Title: Anesthesia Machine Check Simulation

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Conflicts of Interest: None
Financial Disclosures: None
ABSTRACT

Objective: The anesthesia machine check is a recognized safety check to assure proper functioning of the anesthesia machine prior to initiating patient care. The American Society of Anesthesiology (ASA) has a 15-point checklist for a proper machine check, with 5 tasks deemed vital for patient safety. This study evaluated competency of anesthesia residents performing a machine check by assessing resident performance before and after a teaching session and checklist use.

Participants: 27 anesthesiology residents in their 2nd, 3rd, or 4th clinical training year (9/year).

Methods: Following IRB approval, all anesthesiology residents received machine check training at the start of their first CA1 year. Further mentoring by CA2 and CA3 residents occurred until CA1 residents independently and competently performed a machine check. Residents were videotaped in the simulation center’s OR suite performing the 15-task machine check at 3 intervals: pre-teaching session with an anesthesia machine expert on the ASA checklist (no training), post-teaching session without the checklist (training), and post-teaching session with the checklist (training with checklist). Two independent monitors evaluated the videos and scored each task as correct, incorrect, or not performed, yielding 15 scores for each resident.

Analysis: To compare the 3 intervals and vital task performance, data were analyzed in a random effects generalized linear mixed model with p<0.05 significance. Five checklist tasks deemed vital for patient safety were independently evaluated compared to non-vital tasks. To compare performance of differing levels of resident training, data were analyzed utilizing SAS procedure GLIMMIX with a random intercept for each resident.

Results: Ability to correctly perform a task improved after receiving training compared to no training (OR=3.96, 95% CI: 2.69-5.85, p<0.0001). Training with checklist conferred additional benefit toward correct task performance compared to training without checklist (OR=3.24, CI: 1.72-6.09, p=0.0004). Assessments were repeated to evaluate whether resident performance varied across vital and non-vital tasks. When averaged across the 3 intervals, residents did significantly worse on vital tasks than non-vital tasks (OR=1.46, CI: 1.03-2.07, p=0.03). The estimated probability of performing a vital task correctly was 0.96 (CI: 0.93-0.98) for training with checklist, 0.87 (CI: 0.82-0.91) for training only, and 0.63 (CI: 0.55-0.70) without training. The estimated probability of performing a non-vital task correctly was 0.97 (CI: 0.95-0.98) for training with checklist, 0.91 (CI: 0.87-0.94) for training only, and 0.72 (CI: 0.66-0.77) without training. Resident performance was also evaluated by specific vital task performed. The probability of performing a specific vital task correctly was 0.93 (CI: 0.83-0.97) for training with checklist, 0.71 (CI: 0.57-0.82) for training only, and 0.23 (CI: 0.14-0.36) without training. Years of resident experience was not associated with improved outcomes and did not affect performance on vital tasks.
**Conclusion:** Educators assume that teaching methods produce trainees that can competently carry out vital tasks. This assumption is not necessarily true. Anesthesiology residents of all training levels performed significantly better on the machine check after an experiential teaching session, and further improved with a checklist. This reinforces the usefulness of teaching sessions and proper utilization of checklists.

**References:**