

clinical outcomes in geriatric patients with rib fractures. **METHODS/STUDY POPULATION:** A retrospective 5-year review was performed of a single Level 1 Trauma center registry. Geriatric patients (≥65 years of age) diagnosed with rib fractures from January 1, 2014 to December 31, 2019 were included. The primary outcome of interest was in-hospital mortality. Secondary outcomes included hospital and intensive care unit length of stay (HLOS and ICU LOS, respectively) and discharge disposition, as a surrogate for loss of independence. Further, subgroup analysis based on number of rib fractures (i.e. <4 and ≥4 rib fractures) was performed. **RESULTS/ANTICIPATED RESULTS:** 2,134 adult trauma patients were admitted with at least one rib fracture. Of these, 1,037 (49%) were ≥65 years old. This cohort had a mean age of 78.6 years old, injury severity score (ISS) of 11.4, HLOS of 7.4 days and 29% required ICU care with mean ICU LOS of 1.9 days. Only 36% were discharged home compared to 64% who were discharged to a care facility and thus had a loss of independence. Overall mortality was 6.3%. Compared to survivors, non-survivors had a higher ISS (19.3 vs. 10.8, $p < 0.0001$) and longer ICU LOS (7.1 vs. 6.5 days, $p = 0.04$). Analysis based on number of rib fractures showed that those with ≥4 rib fractures had significantly higher mortality (8% vs. 4%, $p = 0.008$), longer HLOS (8.7 vs. 6.1 days, $p < 0.0001$), longer ICU LOS (2.6 vs. 1.3 days, $p < 0.0001$), and significantly lower discharge to home (32% vs. 39%, $p = 0.02$). **DISCUSSION/SIGNIFICANCE:** To our knowledge, this is the largest single-center study of geriatric patients with rib fractures. In this study, the observed mortality in patients ≥65 years of age was 6.3% which represents a lower mortality rate than historically reported. Despite this, only 36% were able to be discharged directly to home.

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Developing a Digitally Integrated Endotracheal Tube for Neonates to Improve Safety and Respiratory Function

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OBJECTIVES/GOALS: Neonatal endotracheal tubes (ETTs) are usually uncuffed to avoid subglottic stenosis and other complications, but cuffed ETTs allow better ventilation. Our goal was to detect and control pressure in the cuff below the limit of occluding venous flow to minimize the risk of subglottic stenosis. **METHODS/STUDY POPULATION:** We designed a pressure sensor to fit on a 2.5 ETT for prototype testing in 8 age adult female rabbits. Eight uncuffed age- and sex- matched rabbits served as control. Study duration was 2 hours during which pressure in the cuff was limited by novel sensor (intervention) or auscultation (control). Anesthesia was maintained with sevoflurane. Ventilation was provided mechanically. Subsequently the tracheae were removed, sectioned crosswise, and compared histologically for mucosal damage. **RESULTS/ANTICIPATED RESULTS:** Preliminary data demonstrated an almost 30% greater amount of intact mucosa in the intervention group. The sensor also provided data on heart rate and respiratory rate, although this signal was not optimal. After filing an invention disclosure and provisional patent, we are refining our device to include multiple compartments for local control of cuff pressure and applying for a STTR Phase I/II application. **DISCUSSION/**

SIGNIFICANCE: Ventilation in neonates with uncuffed ETTs can be suboptimal due to leak around the tube, but cuffed ETTs pose the threat of subglottic stenosis and other complications. We have designed a prototype cuffed ETT with a sensor to maintain low cuff pressure while preventing leaks and largely avoiding damage to the tracheal mucosa.

