Is the Stethoscope on the Verge of Becoming Obsolete?

In 1816 René Laënnec, of Paris, France, invented the first modern stethoscope and ushered in an era of lung and heart auscultation that has been the cornerstone of chest diagnostics for nearly 200 years. This monaural device improved the physician's ability to hear clues to the underlying pathology and thus apply the appropriate treatment in many cases.

You would think that the motivation for developing the first stethoscope would have come from Laënnec's desire to improve the art of medicine. However, it appears as though the motivation came from an attempt to avoid personal embarrassment.[1] Laënnec, a very shy man, dreaded the direct auscultation method that called for placing his ear on the patient's chest. This procedure was uncomfortable for Laënnec, especially when the patient was a woman. To solve this dilemma, he tried to distance himself from the patient and thought a hollowed-out plank of wood might do the trick.[2] To his amazement the device provided improved acoustics and allowed him to hear the lung and heart sounds better than with the direct technique. The device soon gained rapid popularity across France and the rest of Europe.

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Over the next several decades numerous other inventors tried to improve on Laënnec's original design by developing the stethoscope out of other materials and with more customized ear and chest pieces. Soon the stethoscope became the symbol of status among European physicians. Those who had a stethoscope made of exotic material such as ivory claimed the top rung in the medical social ladder.

The stethoscope soon caught on in the United States and inventors here also sought to improve the device. In fact, the next major development in the stethoscope came from a physician in Cincinnati, Ohio, NB Marsh. Marsh theorized that using both ears would improve the auscultation procedure by eliminating outside noise. He was right and the binaural stethoscope was born in 1851. George P Cammann is often credited with developing the binaural stethoscope because he was the one who made it commercially available in the years to follow.[3]

Over the subsequent 150 years the binaural stethoscope was refined. Steel tubes were replaced with rubber to improve flexibility, and the chest pieces now have a bell and a diaphragm to allow better appreciation of heart versus lung sounds. Over the past 30 years researchers began seeking answers to important questions about the clinical implications of the sounds heard with the stethoscope. That research has revealed that specific lung sounds are associated with specific lung pathologies. Late-inspiratory crackles suggest restrictive disease such as pulmonary fibrosis, whereas early-inspiratory crackles indicate severe chronic obstructive pulmonary disease.[4] Polyphonic wheezing is a sign of airways obstruction, and the characteristics of the wheezing predict the degree of obstruction. More severe obstruction is associated with high-pitched wheezes that occupy a large part of the expiratory time.[5,6] Treatment that relieves the obstruction will cause the wheezing to be shorter and lower pitched. We also now know that when clear breath sounds are heard over the entire chest, the chances of pneumonia are remote.[7,8]

The primary benefit of chest auscultation, however, may not be found in the science of lung sounds. It may simply be that auscultation is an opportunity for the clinician and patient to establish a rapport that goes beyond what can be established by conversation. Auscultation is a time when the examiner invades the patient's intimate space and touches him/her in a caring but professional manner.[9] I think it is likely that most patients appreciate this time of bonding and relationship-building, in which trust and confidence are established.[10] Patients often forget components of the interview but usually remember an examiner's proper use of touch and careful examination. Perhaps this is why chest auscultation remains popular today, even though the procedure is very inefficient. At least 10 minutes are needed to perform a thorough examination with the stethoscope, listening to the important regions of the anterior, lateral, and posterior chest. Most clinicians rarely are in a position to spend that amount of time in the assessment phase of patient care. Because of this inefficiency many clinicians perform only a superficial examination and simply wait for the chest radiograph to identify underlying pathology.

Murphy and his associates have developed a new approach to chest auscultation that merges it with the "information superhighway" and that may make the stethoscope a thing of the past.[11] They created a way to simultaneously auscultate 14 different chest wall locations, using a foam pad that has 14 imbedded microphones. The patient simply lies on the pad and takes deep breaths while the microphones simultaneously record the sounds from all 14

locations, and a computer stores the data for analysis and retrieval. In a matter of seconds many chest wall sites are auscultated and the results recorded and analyzed.

In this issue of RESPIRATORY CARE, Murphy et al report the use of this computerized auscultation system to evaluate the lung sounds of 100 pneumonia patients.[11] They found that 91% of the patients had adventitious lung sounds, with 89% having crackles and 63% having a high- or low-pitched wheeze. The system collected the lung sounds from each patient in about 2 minutes at 14 chest wall sites. Conventional auscultation, which requires moving the stethoscope from site to site, would require 28 min to collect the same amount of data. Unless the clinician were to take notes immediately after listening to each site, he or she would probably not be able to remember all the acoustical details heard during that long procedure, so documentation would probably be incomplete.

It is easy to see how this new approach to auscultation could prove very efficient and useful as a diagnostic tool. It also can teach us the typical lung sound profiles of specific diseases, such as chronic obstructive pulmonary disease and pulmonary fibrosis. Time will tell whether the system catches on, but I doubt it will replace the stethoscope any time soon. In the meantime, Murphy et al have stimulated more discussion about the art of chest auscultation and its value in modern health care. At the very least they have developed a more efficient way of gathering and analyzing lung sounds. It would be interesting to hear what Laënnec would say about this computerized auscultation system if he were alive today. Certainly, he would be pleased with the fact that he could distance himself even further from the patient with this system. However, that may not be entirely a good thing.

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Flexible stethoscope.from *The American Armamentarium Chirurgicum*
New York: George Tiemann & Co; 1879
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