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# Coronavirus Disease 2019 and Smoking

## How and Why We Implemented a Tobacco Treatment Campaign



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Smoking is associated with one of five deaths in the United States. Multimodality tobacco treatment increases rates of successful cessation by at least 20%. The coronavirus disease 2019 pandemic has put a halt to many inpatient and outpatient medical visits that have been deemed nonessential, including tobacco treatment. The transition to telehealth has been wrought with challenges. Although data on the association between coronavirus disease 2019 and tobacco products are mixed, the overall health consequences of tobacco point towards increased risk of morbidity and death that is associated with the virus. This leaves smoking as one of the few readily modifiable risk factors in an environment understandably not set up to prioritize cessation. A military health facility on Fort Eustis in Virginia runs a successful tobacco treatment program and adapted it to pandemic times. This article describes the process and lessons learned from this initiative. The model is applicable and scalable to government and civilian health centers as health care adapts to a new normal. CHEST 2020; 158(4):1770-1776

**KEY WORDS:** COVID-19; pandemic; public health; smoking cessation; tobacco treatment

Smoking has been shown to be a risk factor for disease severity and poor outcomes in coronavirus disease 2019 (COVID-19), which is the disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).<sup>1-3</sup> It has been shown to increase the risk of the development of various types of viral infections and the incidence of complications.<sup>4</sup> Current smoking is associated with poorer outcomes in those with severe sepsis and septic shock<sup>5</sup> and the development of acute respiratory disease syndrome in hospitalized patients.<sup>6</sup> In a study that predicted the 90-day mortality rate from viral pneumonias (including coronaviruses) in hospitalized patients, smokers were twice as likely to die compared

with those who did not smoke.<sup>7</sup> Although it is unclear to what extent the severity and management of these conditions mitigate risk,<sup>1</sup> no other risk factors are as immediately modifiable as smoking.

Some researchers suggest a protective effect of smoking and COVID-19 based on epidemiologic data that were not controlled for age and comorbidities and cell signaling hypotheses that were based on animal data. Although they have garnered media attention, they all conclude that the cumulative risk of tobacco to the health of an individual outweighs the theoretic benefits.<sup>8,9</sup>

The Centers for Disease Control and Prevention and the World Health

**ABBREVIATIONS:** ACE 2 = Angiotensin converting enzyme 2; COVID-19 = coronavirus disease 2019; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2

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Organization recommend against smoking to reduce the risk of harm from the disease.<sup>10,11</sup> The World Health Organization has gone as far as to caution against reports that tobacco or nicotine may provide benefit against COVID-19 because there is not sufficient evidence for this claim.<sup>11</sup> Given the conflicting information in the media and the challenges of coping with a pandemic, we felt it of utmost importance to adapt tobacco treatment, promote its importance, and continue to support patients in their efforts to quit during this unique time.

## Tobacco Treatment in the Time of COVID-19

McDonald Army Health Center is a military treatment facility on Fort Eustis in Newport News, VA. It is an ambulatory care center that provides primary and specialty care services to active duty service members, their families, and retirees.

A tobacco treatment program has been run by the clinical pharmacy for >10 years. In 2019, it grew to target specific populations within the active duty community in efforts to minimize tobacco use and improve the health of the force. Educational products and live and video-based programs were developed and implemented. The COVID-19 pandemic emerged in the midst of these efforts, putting the program to a halt. The team quickly restructured their efforts in a way that applied to social distancing orders. This process and what was learned from it will be discussed.

There are three ways that a nicotine user can come to see a clinical pharmacist who manages their tobacco treatment at McDonald Army Health Center. They can self-refer, be referred by their primary care provider, or be referred by a specialist. Prior to their appointment with the clinical pharmacist, they must see a psychologist for an appointment regarding nicotine use, attend a tobacco treatment education class, or complete a online program.

When the pandemic was starting to be recognized in the United States, the tobacco treatment program responded. A message was sent targeting all Tricare beneficiaries (active duty soldiers, family members, and retirees) in the Fort Eustis community via three means of communication. On March 17, 2020, a message was posted on the official McDonald Army Health Center Facebook page, which has >3,400 followers (e-Appendix 1). Five hundred and seventy administrators received an e-mail message to redistribute throughout their organizations, which include brigades and battalions on site. On March 18, a

Tricare Online (patient portal) message was sent to >29,000 patients who were enrolled with a primary care provider at McDonald Army Health Center. It described the risk of COVID-19 in those who smoke and recommended tobacco treatment services through the resources detailed later.

