Health problem addressed
The interpretation of the fetal heart rate and activity requires expensive equipment operated by a trained midwife. Thus for women in resource-poor locations the options for regular screening of fetal well-being are limited.

Product description
The solution consists of a software application that can be run on a mobile phone. This software transforms inexpensive fetal monitoring devices that merely let the user ‘hear’ the fetal heart beat into a system that calculates fetal heart rate, stores it over time, tracks fetal movement, and provides this data to a remote midwife in the same form as standard hospital equipment.

Product functionality
The software on the phone analyses the sound of the fetal heart to calculate the heart rate using a beat-to-beat accuracy algorithm. Data is sent to a server, and can then examined by a midwife using a web browser.

Developer’s claims of product benefits
Fetal cardiotocography can currently only be undertaken in a centre with the appropriate equipment and staff. Devices used ‘in the field’ are limited to producing either just the sound of the fetal heart beating, or displaying an instantaneous heart rate on an LCD screen. Accurate assessment of fetal well-being requires more than this in terms of examining heart rate over time to determine a baseline, variability, and response to fetal movement. This product offers improvements in that it records heart rate over time, correlates it with fetal movements, and can communicate this data for remote diagnosis or confirmation. Being a software solution, the system uses existing mobile phone hardware, and existing portable fetal monitors, vastly reducing the cost.

Operating steps
Instructions are provided on the mobile phone screen. Once the program is started, these instructions consist of: 1. Connect the portable monitor to the phone. 2. Position the probe and listen for the fetal heart, then press ‘start’. 3. Press the ‘movement’ button when the baby kicks. 4. Press ‘Stop’ to finish and upload. Once upload is complete, an automated email is sent from the server to the midwife with a link to the plot of fetal heart rate and activity.

Development stage
The system has been trialled at Mercy Hospital Mount Lawley, Western Australia in a pilot trial with 15-20 mothers. All could use the system with minimal training and the diagnosis from the system matched the one from simultaneous monitoring by the hospital monitor.

Future work and challenges
The current challenge is to conduct a larger scale trial in the field. Funds are needed to buy equipment for trials and to tailor the application for a specific country. The main challenge in terms of low and middle income countries is the distribution of the device. In high income countries mothers would perform self-scans at home with their own equipment. For lower income countries, a more suitable model is to provide the device to local health workers who can use one device on many patients.

Use and maintenance
User: patient, nurse, midwife, physician
Training: Usage instructions provided via the phone screen. Instructions take the mother step-by-step through the process.
Maintenance: Patient, nurse, physician, manufacturer

Environment of use
Setting: Rural and urban, at home and in primary health care facilities.
Requirements: Access to a network (either cell phone, wifi, or fixed line Internet), ideally at point of use, or within easy reach. (i.e.: Visiting health worker can perform scans in people’s homes, saving the data to the phone, then upload from a health post with network access.)

Product specifications
Consumables: None
Other features: Runs on batteries, uses software and is a telemedicine system.
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