Letter to the Editor

Filtration evaluation of expired elastomeric P-100 filter cartridges after months of real-world use during the coronavirus disease 2019 (COVID-19) pandemic

Anthony W. Baffoe-Bonnie MD, Kermit Sheng Zhang BS, Jin Pan MS, Kirsten Simpkins MPH, BSN, RN and Linsey C. Marr PhD

1Virginia Tech Carilion School of Medicine, Roanoke, Virginia, 2Civil and Environmental Engineering, Virginia Tech, Blacksburg, Virginia and 3Carilion Clinic Roanoke Memorial Hospital, Roanoke, Virginia

To the Editor—Complicating the frontline healthcare worker (HCW) response to the COVID-19 pandemic has been the widespread shortage of personal protective equipment (PPE), including disposable single-use N95 filtering facepiece respirators (FFRs). To that end, the Centers for Disease Control and Prevention (CDC) has provided guidance on strategies that healthcare facilities may use to conserve N95s. This guidance includes extended use and reuse of previously single-use N95 FFRs coupled with various modalities of decontamination and augmenting respirator supplies with reusable devices like elastomeric respirators.1,2

In the healthcare setting, there is consensus that elastomeric filter cartridges should be replaced if they become visibly soiled, wet, damaged, or notably harder to breathe through.2 Otherwise, the recommended timing for replacing elastomeric filter cartridges varies from every 30 days to annually.3,4

We previously determined that unopened P100 elastomeric filter cartridges received from the strategic national stockpile (SNS), which were 6 years past their shelf-life, offered similar filtration efficiency to the N95 respirator.5 Our current study evaluates how these filters performed following use in the real-world (ie, healthcare) setting. Information pertaining to this topic is lacking.

Three pairs of P100 filter cartridges that had been in use for 5 and 6 months were obtained from frontline healthcare workers: 1 respiratory therapist (P100 RT 4-2020), 1 progressive care nurse (P100 RN 8MPLM 3-2020), and 1 medical intensive care nurse (P100 RN 8MICU 3-2020). The used cartridges were compared to an unopened and unused filter cartridge (P100- control) from the same SNS batch.

The cleaning protocol for the outer casing of the filters consists of wiping it down with premoistened quaternary ammonium/iso-propyl alcohol wipes between patients. This procedure could be repeated up to 10 times per day. At the end of the shift, the wiped filter pair is disassembled from the mask, which then undergoes further cleaning.6

There was no subjective feeling that the filters were difficult to breathe through by any of the users. No external damage apart from the expected “wear and tear” of the filter cartridge label, likely due to multiple episodes of wiping and cleaning, was noted with the used filters.

Filtration efficiency of the used filters and the control P100 filters from our expired stock was quantified using the methodology described by Patolia et al.7 The pair of filter cartridges from each user was tested with the testing run in duplicate.

The filtration efficiencies of the control, RT 4-2020, and RN 8MPLM 3-2020 cartridges were mostly >95% across different particle sizes. The filtration efficiency of the P-100 RN 8MICU 3-2020 cartridge was ~90%–95% but was not significantly different from that of the control (Fig. 1).

Elastomeric filters that were in good condition but long past their shelf life remained effective at filtering out aerosol-sized particles after being used in the “real-world” healthcare setting. We saw a small but nonsignificant decrease in filter efficiency in 1 of the 2 filter pairs that had been in use for 6 months. Our findings suggest that similar SNS supplies of well-kept but expired nonexpired filters, but we intuitively suspect that the duration of use could be longer.

With the continued coronavirus disease 2019 (COVID-19) pandemic and the possible surge in recently described highly transmissible variants, we anticipate that the use of elastomeric respirators will remain a key component in HCW protection. Our findings may offer other health systems guidance on the duration of use of expired elastomeric filters received from the SNS. Further studies should be conducted in the healthcare setting to determine the optimal duration of the use of nonexpired filters.

Author for correspondence: Anthony Baffoe-Bonnie, E-mail: abaffoe6@vt.edu


© The Author(s), 2021. Published by Cambridge University Press on behalf of The Society for Healthcare Epidemiology of America.
Acknowledgments.

Financial support. No financial support was provided relevant to this article.

Conflicts of interest. All authors report no conflicts of interest relevant to this article.

References


