

# Controversies on the Stethoscope During COVID-19: A Necessary Tool or an Unnecessary Evil?

## INTRODUCTION

“Stethoscope” though a listening device actually means “look into thorax”. It has been over 200 years since Laennec first described his work on auscultation and the stethoscope gradually gained popularity in the practice of medicine.<sup>1</sup> Nowadays it would be rare to see a physician or a physician in training without a stethoscope during patient care. The stethoscope is also commonly used by other healthcare professionals, including nurses and respiratory therapists. Stethoscopes have become so commonplace with clinicians that their presence seems to have an impact on the patient’s perception of trust.<sup>2</sup>

Auscultation with the stethoscope requires minimal cooperation on the part of the patient, it is cost effective and can be repeated as often as necessary.<sup>3</sup> The most common uses of the stethoscope include auscultation of cardiac sounds, lung sounds and bowel sounds. Despite such common use, diagnostic accuracy of the stethoscope is limited.<sup>4,5</sup> Over the past few years, there have been many studies raising red flags about stethoscopes as possible vectors of infections. The question often raised is “In 21st century, does the benefit of the stethoscope still outweigh the risk?” The current pandemic of COVID-19 makes this question even more relevant.

## WHAT IS THE RISK OF STETHOSCOPE CONTAMINATION DURING PATIENT EXAMINATION?

Contamination of the stethoscope is significant even after a single physical exam of the patient.<sup>6</sup> The most common area at risk of contamination is the diaphragm of the stethoscope. In a study examining hospital physician’s stethoscopes, a large percentage were found to have bacterial contamination.<sup>7</sup> The most common organisms isolated were from skin flora.<sup>8</sup> In one study examining 40 random stethoscopes for bacteria, the mean ( $\pm$ SE) number of total colony-forming units was  $158 \pm 33$  per diaphragm and  $289 \pm 54$  per rim.<sup>9</sup> In another review paper describing six studies, all had mean levels of stethoscope contamination in excess of French normalization standard for cleanliness (which equates to  $<20$  colony-forming units per membrane). Potentially pathogenic organisms including *staphylococcus aureus*, *pseudomonas aeruginosa*, *enterococci* and *clostridium difficile* have been recovered from contaminated stethoscopes as well.<sup>10</sup>

Though multiple studies are available on bacterial contamination of the stethoscope, the studies on viral

contamination are limited, likely due to the complex and expensive methods of virus detection. In a study where respiratory secretions of respiratory syncytial virus (RSV) were inoculated on the stethoscope, it confirmed the ability of a virus to survive on the stethoscope surface and advised on routine cleaning of the stethoscope.<sup>11</sup> The severe fever with thrombocytopenia syndrome (SFTS) virus, causing an emerging fatal viral hemorrhagic fever in East Asia, has also been recovered from stethoscopes which came in contact with patients diagnosed with SFTS.<sup>12</sup> Based on available studies, it seems that viruses are as likely to contaminate stethoscopes as bacteria.

## HOW GOOD ARE CLINICIANS AT CLEANING THEIR STETHOSCOPES?

Many studies have indicated that physician practices are variable in cleaning of the stethoscope and overall minimal.<sup>13,14</sup> In one study when medical students were asked about their stethoscope cleaning practices, 22.4% students reported never cleaning their stethoscopes and only 3.9% reported cleaning their stethoscopes after every patient encounter.<sup>15</sup> Another study showed similar findings and suggested implementing a stethoscope cleaning practice curriculum for medical students.<sup>16</sup> It is clear that clinicians are not very good at cleaning their stethoscopes.

## WHAT IS THE RISK OF INFECTION TRANSMISSION FROM A CONTAMINATED STETHOSCOPE?

Despite multiple studies showing the risk of stethoscope contamination with microorganisms, its role on cross transmission of infection has not been shown conclusively.<sup>10</sup> However, it has been shown that microorganisms on stethoscope surfaces can be transferred to other surfaces they touch.<sup>6</sup> Some have advised that stethoscopes be considered a source for potential preventable nosocomial colonization and infection.<sup>17</sup> Though never studied rigorously, like any contaminated surface, the stethoscope likely carries microorganisms and transmits infections.

## WHAT ARE THE EFFECTIVE WAYS OF CLEANING THE STETHOSCOPE?

There are many disinfectants mentioned in the literature for cleaning the stethoscope. A systematic review performed by Napolitani et al. categorized studies into two methods. Chemical methods including disinfection

with 90% ethanol, chlorhexidine, liquid, gel or foam formulations of alcohol-based disinfectants and alcohol-soaked wipes. Physical methods included the use of UVC-LED devices and stethoscopes with antibacterial copper surfaces. Both methods were able to provide effective bacterial decontamination.<sup>18</sup> Hydrogen peroxide wipes are also widely available in the hospital and described as being effective in cleaning the stethoscope.<sup>19</sup> In another study involving stethoscopes used in the intensive care unit (ICU), standardized 60-second cleaning with a hydrogen peroxide wipe decreased contamination of half the stethoscopes to the level of a brand-new clean stethoscope, while the rest still had considerable reductions in the total amount of bacteria.<sup>20</sup> One of the major stethoscope manufacturer's website advice cleaning the stethoscope with alcohol wipes, 70% isopropyl alcohol or 2% bleach solution (risk of tubing discoloration). They advise against use of hand sanitizer for the stethoscope cleaning or dipping of the stethoscope in any solution.<sup>21</sup> In today's healthcare environment, alcohol-based wipes or hydrogen peroxide wipes are likely the most practical tools to clean the stethoscope.

