastrointestinal symptoms, such as diarrhea, nausea, and vomiting are common in patients with COVID-19.[37,38] In this study, the most common symptoms noted were joint pain, weakness, and anosmia, which are similar to recent literature. Only

12 of the 152 HCP reported having a fever. Gastrointestinal symptoms were not observed among any of our HCP diagnosed with COVID-19.

Multiple vaccines have been developed for SARS-CoV-2; however, specific treatment has not been developed, which increases the anxiety of HCP regarding transmission and leads to them seeking alternative chemoprophylaxis options.[6,7,39] Yao et al[40] have demonstrated that HCQ could reduce the spread of SARS-CoV-2 in vitro. In a retrospective study conducted in India, Chatterjee et al[41] have reported that the SARS-CoV-2 incidence is significantly lower in HCP who used prophylactic HCQ. However, Abella et al[16] have reported no significant difference in the incidence of SARS-CoV-2 between HCP administered with HCQ or a placebo. WHO reported no significant difference in patient improvement following the use of HCQ and subsequently removed HCQ from routine treatment recommendations.[17] The results of this study support that HCQ is not effective in preventing SARS-CoV-2 transmission. In addition, the HCP that needed respiratory support and intensive care had been using prophylactic HCQ.

## Limitations

This study had some limitations because of its retrospective nature. First, the number of HCP using HCQ was low compared with the total number of participants. In addition, HCP may have used other drugs/medications, such as vitamin supplements, that were not reported during the study. This situation may have affected the effectiveness of prophylactic HCQ use. PPE use, rule compliance, and HCP behavior against possible transmission in normal daily life were unknown. These limitations prevented any comparisons of transmission occurrence in HCP. To address these factors, multicenter, prospective studies are needed.

## Conclusions

In summary, protective measures in the low-risk areas of hospitals must be improved. All HCP should be trained on proper PPE use at regular intervals, particularly paraprofessional support personnel, such as secretaries or technical staff. Furthermore, according to the results of this study, there was no evidence to support the use of prophylactic HCQ against SARS-CoV-2 transmission.

REFERENCES


1. Centers for Disease Control and Prevention. COVID data tracker. Accessed February 14, 2021. https://covid.cdc.gov/covid-data-tracker
2. World Health Organization. Coronavirus disease (COVID-19) dashboard. Accessed January 8, 2021. http://covid19.who.int/
3. Republic of Turkey Ministry of Health. Turkey COVID-19 Patient Table. Accessed January 8, 2021. https://covid19.saglik.gov.tr/
4. Lai CC, Wang CY, Wang YH, Hsueh SC, Ko WC, Hsueh PR. Global epidemiology of coronavirus disease 2019 (COVID-19): disease incidence, daily cumulative index, mortality, and their association with country healthcare resources and economic status. *Int J Antimicrob Agents*. 2020;55:(4) 105946. https://doi.org/10.1016/j.ijantimicag.2020.105946
5. World Health Organization. Rational use of personal protective equipment (PPE) for coronavirus disease (COVID-19): interim guidance. March 19, 2020. Accessed January 8, 2021. https://apps.who.int/iris/handle/10665/331498
6. Polack FP, Thomas SJ, Kitchin N, et al. Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine. *N Engl J Med*. 2020;383(27):2603-2615. https://doi.org/10.1056/NEJMoa2034577
7. Haynes BF, Corey L, Fernandes P, et al. Prospects for a safe COVID-19 vaccine. *Sci Transl Med*. 2020;12(568):eabe0948. https://doi.org/10.1126/scitranslmed.abe0948
8. Goodman JL, Grabenstein JD, Braun MM. Answering key questions about COVID-19 vaccines. *JAMA*. Published online October 16, 2020. https://doi.org/10.1001/jama.2020.20590
9. Huang AT, Garciar-Carreras B, Hitchings MDT, et al. A systematic review of antibody mediated immunity to coronaviruses: antibody kinetics, correlates of protection, and association of antibody responses with severity of disease. Preprint. Posted online April 17, 2020. medRxiv. doi:10.1101/2020.04.14.20065771
10. Vincent MJ, Bergeron E, Benjannet S, et al. Chloroquine is a potent inhibitor of SARS coronavirus infection and spread. *Virol J*. 2005;2:69. https://doi.org/10.1186/1743-422X-2-69
11. Ayten O, Özdemir C, Aktürk ÜA, Şen N. Potential treatment of COVID-19. *Eurasian J Pulmonol*. 2020;22(4):35-44. https://doi.org/10.4103/ejop.ejop_61_20
12. Tang W, Cao Z, Han M, et al. Hydroxychloroquine in patients with mainly mild to moderate coronavirus disease 2019: open label, randomised controlled trial. *BMJ*. 2020;369:m1849. https://doi.org/10.1136/bmj.m1849
13. RECOVERY Collaborative Group, Horby P, Mafham M, Linsell L, et al. Effect of hydroxychloroquine in hospitalized patients with Covid-19. *N Engl J Med*. 2020;383(21):2030-2040. https://doi.org/10.1056/NEJMoa2022926
14. Cavalcanti AB, Zampieri FG, Rosa RG, et al. Hydroxychloroquine with or without azithromycin in mild-to-moderate Covid-19. *N Engl J Med*. 2020;383(21):2041-2052. https://doi.org/10.1056/NEJMoa2019014.
15. Skipper CP, Pastick KA, Engen NW, et al. Hydroxychloroquine in nonhospitalized adults with early COVID-19 : a randomized trial. *Ann Intern Med*. 2020;173(8):623-631. https://doi.org/10.7326/M20-4207
16. Abella BS, Jolkovsky EL, Biney BT, et al. Efficacy and safety of hydroxychloroquine vs placebo for pre-exposure SARS-CoV-2 prophylaxis among health care workers: a randomized clinical trial. *JAMA Intern Med*. 2021;181(2):195-202. https://doi.org/10.1001/jamainternmed.2020.6319

