first and largest systematic review assessing postoperative headache outcomes after treatment of unruptured intracranial aneurysm. A significant reduction in headache intensity after treatment is observed in the current published literature. This study highlights an interesting clinical phenomenon that still warrants scientific effort before it can influence clinical practice. We encourage future study to stratify headache outcomes by aneurysm size, location and treatment modality.

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Saskatchewan experience with mechanical thrombectomy under general anaesthesia

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Background: While recent clinical trials have demonstrated immense efficacy of mechanical thrombectomy (MT) in the setting of acute stroke, there remains debate over the safety in performing this procedure under general anesthesia (GA). In the Saskatchewan Acute Stroke Pathway, all patients presenting with LVO have endovascular thrombectomy performed under GA. **Methods:** Data was retrospectively reviewed on 108 consecutive LVO in 2016-2017. All MT were done under GA. Anatomical location of LVO, pre-MT ASPECTS score, post-MT TICI scores and 90-day NIHSS and mRS were recorded. **Results:** Of 108 LVO, 103 went on to have MT. 44 were right anterior circulation, 50 were left anterior circulation and 9 were posterior circulation. Of 94 anterior circulation strokes, 47 (50.0%), 43 (45.7%) and 4 (4.3%) had good, moderate and poor collateral circulation respectively, and the average pre-MT ASPECTS was 8.6. The average pre-MT NIHSS was 14.7. 81/90 (90.0%) achieved thrombolysis in cerebral infarction (TICI) perfusion scale grade of 2b/3 after recanalization. Average documented 90-day NIHSS was 2.4 and mRS was 2.5. Overall mortality was 21/103 (20.4%). **Conclusions:** In the Saskatchewan acute stroke pathway, general anesthesia is a safe modality for MT. This adds to the body of evidence supporting GA as a viable option for sedation in MT.

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Predicting cerebral vasospasm following aneurysmal subarachnoid hemorrhage is still an imperfect science

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Background: Cerebral vasospasm is a leading cause of neurological disability following aneurysmal subarachnoid hemorrhage (aSAH). Clinical features associated with vasospasm development include blood burden on CT, neurological status, age and aneurysm location. Early cerebral CT perfusion (CTP) scanning in aSAH may be an independent predictor of vasospasm and/or delayed cerebral ischemia (DCI). **Methods:** Forty-one patients with aSAH were prospectively enrolled. Baseline data collected included WFNS grade, loss of consciousness at ictus, and modified Fisher grade. CTP was obtained at baseline and on day 6 post SAH. Cerebral blood volume, cerebral blood flow and mean transit time were measured. DCI was confirmed by a combination of clinical assessments, non-contrast CT and CTP. Radiological vasospasm was assessed with CT angiography. **Results:** Despite 80% of patients having a modified Fisher grade 3 or 4 aSAH, one-third presenting with ictal LOC and half having anterior communicating artery aneurysms, only one patient developed clinical evidence of vasospasm/DCI. Two others had asymptomatic radiological vasospasm. CTP parameters did not differ between groups defined by clinical predictors. **Conclusions:** In an unexpected finding, clinical and radiological vasospasm were very uncommon in this cohort. Clinical predictive variables correlated poorly with development of vasospasm. CTP may help refine the model but further work is needed.

Other Neurosurgery

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The opinion of Canadian spine surgeons on medical assistance in dying (MAID); a cross-sectional survey of Canadian spine society (CSS) members

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Background: On February 6, 2015, the Supreme Court of Canada struck down the Criminal Code absolute prohibition on assisted dying, and in June 2016 the new law, Bill C-14, came into effect allowing for medical assistance in dying. We sought to determine the attitudes and opinions of Canadian neurosurgeons and orthopedic spine surgeons regarding MAID. **Methods:** A cross-sectional survey was sent out to members of the Canadian Spine Society (CSS), which included 21 questions pertaining to opinions regarding MAID. Responses were collected between May-June 2016. **Results:** A total of 51 surgeons responded to the survey, comprised of a mix of spine surgeons from across the country. The majority of surgeons supported MAID (62.8%), and right of physicians to participate (82.4%). Most surgeons supported the right to conscientious objection (90.1%), but also mandatory duty to refer (49.0%). The conditions most frequently felt to be appropriate for MAID included metastatic spine tumour (76.5%), malignant intramedullary tumour (64.7%), primary malignant spine tumour (54.9%), cervical spinal cord injury with tetraplegia (49.0%) and multiple myeloma (33.3%). **Conclusions:** This study highlights the complex landscape that exists when discussing MAID, but also the overall support of physicians, and need for ongoing conversations, particularly with issues not addressed by the current legislation.

