Afghanistan is facing a serious shortage of healthcare workers, facilities, and equipment in its treatment response. According to the WHO, Afghanistan is one of the most vulnerable countries in the world, with 9.4 skilled health professionals and 1.9 physicians, per 10,000 population. In Afghanistan, physicians are disproportionately distributed across the country, with 7.2 physicians per 10,000 population in urban areas and only 0.6 physicians per 10,000 population in rural areas.[4]

Approximately 90% of health centers in Afghanistan belong to the private sector, which has not been called upon to diagnose and treat COVID-19. Unfortunately, Afghanistan cannot use this capacity due to the lack of a proper health system, lack of insurance, and high treatment costs. In addition, the lack of protective equipment has also affected many healthcare workers, and some have even been forced to resign or stay home.[3]

Overall, because 71.5% of Afghanistan's population lives in rural areas, where cinemas, subways, apartment living, and even large public transportation are not common, contact between people is naturally less, which slows the transmission of SARS-CoV-2.[5] However, other factors, such as young population, long history of BCG vaccination, resistance to harsh and stressful conditions, and exposure to contaminated environments may make the Afghan people more resilient. If the problems are not solved and the situation does not improve, a high percentage of people may be infected and many may die. In addition, this virus may remain in the country for a long time, making it a potential outbreak source in subsequent epidemic waves.

To improve both the present and future situation of Afghanistan to fight COVID-19, we suggest the following measures:

1) Continuing quarantine status in major cities of Afghanistan
2) Increasing the medical equipment and devices for the prevention, diagnosis, and treatment of this disease
3) Increasing the number of and training healthcare workers
4) Informing people through media such as television, radio, web pages, etc
5) Setting up more centers for the diagnosis and treatment in other states
6) Implementing social distancing and more restrictions on travel
7) Strengthening the detection and isolation of patients
8) Closing mosques, congregational prayers, Jumu'ah prayer (Friday prayer), and religious places
9) Providing cash and noncash aid to vulnerable and low-income individuals.

Although Afghanistan has faced many difficulties in prevention, diagnosis, and treatment, implementing these measures may maximize its defense againts COVID-19 pandemic.

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Filtration evaluation and clinical use of expired elastomeric P-100 filter cartridges during the COVID-19 pandemic

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To the Editor—The limited supply of more conventional disposable personal protective equipment (PPE), namely single-use N95 filtering facepiece respirators (FFRs), among hospital systems in the United States during the COVID-19 pandemic has been alleviated with the adoption of extended use and reuse policies by the Centers for Disease Control and Prevention (CDC).[1] These measures, along with a variety of implemented decontamination methodologies (eg, ultraviolet germicidal irradiation, vaporized hydrogen peroxide, etc), have prolonged PPE supplies during pressing times. Another strategy adopted by the CDC and health systems to protect healthcare providers caring for COVID-19 patients and patients under investigation in limited resource settings includes the use of elastomeric FFRs with reusable cartridges. Although elastomeric respirators have not been approved by the Food and Drug Administration for fluid resistance, they have been

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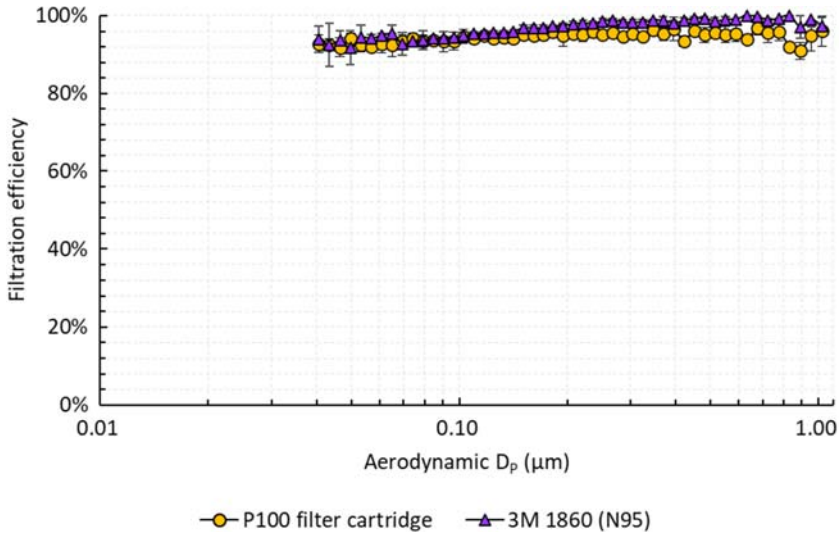

Fig. 1. Filtration efficiency of the P100 filter cartridge and 3M 1860 (N95) for salt (NaCl) particles 0.04–1.0 μm in aerodynamic diameter. Error bars represent standard deviations across 2 cartridges, each tested twice.

endorsed by the CDC as reasonable alternatives for N95 FFRs during the COVID-19 pandemic due to their filtration approval by the National Institutes for Occupational and Safety Health (NIOSH).[2] Subsequently, elastomeric respirators have formed a major arm of the COVID-19 pandemic response strategy in many hospital systems.

Elastomeric FFRs contain plastic components that can be easily decontaminated for repeated use. Those elastomeric respirators containing a full facepiece can afford greater protection to wearers by diminishing face seal leakage and provide eye protection. Although various types of elastomeric FFRs exist, their filtration mechanism is universally housed in exchangeable cartridge filters. The replacement of these filters is determined by their respective expiration dates indicated by the manufacturers as well as the presence of visible soiling, contamination, and/or damage. The strategic national stockpile was not significantly restocked after it had been mobilized for the 2009 influenza pandemic.[3] Thus, cartridges for elastomeric respirators in the strategic national stockpile may have surpassed their expiration dates, which voids NIOSH approval regarding filtration efficiency.