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Biobehavioral predictors of dose-limiting toxicities of cancer therapy: Identification of areas for preventative intervention[†]

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OBJECTIVES/GOALS: This presentation outlines a novel approach to evaluating multiple risk factors for the development of dose-limiting toxicities in adolescents and young adults with cancer. This is the first to evaluate biobehavioral predictors originally identified in animal models in clinical human studies. **METHODS/STUDY POPULATION:** Adolescents and young adults (AYAs) have seen the slowest improvements in cancer survival and have some of the highest rates of dose-limiting mucositis (mouth sores). AYAs receiving chemotherapy with a significant chance of dose-limiting mucositis were recruited for a prospective study. Baseline perceived psychologic stress levels and inflammatory markers were collected at the time of chemotherapy administration and participants completed a daily assessment of mucositis for 14 days following chemotherapy. Logistic regression will be used to evaluate stress and inflammation as predictors of mucositis and Sobels testing will evaluate the role of inflammation as mediators in this relationship. **RESULTS/ANTICIPATED RESULTS:** We anticipate that, as seen in animal models, stress and inflammation will predict mucositis development. First, we hypothesize that stress levels and inflammatory markers will have a direct correlation and that the level of inflammation at the time of chemotherapy administration will predict mucositis incidence and severity. Through mediation testing, we hypothesize that inflammatory markers will explain a significant amount of the variance in mucositis also explained by stress, identifying inflammation as a mediator in this relationship. In all, we expect that stress and inflammation both predict mucositis development and will be identified as important modifiable factors that can be altered to reduce the risk of toxicity development during cancer therapy. **DISCUSSION/SIGNIFICANCE:** This work intends to evaluate predictors of chemotherapy-related toxicity development in AYAs with cancer and identify areas of intervention that will reduce toxicity profiles and close the gap in cancer survival for AYAs. Findings are applicable to biomedical, nursing, and psychosocial professionals and will inform future, large clinical studies

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Exoskeletons increase paretic limb use in stroke survivors during a bimanual virtual reality reaching task*

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OBJECTIVES/GOALS: Almost 8 million Americans live with disability caused by stroke. However, recent advances in stroke rehabilitation are costly and lack resemblance to activities of daily living. The goal of this study was to develop a rehabilitation platform to increase

stroke patients paretic limb use using inexpensive virtual reality and exoskeleton devices. **METHODS/STUDY POPULATION:** We conducted a feasibility study with 2 hemiplegic stroke participants. They reached for targets in a virtual reality environment using both hands. They completed 162 reaches divided into 3 blocks. Following baseline, we used an exoskeleton to provide 50% arm weight compensation to the paretic limb and used wrist weights to provide 50% arm weight resistance to the non-paretic limb. We removed the exoskeleton and wrist weights during the retention block. We used electromyography to approximate muscle activity in the biceps brachii. Relative contribution (RC) was calculated as the displacement of the paretic arm divided by the sum of displacements for both arms. Muscle contribution (MC) was calculated as the root mean square of paretic arm muscle activity divided by the sum of activity for both arms. **RESULTS/ANTICIPATED RESULTS:** During baseline, RC of the impaired limb was 44% and 48%, and MC of the impaired bicep was 43% and 35% in two mild to moderately impaired patients (Fugl-Meyer Upper Extremity scores of 43 and 37, respectively). During loading, RC increased by 5.6% and 1.1% and MC decreased by 8.3% and 11.8%. These data suggest hemiplegic stroke participants alter limb coordination when our device normalizes muscular output asymmetries between limbs. Importantly, these results closely match data from our previous work in 12 healthy controls, where we found a 2% increase in RC is significantly predicted by a 11% decrease in MC. By collecting more data on stroke patients, we will quantify this tradeoff between coordination and muscle activity modulation, allowing us to optimize the exoskeleton mechanics to maximize paretic limb use. **DISCUSSION/SIGNIFICANCE:** We demonstrate our platform is well tolerated by mild to moderately impaired stroke patients; this feasibility study forms the basis for low cost at-home technologies for stroke rehabilitation. With further development, clinicians can use our platform to fine-tune the level of limb constraint based on the individual needs of the patient.

