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Thrombocytopenia and whole blood transfusion in children with severe falciparum malaria

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OBJECTIVES/GOALS: Severe malarial anemia due to *Plasmodium falciparum* is often accompanied by thrombocytopenia. Treatment includes transfusion of whole blood, which contains erythrocytes, platelets, and other blood components. The objective of the study was to assess the effect of whole blood transfusion on survival in children with severe falciparum malaria and to examine the potential interaction of thrombocytopenia with malaria mortality and transfusion response. **METHODS/STUDY POPULATION:** We analyzed a retrospective cohort of 842 hospitalized children in Zambia with severe malarial anemia (703 transfused, 139 not transfused due to stock-out or other reason). Severe malarial anemia was defined as a positive rapid diagnostic test or blood smear in combination with an admission hemoglobin concentration ≤ 5 g/dL. **RESULTS/ANTICIPATED RESULTS:** Mortality was 13% (94/703) in the transfused group and 24% (34/139) in the non-transfused group. Kaplan-Meier survival estimates stratified by transfusion status and thrombocytopenia (150,000/ μ L threshold) showed increased mortality in children with thrombocytopenia who did not undergo transfusion, with no differences in mortality among the other transfused and non-transfused groups (log-rank test $P = 0.0001$). Effect modification analysis by Cox proportional hazards regression adjusted for age, sex, hemoglobin concentration, blood group type, and eosinophilia showed a significant interaction between platelet count and transfusion status ($P = 0.028$). Children with thrombocytopenia who were transfused and died had little or no post-transfusion increase in platelets, in contrast to those who survived. Freshness of transfused whole blood, construed from expiration dates, correlated with greater platelet recovery and improved survival. **DISCUSSION/SIGNIFICANCE OF IMPACT:** The role of platelets in malaria pathophysiology is complex and incompletely understood; prior studies describe preferential binding of platelets to parasitized erythrocytes and direct parasitocidal activity, whereas others detailed deleterious effects in malaria involving the central nervous system vasculature. These findings point to a potential clinical role for platelet-directed transfusion strategies to improve survival in children with severe falciparum malaria, which should be further assessed in randomized interventional studies.

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TL1 Team Approach to Peripartum Obsessive-Compulsive Disorder: a meta-analysis of the perceived impact of gestation and delivery on symptomatology

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OBJECTIVES/GOALS: Obsessive compulsive disorder (OCD) is a serious and impairing disorder. The peripartum is associated with

changes in pre-existing OCD, including exacerbation and improvement of the disorder. This meta-analysis seeks to understand the proportion of women reporting a change in OCD during this time. **METHODS/STUDY POPULATION:** Nine studies with independent samples examining change in obsessive-compulsive symptomatology (OCS) in the peripartum were included in the meta-analysis. Studies were included if the sample examined with women with a clinical diagnosis of OCD that pre-existed pregnancy onset. The meta-analysis was conducted using R Studio with Meta, Metafor and WeightR packages. A moderation analysis was conducted to examine the impact of gestational period on OCD symptoms. Gestational periods were defined as pregnancy, postpartum, or the peripartum. Peripartum refers to a collapsed postpartum/pregnant period such that the period was not identified or specified during data collection. **RESULTS/ANTICIPATED RESULTS:** The summary proportion of women who experienced no change in symptoms was 46.7% (CI: 42.0-51.4%). No change by period was: pregnancy 49.6% (CI: 36.3-62.9%); postpartum 45.6% (CI: 41.4-49.9%); peripartum 52.4% (CI: 42.4-50.3%). The summary proportion of women who experienced exacerbation was 39.2% (CI: 33.5-45.5%). Exacerbation by period: pregnancy 35.5% (CI: 24.8-47.9%); postpartum 42.9% (CI: 34.8-51.4%); peripartum 34.6% (CI: 23.7-47.4%). The summary proportion of women who experienced improvement was 11.5% (CI: 9.3-14.4%). Improvement by period: pregnancy 42.9% (CI: 14.7-77.0%); postpartum 7.8% (CI: 5.7-10.4%); peripartum 19.6% (CI: 13.7-27.3%). Gestational period had a moderating effect. **DISCUSSION/SIGNIFICANCE OF IMPACT:** During the peripartum 46% report no change, 40% a worsening and 12% an improvement. Improvement typically occurs during pregnancy and may be followed by a postpartum worsening. This may reflect a hormonally-sensitive subsection of women impacted by the acute changes that occur during this time.