Interested patients could send an e-mail message to a monitored account if they wanted to quit. Clinic staff made appointments with a clinical pharmacist who has prescribing privileges within the Military Health System and is trained in tobacco treatment. Patients were also provided with a link to the program *Time to Quit*, which was created by the Health Net Federal Service, prior to their appointment.<sup>12</sup> This online tool has been particularly useful during the pandemic because psychologist appointments may be limited and classes may be cancelled temporarily.

During the initial telehealth appointment, a concise nicotine use history was conducted (e-Appendix 2). It assessed the types and quantity of nicotine products used, the length of use, medical conditions that may limit medication options, the triggers and times that the patient normally uses nicotine products, and an overview of previous attempts to quit. This was followed by a discussion of behavioral interventions and nicotine withdrawal symptoms. Medication therapy options included varenicline, bupropion, and nicotine replacement therapy patches, gum, and lozenges, which have proven efficacy and safety as both monotherapy and in combination with each other.<sup>13</sup> At the end of the appointment, patients were provided with discharge instructions through secure messaging or e-mail messaging (e-Appendix 3).

Patients had the option of obtaining their medications in one of three ways: through their local Military Treatment Facility, through mail order, or through a retail pharmacy (coverage dependent). The military treatment facility pharmacy had developed a drive-through only operation to reduce risk of viral spread. Patients were scheduled for at least two follow-up telehealth appointments to track progress, to provide behavioral intervention, and to address any ongoing concerns.

## What Was Learned and What to Consider With Future Campaigns

Fewer patients responded than was anticipated, and the process was analyzed for how it can be improved. The three main takeaways from the campaign are detailed here and summarized in Table 1.

**TABLE 1 ] Barriers to Tobacco Treatment Campaign in the Time of Coronavirus Disease 2019 and Solutions**

Variable	Barrier	Solution
Message exposure	Patients not subscribed to patient portal	Counsel patients on signing up for patient portal
	Administrators too busy to send messages to constituents	Send message to all organization constituents, not just administrators, and Reminder e-mail messages
	Low electronic communication literacy	Telephone line availability, advertising with television and radio
	Limited clinic phone answering capabilities due to quarantine	Forward clinic number to personal or home phone of providers or staff
Behavioral health	Lack of provider time and expertise for counselling	Involve behavioral health specialists
	Social isolation	Provide with online and phone-based counseling support resources
Resources	Potential for overwhelming response, lack of provider time	Use clinic staff and questionnaires to gather medical and tobacco history
	Primary care managers busy with surge responsiveness	Use clinical pharmacy or other providers who are certified in tobacco treatment
	Not all tobacco treatment trained staff have prescribing authority	Authorize standing order for tobacco treatment medications
	Virus exposure	Use the mail-order pharmacy, 90-day prescriptions, and telehealth

### Broadening Message Exposure

The timing and platform in which the message goes out to patients is important. The original campaign message went out during a tumultuous time. Community spread of COVID-19 was beginning: a state of emergency had been declared in Virginia, the governor sent a message on March 13 for schools to close starting March 16, and restrictions were implemented on restaurants, recreation, entertainment, gatherings, and nonessential retail businesses. Health Protection Condition levels, a Department of Defense public health emergency management framework that communicates key protective measures to the community, were escalating rapidly. It is likely that many patients missed the message given the context or did not have the bandwidth to consider a nonemergent medical appointment. Army administrators may also have been too inundated with pandemic preparedness duties to pass the message throughout their organizations.

Not all patients subscribe to secure messaging through the Tricare Online patient portal or use Facebook or even e-mail messaging. It is essential to plan to have a phone number that patients can call to reach a provider who is working from home in the setting of foreseen or unforeseen clinic closure. Outreach via various media sources, such as local newspapers and television stations, can broaden public exposure to the message and

resource, especially to those in the population who do not use electronic communication.

### Behavioral Intervention

The 2020 Report of the Surgeon General, along with clinical practice guidelines from the United States Preventive Services Task Force, United States Public Health Service, and the American College of Cardiology all highlight the importance of behavioral intervention for tobacco treatment in addition to pharmacotherapy.<sup>13,14</sup> Key aspects of a tobacco treatment appointment are education about nicotine withdrawal symptoms and behavioral interventions. Behavioral intervention techniques include cognitive behavioral strategies (stimulus control, stress reduction, avoidance, delay tactics, reframing) and motivational interviewing that is based on theories of behavior change (health belief model, transtheoretical model, social cognitive/learning theory). These methods can be used to target a patient's perceptions of smoking and help them change behaviors that facilitate cessation of use.<sup>14,15</sup> Smoking cessation telephone counseling, as performed in our protocol, has been shown to be effective at improving rates of quitting.<sup>15,16</sup>

Although it is preferable to have all patients see a behavioral health provider, this is not possible in many settings due to limited resources. Referrals to a

behavioral health provider should be discussed with patients who are felt to be having a particularly hard time coping, who have low self-efficacy, who have a history of struggles with cessation, or who express interest in seeing a behavioral health provider.

