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ARTICLE ANALYSIS & EVALUATION // DIAGNOSIS/TREATMENT/PROGNOSIS

FEVER AND OTHER CLINICAL INDICATORS MAY FAIL TO DETECT COVID-19—INFECTED INDIVIDUALS

Do temperature checks and questions about COVID-19 symptoms protect dental practices from COVID-19 infection?

REVIEWERS
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ARTICLE TITLE AND BIBLIOGRAPHIC INFORMATION
Estimation of the asymptomatic ratio of novel coronavirus infections (COVID-19). Nishiura H, Kobayashi T, Miyama T, et al. Int J Infect Dis 2020;94:154-155. https://doi.org/10.1016/j.ijid.2020.03.020.

SUMMARY

Background
Many people infected with COVID-19 display no symptoms. Improving estimates of the asymptomatic ratio, the percentage of infected individuals with no symptoms, might improve the understanding of COVID-19 transmission. This information will also allow us to determine the effectiveness of using fever and other symptoms to screen people for COVID-19 infection. This asymptomatic ratio can be determined by using seroepidemiological data obtained from large populations. Instead, the authors examined a sample of people at risk for COVID-19 infection, a group of Japanese nationals evacuated from Wuhan, China, to Japan.

Subjects
A total of 565 Japanese nationals evacuated from Wuhan, China, to Japan.

Key Study Factor and Outcome Measure
All 565 evacuees were assessed for symptoms including fever determined by temperature screening and interviews to collect information concerning cough and other nonspecific symptoms that are consistent with COVID-19 infection. COVID-19 reverse transcription polymerase chain reaction (RT-PCR) was also performed on all evacuees. The authors used Bayes theorem to determine the asymptomatic ratio within this population.

Main Results
Among 565 passengers who were evacuated from China, 63 (11.2%) were symptomatic. RT-PCR testing revealed that there were 4 asymptomatic and 9 symptomatic people who tested positive for COVID-19. The sensitivity of symptoms-based screening was 69.23%, and specificity was 90.3%. Probability was determined that 30.8% (95% confidence interval = 7.7%-53.8%) of infected individuals are asymptomatic.
Conclusions
Asymptomatic infections cannot be determined if they are not confirmed by being tested with RT-PCR, and symptomatic cases may not be detected if they do not seek medical attention. These results indicate that symptom-based screening of COVID-19 is likely to fail to detect many infected individuals.

COMMENTARY AND ANALYSIS
When the severity of the COVID-19 pandemic was recognized in March 2020, in-office dental treatment came to a virtual halt. At our dental school, only emergency services were available during this shutdown period. These services were supplemented by teledentistry, which acted as a gateway to in-person dental intervention. At that time, education switched from live classes to online instruction, and few faculty, staff, students, or patients entered the facility. During this period, ingress to the dental school was restricted to an entrance where all persons entering underwent questioning concerning flu-like symptoms and body temperature checks. The rationale behind COVID-19 screening by assessing temperature and self-reported flu-like symptoms is to identify individuals who are likely to be infected. Similar screening programs take place at airports and other public facilities. Before the COVID-19 pandemic, fever and symptom screening were used to contain other communicable diseases such as Ebola and severe acute respiratory syndrome, which similar to COVID-19, is a coronavirus-caused illness.1

Because many dental procedures result in aerosols, COVID-19–infected patients pose an infection risk to staff and other patients even with infection control practices. As dental care resumes during the summer of 2020, it is important to detect infected individuals. Access to COVID-19 testing is still limited. At our school, COVID-19 testing of personnel is available, but patients are not tested by the school. In the coming weeks, the number of individuals screened daily by symptom checking will increase. The goal of this commentary is to describe the limitations of symptom-based screening.

Published in the early months of the disease, the report by Nishiura et al. illustrates the limitations of identifying COVID-19–infected individuals based on fever and other symptoms.2 This study was conducted on Japanese citizens being evacuated from Wuhan, China. All evacuees were assessed for fever or other nondescript symptoms and had an RT-PCR test for COVID-19. Of the 13 subjects found to be COVID-19 positive, 4 (30.8%) were asymptomatic.

