Wireless Stethoscope for Patient Monitoring by Anesthesiologists

BME 301 Executive Summary

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Background

During any highly invasive surgery, patients are given induced anesthesia. Many complications arise from sedating the patient and can result in serious effects to the patient if it is not monitored correctly. According to the National Institute of Health, 7.3% of all anesthesia fatalities are due to general complications during the procedure (Guohoa et al., 2005). These deaths can possibly be prevented if the patient's symptoms can be caught early. As technology has advanced, some anesthesiologists have started to move away from using the classic stethoscope and choose to monitor the patient in other, more convenient ways, such as pulse oximetry and capnography. However, the stethoscope is the most effective at detecting any irregularities with the patients' heart and breathing airway (Watson et al., 2001). Current models require that the anesthesiologist be nearby the patient and don't allow for multiple signals without constantly moving the stethoscope head around. Further complications can arise while the patient is in recovery and begins to come off the anesthesia medicine. Patients are still at risk during this time of obstructing their airway and possibly suffocating.

Requirements

There is a need in the market for a device that focuses specifically on detecting abnormalities over long periods of time, i.e. during a surgical procedure. A product needs to be developed that is cost efficient and able to transmit two or more clear signals to an examiner in order to diagnose breathing or heart irregularities. Fig. 1 shows the prototype of a wireless stethoscope we have created in order for anesthesiologists to monitor their patients both during and after surgery. The prototype serves as a viable option for anesthesiologists to use in the operating room in order to reduce the chances of patient complications.

Some of the most novel features of our design include:

1. Eliminating the tubing that directly links the stethoscope to the earpiece allows the anesthesiologist to work from a more comfortable location and prevents him from being obtrusive to the surgeon or his assistants.
2. The system works by using a commercial chest piece with a small tube containing a microphone connected to a transmitter. A small gauge wire runs from the chest piece to the transmitter, which is the size of a deck of cards. This allows the anesthesiologist to place the transmitter in the most inconspicuous position possible for the current surgery.
3. A transceiver receives the audio signal from the transmitter and allows the anesthesiologist to listen using either a wireless headset or a speaker system.
4. The transceiver can support multiple transmitters by assigning each transmitter a different frequency band, which means that the anesthesiologist can place chest pieces at any location and then easily switch between which sounds he is listening to using the controls located within the transceiver.
5. The transceiver is able to pick up sounds from 50 Hz to 10,000 Hz, which detects breathing and heart frequencies.
6. It operates on a 7 volt battery that can easily last through multiple surgeries.

Fig. 1 Microphones are in a small tube near the chest piece. The transmitter is nearby. A short distance away is the receiver, which can yield the sound by either speaker or wireless headset.