A pandemic may lead to an even higher need for behavioral health services to help with depression and anxiety that stems from isolation from friends and family, financial hardship, and increased stress. Normally, life stressors are staggered over time in a population. In a pandemic, everyone experiences the same stressor at the same time. This may mean that the tobacco treatment clinician has to take on an even greater role in the behavioral health aspects of their patients if behavioral health provider capacity is decreased.

Although more free time may provide patients with motivation to quit, it may also be a deterrent due to struggles with stress and isolation. Major life events may increase use in those already using, cause former users to reinstate use, and make it less likely for those that are using to quit. Self-efficacy is an important predictor of abstinence rates, and outcomes are best when confidence in quitting is reinforced by community or a provider.<sup>14</sup>

Follow up is key during a pandemic because the impact of population-wide social, psychological, and behavioral changes are uniquely challenging in the setting of isolation. At least three total telehealth appointments should take place to provide effective care.<sup>15</sup> Additional resources such as quit lines (1-800-QUIT-NOW), text messaging programs, phone applications, and online services offer counseling support that can supplement the telehealth interaction.<sup>13,15</sup> Another resource that augments patient-provider interactions is the *Time to Quit* program that highlights the reasons that people smoke, management of withdrawal symptoms, health benefits of cessation, and maintenance of motivation.

### *Resource Utilization and Practical Considerations*

In a pandemic, physicians, nurse practitioners, and physician assistants may be pulled from their outpatient roles for acute care. A pharmacist trained in tobacco treatment is an ideal provider to treat these patients. A standing order for varenicline, bupropion, and various types of nicotine replacement therapy by a physician permits those medications to be available to patients, even if they are seen by a health care provider without prescribing privileges.

As response rates go up, providers have to prepare to handle an increased volume of telehealth visits. As such,

having as much of the essential visit logistics completed ahead of time as possible would allow for more bandwidth for counseling and for more patients to be treated. Support staff can call a patient before their visit to document pertinent history, or patients can fill out a questionnaire through a secure messaging platform that details pertinent medical and nicotine use history to the provider.

There is no single algorithm for tobacco treatment. The provider should recognize that, just like with other chronic disease states, treatment is patient specific. Some patients may require two 21-mg patches at once; some patients may need triple medication therapy, and other patients may not be able to tolerate twice daily varenicline or bupropion and need to take it once daily. Different approaches work for different patients, so flexible dosing and treatment durations should be available for patients depending on how their treatment progresses.

Another consideration is to limit virus exposure in this vulnerable population and respond to patient fears. Patients may have heard that tobacco or nicotine could protect them from SARS-CoV-2, may be less likely to contact their providers for help with tobacco treatment if they do not know that telemedicine is an option, or may be afraid to reach out because they see going to a provider or a pharmacy as a risk to their health.

It is important to reach out to the patient in such times to inform them of the risks and the resources available, which include telehealth (in the form of tobacco treatment as well as behavioral health), and mail-order prescriptions. No show and follow-up rates, which can be higher with tobacco treatment compared with other appointments, may actually be reduced due to telehealth. The telehealth appointment generally is initiated by the provider as opposed to being dependent on the patient to show up at the clinic.

Last, providers have to adapt to telehealth technology and to scheduling remotely. The ideal type of appointment depends on the patient population. Older patients may have less access to audiovisual resources, and the telephonic appointment may be the only option. As telehealth expands, the abilities and needs of the patient must come first. Clinics are often faced with questions about whether payors cover telehealth. Providers should be aware that the federal government has eased restrictions on telehealth services during the pandemic, making them much more accessible. An extensive guide on the use of telehealth to support



tobacco cessation was created by the American Lung Association.<sup>17</sup> Long term, the widespread implementation of telehealth may allow us to provide tobacco treatment to those in more rural areas who previously would not have had the ability to follow up in person on a monthly basis.

## Review of the Literature

There is no template for telehealth, let alone tobacco treatment, during a pandemic. The literature that does exist is in support of such an intervention. Smoking has innumerable adverse health effects, and evidence points towards increased disease severity and worse outcomes in patients who smoke and experience COVID-19.<sup>1-3</sup> Also, the use of inhaled products or smokeless tobacco requires the user to put their hands near their mouth, which increases the risk of transmission of disease.<sup>18</sup> A better understanding of the interplay between smoking and COVID-19 can help us learn more about the pathophysiologic effect of each of them individually and identify targets for possible therapies and interventions. In our review of the literature, we found that both severe acute respiratory syndrome-related coronaviruses and smoking dysregulate the immune system, cell signaling, coagulation, and the cardiovascular system, which cumulatively can lead to poor outcomes.

