The COVID-19 pandemic has called into question the triple-faceted role of the stethoscope: a diagnostic tool, symbol of patient–provider connection, and possible vector for infectious disease (Figure 1). A recent article in the American Journal of Medicine discusses developments in each arm of this triple role with reference to COVID-19, arguing that developments in stethoscope diagnostic technology, a need to bolster clinical skills, and developments in stethoscope hygiene methods will perpetuate both its relevance and safety. This argument is bolstered by the need for innovative stethoscope hygiene, and innovation rather than cast the stethoscope aside.

The COVID-19 pandemic has fostered an era of increased infection control vigilance, and thus the benefits of the stethoscope must be rationally weighed against the risks. In the vignette posed here, the cardiology resident recovered, re-tested negative for COVID-19, and has now returned to her normal duties.

Studies have demonstrated that stethoscopes can harbour similar levels and types of microbes to those on one’s hand. Thus, it is no surprise that the stethoscope has been christened as the physician’s ‘third hand’, with reference both to its potential for pathogen transmission and its integral role in patient–provider connection. Despite this, no clear guidelines exist for performing stethoscope hygiene. The Centers for Disease Control (CDC) classifies the stethoscope as a ‘non-critical’ medical device (i.e. only in contact with intact skin, not with bodily fluids), and recommends cleaning between as often as after contact with each patient to once weekly using an alcohol or bleach-based disinfectant.3 It has been demonstrated that viruses, including COVID-19,4 are capable of surviving on skin and other surfaces for an extended period of time.5 Thus, current guidelines may not adequately reflect the risk that stethoscope contamination poses.

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The COVID-19 pandemic has fostered an era of increased infection control vigilance, and thus the benefits of the stethoscope must be rationally weighed against the risks. In the vignette posed here, the cardiology resident recovered, re-tested negative for COVID-19, and has now returned to her normal duties.
resident felt the need to use her stethoscope to assess the COVID-19 patients on her round. Her likely rationale was the utility it provides in assessing the variety of cardiopulmonary abnormalities that can manifest during a COVID-19 infection. One of the most common manifestations of COVID-19 infection is multifocal pneumonia, often occurring prior to acute respiratory distress and need for mechanical ventilation. While pneumonia is diagnosed most definitively using imaging modalities (CT and X-ray) and laboratory testing, resource-limited scenarios might necessitate the usage of a stethoscope to listen for pulmonary indications (coarse breath sounds). Furthermore, there is growing evidence that cardiovascular disease is highly comorbid with COVID-19 infection, leading to worse outcomes. The most common cardiovascular comorbidities among hospitalized COVID-19 patients are hypertension, coronary artery disease, and diabetes mellitus. In addition, recent reports have implicated COVID-19 in causing myocardial injury and left ventricular systolic dysfunction. Considering the sequelae of COVID-19 cardiopulmonary manifestations, auscultation using a stethoscope can be highly warranted. Therefore, emphasis must be placed on ensuring that the stethoscope can be used safely.

Assessments of stethoscope hygiene practices have widely demonstrated deficits in adherence and method. Direct observational studies have demonstrated stethoscope hygiene rates using recommended methods (wiping with alcohol, bleach, hydrogen peroxide, etc.) between 11.3% and 24%, with unconventional practices also being reported such as placing a glove over the stethoscope prior to auscultation or washing it with water/hand towel in a sink. Such findings imply that while stethoscope hygiene practices are deficient, providers who are cognizant of stethoscope contamination are struggling to find an effective form of hygiene that does not impede workflow—a proverbial ‘cry for help.’ With regard to current methods of stethoscope hygiene, providers cite lack of access to cleaning supplies, forgetfulness, or a lack of time as reasons for not performing stethoscope hygiene.

Healthcare guidelines advise against using personal stethoscopes in contact precaution settings in order to limit the potential for cross-contamination; rather, single-patient disposable stethoscopes are often used for such patients. However, the audio quality of single-patient stethoscopes is quite poor, and it has been demonstrated that these...
stethoscopes can be contaminated with pathogens that can potentially be transmitted to providers, who must share this stethoscope.\textsuperscript{14} Proper cleaning of these stethoscopes between usage may not occur in high-workflow environments, such as the intensive care unit (ICU). Thus, a more feasible and effective modality of stethoscope hygiene is warranted.

A ray of hope for stethoscope hygiene is technological innovation. Among the solutions presented in recent years have been a UV-LED case for the stethoscope diaphragm,\textsuperscript{1} stethoscopes made from antimicrobial copper alloys,\textsuperscript{16} and disposable stethoscope diaphragm covers.\textsuperscript{17} The challenge imposed by the first two innovations is a lack of complete microbial disinfection. Given that it is unknown what viral dose threshold corresponds to COVID-19 pathogenesis, current infection control standards might necessitate a method that ensures zero transmission. Stethoscope diaphragm covers alone can provide an aseptic contact surface during auscultation,\textsuperscript{17} but one is likely to encounter the same impediments stated for conventional stethoscope cleaning.\textsuperscript{12} A company based in San Diego, USA (AseptiScope Inc., San Diego, CA, USA) has attempted to overcome this issue by developing a touch-free diaphragm barrier dispenser.\textsuperscript{1} A recent article discussed the role of stethoscope contamination during COVID-19, stating that a specific barrier for the stethoscope is needed to prevent stethoscope contamination and subsequent transmission to patients and providers.\textsuperscript{18} A touch-free stethoscope diaphragm dispenser might be a feasible solution for this need.

In the era of COVID-19, the stethoscope carries both profound utility as well as risk to patients if effective hygiene practices are not implemented. Thus, providers need to exercise caution when auscultating patients with COVID-19 given the risk for cross-contamination. However, rather than casting aside the stethoscope due to this risk, safety should be bolstered through education, hygiene practice, and consideration of innovative solutions.

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References are available as supplementary material at European Heart Journal online.

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\textbf{In Memoriam}

\textbf{Dr Norman M. Kaplan (1931–2020): a giant in the field of hypertension has departed}

The Guru, the Almanac, the Encyclopaedia, and the Legend of hypertension—Norman Kaplan passed away on 5 April 2020 in Dallas, TX, USA. He spent his entire professional career at the University of Texas Southwestern Medical School in Dallas—except for 1 year at the National Institutes of Health.

Norman’s parents had a small grocery store in Dallas; and the son of a grocer went on to become a peerless global commander in the field of hypertension. A graduate of the University of Texas Southwestern Medical School in 1954, he trained at the same institution in Internal Medicine and Endocrinology. After a year of collaborative work at NIH with the renowned Dr Fred Bartter (of Bartter’s syndrome), Norman joined the faculty of his alma mater—in 1961—where he remained until 2015. Upon stepping down, he told a medical reporter ’Sixty-one years is enough’!\textsuperscript{1}

Norman’s scientific contributions to the field of hypertension are extraordinary. Although he lived for 90 calendar years, his impact on the field of hypertension will be felt for a long time. The majority of his contributions to hypertension are well known and recorded. Therefore, I would like to draw attention and comment on some of his ‘characteristic’ but less widely publicized papers. Amazingly, he identified some of the precursors of aldosterone synthesis (\textit{Journal of Clinical Investigation} 1962; 41:715–724) and actually measured the aldosterone content of adrenal adenoma (\textit{Journal of Clinical Investigation} 1967; 46:728–734). It is because of his insight that random sampling of urine for metanephrine to screen for pheochromocytoma became an acceptable substitute for the laborious 24-h urine collections (\textit{Archives of Internal Medicine} 1977; 137:190–193).