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PII: S0196-6553(22)00598-3  
DOI: <https://doi.org/10.1016/j.ajic.2022.08.001>  
Reference: YMIC 6315

To appear in: *AJIC: American Journal of Infection Control*

Please cite this article as: Ricardo Abreu-Irizarry MD , Norberto J. Torres-Lugo MD ,  
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Christian Foy-Parilla MD , Is the whole-day use of Surgical Masks during the Coronavirus Pan-  
demic increasing the Contamination of Surgeons' Masks?, *AJIC: American Journal of Infection Control*  
(2022), doi: <https://doi.org/10.1016/j.ajic.2022.08.001>



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Brief Report | Brief Report

## **Is the whole-day use of Surgical Masks during the Coronavirus Pandemic increasing the Contamination of Surgeons' Masks?**

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### **Abstract**

Evaluating the impact of surgical masks' conservation practices during the Coronavirus Disease pandemic in the bioburden of the operating room seems imperative, as they play a critical role

against this pandemic. We demonstrate that surgeons' masks tend to be contaminated due to the conservation techniques to maximize protection equipment during the pandemic. Health institutions should highlight the importance of surgical mask exchange to avoid increments in surgical mask contamination.

**Keywords:** Surgical Masks; COVID-19; Pandemic; Reuse; Operating Room; Bioburden.

## Introduction

The coronavirus disease (COVID-19) is a highly contagious illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).<sup>1,2</sup> Among the primary measures to reduce COVID-19 dissemination, multiple health authorities, including the World Health Organization (WHO), recommended using protective equipment such as facemasks in public spaces.<sup>3</sup> This situation significantly strained healthcare systems, resulting in a significant personal protective equipment (PPE) shortage.<sup>4</sup> Consequently, the traditional recommendations promoting strict removal of PPE, specifically surgical masks (SM), before entry into patient care areas outside of the operating room (OR) were replaced with strategies focused on reusing or extending the disposable SM for multiple encounters.<sup>5</sup>

Specific policies about SM extended use during the COVID-19 pandemic had raised concerns due to its possible risks to patients and providers, especially in the OR setting.<sup>5</sup> Up to this date, the studies regarding the effectiveness of PPE conservation exercises remain inconsistent.<sup>6,7</sup> Due to a persistent local executive order that required SM use in public spaces, there has been an increasing tendency to reuse and extend a mask utility among health and non-health related environments for a period that can extend up to a few days. Based on this behavior

observed locally and internationally, we aimed to evaluate the impact of SM extended use among surgeons as a potential source of increased SM contamination.

## Material and Methods

We used a cross-sectional design to evaluate the contamination of the masks worn by surgeons in the OR of our teaching hospital. During ten consecutive workdays during the COVID-19 pandemic, five different surgeons present at the surgery unit were randomly selected for mask sample collection prior to OR entrance. Those surgeons who picked a new mask before entering the surgery unit were excluded from the study. Masks cultures were used for bioburden assessment. The investigators used sterile surgical gloves to expose the mask's middle and central outer surface. The external was pressed with sterile gloves from the inner surface of the mask using three fingers on a *Remel*<sup>TM</sup> Blood Agar for two seconds. The samples were labeled with the date, time, type of mask, and surgeon specialty. Culture growth was evaluated after 48 hours and reported based on colony abundancy, organisms' morphology, and gram stain.

Descriptive statistics portrayed the results as categorical variables using frequency and percentages. The Institutional Review Board approved this study at our institution.

## Results

Forty-four different surgeons' masks were sampled during the ten days of this study. They were distributed as 23 ENT (52.27%), 13 General Surgery (29.55%), 5 Orthopedics (11.36%), and 3 Urology (6.82%). Most of the masks were SM (39; 89%), with the rest consisting of N95 or KN95 Respirators (5; 11%). Colony abundance was reported as Abundant (13; 29.55%), Moderate (9; 20.45%), Few (12; 27.27%), and Scanty (10; 22.73%). All the masks showed some colony manifestation. Gram staining was positive (+) in 43 cultures (97.73%), and one culture showed no staining compartment. Organisms' morphology reports included

Staphylococcus (42; 95.45%), Bacilli (18; 40.91%), Diphtheroid (5; 11.36%), and Streptococcus (4; 9.09%) with 15 masks (34.09%) showing more than one organism's morphology.

## Discussion

This study is the first to evaluate the potential effects of SM conservation practices during the COVID-19 pandemic on surgical mask contamination. Our results suggest that those masks that surgeons are reusing or extending their use are contaminated, representing a potential increment in contaminants in the OR. Prior studies have proposed prolonged wearing time, speaking, and poor facial hygiene among the factors contributing to an increment in SM bioburden.<sup>8,9</sup> As governments need to lift their lockdowns, the strategies to mitigate COVID-19 transmission continue under debate, with data suggesting that SM remain a cost-effective alternative against COVID-19 in the post-lock down phase.<sup>3</sup> However, their strategic success in viral transmission mitigation is not without consequences. Due to the PPE shortage, Fraser et al. revealed that at his institution, the OR policy limits to one the standard SM for the duration of operative cases within a single day.<sup>5</sup> Given this recommendation, an increment in SM contamination can cause a potential source of bacterial shedding.<sup>8,9</sup> Despite a recovery in SM availability, SM conservation remains a common practice among surgeons and surgical staff. Although SM use remains an essential strategy against the COVID 19 pandemic, SM reuse or extended use should be limited to extreme scenarios such as PPE shortage. Health institutions should reevaluate their COVID-19 policies in the light of the current data to highlight the importance of frequent SM exchange to limit the contribution of SM contaminants to the OR bioburden.

This study has some limitations. First, a control group sampling new surgical masks was not included since all samples were taken from masks used for more than one day or masks

reused after use in areas outside the OR. Most surgeons were ambiguous about the exact time frame they used the same masks; therefore, we could not quantify the specific time range of reuse or extended use. Second, SM cultures were performed only on one type of culture medium; thus, we may overlook some organisms that require a more specific growth medium. Based on these results, future studies could consider the potential effects of the increment in the OR bioburden due to the SM extended use on surgery complications.

### **Conclusion**

This study demonstrates that surgeons' masks tend to be contaminated, which has been linked to conservation techniques to maximize protective equipment during the COVID-19 pandemic. Our findings could be a fundamental ground for further investigation to address the concerns regarding SM extended use practices.

### **Conflict of Interest**

The authors declare no conflicts of interest for their work on this manuscript.

### **Acknowledgments**

The UPR supported this study Endowed Health Services Research Center through grants 5S21MD000242 and 5S21MD000138, from the National Center for Minority Health and Health Disparities, National Institutes of Health (NCMHD-NIH). Its contents are the authors' sole responsibility and do not necessarily represent the official views of NCMHD-NIH.

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