## WHY IS IT IMPORTANT TO DISCUSS THE STETHOSCOPE DURING COVID-19?

The current pandemic of coronavirus disease 2019 (COVID-19) is caused by SARS-CoV-2 virus. At the time of this writing it has already infected over 7 million patients across 188 countries.<sup>22</sup> It has been shown that SARS-CoV-2 can survive on steel and plastic surfaces for 72 hours or more.<sup>23</sup> There have been arguments about the stethoscope as a minimally useful tool and potentially a disease spreading vector during the pandemic.

Most clinicians would remember times when auscultation of the lungs changed clinical management. But it is hard to argue in favor of routine lung auscultation in hospitalized patients, as usually it does not change patient management. The risks associated with stethoscope contamination need serious consideration, especially during the current pandemic.

At this point, it is difficult to answer if the stethoscope is a necessary tool or an unnecessary evil during the COVID-19 pandemic, but removing it altogether from the care of patients with COVID-19 does not seem practical. Following are some basic guiding principles that we use at our institute:

1. Restrict auscultation to limited providers.
2. Allow and encourage providers (including bedside nurses and respiratory therapists) to avoid auscultation if they feel likelihood of changing management is small and advise to rely on other clinical signs/symptoms.
3. Advise against use of personal stethoscopes.
4. Use disposable isolation stethoscope.
5. Cleaning of isolation stethoscope after patient auscultation with predefined stethoscope cleaning protocols (hydrogen peroxide wipes or alcohol wipes for 60 s).
6. Use bedside ultrasound periodically for pulmonary evaluation where expertise and technology are available and follow institutional cleaning protocols.

Point of care ultrasound (POCUS) can be a very useful technology that provides more answers than the stethoscope, but it is not immune to contamination with infectious agents. In a 2016 article titled "Is lung ultrasound the stethoscope of the new millennium? Definitely yes", Copetti highlighted several advantages of lung ultrasound compared with the stethoscope.<sup>24</sup> Despite advantages of bedside ultrasound over the stethoscope, availability of equipment and trained clinicians are barriers to widespread use of bedside ultrasound.<sup>25</sup>

Based on current literature, there is a valid argument that routine auscultation with personal stethoscopes have risks that may be heightened during the current pandemic. We have addressed these concerns with the six recommendations above and invite others to consider implementing them at their institutions as they look at routine use of personal stethoscopes during the COVID-19 pandemic.

## AUTHOR CONTRIBUTIONS

LP conceived the idea of this article and contributed to writing the manuscript substantially. DG contributed to the final draft of manuscript and its revision substantially. DB contributed to design and revision of the manuscript.

The authors have no conflicts of interest.

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## REFERENCES

1. Laënnec and the stethoscope. *JAMA*. 2019;322(5):472. <https://doi.org/10.1001/jama.2018.15451>.
2. Jiwa M, Millett S, Meng X, Hewitt VM. Impact of the presence of medical equipment in images on viewers' perceptions of the trustworthiness of an individual on-screen. *J Med Internet Res*. 2012;14(4):e100. <https://doi.org/10.2196/jmir.1986>. Published 2012 Jul 10.
3. Bohadana A, Izbicki G, Kraman SS. Fundamentals of lung auscultation. *N Engl J Med*. 2014;370(8):744-751. <https://doi.org/10.1056/NEJMra1302901>.
4. Lichtenstein D, Goldstein I, Mourgeon E, Cluzel P, Grenier P, Roubey JJ. Comparative diagnostic performances of auscultation, chest