At our institution, we hoped to distribute the P100 elastomeric respirators to providers caring for COVID-19 patients and patients under investigation that we received from the strategic national stockpile. P100 respirators are designed to filter out at least 99.97% of airborne particles. Although data regarding the performance of P100 respirators for viral aerosols are scarce, clear evidence has demonstrated their filtration superiority compared to N95 respirators.[4] During our initial distribution of P100 elastomeric respirators, we observed that our supply of filter cartridges from the strategic national stockpile had surpassed their 5-year shelf life; they had expired in 2014. They were well kept in unopened packages. Based on collected feedback from frontline providers, many expressed concern and alarm regarding the effectiveness of these devices and their filtering efficiency. In an effort to rapidly verify the filtering efficiency of our elastomeric respirator supply and to ensure the safety of our provider staff, we evaluated a sample of our P100 filter cartridges using quantitative methods.

Filtration efficiency was evaluated by challenging the cartridges with aerosols generated from a 2% sodium chloride solution using a Collison 3-jet nebulizer (BGI MRE-3) in a 280-L polyethylene chamber (Sigma AtmosBag). The concentration and size distribution of the aerosols were measured using a scanning mobility particle sizer (TSI SMPS 3936). For testing, the cartridge was sealed inside a cardboard box, and the cartridge and box were further covered with electrical tape, except for the opening of the cartridge, to prevent leakage through the box itself. A vacuum line was connected to the box, and the challenge aerosol was pulled through the cartridge at a flow rate of 15 L per minute. Figure 1 shows the filtration efficiency of the cartridge compared to that of an N95 that was measured using the same experimental setup. The cartridge removed at least 90% of aerosols over the size range of 0.04–1 μm, including the most penetrating size of 0.1–0.3 μm where it demonstrated an efficiency comparable to the N95 respirator.

Our studies demonstrated that the filtration efficiency of P100 filter cartridges past their 5-year expiration date was not significantly different from that of an N95 respirator (3M 1860) ($P > .05$), although it was <99.97%. These studies are preliminary, but they suggest the possibility of safely implementing expired filter cartridges in elastomeric respirators during limited resource scenarios and patient surges, particularly during the significant logistical challenge presented by the COVID-19 pandemic. With considerable disruptions in global supply chains for N95 respirators, hospital systems may consider adopting guidelines that conditionally endorse the use of expired filter cartridges in elastomeric FFRs.

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Facepiece filtering respirators with exhalation valve should not be used in the community to limit SARS-CoV-2 diffusion

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To the Editor—From the first identified cases of COVID-19 onward, the pandemic spread of COVID-19 has presented difficult challenges for the scientific community. Many countries have already experienced periods of social lockdown, with the aim of containing the virus but with dramatic economic consequences. To balance health and economic and social needs in the long term, de-escalation of quarantine restrictions has been proposed in many countries.

During normal speech, a huge number of droplets are produced, and face covering may be effective in limiting the distance reached by the droplets, potentially reducing the transmission of the virus from individuals who are unaware that they are infected.[1]

Face covering with masks or tissue has been widely recommended as a complementary measure to reduce the infection rate in the community by limiting the excretion of droplets from asymptomatic or presymptomatic individuals.[2] In this context, some governments are ordering face covering, especially during activities when social distancing is impossible or difficult (eg, using public transportation and visiting grocery stores or supermarkets, etc).[2,3]

Such measures should be intended as a protection towards the community and not as self-protection. A distorted comprehension of the real aim and a scarce knowledge of the differences among protective devices, has led many people to start using facepiece filtering respirators (FFRs) instead of the suggested nonmedical or medical masks, which are the most appropriate devices for source control, especially in the context of a pandemic.

FFRs are disposable filtering media, designed to provide the wearer an inward protection from inhaling contaminants conveyed by respiratory droplets or aerosols.[4] On one hand, this 'panic buying' of FFRs may have contributed to the lack of supplies available for those employed in risky settings, such as healthcare workers frequently exposed to aerosol generating procedures, and it has also likely encourages counterfeiting.[5] On the other hand, the uncontrolled sale of FFRs to people who are unaware of their specific features and are untrained in their use can create additional risks: incorrect doffing procedures can increase cross contamination; a false perception of safety can reduce the compliance to other measures (ie, hand hygiene, respiratory etiquette, social distancing); and even worse, the use of FFRs with exhalation valves in the community may be an additional and underrecognized transmission source.

The risks related to the presence of an exhalation valve are not intuitive for the general population and should not be silenced by institutions and governments. FFRs endowed with exhalation valves are meant for prolonged use, such as during extended work shifts when the wearer may experience discomfort and heat due to high resistance during exhalation. The valve opens only during the expiration, lowering resistance encountered during expiration. At lower inward pressures than those created by the expiratory airflow, the valve closes and, despite minimal inward leakage, filtering occurs during inspiration, together with a more comfortable expiration.[6]

The functioning of exhalation valves poses major concerns about outward protection, which is reasonably diminished by FFRs. Several institutions have already expressed concerns about their use outside the recommended context. The European Centres for Disease Prevention and Control (ECDC) and Africa Centre for Disease Prevention and Control have provided clear statements against their use in the community setting.[7,8] The US Centers for Disease Prevention and Control (CDC) recommended against their use in healthcare settings where a sterile field must be maintained, thus implying that the outward protection is not provided by FFRs.[9] Recently, the City and County of San Francisco explicitly listed respirators with one-way valves among those forbidden for use in the community, clarifying that they 'allow droplets out of the mask, putting others nearby at risk,' thus not complying with the face-covering order.[10]

Communication campaigns should aim to promote the wearing of masks as a source control measure and to increase awareness that FFR supplies are already insufficient to protect highly exposed

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