

Virtual ACS 2021 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

Research

Non-Technical Skills Evaluation of Medical Students Through Objective and Subjective Measures

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Introduction: Non-technical skills (NTS), particularly communication, have been found to impact clinical performance and outcomes. Current evaluation methodologies are subjective and depend on self or expert ratings. Wearable sensors and sensing technology may enable objective assessment of NTS. The objective of this study was to examine novel sensing approaches and preliminary models of automating NTS assessment. Our goal is to stimulate discussions between surgeons and engineers regarding objective factors reflective of NTS and how to capture them.

Methods: Fifty-seven third-year medical students participated in acute care team simulations (ACTS) and performed patient assessments by interacting with a nurse confederate and a high-fidelity patient manikin. Students' NTS was assessed by a clinician and a human factors engineer using an NTS assessment tool (0 – 6 scale; 6 representing model behavior) with the following NTS constructs: communication, situation awareness, cooperation, leadership, and decision making. A lapel microphone was used to record participants' audio. Speech and communication metrics (e.g., speech duration, ratio, intensity, rate, discourse between team members) were calculated. Pearson's correlation and multiple regression analyses were conducted to identify the relationship between NTS ratings and sensor metrics.

Results: The average overall NTS score was 2.9/6. Student' speech duration and intensity correlated significantly with the cooperation ($r=-0.30$, $p=0.021$) and decision making ($r=0.29$, $p=0.027$) constructs. The frequency of communication from student to nurse/patient (Figure 1) was also correlated significantly with average score ($r=0.40$, $p=0.002$). The relation of objective communication metrics with the overall NTS score using a multiple regression model yielded an r^2 of 0.21.

Conclusions: Objectively measured audio metrics were significantly correlated to expert ratings of communication, suggesting the feasibility of our sensing approach to quantify NTS. Future steps include integrating objective communication assessment into training and feedback for NTS training of residents.

