CCTS Oral Presentation Abstracts

Abstract Title:	**Perfusion Index (PI) Predicts the Effect of Red Blood Cell Transfusions (RBCtx) on Oxygenation in Preterm Infants**
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Abstract: Background: Intermittent hypoxemia (IH), or episodic drops in oxygen saturation (SpO2), is common in preterm infants. IH is associated with long term neonatal morbidities. RBCtx decreases IH events, however, effect remains inconsistent. The variable effect of RBCtx on IH may be due to perfusion/oxygen capacity differences among patients. PI, a non-invasive perfusion measure, may guide transfusion management in preterm infants. Objective: To determine whether PI predicts the effect of RBCtx on IH. We hypothesize that a lower PI pre RBCtx is associated with greater improvement in IH post RBCtx. Methodology: We prospectively enrolled patients with gestational age (GA) <32wks who received RBCtx. We continuously monitored PI and SpO2 with high resolution pulse-oximeters (2s averaging time, 1s sampling rate). Mild, moderate and severe IH were defined as drop in SpO2<90%, 85% and 80%, respectively. We compared IH frequency 24h pre and post RBCtx. Results: Seven infants receiving 11 RBCtx were analyzed. Mean GA: 26wks (24.6 –29.3), postnatal age: 17days (4-55), birthweight 855g (665-1220). PI predicted the effect of RBCtx on IH<90%: for every 1-unit decrease in PI, the mean change increased by 4.9IH/hr [95%CI:(0.6,9.1),p=0.04]. Linear regression model showed that as PI rises by 1-unit the mean number of events after RBCtx increases by 3.83IH/hr [95%CI:(1.29,6.37) p=0.0009]. There was no association between PI and IH for IH<85% and IH<80%(all p>0.1). Conclusion: PI predicts the effect of RBCtx on IH frequency in preterm patients. This novel pilot study shows that PI is a promising guide for transfusion management in preterm infants.

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CCTS Oral Presentation Abstracts

Abstract Title:	**Family Perceptions and Experiences with the Early Hearing Detection and Intervention System in Rural Communities**
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Abstract: Objective: Many rural areas, including the Appalachian region, face significant disparities in hearing health care, leading to frequent delays in identification and treatment of hearing loss. The accessibility of care and barriers to the Early Hearing Detection and Intervention (EHDI) system in rural communities are not well understood. The purpose of this study is to elucidate the barriers rural Appalachian families face in receiving hearing health care for their children. Methods: Semi-structured telephone interviews were conducted with the families of children who failed their New Born Hearing Screening (NBHS) regarding their knowledge, attitudes and behaviors as they progressed through the EHDI system. Qualitative date analysis was used to identify commonalities across interviews. Results: Results revealed multiple shared barriers among the families of children who failed the NBHS and live in rural communities. Families reported financial barriers to care, such as a lack of reliable transportation, as well as limited access to local care, often with many hours of travel required. They also struggled to receive accurate, quality information and some found that providers lacked the appropriate knowledge. These obstacles prevented children from meeting crucial benchmarks in the timeline of hearing healthcare. Conclusions: In interviewing the families of children who failed their NBHS, we gained a greater understanding of the difficulties they face in accessing hearing healthcare. We found that numerous shared barriers exist that impede rural Appalachian families in receiving timely diagnosis and intervention.

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CCTS Oral Presentation Abstracts

Abstract Title:	**Irritability and Aggression as Indicators of Persistent Post-Concussive Symptoms in Adolescent Athletes**
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Abstract: Prevalence of sport-related concussions ranges between 300,000-3.8 million annually (Halstead et al., 2010; Langlois et al., 2006). Post-concussive symptoms vary, but typically include physical, emotional, and/or cognitive difficulties. Although research suggests most symptoms resolve within one week, younger athletes are frequently symptomatic 7-10 days longer (Field, Collins, Lovell, & Maroon, 2003; McCrea et al., 2009). This extended recovery time for adolescents highlights the importance of identifying markers that suggest and predict such atypical recovery. Thus, we examined 46 adolescent athletes (Mage = 14.39) with persistent concussion symptoms. Clinical interview and Beck Youth Inventory Second Edition (BYI-II) were completed as part of a larger neurocognitive battery. Self-reported increased irritability/aggression was common and easily identified. Therefore, athletes were split into two groups: Those endorsing irritability/aggression (IRR; n = 24) and those denying this symptom (CON: n = 22). Adolescents endorsing irritability subjectively described more physical complaints such as fatigue ($p < .001$), disordered sleep ($p < .001$), headache ($p < .001$), and vertigo/dizziness ($p < .001$) during interview. Adolescents reporting more irritability also had elevated scores on affective/emotional scales, including the BYI-II Anxiety ($t(41) = -2.916$, $p = .006$), Depression ($t(41) = -3.551$, $p = .001$), and Anger Scales ($t(41) = -2.958$, $p = .005$). These findings suggest that irritability/aggression may provide an easily identifiable marker of atypical recovery post-concussion, with utility for both clinical professionals and associated laymen. It may also predict other maladaptive symptoms, including mood instability. The causal relationships among these symptoms remain a focus of ongoing investigation.