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Excalibur, a novel haptic hand-controller for robot-assisted microsurgery

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Background: For robot-assisted telesurgery, the workstation, in particular the haptic handcontroller itself a robot, is paramount to the performance of surgery. Based on the requirements for microsurgery, a novel haptic handcontroller *Excalibur* has been developed. **Methods:** Thirty-two surgeons performed a peg-in-hole task (simulating micro-

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manipulation) with Excalibur and two commercially available handcontrollers (Sigma 7 and PHANToM Premium 3.0). A modified Kuka endeffector with bipolar forceps, and Leica microscope completed the remote robotic site. Comparisons were made based on training time, task completion time and number of errors. All participants completed a questionnaire. **Results:** Repeated measures ANOVA demonstrated significance for task completion time (p=0.004), training time (p=0.021) and number of errors (p=0.004). Surgeons were faster with Excalibur (72s) than with Sigma (96s,p=0.005) and PHANToM (96s,p=0.036). Training time was shorter with Excalibur than with PHANToM (210s vs 310s,p=0.013), and users made fewer errors (0.7 vs 2.1,p=0.008). Training time required for Sigma (285s) and the number of errors (1.3) were not significant. The surgeons found Excalibur smoother, more comfortable, less tiring and easier to maneuver, with more realistic force feedback and superior movement fidelity. **Conclusions:** Surgical performance was superior with Excalibur compared to the other handcontrollers. This may reflect the microsurgical requirements and unique design architecture of Excalibur.

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Impact of postoperative discharge destination on length of stay

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Background: The aim of this study is to assess factors impacting the postoperative length of stay (LOS) for patients undergoing microvascular decompression (MVD) surgery. **Methods:** A consecutive series of patients undergoing MVD at the Winnipeg Centre for Cranial Nerve Disorders were reviewed. All patients were monitored in a neurosurgical stepdown unit for at least 6 hours postoperatively and when medically stable discharged at their own discretion. The hospital LOS was measured in hours from midnight after day of surgery and categorized by days in hospital. **Results:** The 112 patients included 53 Manitobans (MB) and 59 from out of province (OOP). The overall LOS was 38±52 hours, and not significantly different between genders, diagnosis or age. LOS was significantly shorter for OOP versus MB patients (28±23/48±71 hours; p=0.02). OOP patients were also more often discharged on the first postoperative day (59% versus 32%; p=0.02) and 85% of them stayed at the hotel within the hospital complex prior to travelling home. **Conclusions:** Postoperative discharge to an adjacent hotel appears to have led to shorter LOS. These patients may have been reassured by the physical proximity to medical care. The utilization of discharge to an adjacent hotel or comparable faculty may reduce hospitalization days and associated costs.

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Rapid intraoperative reconstruction of cranial implants for craniotomy procedures: a feasibility study

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Background: The aim of this study was to investigate intraoperative methods to generate patient-specific PMMA bone implants during a craniotomy. The proposed methods combine a cost-efficient, and non-invasive structured light scanner (SLS) as an imaging modality and a prototype printer for rapid generation of implant molds. **Methods:** This simulation study was performed using retrospective data from three craniotomy patients. The extracted bone flap and the cranial defect were scanned using a SLS, which generates a 3D surface model of an object by projecting a series of light-patterns on it. Prototype printed implant models were generated using two different techniques. The molds were then used to shape PMMA bone implants. These implants were evaluated regarding their accuracy to reconstruct the natural skull anatomy and compared to freehand formed implants. **Results:** The patient-specific bone implants reconstructed the preoperative anatomy with an average RMS error of 1.37mm (StDev 0.27), compared to an error of 1.5mm (StDev 0.43) for the freehand shaped implants. On average the intraoperative scanning time was 4.7min. The average time to generate and print the implant molds was 204 min. **Conclusions:** Results of this study have shown great promise for the proposed method to be used for patient-specific bone flap reconstruction during craniotomies.

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The prediction of outcome after shunting for idiopathic normal pressure hydrocephalus

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Background: Idiopathic normal pressure hydrocephalus (iNPH) is a triad of impaired gait, cognition and urinary control in the setting of normal pressure ventriculomegaly. Various options for shunt implantation exist, but there is limited ability to predict outcome. **Methods:** This study is a retrospective chart review of 82 shunted patients for iNPH between 2007 and 2018. Factors examined included age, sex, lumbar puncture results, use of laparoscopic approach, type of shunt used, Charlson Comorbidity Index and imaging (callosal angle and DESH). Patient outcome was assessed via modified Rankin Scale (mRS). **Results:** 52 patients were male and 30 were female. Average age at surgery was 71.4 years. 58/62 (94%) improved following lumbar puncture. 41% of patients had VP shunt, and 59% of patients had LP shunt. 30/79 (38%) had laparoscopic placement of the distal catheter. 23/75 (31%) and 30/81 (36%) had a complication and required reoperation, respectively. Callosal angle showed statistically significant increase post-shunting (76 to 94 degrees, p<0.005). Presence of DESH did not change post-shunting. Average Charlson Comorbidity Index was 4.4. The mRS decreased from 3.84 to 2.66 postoperatively (p<0.005). **Conclusions:** In our centre, iNPH patients had clinicoradiologic improvement following shunting. We will perform regressional statistics to elucidate the factors influencing outcomes.

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Normal pressure hydrocephalus with associated tremor

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Background: Normal pressure hydrocephalus is a frequent cause of cognitive and functional impairment. Many symptoms are shared between Parkinson's disease and normal pressure hydrocephalus. Only few studies examine extrapyramidal signs in NPH, and only one case report exists describing tremor improvement with shunting. **Methods:** We performed a retrospective chart review of our

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