Among the 63 symptomatic evacuees, there were 54 individuals (85.7%) who were found to be free of COVID-19 infection. This false positive group outnumbered the true positives (symptomatic individuals testing COVID-19 positive).

Because the travelers in this study were under observation for a minimum of 30 days, it was concluded that none of the subjects were still in the disease’s incubation period. This study documented individuals who were infected, potentially capable of spreading the disease and asymptomatic. In the report by Nishiura et al.,2 fever was not defined, nor was the method of temperature measurement. Also, the source of material and other information pertaining to the RT-PCR procedure was not described. Despite these limitations, these results and other observations call into question the effectiveness of symptom-based COVID-19 screening as a means of preventing infected persons from having contact with unexposed populations.1,3

Several other studies have examined the relationship between detailed assessment of symptoms and odds of having a COVID-19 infection in healthcare workers (HCWs) serving populations with high infection rates. In a study of 1573 HCWs in Milan, Italy, who underwent nasopharyngeal swab sampling for COVID-19 testing, 36.0% of the COVID-19–positive HCWs had none or only one symptom.3 Among the HCWs with symptoms, fever was positively associated with infections with an odds ratio of 9.12% (95% confidence interval = 5.61-14.8), however, as was observed by Nishiura et al., the false positive rate for fever was high (62%), and 43.9% of infected HCWs were fever free. Loss of smell and taste were not commonly observed symptoms, being observed in only 14.4% of the COVID-19–positive subjects. These symptoms were however predictive of infection, with a low false positive rate of 23.1%. Other studies conducted on populations of HCWs indicate that having multiple symptoms increased the odds of being infected with COVID-19, especially having loss of taste and smell. In contrast, nasal congestion was not indicative of COVID-19 infection.5

Several publications have estimated the effectiveness of symptom-based COVID-19 screening by mathematical modeling.6,7 One key variable predicted to increase the proportion of asymptomatic individuals, who would be missed in symptom-based screening, is the fraction of the infected population within the disease’s incubation period. In populations where the disease is spreading rapidly, as is currently the case in many areas of the US, the effectiveness of symptom-based screening would be less than in areas where the spread of the disease is limited.7 Currently, there are calls to quarantine individuals traveling from highly affected areas to areas of lower prevalence.

Although symptom-based screening does identify COVID-19–infected individuals, many factors can impact its
effectiveness. The reliability of the methods and equipment used to detect fever may be poor. People to be screened may not be truthful about symptoms and may have taken antipyretic medications. Unlike the surveys given to HCWs in studies, the questions given to members of the public may yield little useful information.

Similar to every diagnostic procedure, symptom-based COVID-19 screening has false positive and false negative determinations. Although the specificity of symptom-based screening is good (90.3% in the study by Nishiura et al.), there are likely to be more false positives than true positives in most populations due to the low prevalence of infection. In the dental setting, the treatment of these false positive individuals may be delayed pending determination of their true status. The high number of false negatives consisting of asymptomatic and presymptomatic individuals (estimated to be at least 50% by Gostic et al.) is more problematic. These individuals may inadvertently spread the infection to staff and other patients because the COVID-19 virus can be transmitted through aerosols produced by dental procedures. This conclusion highlights the continuing need for effective infection control practices and training of the dental workforce.

Although commonly conducted in dental facilities, using body temperature measurements and a person’s self-report of symptoms can fail to identify COVID-19–infected individuals. In areas where the rate of infection is increasing, the number of asymptomatic and infected individuals will increase, further eroding the effectiveness of symptom-based screening. We recommend that symptom-based screening continue and improve in dental facilities. The evidence does however indicate that symptom-based screening of patients and staff for COVID-19 should not be relied on to protect the dental environment from this virus.

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