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## **Manipulating anaesthetists' workload in high-end simulators to evaluate new patient monitoring displays**

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**Background:** New patient monitoring displays are regularly introduced into the healthcare domain. Unfortunately some displays lead to adverse patient outcomes because of design faults. We examine the use of workload manipulations in high-end simulators to evaluate new displays.

**Method:** Sixteen anaesthetists took part in the evaluations of new auditory displays and head mounted displays (HMD). Anaesthetists participated in four 22-minute scenarios in a full-scale anaesthesia simulator. Participants experienced four display conditions in a counterbalanced order:

- Visual—Standard visual monitor and variable-tone pulse oximetry
- HMD—Visual plus HMD [1]
- Audio—Visual plus advanced auditory displays (respiratory sonification [2] and blood pressure earcons [3])
- Both—Visual plus HMD plus Audio.

Participants supervised a junior anaesthesia colleague while carrying out a distractor task that oriented them away from the visual monitor. Participants were asked to indicate any event that could harm the simulated patient.

**Results:** Compared with detections in the Visual condition (52% detection), anaesthetists detected significantly more events in the Audio (90%) and Both (92%) conditions but not in the HMD condition (75%). The Visual condition was also the least preferred monitoring condition.

**Conclusion:** The auditory displays improved the distracted anaesthetists' awareness of a simulated patient's status whereas the HMD did not strongly improve performance. The workload involved in supervision of a junior anaesthesia colleague and use of a distractor task let differences in display conditions be detected with only 16 participants. We still need to assess how representative the workload manipulations are of clinical workload.

## **References**

1. The HMD was the monocular transparent Microvision Nomad™.
2. Watson, M. & Sanderson, P. (2004). Sonification helps eyes-free respiratory monitoring and task timesharing. *Human Factors*, **46**(3), 497-517.
3. Watson, M., Gill, T., & Low, W.J. (2006). Making sound meaningful in the operating theatre: Blood pressure earcons. (Abstract). *Proceedings of the Annual Scientific Meeting of the Australian and New Zealand College of Anaesthetists (ANZCA ASM 2006)*, 13-17 May, Adelaide, SA.