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Development of a Mobile Software Application to Promote Education, Self-Care, and Treatment Follow-Up among Puerto Rican Breast Cancer Patients

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OBJECTIVES/GOALS: This project will design, develop and pilot-test a Spanish-mobile application for breast cancer patients. It is intended that patients will improve treatment adherence, have a personal information storage system for their follow-up healthcare and can have greater control in the processes of diagnosis, treatment, education, and recovery. **METHODS/STUDY POPULATION:** In the first phase, a team of undergraduate engineering students was recruited to work on the areas of: Front End, Database Development, Security Protocols, and Integration. Team Venus will provide the cancer-related content. In the second phase, the engineering team will identify bugs, usability, satisfaction, and workability of the application among a pilot convenience sample of 20 participants from four cancer clinics and the community. The inclusion criteria are being > 21 years old and having a cell phone. The exclusion criterion is not knowing how/being able to use a mobile application. Participants will complete a questionnaire on socio-demographic data, mobile phone and application use, efficacy,

usability, and security. Univariate and bivariate statistical analysis will be performed using SPSS. **RESULTS/ANTICIPATED RESULTS:** The researchers are defining specific visual and content features they would like the application to have. They are also searching and collecting reliable information about cancer from primary sources to incorporate into the tools available to the application's users. In addition, they have also begun to identify potential cancer treatment facilities and medical personnel to assist in the recruitment of patients for pilot-testing the application. The researchers have divided them into geographical areas in Puerto Rico and each Team Venus member will approach and orient patients and medical personnel about the project. **DISCUSSION/SIGNIFICANCE:** It is intended that patients will improve treatment adherence, have a storage system for their follow-up healthcare and greater control in their processes of diagnosis, treatment, education, and recovery. Future goals include use of the database feature by researchers and expanding the testing of the application with a larger patient-base.

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Frontal-cerebellar EEG source localization and functional connectivity as predictors of Alzheimer's disease-related cognitive decline

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OBJECTIVES/GOALS: Novel EEG source localization and functional connectivity will assess frontal and cerebellar activity as predictors of subsequent memory and executive functioning (EF) decline in healthy, asymptomatic older adults who carry the Apolipoprotein-E $\epsilon 4$ allele ($\epsilon 4+$), which conveys up to 12x increased risk for Alzheimer's disease (AD). **METHODS/STUDY POPULATION:** Healthy, cognitively intact $\epsilon 4+$ older adults ($n = 23$; ages 65-89) completed neuropsychological testing (focus on memory and EF) and EEG at Time 1, returning an average of one year later for neuropsychological retesting. EEG data during successful stop-signal inhibitory control trials will be used for advanced source localization and functional connectivity, with a focus on frontal and cerebellar regions of interest (ROIs). Source analyses will focus on the N200 time window (~200-350ms) to assess conflict processing and P300 (~300-550ms) for performance evaluation. Connectivity analyses are frequency-based, and will focus on theta band connectivity to assess conflict processing and delta to assess performance evaluation. **RESULTS/ANTICIPATED RESULTS:** Using hierarchical linear regression models, the magnitude of source activation within ROIs and connectivity metrics between ROIs will be used to predict residualized change in memory and executive function metrics between Time 1 and Time 2. We anticipate that 1) greater, compensatory activation in frontal ROIs during the N200 window, and 2) less cerebellar activation during P300, will predict memory and executive decline over the retest interval. Decline will also be predicted by 3) greater inter-hemispheric frontal connectivity in the theta band (conflict processing) and 4) less frontal-cerebellar delta connectivity (performance evaluation). **DISCUSSION/SIGNIFICANCE:** At most, ~50% of $\epsilon 4$ carriers will develop AD. Thus, identifying which carriers will decline is crucial to enabling successful, early intervention. Cerebellar dysfunction and impaired connectivity may be among the earliest indicators of incipient AD. Cutting-edge cerebellar EEG may enable an accessible option for early discernment of AD risk.