

years old) who sustained a severe head injury (defined as an AIS of 3 or more) during OEF or OIF from 2001 to August 31, 2010. A number of datapoints were collected, with the primary endpoint being in-hospital mortality.

**RESULTS:** Five hundred thirty-nine children ( $m = 401$ ,  $f = 138$ ) met our criteria. The mean age was  $7.9 (\pm 4.4)$ . Blunt injury was the mechanism in 197 children; penetrating in 342. The average GCS on admission was 8.2. Intracranial pressure monitoring was performed in 198 patients (138 ventriculostomies, 60 bolts) and 118 underwent a craniotomy or craniectomy. The average length of stay and GCS at time of discharge was 5.5 days and 12.9, respectively. In-hospital death occurred in 127 (23.5%) children. There was no difference in mortality based on age, OEF vs OIF, gender and type of injury (penetrating vs non-penetrating).

**CONCLUSION:** Many children who were injured as a result of combat operations or non-battlefield causes were cared for by coalition forces during OEF and OIF. Almost one-quarter of children with severe head injuries died. Given the challenging environment and limited available resources, coalition forces were able to provide quality and timely care.

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### **Optogenetic Stimulation of Motor Cortex Neurons Promotes Functional Recovery After Stroke**

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**INTRODUCTION:** Functional recovery after stroke has been observed in both animal and human studies and is currently attributed to both brain remodeling and plasticity. Brain stimulation techniques such as electrical stimulation and transcranial magnetic stimulation have been used successfully to enhance recovery. However, what mediates this recovery is not well understood. Elucidating the mechanism(s) is difficult because these stimulation techniques non-specifically activate all cell types near the stimulation site. Here we use optogenetic techniques to specifically stimulate layer V pyramidal neurons in the ipsilesional motor cortex at day 5 post-stroke, and investigate the effects on functional recovery as well as underlying mechanisms.

**METHODS:** Thy-1-ChR2-YFP line-18 transgenic male mice were used. Mice underwent stereotaxic surgery to implant a fiber cannula in the ipsilesional M1. All mice were then subjected to an intraluminal middle cerebral artery suture occlusion (30 minutes). Optogenetic stimulation began at day 5 post-stroke and continued until day 14 post-stroke. Sensorimotor behavior tests were used to assess their behavioral recovery at day 0, 2, 7, 10 and 14 post-stroke. Changes in cerebral blood flow following stimulation were measured at day 14 post-stroke using the Laser Doppler Flowmetry.

**RESULTS:** Rotating beam test revealed that stimulated mice recovered significantly faster than non-stimulated control mice at day 10 and 14 after stroke ( $P < .05$ ). Stimulated mice also performed significantly better in the adhesive tape test at day 14, with a shorter tape removal time on the contralesional limb ( $P < .05$ ). Cerebral blood flow measurements revealed that stimulated mice exhibited significantly larger increase in cerebral blood flow following stimulation at day 14 post-stroke ( $P < .05-.01$ ).

**CONCLUSION:** These data indicate that optogenetic stimulation of motor cortex neurons can promote behavioral recovery in mice after stroke. Current studies examine the mechanisms underlying this recovery, including genes related to neurotrophic factors after stimulation.

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### **High Performance Computer Cursor Control Using Neuronal Ensemble Recordings From the Motor Cortex of a Person With ALS**

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**INTRODUCTION:** Chronically implanted brain-computer interface systems have been demonstrated in several human research participants, with encouraging early results. A major aim of the current project is to provide improved speed and accuracy of computer cursor control for people with paralysis.

**METHODS:** A 50-year-old woman with Amyotrophic Lateral Sclerosis (ALS) and weakness of all 4 limbs (but with some retained upper extremity function) underwent implantation of an array of 100 silicon microelectrodes into the "hand knob" area of the precentral gyrus as part of a multi-site pilot clinical trial (Braingate2, IDE). Beginning 1 month following implantation, twice-weekly recording sessions were carried out in the participant's home. A circular cursor and several targets were displayed on a computer monitor. The participant performed a "center-out" cursor task by moving her finger on a trackpad to acquire the targets while neural activity was recorded. This neural activity was correlated with finger movement to produce a velocity-based Kalman filter, which was in turn used to derive on-screen cursor movement from neural activity. Under neural control, the participant acquired 1 of either 4 or 8 peripheral targets, placed between 150 and 225 pixels from a central target. Each block consisted of 160 consecutive trials. Targets were acquired by touching the target with the neurally controlled cursor, with or without a required dwell time. All targets had a diameter of 100 pixels

**RESULTS:** Accuracy and acquisition time varied across 36 blocks, with more recent sessions tending toward higher performance. Best performance in the 8 target task with 250 msec dwell was 92% accuracy, with average acquisition time of  $1.89 \pm 1.09$  seconds.

**CONCLUSION:** Our research participant was able to acquire targets using neural control with high speed and accuracy. Optimizations are being explored to increase performance further, with the eventual goal of providing cursor control approaching that achievable by able-bodied computer users.

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### **What is the Current Practice of Restarting Oral Anticoagulant in Patients With Subdural Haemorrhage?**

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**INTRODUCTION:** Patients with mechanical heart valves (MHV) who present with subdural haemorrhage (SDH) are initially treated by reversing their coagulopathy. However, these patients will ultimately require that their oral anticoagulant (OAC) be restarted. The time at which OAC is restarted is critical. Too early may increase the risk of recurrent bleeding, while withholding anticoagulants increases the patient's risk of thromboembolic events.