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The feedback limitation - Can wearable devices offer de-centralized simulation training?

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Abstract
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Abstract

1) Rationale/impetus for the innovation:

Technical skills simulation training for healthcare professionals expects trainees to come to a physical location at a specific time to train/master the required skills. One of the main limitations of this centralized model is the feedback needed for an effective educational experience. Evidence shows that simulation effectiveness requires objective feedback to be provided by an expert, which availability is limited due to the multiple demands of expert health professionals. Currently, the ratio of trainees to experts during in-person simulation sessions could be 20:1, which affects the quality of feedback provided.

This centralized simulation training model is also one of the most significant barriers to simulation access, contributing to the disparity of training opportunities between urban and city environments. Expert time to provide feedback is scarce and highly costly, limiting training offerings in remote areas.

2) Goal or learning objectives;

Develop a suite of wearable devices capable of offering independent, asynchronous, expert feedback when practicing technical skills.

3) Description of the innovation

We developed a suite of wearable devices that track the different movements, accelerations, inclinations, forces and other variables while any user (expert or novice) is practicing technical skills. We have focused on three types of wearable devices: a two-finger glove, a bracelet, and a forearm model.

We characterized the performance of experts while performing intramuscular injections, simple interrupted sutures, and continuous suturing, using the signals collected through our wearable devices. To characterize the performance, we used a neuronal network machine learning model that helped identify common patterns. We compared these patterns to the performance characterization of a trainee to offer instant, detailed, independent expert-based feedback during training.

4) Summary of usage/evaluation.

Our initial test validity testing showed that using the signals collected through our wearable devices, we are able to characterize training performance, differentiate between the performance of a novice and an expert, and offer independent, expert-based feedback to help improve performance.

We are conducting a construct validity study in Singapore, where the developed wearable devices and machine learning models are used for curricular assessment purposes in nursing and medicine.