17. Pan H, Peto R, Henao-Restrepo AM, et al. Repurposed antiviral drugs for Covid-19 - interim WHO solidarity trial results. *N Engl J Med*. 2021;384(6):497-511. https://doi.org/10.1056/NEJMoa2023184
18. Boulware DR, Pullen MF, Bangdiwala AS, et al. A randomized trial of hydroxychloroquine as postexposure prophylaxis for Covid-19. *N Engl J Med*. 2020;383(6):517-525. https://doi.org/10.1056/NEJMoa2016638
19. van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med*. 2020;382(16):1564-1567.
20. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;323(13):1239-1242. https://doi.org/10.1001/jama.2020.2648
21. Wax RS, Christian MD. Practical recommendations for critical care and anesthesiology teams caring for novel coronavirus (2019-nCoV) patients. *Can J Anesth*. 2020;67(5):568-576. https://doi.org/10.1007/s12630-020-01591-x
22. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. *JAMA*. 2020;323(11):1061-1069. Published correction appears in *JAMA*. 2021;325(11):1113. https://doi.org/10.1001/jama.2020.1585
23. Istituto Superiore di Sanità. Integrated surveillance of COVID-19 in Italy. Accessed April 10, 2020. https://www.epicentro.iss.it/en/coronavirus/bollettino/Infografica_10aprile%20ENG.pdf
24. Chou R, Dana T, Buckley DI, Selph S, Fu R, Totten AM. Update alert 3: epidemiology of and risk factors for coronavirus infection in health care workers. *Ann Intern Med*. 2020;173(6):W123-W124. https://doi.org/10.7326/L20-1005
25. TTB COVID-19 Pandemisi 6. Ay Değerlendirme Raporu. TTB - TÜRK TABİPLERİ BİRLİĞİ. TÜM HAKLARI SAKLIDIR. Accessed January 8, 2021. https://www.ttb.org.tr/kollar/COVID19/yayin_goster.php?Guid=42ee583e-fb2d-11ea-abf2-539a0e741e38
26. de la Calle C, Lalueza A, Mancheño-Losa M, et al. Impact of viral load at admission on the development of respiratory failure in hospitalized patients with SARS-CoV-2 infection. *Eur J Clin Microbiol Infect Dis*. 2021. Published online January 7, 2021. https://doi.org/10.1007/s10096-020-04150-w
27. Chowell G, Abdirizak F, Lee S, et al. Transmission characteristics of MERS and SARS in the healthcare setting: a comparative study. *BMC Med*. 2015;13:210. https://doi.org/10.1186/s12916-015-0450-0
28. Hunter E, Price DA, Murphy E, et al. First experience of COVID-19 screening of health-care workers in England. *Lancet*. 2020;395(10234):e77-e78. https://doi.org/10.1016/S0140-6736(20)30970-3
29. Northington WE, Mahoney GM, Hahn ME, Suyama J, Hostler D. Training retention of Level C personal protective equipment use by emergency medical services personnel. *Acad Emerg Med*. 2007;14(10):846-849. https://doi.org/10.1197/j.aem.2007.06.034