CCTS Oral Presentation Abstracts

Abstract Title:	**Preoperative Patient Factors Associated with Neuromuscular Quadriceps Function Prior to Anterior Cruciate Ligament Reconstruction**
Author(s):	C.M. Gabler, Dept of Rehabilitation Sciences, U of Kentucky C.M. Mattacola, Dept of Rehabilitation Sciences, U of Kentucky

Abstract: Context: Preoperative quadriceps function is a significant predictor of postoperative outcomes in patients who have undergone anterior cruciate ligament reconstruction(ACLr). However, the effects of preoperative patient factors on quadriceps function observed prior to surgery remain unknown. Objective: To investigate the relationship between preoperative patient factors and preoperative quadriceps function. Design: Cross-sectional study. Participants: 35 patients(24 females,11 males; age=19.3±5.2yr) scheduled to undergo ACLr participated in this study. Main Outcome Measures: The patient factors examined were time-from-injury, pain, joint swelling, and thigh atrophy. Pain was assessed with a 100 mm visual analog scale. Joint swelling and thigh atrophy were based on girth measurements(cm) taken at the joint line and 1/3 the distance from the tibial tuberosity to the anterior superior iliac spine, respectively. Girth measurements of both limbs were used to obtain limb symmetries(%). Both girth measures have demonstrated high reliability(ICC>0.8) and responsiveness. The neuromuscular measures of interest were peak isometric knee extension torque, quadriceps activation, and cortical excitability of the quadriceps using transcranial magnetic stimulation. Pearson correlations were performed to examine the relationships between patient factors and neuromuscular measures. Results: Descriptive statistics(mean±SD) for all study variables were as follows: time-from-injury(27.0±21.7 days), joint swelling(+2.7±1.9%), thigh atrophy(-2.7±2.4%), pain(46.1±25.5mm), normalized peak torque of injured(2.6±0.7Nm/kg) and uninjured limbs(3.0±0.6Nm/kg), central activation ratio(CAR) of injured(91.5±7.9%) and uninjured limbs(87.6±9.3%), and active motor threshold(36.6±8.2%). Significant correlations were observed between preoperative thigh atrophy and CAR for both injured(r=0.43, p=0.01) and uninjured limbs(r=0.58, p=0.001). There were no significant correlations observed with any other preoperative measures(p>0.05). Conclusions: There were significant associations between thigh atrophy and quadriceps activation in patients before ACLr. Thigh girth may be an economical method of identifying factors correlated with quadriceps inhibition. This information is useful for the implementation of disinhibitory interventions preoperatively to maximize quadriceps activation and limit muscle atrophy.

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CCTS Oral Presentation Abstracts

Abstract Title:	**Advanced Cardiac Chemical Exchange Saturation Transfer (cardioCEST) - MRI for In Vivo Multi-color Cell Tracking and Myocardial Creatine Imaging**

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Abstract: Purpose A recently developed cardiac chemical exchange saturation transfer (CEST) pulse sequence is validated and used to track paraCEST labeled cells in the mouse heart. Furthermore, changes in myocardial creatine in diet-induced obese mice are identified. Methods Pulse Sequence: CEST encoding used a 2s train of 8.8ms Gaussian saturation pulses prior to a constant TR (7.3ms) cardio-respiratorty gated cine gradient echo readout. Four averages of one phase-encode step were acquired for each cardiac phase with dummy pulses used to maintain steady state magnetization during respiratory motion. Cell Tracking: Cells labeled with either the paraCEST agent Eu-HPDO3A or saline were implanted in the wall of the left ventricle. CardioCEST was performed 24 hours later with saturation offsets of ±15ppm. Creatine CEST: Mice were fed either a high-fat or a low-fat diet for 14 weeks. Creatine CEST imaging was performed via the acquisition of cardioCEST image pairs at ±1.8ppm. Results MTRasym was significantly higher in slices containing Eu-HPDO3A labeled cells than saline labeled cells and control slices. Despite significantly higher body mass in high-fat diet mice, creatine MTRasym was significantly lower compared to low-fat diet mice with no attenuation to structure or function. Conclusion CardioCEST imaging enabled the selective visualization of cell survival without disturbing underlying image contrast, and can be multiplexed with measurements of ventricular structure and function in cell therapy models. In a mouse model of diet-induced obesity, significantly reduced myocardial creatine was measured in the absence of structural or functional changes, reflecting early metabolic failure before overt heart failure.

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CCTS Oral Presentation Abstracts

Abstract Title:	**Big Data Analytics: Parallelization of Algorithms for Precision Medicine**
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Abstract: Genes work in concert as a system, not as independent entities, to mediate disease states. There has been considerable interest in understanding variations in molecular signatures between normal and disease states. The selective-voting convex-hull ensemble procedure accommodates molecular heterogeneity within and between groups and allows retrieval of sample-specific sets and investigation of variations in individual networks relevant to personalized medicine. The work here describes using the convex-hull voting method on a large data set. Hypothesis: Using parallelization techniques, we predict that we can execute the convex-hull voting algorithm on the University of Kentucky cluster (DLX) using a dataset much too large to run in a feasible time on a single machine. Procedures: A parallel-for loop is used within the R code allowing multiple processors within a node to concurrently perform the voting calculations of different sample pairs within one iteration. Then multiple jobs are submitted to perform randomized iterations. This turns a computationally intensive problem into a data intensive problem since each iteration produces just over 6 GBs of data. Results: The final runtime of one iteration of the large dataset was just under 34 hours and up to 32 iterations can run concurrently on DLX. The entire run of 100 iterations using this large data set took less than a week time. Future Work: Future work will involve the parallelization of the entire computationally and data intensive steps in a way that reduces the complexity of job submission and scalability of the entire job.

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