error (FRE)Results: Ninety-nine patients were analyzed, with a median FLE of 0.76mm, 0.74mm, 0.71mm and 0.66mm for the right electrode, left electrode, AC and PC respectively (no significant difference, Wilcoxon sign rank). The median FRE was 1.59mm for AC and 1.21mm for PC, significantly higher than FLE at those coordinates (Wilcoxon sign rank, $p<0.001$). Conclusions: Raters can accurately localize DBS electrodes, AC and PC from clinical images with sub-millimetric accuracy. Higher FREs at AC and PC suggested registration errors may contribute more than localization errors to electrode uncertainty in a common space.

Neuroscience Education

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Quantitative evaluation in competency-based medical education – a nationwide survey of the spinal surgical training landscape

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Background: The competency-based medical education (CBME) model has been recently implemented in spinal neurosurgical and orthopedic residencies. This model is grounded on entrustable professional activities (EPAs) that allow the assessment of clinical milestones. Integrating quantitative metrics to evaluate procedural competencies could refine the assessment's scope. This survey, administered to program directors (PDs), aims to evaluate the current state and anticipated needs for quantitative evaluation to develop innovative assessment techniques. Methods: We surveyed 32 PDs of neurosurgical (N=14) and orthopedics (N=16) programs with a spine service via RedCap. We collected information on the programs' characteristics. We inquired about existing assessment methods and the perceived values of developing quantitative metrics to assess spinal technical competencies using thirteen questions. Results: The response rate was 53%. All programs use EPAs to assess procedural competencies through direct observation in the operation room. One surgical program employed quantitative metrics for examination. Four PD valued the profitability of quantitative evaluation methods in a clinical or simulatory context. Conclusions: The use of quantitative metrics to assess spinal surgical competencies in Canadian neurosurgical and orthopedic residency programs is seldom. Despite its underutilization, PDs acknowledge the potential for quantitation to improve the accuracy and reliability of CBME assessments in both simulated and clinical settings.

Neurotrauma

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Near infrared spectroscopy based indices of cerebrovascular reactivity cluster with intracranial pressure based indices in moderate to severe TBI patients

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Background: Cerebrovascular reactivity has been identified as an important contributor to secondary injury following moderate to severe traumatic brain injury (TBI). "Gold-standard" intracranial pressure (ICP) based indies of cerebrovascular reactivity are limited by their invasive nature poor spatial resolution. Near infrared spectroscopy (NIRS) based indices of cerebrovascular reactivity are minimally invasive and have improved spatial resolution. In this study, classical machine-learning algorithms are leveraged to better characterize the relationship between these indices. Methods: High-resolution physiologic data was collected in a cohort of adult moderate to severe TBI patients. From this data both ICP and NIRS based indices of cerebrovascular reactivity were derived. Utilizing Agglomerative Hierarchical Clustering (AHC) and Principal Component Analysis, the relationship between these indices in higher dimensional physiologic space was examined. Results: A total of 83 patients with 314,395 minutes of unique and complete physiologic data was obtained. Through AHC and PCA there was higher order clustering between NIRS and ICP based indices, separate from other physiologic parameters. Conclusions: NIRS and ICP based indices of cerebrovascular reactivity relate to one another in higher dimensional physiologic space. NIRS based indices of cerebrovascular reactivity may be a viable alternative to ICP based indices.

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Quantification of the relationship between near infrared spectroscopy based and intracranial pressure based indices of cerebrovascular reactivity in moderate to severe TBI

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Background: Cerebrovascular reactivity is an important contributor to secondary injury following traumatic brain injury (TBI). The poor spatial resolution and invasive nature of "Gold-standard" intracranial pressure (ICP) based indies of