### Immune Modulation

Cigarette smoke has been shown to up-regulate inflammation through activation of nuclear factor kappa-light-chain-enhancer of activated B cells, tumor necrosis factor- $\alpha$ , IL-1beta, and neutrophils<sup>19,20</sup> and to down-regulate successful immune function.<sup>21-24</sup> This effect is proportional to an increase in smoking and does not subside immediately after discontinuation of use.<sup>25-27</sup> Patients with SARS-CoV-2 have been shown to have elevated levels of the inflammatory cytokines tumor necrosis factor- $\alpha$ , IL-2R, and IL-6 on presentation, and the virus causes lymphocytopenia.<sup>28,29</sup>

### Cell Signaling and Viral Entry

The mechanisms that coronaviruses use to get into cells affect downstream signaling pathways that may potentiate immune system dysregulation in parallel with smoking. SARS-CoV and SARS-CoV-2 enter cells through cell wall proteins related to the renin-angiotensin system.<sup>30</sup> The SARS-CoV spike (S) protein, once bound to Angiotensin converting enzyme 2 (ACE2), expeditiously down-regulates ACE2 expression<sup>31</sup>; it is presumed that SARS-CoV-2 has the same effect.<sup>30</sup>

Rodent studies have shown a reduction in ACE2 expression with cigarette smoke and nicotine in rats with pulmonary arterial hypertension due to smoking.<sup>32,33</sup> Although down-regulation of ACE2 could decrease SARS-CoV-2 infection,<sup>8</sup> it leads to an increase in vasoconstriction, vascular permeability, inflammation, and acute lung injury downstream. Human studies have shown that cigarette smoke actually up-regulates ACE2 expression in the lungs, which could lead to an increased risk of SARS-CoV-2 infection.<sup>34,35</sup> Either way, the effects of nicotine and smoking on COVID-19 infection are inconclusive at best. Even if there was an protective effect of nicotine, nicotine replacement therapy is substantially safer and less habit-forming than tobacco use; clinical trials would be needed to determine the efficacy and safety of this approach. Overall, there are many deleterious effects that nicotine exhibits on the human body, so for now, the definite risks outweigh the potential benefits.

### Coagulation and Cardiovascular

Smoking, along with high nicotine and cotinine levels, have been shown to put smokers in a prothrombotic state.<sup>36</sup> Risk of VTE has been shown to be higher in smokers than former smokers or nonsmokers and may cause a synergistic effect when combined with COVID-19, which triggers the extrinsic coagulation cascade through cytokine storm.<sup>37-39</sup> Interim guidance from the International Society of Thrombosis and Haemostasis has recommended prophylactic dose low-molecular-weight heparin for all patients who are admitted to the hospital for COVID-19 without contraindications.<sup>38</sup> This guidance may be of even greater importance in smokers.

Myocarditis is another complication that is associated with COVID-19 through an unclear mechanism.<sup>40</sup> Smoking has been correlated with myocarditis in people<sup>41</sup> and has been shown to exacerbate the severity of viral myocarditis in mice through a presumed mechanism of catecholamine and adrenergic agonism.<sup>42</sup>

## Conclusion

Tobacco treatment is important to decrease the risks of a myriad of health conditions. Quitting smoking during a pandemic is an unprecedented challenge for patients and health care providers. We describe the process through which we learned the steps that lead to a successful tobacco treatment campaign in the setting of a pandemic. They include a standing order for medication therapy, appropriately timed campaign advertisement

and efficient telehealth services, and the availability of professionals with the skills to deliver efficacious behavioral treatments. Although discrete data on the interplay between smoking and coronaviruses are lacking, both tobacco and COVID-19 contribute to lung injury, immune dysregulation, hypercoagulation, and cardiomyopathy. Tobacco treatment runs the risk of being de-emphasized when the priority is “essential” medical care. We argue that tobacco treatment is even more important during this time and should be prioritized and adapted to the new health care environment.

## Key Points

- Smoking is the only immediately modifiable risk factor of COVID-19 disease severity.
- Reports of the protective effects of smoking on COVID-19 are unfounded. Rather, both detrimentally affect immune system regulation, cell signaling, coagulation, and heart function.
- This should motivate both providers and patients to prioritize tobacco treatment as an essential medical intervention.
- There are no data or template for tobacco treatment during a pandemic.
- Our model used a standing order for medication therapy, media to spread an appropriately timed message, efficient telemedicine, redistribution of tasks between support staff and providers, and effective multidisciplinary behavioral interventions.
- This model is applicable and scalable to health systems everywhere.

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**Additional information:** The e-Appendixes can be found in the Supplemental Materials section of the online article.

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