

Tele-auscultation of respiratory sounds with a low-cost digital stethoscope

Sir,

Digital stethoscopes can record breath sounds for further analysis.^[1] However, it is too costly to procure in resource-poor settings. Previous studies showed how to make a low-cost digital stethoscope with a wired earphone.^[2,3] Currently, one Bluetooth-based wireless phonocardiograph has been reported.^[4] However, we failed to record breath sounds with that device.

In some areas, cultural barrier causes hindrance for medical examination by doctors, especially male doctors on female patients.^[5] In those cases, chest auscultation becomes difficult.

To overcome this difficulty, we made a Bluetooth-based wireless digital stethoscope which can be held on the chest by the patients. Doctors can record the breath sounds from a distance and examine the sounds by playing it on the audio player.

We used a Bluetooth headset, an empty aluminum deodorant container, and a stethoscope diaphragm to make the device. In addition, we used a hack saw blade, a pair of scissors, a pencil compass, some polyvinyl carbonate (PVC) tape, and packaging cardboard for developing the device.

Following are the steps of development [Figure 1]:

1. The deodorant container was cut with the help of a hack saw blade and scissors to separate the lower part

2. Rough edges were cut with scissors and secured with PVC tape to prevent any injury
3. A central hole was made with the help of a compass and rough edges were nibbled
4. The casing of the Bluetooth headset was opened, and the microphone was made face outside
5. A round opening was made with the help of the compass
6. The casing was replaced so that the microphone is facing outward through the opening
7. The cylinder was measured for a room to place the headset
8. Measured depth was cut
9. The microphone was put on the central opening of the dome and was fixed on the position by PVC tape
10. The stethoscope diaphragm was cut circumferentially to make it fit on the edges of the groove and was fixed by PVC tape
11. A piece of cardboard was cut and fixed on the opposite site
12. The final device.

This device, a cell phone, and an audio recording application Parrot (Parrot Inc., USA) were used to record normal breath sounds. After taking written consent, an adult female (age 24 years) was recruited conveniently. She placed the device at different parts of the chest herself sitting behind a screen where we were able to record the sounds from a distance of 5 m.



Figure 1: Development of a Bluetooth-based wireless digital stethoscope

The developed low-cost device can be made in any resource-limited setting where high fidelity instruments cannot be procured. This device helps to capture, listen, store, and share breath sounds. It can also be used in teaching medical students or in telemedicine. However, its sensitivity and specificity in the diagnosis of chest diseases are a topic of future research.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published, and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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