Transforming the Healthcare Simulation Spectrum:
Now, Next and Beyond

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Preliminary Experience Using Eye-tracking Technology To Evaluate Effectiveness in Procedural Skills Transfer in Medical Simulation Training

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Introduction and Aim

Introduction

Eye-tracking technology emerges as a potentially useful learner assessment tool in different medical specialties by providing observable and objective parameters to reveal participant performance.

Core Medical Skills Course for Basic Physician Trainees (CMSC-BPT) was developed to enhance bedside procedural skills via different skill stations and scenario-based simulation training. This training course provides structured training to all basic physician trainees and to maintain quality in patient care. Airway management is introduced to BPT, who has limited experience.

Aim

To determine if eye-tracking technology can provide novel quantitative metrics to evaluate the effectiveness of skills transfer in procedural skills, specifically of the focused assessment using video laryngoscope in the intubation procedure.

Methods

A convenience sample of basic physician trainees and trainers in the CMSC-BPT training was invited voluntarily to participate. Each participant has to wear eye-tracking devices to perform intubation procedures before and after the training. A commercially available eye-tracking device showed their gaze patterns.

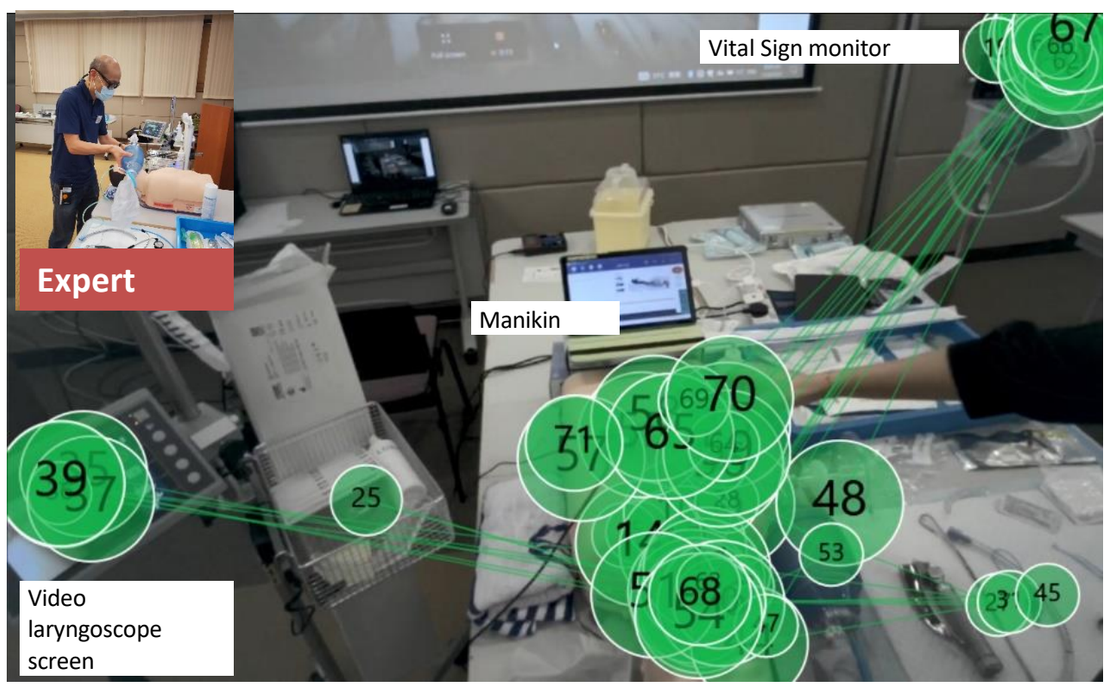

Fig 1:
The number, sequence of fixation and distribution during the intubation by an expert trainer.
A "triangular approach" is observed, which focuses on "Vital sign monitor", "Manikin (patient)" and "Video laryngoscope screen".

The primary outcome was total gaze time on the area of interest (AOI) in three critical areas defined in intubation (Manikin/ patient, vital sign monitor, and screen of video laryngoscope) of the novices. The secondary outcomes include total time to fixation, the mean number of fixations, and the gaze pattern of the novices. Basic physician trainees were named under the group "novice", and trainers were named "experts".

Results

Three classes of CMSC-BPT were held from 7 to 14 August 2021 in Nethersole Clinical Simulation Training Centre (NCSTC). Total 131 doctors completed the training. Fifteen novices and 2 experts joined the study.