30. Oran DP, Topol EJ. Prevalence of asymptomatic SARS-CoV-2 infection: a narrative review. *Ann Intern Med*. 2020;173(5):362-367. https://doi.org/10.7326/M20-3012
31. Jin H, Hong C, Chen S, et al. Consensus for prevention and management of coronavirus disease 2019 (COVID-19) for neurologists. *Stroke Vasc Neurol*. 2020;5(2):146-151. https://doi.org/10.1136/svn-2020-000382
32. Long B, Brady WJ, Koyfman A, Gottlieb M. Cardiovascular complications in COVID-19. *Am J Emerg Med*. 2020;38(7):1504-1507. https://doi.org/10.1016/j.ajem.2020.04.048
33. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*. 2020;395(10229):1054-1062. Published correction appears in Lancet. 2020;395(10229):1038. https://doi.org/10.1016/S0140-6736(20)30566-3
34. Grasselli G, Pesenti A, Cecconi M. Critical care utilization for the COVID-19 outbreak in Lombardy, Italy: early experience and forecast during an emergency response. *JAMA*. 2020;323(16):1545-1546. https://doi.org/10.1001/jama.2020.4031
35. Wu D, Wu T, Liu Q, Yang Z. The SARS-CoV-2 outbreak: what we know. *Int J Infect Dis*. 2020;94:44-48. https://doi.org/10.1016/j.ijid.2020.03.004
36. Stokes EK, Zambrano LD, Anderson KN, et al. Coronavirus Disease 2019 case surveillance - United States, January 22-May 30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(24):759-765. https://doi.org/10.15585/mmwr.mm6924e2
37. 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. https://doi.org/10.1001/jama.2020.6775
38. Cheung KS, Hung IFN, Chan PPY, et al. Gastrointestinal manifestations of SARS-CoV-2 infection and virus load in fecal samples from a Hong Kong cohort: systematic review and meta-analysis. *Gastroenterology*. 2020;159(1):81-95. https://doi.org/10.1053/j.gastro.2020.03.065
39. Zhang WR, Wang K, Yin L, et al. Mental health and psychosocial problems of medical health workers during the COVID-19 epidemic in China. *Psychother Psychosom*. 2020;89(4):242-250. https://doi.org/10.1159/000507639
40. Yao X, Ye F, Zhang M, et al. In vitro antiviral activity and projection of optimized dosing design of hydroxychloroquine for the treatment of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). *Clin Infect Dis*. 2020;71(15):732-739. https://doi.org/10.1093/cid/ciaa237
41. Chatterjee P, Anand T, Singh KJ, et al. Healthcare workers & SARS-CoV-2 infection in India: a case-control investigation in the time of COVID-19. *Indian J Med Res*. 2020;151(5):459-467. https://doi.org/10.4103/ijmr.IJMR_2234_20


For presubmission guidance, please contact Pat Clutter, MEd, BSN, RN, CEN, FAEN at: prclutter@gmail.com or Nancy Mannion, DNP, RN, CEN, FAEN at: NBonalumi@comcast.net. Submit a manuscript directly to *JEN*.