

### **Ultrasonographic simulation system for training of screening examination of the fetal heart**

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**Objectives** To evaluate virtual reality performance of an ultrasonographic scanning simulation system for training of screening examination of the fetal heart. **Methods** We developed an ultrasonographic simulation system that comprised of a mockup probe module, a pregnant abdominal manikin and computer software for projection of dynamic 2D fetal heart image from 4D STIC volume. The mockup probe was equipped with orientation sensors set up with the manikin and was connected to a laptop for spatial calculation. The laptop monitor was used as system monitor. The system had additional real-time 3D-orientation-guided graphics displaying the corresponded fetal orientations and scanning planes for trainees' practice and had ability to save dynamic images of 4CH, LVOT, RVOT and 3V for subsequent evaluation by trainers. The system was evaluated by experienced sonologists using pre-installed normal STIC volumes acquiring in apical and transverse cardiac orientations. Volume standardization towards virtual cephalic and breech fetal orientation was carried out in every volume prior to system evaluation. After practicing with the simulator for 20 minutes, each sonologist rated the system in a scale of 1-10 evaluation form. **Results** Ten sonologists participated in system evaluation. All of them were able to display the 4CH, LVOT, RVOT and 3V during practicing in all cardiac (apical/transverse) and fetal orientation (cephalic/breech). The rated scales (median, range) for virtual reality of the dynamic 2D images, probe-images correlation and overall virtual reality performance of the system were 9 (8,10), 10 (9,10) and 9 (8,10), respectively. The orientation-guided graphics had a rated scale for the respective dynamic display of 8 (8,10) and for detailing 3D perception while practicing of 8 (7,10). Rated scale for the potential of using the system for training of fetal heart screening was 10 (9,10). **Conclusions** The ultrasonographic simulation system offers a respectable virtual reality performance and has potential in the training for ultrasonographic fetal heart screening.

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เสนอโดยนายสุรศักดิ์ จันทร์แสงอร่าม นายแพทย์เชี่ยวชาญ โรงพยาบาลราชวิถี

ในการประชุม 24<sup>th</sup> World Congress on Ultrasound in Obstetrics and Gynecology

ซึ่งจัดขึ้นระหว่างวันที่ 14 - 17 กันยายน 2557 ณ ประเทศสเปน