Primary outcome		
	Before training	After training
Total gaze time	107338.3ms	54409.38ms
Secondary outcome		
	Before training	After training
Total time to fixation	10760.68ms	7071.44ms
Mean no. of fixation	24.8	14.67

For total gaze time on the AOI, the total time to fixation and mean no. of fixation were significantly reduced or shortened after training. These indicated the novices spent less time in visual searching. The gaze patterns of post-training novices were similar to those of the experts, which illustrates the successful skills transfer and visual patterns from the expert to the novices after attending the training course.

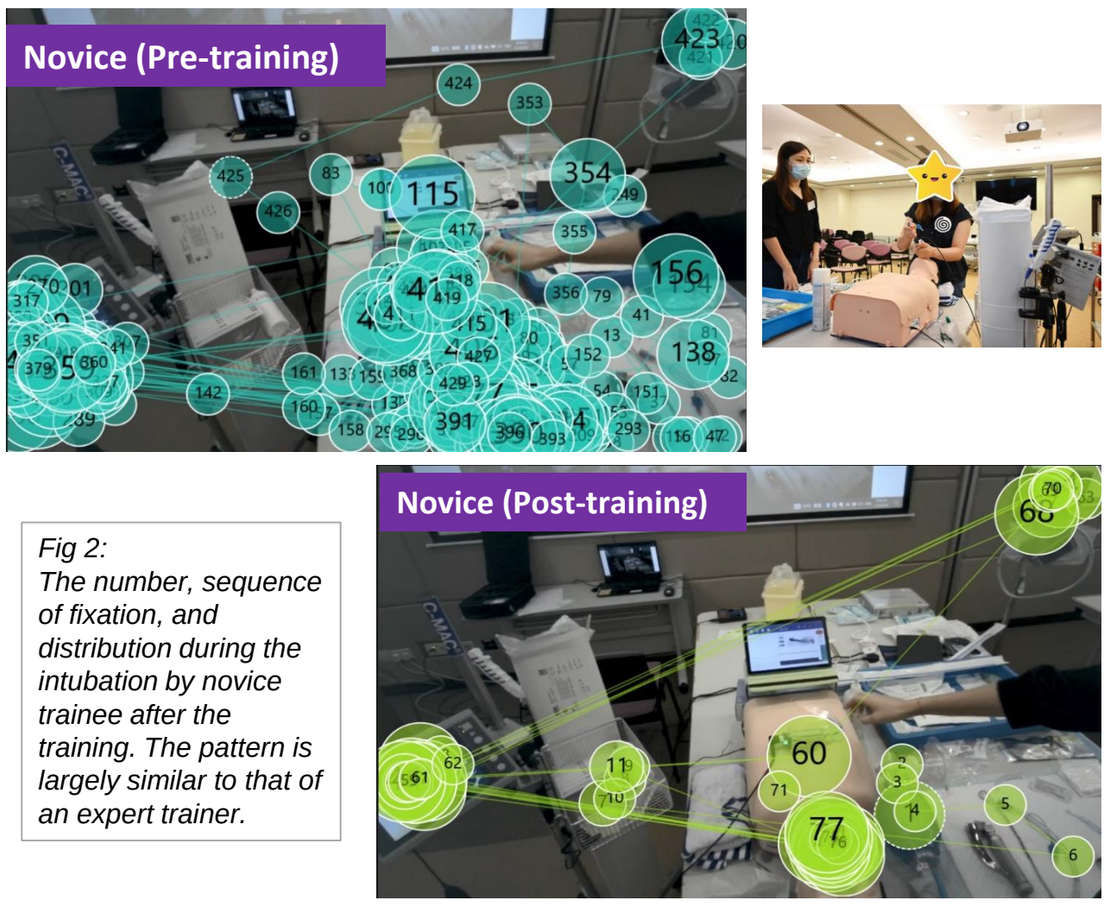

Fig 2:
The number, sequence of fixation, and distribution during the intubation by novice trainee after the training. The pattern is largely similar to that of an expert trainer.

The above finding support that eye-tracking technology has the potential to evaluate the effectiveness of procedural skills transfer. Besides, the total gaze time on the AOI may be a useful metric to help in the assessment of competency in procedural skills. In addition, the evaluation of gaze patterns may help educators identify the performance gap and caliber training strategies. Future studies are indicated to validate these metrics in a larger cohort.

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