- radiography, and lung ultrasonography in acute respiratory distress syndrome. *Anesthesiology*. 2004;100(1):9–15. <https://doi.org/10.1097/0000542-200401000-00006>.
5. **Pancaldi F, Sebastiani M, Cassone G, et al.** Analysis of pulmonary sounds for the diagnosis of interstitial lung diseases secondary to rheumatoid arthritis. *Comput Biol Med*. 2018;96:91–97. <https://doi.org/10.1016/j.compbiomed.2018.03.006>.
  6. **Longtin Y, Schneider A, Tschopp C, et al.** Contamination of stethoscopes and physicians' hands after a physical examination. *Mayo Clin Proc*. 2014;89(3):291–299. <https://doi.org/10.1016/j.mayocp.2013.11.016>.
  7. **Bernard L, Kereveur A, Durand D, et al.** Bacterial contamination of hospital physicians' stethoscopes. *Infect Control Hosp Epidemiol*. 1999;20(9):626–628. <https://doi.org/10.1086/501686>.
  8. **Núñez S, Moreno A, Green K, Villar J.** The stethoscope in the Emergency Department: a vector of infection? *Epidemiol Infect*. 2000;124(2):233–237. <https://doi.org/10.1017/s0950268800003563>.
  9. **Marinella MA, Pierson C, Chenoweth C.** The stethoscope. A potential source of nosocomial infection? *Arch Intern Med*. 1997;157(7):786–790. <https://doi.org/10.1001/archinte.157.7.786>.
  10. **O'Flaherty N, Fenelon L.** The stethoscope and healthcare-associated infection: a snake in the grass or innocent bystander? *J Hosp Infect*. 2015;91(1):1–7. <https://doi.org/10.1016/j.jhin.2015.04.010>.
  11. **Blydt-Hansen T, Subbarao K, Quennec P, McDonald J.** Recovery of respiratory syncytial virus from stethoscopes by conventional viral culture and polymerase chain reaction. *Pediatr Infect Dis J*. 1999;18(2):164–165. <https://doi.org/10.1097/00006454-199902000-00017>.
  12. **Ryu BH, Kim JY, Kim T.** Extensive severe fever with thrombocytopenia syndrome virus contamination in surrounding environment in patient rooms. *Clin Microbiol Infect*. 2018;24:911.e1–911.e4.
  13. **Vasudevan RS, Mojaver S, Chang KW, Maisel AS, Frank Peacock W, Chowdhury P.** Observation of stethoscope sanitation practices in an emergency department setting. *Am J Infect Control*. 2019;47(3):234–237. <https://doi.org/10.1016/j.ajic.2018.08.028>.
  14. **Boulée D, Kalra S, Haddock A, Johnson TD, Peacock WF.** Contemporary stethoscope cleaning practices: what we haven't learned in 150 years. *Am J Infect Control*. 2019;47(3):238–242. <https://doi.org/10.1016/j.ajic.2018.08.005>.
  15. **Saunders C, Hryhorskyj L, Skinner J.** Factors influencing stethoscope cleanliness among clinical medical students. *J Hosp Infect*. 2013;84(3):242–244. <https://doi.org/10.1016/j.jhin.2013.04.003>.
  16. **Gazibara T, Radovanovic S, Maric G, Rancic B, Kisic-Tepavcevic D, Pekmezovic T.** Stethoscope hygiene: practice and attitude of medical students. *Med Princ Pract*. 2015;24(6):509–514. <https://doi.org/10.1159/000434753>.
  17. **Maki DG.** Stethoscopes and health care-associated infection. *Mayo Clin Proc*. 2014;89(3):277–280. <https://doi.org/10.1016/j.mayocp.2014.01.014>.
  18. **Napolitani M, Bezzini D, Moirano F, Bedogni C, Messina G.** Methods of disinfecting stethoscopes: systematic review. *Int J Environ Res Public Health*. 2020;17(6):1856. <https://doi.org/10.3390/ijerph17061856>. Published 2020 Mar 13.
  19. **Holleck JL, Campbell S, Alrawili H, et al.** Stethoscope hygiene: using cultures and real-time feedback with bioluminescence-based adenosine triphosphate technology to change behavior. *Am J Infect Control*. 2020;48(4):380–385. <https://doi.org/10.1016/j.ajic.2019.10.005>.
  20. **Knecht VR, McGinniss JE, Shankar HM, et al.** Molecular analysis of bacterial contamination on stethoscopes in an intensive care unit [published online ahead of print, 2018 Dec 18]. *Infect Control Hosp Epidemiol*. 2018;1–7. <https://doi.org/10.1017/ice.2018.319>.
  21. Littmann Stethoscopes. Stethoscope cleaning and care. Littmann Stethoscopes. Available at: [https://www.littmann.in/3M/en\\_IN/littmann-stethoscopes-in/my-stethoscope/using-your-stethoscope/care/](https://www.littmann.in/3M/en_IN/littmann-stethoscopes-in/my-stethoscope/using-your-stethoscope/care/). Accessed June 9, 2020.
  22. Johns Hopkins University. COVID-19 map. Johns Hopkins Coronavirus Resource Center. Available at: <https://coronavirus.jhu.edu/map.html>. Accessed June 9, 2020.
  23. **van Doremalen N, Bushmaker T, Morris DH, et al.** Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N Engl J Med*. 2020;382(16):1564–1567. <https://doi.org/10.1056/NEJMc2004973>.
  24. **Copetti R.** Is lung ultrasound the stethoscope of the new millennium? Definitely yes!. *Acta Med Acad*. 2016;45(1):80–81. <https://doi.org/10.5644/ama2006-124.162>.
  25. **Mengarelli M, Nepusz A, Kondrashova T.** A comparison of point-of-care ultrasonography use in rural versus urban emergency departments throughout Missouri. *Mo Med*. 2018;115(1):56–60.