

ACS 2024 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

P-B-06

Research-In-Progress

Enhancing Cardiac Surgeons' Ergonomics: Minimizing the Neck Movements During Heart Surgery Using Micro-Monitors

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Introduction: During cardiovascular surgery, surgeons rely heavily on the hemodynamic data displayed on the overhead monitors. Surgeons frequently scan these monitors by neck extension/flexion motions to review the data. The frequent upward looking at the monitor besides causing distraction from the surgical field, can potentially cause cervical spine discomfort and general fatigue. We designed a study first to examine the significance of this issue and then designed a practical solution to address it effectively.

Methods: The number flexion/extension motions of the neck were determined by an Inertial Measurement Unit (IMU) placed on the surgeon's occipital area during different types of heart surgeries. The Euler angle corresponding to neck flexion/extension was recorded to count the number and the duration of angular changes. To eliminate the need for multiple neck extensions, we added a micro-monitor to the surgical loupes that mirrors the hemodynamic data monitor directly in front of surgeon's eye.

Preliminary Results: During a routine heart surgery, a surgeon extended the neck to look at the monitor 18 times for a coronary surgery, and 26 times for a valve surgery. Duration of the extensions are often as short as 2-3 seconds, during which the monitor data is read and then the neck is flexed to look back at the field. The short duration of the neck extension essentially causes more strain on the neck and adds to surgeon's fatigue.

Next Steps: Following validation of the results from additional recordings, we plan to study the effect of using the micro-monitor on reducing the number/duration of the neck extensions and its influence on lowering surgeons' fatigue level. By using this micro-monitor, surgeons can continue looking at the surgical field and simultaneously read the hemodynamic data with no need to change the head/neck positions.