



Is there Risk of Hypercapnia from Prolonged Use of N95 Filtering Facepiece Respirators?

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Received: May 24, 2021

Published: May 28, 2021

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Due the pandemic outbreak associated with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) the use of PPE is of vital importance allowing the prevention and control that can limit the spread of the disease. According to the FDA, an N95 respirator is a respiratory protective device designed to achieve a very close facial fit and very efficient filtration of airborne particles, where its edges are designed to form a seal around the nose and mouth. Maxillofacial surgeons, as well as others who perform procedures in the head and neck region, are at high risk of being exposed to and infected by COVID-19 [1]. Lately, there has been concerns about the risk of the prolonged use of N95 filtering face piece respirators (FFR) as a part of personal protective equipment (PPE) on the healthcare workers, however, research associated with the potential long-term physiological impacts on the use of N95 FFRs has been limited.

In previous studies it has been reported high concentrations of inhaled carbon dioxide and decreased concentrations of inhaled oxygen in the dead space between the mouth-nose and mask, founding that most average inhaled CO₂ concentrations were lower than 2.0% for level of energy expenditure at 2.01 min⁻¹ or greater [2]. While Roberge, et al. [3] recruited 10 healthy health workers, finding that lowering oxygen saturation with the use of N95 FFRs with or without valves is possible, decreasing the risk when its use is less than 1 hour with low energy jobs.

Rebmann, et al. [4] evaluated the physiological impact of the use of N95 FFRs in 10 healthy health workers, in 12-hour shifts, measuring the respiratory rate, heart rate, transcutaneous CO₂ and O₂ saturation; finding that the only negative physiologic change resulting from long-term respiratory protection use was elevated CO₂ levels (32.4 to 41.0), with CO₂ increasing over time when wearing an N95 alone, and increasing even more significantly when wearing an N95 and mask compared with when they only wore an N95; also reported subjectively perceived exertion, shortness

of air, complaints of headache, lightheadedness and difficulty communicating.

Although no levels that reach the definition of hypercapnia have been found in the reported studies, the psychological impact and presence of various subjective symptoms in the workers studied such as dyspnea, headache, among others has been evidenced [3,4]. Because some of these symptoms are similar to those evidenced in patients with COVID-19, it is important to discern and take into account the possibility of the development of such symptoms due to the prolonged use of FFR, where in the presence of severe symptoms it would be advisable its withdrawal as far as possible until recovery. Likewise, it is necessary to avoid their prolonged use, according to the physical activity developed during the clinical activity or presence of possible respiratory diseases, being its use recommended in healthy health personnel for up to 1 hour or more in the absence of symptoms. Further study is necessary to determine the physiological changes and risks of use for continuous periods of N95 FFRs in healthcare workers.

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Volume 3 Issue 6 June 2021

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