In press, *Anesthesia and Analgesia*

Monitoring with head-mounted displays: Clinical evaluation for simple anesthesia

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Abstract

Background. Patient monitors in the operating room are often positioned where it is difficult for the anesthesiologist to see them when performing procedures. Head-mounted displays (HMDs) can help anesthesiologists by superimposing a display of the patient's vital signs over the anesthesiologist's field of view. Simulator studies indicate that by using an HMD, anesthesiologists can spend more time looking at the patient and less at the monitors. A clinical evaluation tested whether this finding would apply in practice.

Methods. Six attending anesthesiologists provided anesthesia to patients undergoing rigid cystoscopy. Each anesthesiologist performed six cases alternating between standard monitoring using a Philips IntelliVue™ MP70, and standard monitoring plus a Microvision Nomad™ ND2000 head-mounted display. The HMD interfaced wirelessly with the MP70 monitor and displayed waveform and numerical vital signs data. Video was recorded during all cases and analyzed to determine the percentage of time, frequency, and duration of looks at the anesthesia workstation and at the patient and surgical field during various anesthetic phases. Differences between the display conditions were tested for significance using repeated-measures ANOVAs.

Results. Video data were collected from 36 cases that ranged from 17 to 75 minutes in duration (median 31 minutes). Compared with when they were using standard monitoring, when using the HMD participants spent less time looking towards the anesthesia workstation (25.3% vs. 21.0%, p=0.003) and more time looking towards the patient and surgical field (51.5% vs. 55.9%, p=0.014). The HMD had no effect on either the frequency of looks or the average duration of looks towards the patient and surgical field or towards the anesthesia workstation.

Conclusions. A head-mounted display of patient vital signs reduces anesthesiologists' surveillance of the anesthesia workstation and lets them spend more time monitoring their patient

Implications Statement

Clinical evaluation of a head-mounted display (HMD) of vital signs showed that anesthesiologists spend less time looking at the anesthesia workstation and more time looking towards the patient and surgical field while wearing an HMD.