Health problem addressed

Ultrasonic fetal heart detectors are low-cost devices used in a variety of healthcare settings to provide audible and visual information about the fetus. The unit provides quick reassurance of fetal well-being to both the mother and the healthcare worker. Fetal heart detectors can easily detect fetal heart sounds throughout the pregnancy, starting as early as 8 weeks. The ability of most units to accurately calculate the fetal heart rate has also made these devices valuable diagnostic tools.

Product description

Fetal heart detectors are devices that use ultrasonic waves to provide audible and/or visual information. They consist of an ultrasound-frequency electrical generator and appropriate ultrasound transducers housed in a probe that is placed on the maternal abdomen. Ultrasonic heartbeat detectors amplify the audible frequency shift signal of the returned ultrasonic waves and deliver it to speakers or headphones; the heart rate is determined either by measuring the timing of the peaks in the Doppler signal or, more accurately, by using automated autocorrelation procedures. These devices can detect fetal heart activity as soon as 10 weeks after conception. Advanced units can even detect bidirectional blood flow, allowing the clinician to evaluate maternal vessels, such as the uterine artery.

Principles of operation

Fetal heart detectors transmit high-frequency sound waves either continuously or in pulses. In continuous-wave (CW) units, a crystal vibrates as an electrical current passes through it, creating and transmitting acoustic energy, while a second crystal detects echoes from structures in the body. In pulsed-Doppler systems, a single crystal alternately transmits periodic bursts of ultrasonic waves and senses the echoed energy. In both systems, the reflected wave is reconverted to an electrical signal that can be used to create an audible sound or a waveform. Ultrasonic heartbeat detectors amplify the audible frequency shift signal of the returned ultrasonic waves and deliver it to speakers or headphones; the heart rate is determined either by measuring the timing of the peaks in the Doppler signal or by using automated autocorrelation procedures.

Operating steps

An acoustic coupling gel is spread over the skin to facilitate the efficient transmission of ultrasound waves into and out of the body. The probe is placed against the mother’s abdomen. If the scanned structures are in motion, the frequency of the returning sound waves changes in proportion to the velocity and direction of the moving structures. Fetal heart detectors amplify this audible frequency change, known as Doppler shift, and channel it to speakers or headphones.

Reported problems

Although researchers have yet to establish whether a significant risk exists, there is some concern about whether exposure to ultrasonic energy during diagnostic procedures is safe. Many factors can affect the ability of the unit to detect the fetal heartbeat (i.e., body fat and blood flow can absorb acoustic energy). Since pathogens may be present on the patient’s skin, transmission of these organisms to the transducer head commonly occurs.

Use and maintenance

User(s): Physicians, obstetric nurses, community midwives

Maintenance: Biomedical or clinical engineer/technician, medical staff, manufacturer/servicer

Training: Initial training by manufacturer, operator’s manuals, user’s guide

Environment of use

Settings of use: Obstetrics (hospital, OB/GYN practices), emergency medicine

Requirements: Battery, uninterruptible power source (recharge batteries), appropriate transducer with gel

Product specifications

Approx. dimensions (mm): 100 x 150 x 200
Approx. weight (kg): 1
Consumables: Batteries, gel
Price range (USD): 350 - 800
Typical product life time (years): 8
Shelf life (consumables): NA

Types and variations

Portable, handheld, tabletop units