

How much training is enough? Low-dose high-frequency simulation training and maintenance of competence in newborn ventilation

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Introduction

- Face mask ventilation is the most important and challenging element of newborn resuscitation
- Simulation training offers the potential to attain and maintain ventilation competence
- We recently demonstrated the fidelity of a new manikin in simulating similar ventilation parameters and conditions encountered in real newborn ventilation¹
- Less experienced healthcare personnel training with the manikin achieved the same competence as those with more experience²



Objectives

- To identify the optimal simulation-training load (frequency and dose) to maintain ventilation competence for healthcare personnel with differing resuscitation experience

Methods

- Prospective observational study in a teaching hospital in Norway
- Healthcare personnel from six different professions from obstetric, anaesthesia and paediatric services were randomised to simulation training with the high-fidelity manikin² twice monthly or as desired over nine months
- All training was logged, providing data on every simulation (case) performed in each session, and competence scores for each case to a maximum score of 30
- Competence scores incorporated seven skill elements such as maintenance of airway patency and using appropriate ventilation pressure
- We analysed competence scores and individual skill elements with linear mixed models, using number of months in which training occurred, number of training sessions (frequency), and number of cases (dose) as predictor variables

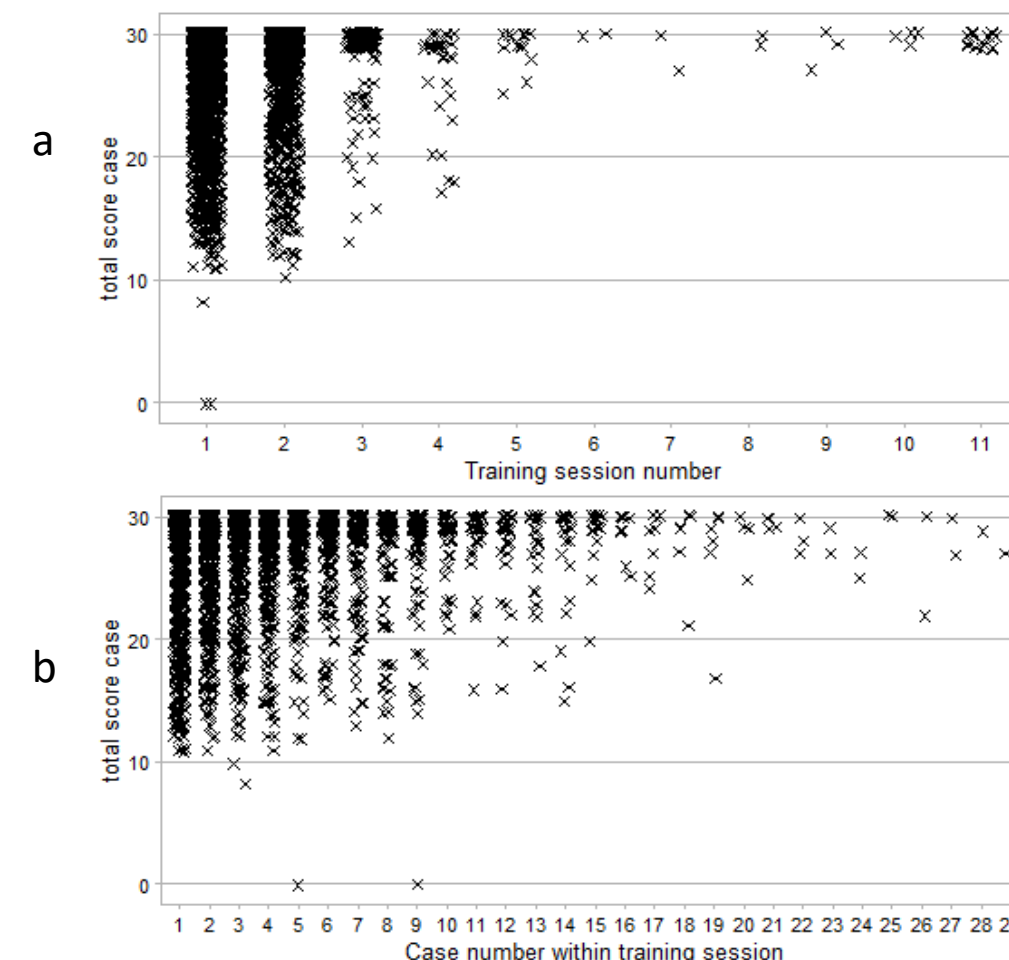


Conclusions

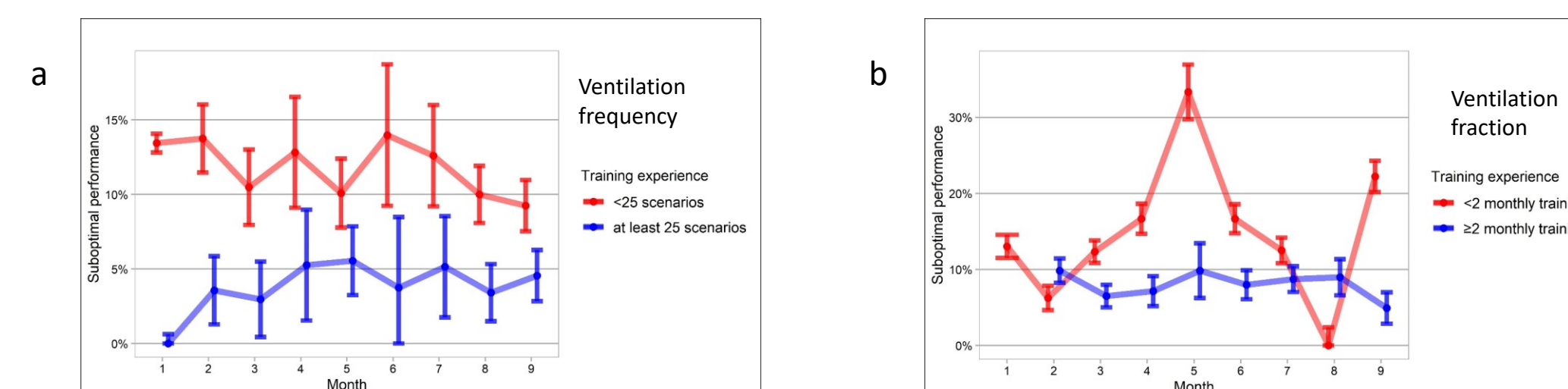
- For healthcare personnel with differing real-life resuscitation experience, simulation training frequency is important to maintain ventilation competence
