

# Objective Measurement of Clinicians' Cognitive Load During Fidelity Trauma Simulations

Park S<sup>1,2</sup>, Al-Ballaa A<sup>1</sup>, Goldberg S<sup>2</sup>, Tayeb B<sup>6</sup>, Basurrah M<sup>1</sup>, Abahuje E<sup>7</sup>, Pozner CN<sup>1,2</sup>, Yule S<sup>3,4,5</sup>, Dias RD<sup>1,2</sup>

<sup>1</sup>Neil and Elise Wallace STRATUS Center for Medical Simulation, Brigham and Women's Hospital, <sup>2</sup>Department of Emergency Medicine, Harvard Medical School, <sup>3</sup>Department of Clinical Surgery, University of Edinburgh, <sup>4</sup>Department of Surgery, Harvard Medical School, <sup>5</sup>Center for Surgery and Public Health, Brigham and Women's Hospital, <sup>6</sup>Department of Anesthesia and Critical Care, King Abdulaziz University, <sup>7</sup>Northwestern University Feinberg School of Medicine

## Introduction

Previous literature has shown that cognitive overload can negatively impact both learning and clinical performance. We investigated learners' cognitive load during trauma team training (TTT) using an objective digital biomarker.

## Methods

A 3-hour simulation-based interprofessional TTT program was conducted. Each session included 3 scenarios followed by a debriefing session. One scenario involved multiple patients. Each learner wore a heart rate sensor that detects continuous interbeat intervals. Low frequency/high frequency ratio (LF/HF ratio) was used as a validated proxy for cognitive load. A mixed model analysis was used.

## Results

Ten subjects participated in 12 simulations. There was a statistically significant difference in LF/HF ratio between scenario and debriefing: 1.91; 95% CI = [1.28 – 2.53];  $p < 0.001$ . Compared to single-patient scenarios, multiple-patient scenarios posed a higher cognitive load to learners: mean difference = 1.34; 95% CI = [0.35 – 2.32];  $p = 0.008$

## Conclusion

Cognitive load during simulation activities were higher than the average normal and was increased during all three scenarios compared to debriefings suggesting that HRV is a sensitive tool to detect cognitive load in varying simulation phases.

