A new approach for Intrapartum Fetal heart Rate Tracing
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Objective
To determine the efficacy of a novel Electronic Uterine Monitoring (EUM100pro system) device for monitoring fetal heart rate (FHR) tracing during labor.

Methods
Observational, prospective, three-way within subject study conducted in a single tertiary center between April-October, 2014. Intrapartum FHR tracing was recorded simultaneously using 3 different methods: 1) Internal fetal scalp electrode (gold-standard), 2) External Doppler and 3) EUM100pro system. The EUM100pro device acquired 9 signals from the patient’s skin with multi-electrode patches. Using signal processing techniques, maternal and fetal ECG and uterine signal, were separated. FHR tracings obtained from all devices during the first and second stages of labor were analyzed. Validity and accuracy of EUM100pro and external Doppler were assessed in comparison to the internal scalp electrode monitor. For pathological tracings of fetal baseline (tachycardia and bradycardia) level of agreement, sensitivity and specificity were also evaluated.

Results
Overall, 712, 800 FHR tracings were obtained from 33 parturients during the latent phase, active phase and second stage of labor. There were significant differences in the positive predictive agreement; the mean positive percent of agreement for EUM was 98. 5% (95%CI: 98. 5%-99. 6%) compared with 96% (95%CI:95%-98. 2%) for Doppler, demonstrating non-inferior results of the EUM as compared to Doppler in terms of percent of interpretable FHR. The mean root mean square error from Bland Altman was 1. 47 bpm for EUM100pro compared with 4. 42 bpm for Doppler indicating that EUM is more similar to gold standard fetal scalp electrode measurement compared to Doppler. The mean delta from scalp was 0. 009 (95%CI: 0. 007-0. 015) for EUM100pro compared with 0. 232 (95%CI: 0. 227-0. 256) for Doppler indicating that EUM100pro was more similar to gold standard fetal Scalp electrode measurement compared to Doppler. Even with regard to tracings of fetal tachycardia and bradycardia, the accuracy, sensitivity and specificity of EUM100pro relative to internal scalp electrode monitor, were significantly greater than those of external Doppler.

Conclusion
Intrapartum FHR with the novel EUM100pro is both valid and accurate. In comparison to external Doppler, its results were more similar to those obtained by internal scalp electrode monitoring. As such, it may provide a better framework for non-invasive evaluation of intrapartum FHR.