- Performing a mean of 0.6 or more trainings per month predicts high overall competence scores
- Training dose (time spent) is predictive of optimal performance of a number of individual skill elements
- This may offer individualized training schedules for healthcare personnel struggling with particular skills.

Results

- 187 participants performed 4348 cases
- Scatter plots of competence scores according to number of sessions performed per month and number of cases performed per session indicate higher scores within a shorter range with greater training load
- The linear model using number of sessions showed the best prediction of competence scores, $p < 0.001$
- Performing ≥ 5 sessions in 9 months predicts competence scores > 28 of maximum 30 points, i.e. average ≥ 0.6 sessions/month
- Dose (cases/scenarios performed) best predicts performance of most skill elements, with ≥ 25 cases required to ensure correct ventilation frequency and ≥ 35 cases to provide ventilation within the target pressure range
- Training frequency is more important for maintenance of airway patency and ventilation fraction (VF); performing training in at least 3 (airway) and 2 (VF) of the 9 months ensured competence



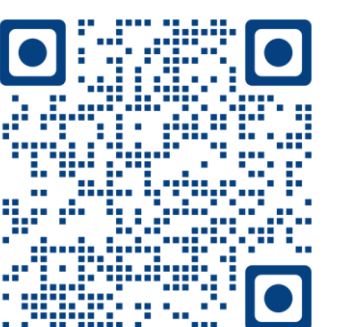
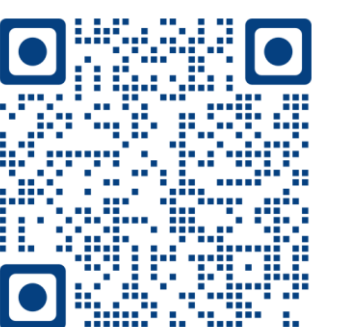
Scatter plots of competence scores according to a) number of sessions per month and b) number of cases per session



Error bar plots of mean \pm standard error percentage of suboptimal performance in all trainings for a) ventilation frequency and b) ventilation fraction. Blue bars represent cases performed by those achieving training load at/over that predicting competence; the red line those performing less than this training load

References

1. Haynes et al. Children 2021. doi.org/10.3390/children8100940
2. Haynes et al. Children 2021. doi.org/10.3390/children8121115



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