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MONITORING WITH HEAD-MOUNTED DISPLAYS (HMDS) IN ANESTHESIA: SIMULATOR AND CLINICAL EVALUATIONS

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INTRODUCTION: Head-mounted displays (HMDs) can superimpose patient vital signs over the field of view, letting the anesthesiologist see vital patient signs whatever the direction of gaze or the location in the operating room. Prior evaluations in simulators reveal benefits of HMDs, such as faster detection of critical events, less physical movement needed to monitor, and subjectively easier monitoring compared with standard monitoring (see [1]). However, HMD users may miss salient but important events in the world [2] due to eye mis-accommodation and inappropriate HMD focus. We investigated these issues in two simulator settings and one clinical setting.

METHODS: Full-scale simulator. Twelve anesthesiologists provided anesthesia to simulated patients [3]. We investigated whether anesthesiologists wearing an HMD may: 1) detect vital signs changes faster than with standard monitoring alone, 2) be more likely to miss "peripheral" events in the operating room but not on the monitor, and 3) be affected by HMD focus. Part-task trainer. We investigated HMD use where the anesthesiologist is more physically constrained [4]. Twelve anesthesiologists navigated a maze on an endoscopic dexterity trainer while monitoring vital signs on a monitor located directly behind them, with and without the HMD. Clinical study. We are trialing the HMD with six anesthesiologists on procedural cystoscopy cases. Video analysis will indicate whether the HMD changes anesthesiologists' behavior and performance.

RESULTS: Full-scale simulator. Participants wearing the HMD spent more time looking towards the patient and less time towards the anesthesia machine than with standard monitoring alone. Neither using the HMD, nor the HMD's focus setting, affected event detection times. Part-task trainer. Participants wearing the HMD turned to look at the monitor less often. Two of four events presented were detected faster with the HMD, while one event was detected more slowly. Participants reported that they could monitor the patient and perform the maze task more easily with the HMD, but they disliked the HMD equipment's bulk, and wanted more waveform displays. Clinical study. Results are pending, but feedback from initial cases is encouraging.

DISCUSSION: HMDs free the anesthesiologist's visual attention so there is proportionally more time spent focusing on the patient and surgical field. Although the benefits of HMDs under normal conditions are unclear, HMDs can be helpful under specific circumstances and seem unaffected by inattentional blindness. Although HMD focus settings seem not to affect HMD use, the way information is presented on the HMD sometimes affects event detection speed. Anesthesiologists rated HMDs favorably, but future HMDs must be small, light-weight and non-intrusive.

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Category: Technology Development and Evaluation

COI Statement: The authors indicate they have nothing to disclose.

RESEARCH ABSTRACT 50

FACTORS AFFECTING PARTICIPANT INACTION DURING HIGH-FIDELITY SIMULATION OF ACLS MEGACODES

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INTRODUCTION: Errors in ACLS performance occur as wrong actions or inaction due to a lack of knowledge of correct sequence and timing of actions, which can lead to adverse consequences.[1,2] The best methodology to reduce inaction during treatment of cardiac arrest remains unknown. Accordingly, we performed a trial to test whether ACLS reference cards can reduce inaction in real-time simulations of MegaCodes.

METHODS: Thirty-one medical students participated. The study consisted of four sessions. The first was didactic, covering ACLS protocols, and the second was an ACLS performance training session. Students were then randomized into three groups (see Figure 1). Those participants using the ACLS reference cards were oriented to the use of each card. The final two sessions involved testing scenarios in which students were presented with a single MegaCode scenario per ACLS/AHA guidelines and required to treat various patient states. The testing scenarios were videotaped and graded according to checklists in the ACLS/AHA training manuals. The groups were then crossed over for the second testing session (see Figure 1). Data was analyzed by unpaired t-test and are presented as Mean+/−SEM.

RESULTS: All groups demonstrated a significant decrease in inaction from testing session 1 to 2 ($p = 0.02$). Group 3 demonstrated a significant decrease in inaction from testing session 1 to 2 ($p = 0.004$).

DISCUSSION: This is the first study to evaluate the use of ACLS reference cards in decreasing inaction during ACLS performance. The data show that multiple exposures to simulation improves performance. Use of either reference card during both scenarios significantly improved performance. Thus, the use of a reference card during repeated exposures of ACLS performance may improve adherence to ACLS protocols. Further study is being undertaken to determine if there is an effect of the reference cards on retention of skills after three months.

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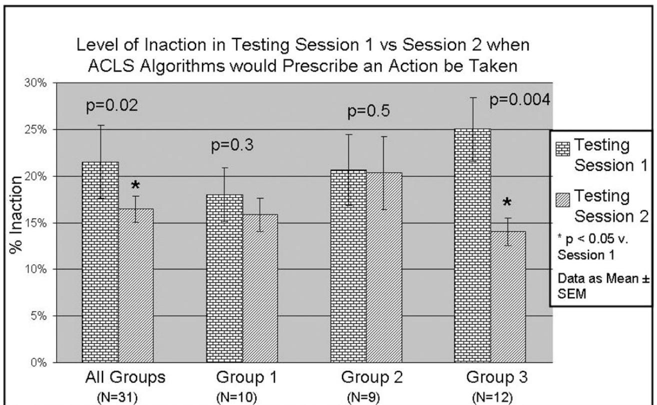
Category: Education

COI Statement: The authors indicate they have nothing to disclose.



Group/Session	Session 1	Session 2
Group 1	No Card	MUSC
Group 2	AHA	No Card
Group 3	MUSC	AHA

Figure 1: Overall, all groups showed a decrease in inaction from session 1 to session 2. Those with both MUSC & AHA cards showed a significant decrease in inactions by the end of the study.