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Twenty-four-hour Urinary Sodium Excretion Estimated from a Spot Urine Sample May Be Used as an Indicator of Intake in CKD Patients

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OBJECTIVES/GOALS: Sodium (Na) intake can elevate blood pressure and is a factor in developing chronic kidney disease (CKD). Twenty-four-hour urinary Na (24hUNa) is the gold standard for assessing Na intake but is burdensome. Validated equations estimate 24hUNa (e24hUNa) from a spot urine sample, but these estimations are not validated against a known Na intake in CKD. **METHODS/STUDY POPULATION:** The current study is a secondary analysis of a 9-day controlled feeding study in moderate CKD patients matched to healthy adults. Only CKD patients were used for the current analyses ($n = 8$). Participants consumed a controlled diet for 9 days, providing ~ 2400 mg Na/d as determined by inductively coupled plasma optical emission spectroscopy (ICP). On days 7 and 8, participants collected all urine in an inpatient setting, beginning with a fasting sample on day 7. Urine sample mineral analyses were performed by ICP and urinary creatinine by the Jaffe reaction. The day 7 fasting urine sample was used to calculate e24hUNa using 6 published equations. Log-transformed Na intake, measured 24hUNa, and e24hUNa were compared by repeated-measures ANOVA with planned contrasts using SAS. **RESULTS/**

ANTICIPATED RESULTS: Fifty percent of the CKD patients ($n = 4$) were female; 63% ($n = 5$) were white, and 37% ($n = 3$) were black. On average, participants were aged 56.6 ± 13.8 y with a BMI of 31.7 ± 9.4 kg/m² and eGFR of 40.7 ± 7.9 mL/min. Based on actual food intake, average Na intake on day 7 was 2024 ± 388 mg. Average measured 24hUNa was 2529 ± 1334 mg. The main ANOVA was significant ($p = 0.02$). Results from the planned contrasts found that e24hUNa from the SALTED cohort, an equation developed specifically for CKD patients, was significantly higher than both Na intake ($p < 0.001$) and measured 24hUNa ($p = 0.007$). For the remaining 5 equations, e24hUNa was not significantly different from measured 24hUNa nor dietary Na intake. **DISCUSSION/SIGNIFICANCE OF IMPACT :** Our results suggest that e24hUNa calculated using most published equations may provide a reliable and low-burden method of assessing dietary Na intake in moderate CKD patients. These findings should be confirmed in larger samples. Additional studies are needed to validate or dispute the use of the SALTED equation for estimating Na intake.

Commercialization/Entrepreneurship

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An innovative rib construct for treatment of pediatric spinal deformity

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OBJECTIVES/GOALS: The rib construct is a novel device for treating childhood hyperkyphosis and kyphoscoliosis. The purpose of this study was to investigate the biomechanics, mechanism, and clinical outcomes of this device. The overarching hypothesis was that the rib construct is safe and effective for correcting hyperkyphotic spinal deformity. **METHODS/STUDY POPULATION:** **Biomechanical evaluation:** An *ex vivo* porcine spine biomechanical study compared traditional pedicle screw proximal fixation to the rib construct in terms of proximal fixation strength and construct stiffness. **Porcine model hyperkyphosis correction with rib construct:** An *in vivo* hyperkyphotic porcine model was used to study the ability of the rib construct to correct hyperkyphosis in the developing porcine spine. **Human hyperkyphotic correction with rib construct:** A retrospective study was conducted to examine the radiographic outcomes, complication rates, procedure times, and blood losses experienced by human patients that received rib construct surgery. **RESULTS/ANTICIPATED RESULTS:** **Biomechanical evaluation:** The rib construct was significantly less prone to proximal fixation failure and less stiff compared to pedicle screws. **Porcine model hyperkyphosis correction with rib construct:** The average T6-T14 thoracic kyphosis was $35.8 \pm 3.2^\circ$ at the time of hyperkyphosis creation surgery. In response to corrective surgery with the rib-hook construct, T6-T14 thoracic hyperkyphosis decreased immediately post-op to $11.3 \pm 7.8^\circ$ and continued to decrease to $7.8 \pm 7.6^\circ$ until final follow-up 8 weeks post-op ($n = 3$). **Human hyperkyphosis correction with rib construct:** Pre-op sagittal Cobb angle was $81 \pm 31^\circ$ and fell to $43 \pm 24^\circ$ post-op and to $38 \pm 24^\circ$ at final follow-up; indicating ~100% correction (normal thoracic kyphosis is 40°). **DISCUSSION/SIGNIFICANCE OF IMPACT:** The results suggest that the rib construct is a highly effective technique and superior to existing methods.

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Translational Characterization of Blood Pressure Changes Following the DASH Diet- from Nutrition to Electrolytes to Exosomes

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OBJECTIVES/GOALS:

1. analyze urinary protein exosome content pattern before and during DASH diet.
2. characterize urine electrolyte changes associated with changes in protein profiles, and hormonal changes before/after DASH diet.
3. analyze the association of these changes to the DASH-related BP response.

METHODS/STUDY POPULATION: In this proof of concept study, hypertension stage 1 volunteers will receive a DASH based menu during 14 consecutive days of elective admission to the RU research hospital. Participants will complete a food frequency questionnaire (VioScreen) with a bionutritionist. Throughout the intervention period, participants will be assessed for blood pressure, plasma renin and aldosterone, and 24 hour urines for electrolytes, creatinine, protein, albumin and first morning urine collected for exosomes. Exosome analysis will be performed by a commercial lab. Proteome analysis will be conducted in the RU Mass-spectrometry service. **RESULTS/ANTICIPATED RESULTS:** The causal pathway we will elucidate hypothesizes that: 1) changes in diet affect blood electrolytes, and through these, aldosterone. 2) Aldosterone alters the expression of specific transporter proteins in the renal tubule; protein expression will be reflected in the urine exosome. 3) These transporters affect the excretion of electrolytes, as reflected by urinary ratio of sodium (Na) to Potassium (K). During consumption of the Western diet, the Na/K ratio is approximately 2-2.5, whereas we expect the urinary sodium/potassium ratio to be < 1 , when the participant is eating a DASH based diet. **DISCUSSION/SIGNIFICANCE OF IMPACT:** This assay provides a clinical tool to assess dietary adherence, and the project will provide insights into the mechanism whereby DASH reduces blood pressure.

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Development of a Catheter Stabilization Device for Stent Placement Aid

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OBJECTIVES/GOALS: Precisely, the goal of the device is to initiate a friction force between the delivery system and the arterial vessel wall to both assure immediate stent deployment and prevent axial advancement of the stent-anchoring wire. **METHODS/STUDY POPULATION:** A prototype was constructed and its effectiveness of applying a friction force to a vessel wall was tested *ex vivo* using an LRX Plus Materials Testing Machine. Afterwards, the experimental performance of the device was compared to that of a finite element simulated model. **RESULTS/ANTICIPATED RESULTS:** The device demonstrated the ability to apply a friction force to the vessel wall to meet its objective. However, experimental values were consistently greater than those gathered from the simulation. Since the force prescribed by the device is minimal, future work includes increasing the