

IMPRS Award Winners

Beyond Joint Hypermobility: Investigating Bladder Dysfunction in Hypermobile Ehlers-Danlos Syndrome

Marium Ansari, Mallory Pine, Viktoriya Sapkalova, Emily Brodowsky, Charles R. Powell, Ramzy T. Burns

Background and Objective: Hypermobile Ehlers-Danlos Syndrome (hEDS) is the most common subtype of Ehlers-Danlos Syndromes, a group of heritable connective tissue disorders caused by collagen abnormalities. While musculoskeletal features of hEDS are well documented, its impact on visceral organs, including the bladder, remains underexplored. Despite frequent patient reports of urinary symptoms, a definitive link between hEDS and bladder pathology has not been established. This study aims to characterize lower urinary tract symptoms (LUTS) and urodynamic (UDS) findings in patients with hEDS to better understand potential mechanisms underlying bladder dysfunction in this population.

Methods: A retrospective chart review was conducted on patients with hEDS who underwent video UDS at a single tertiary-care center between 2022-2025. Inclusion criteria included age >18 years, confirmed hEDS diagnosis (2017 criteria), and completed UDS.

Data were analyzed using Welch's t-test and Fisher's Exact Test.

Results: Among 27 patients, the mean age at hEDS diagnosis was 30.9 years (range 18-49), 92.6% (n=25) were female, and 92.6% (n=25) were white. Common LUTS seen in these patients included urinary frequency in 74.1% (n=20), urinary incontinence in 14.8% (n=4), frequent urinary tract infections in 25.9% (n=7), bladder pain in 33.3%(n=9), nocturia in 48.1%(n=13), and weak urinary stream in 51.8% (n=14) of patients. UDS findings revealed no evidence of detrusor overactivity, stress urinary incontinence, abnormalities in bladder compliance, or incomplete bladder emptying. Pelvic floor dysfunction was seen in 18.5% (n=5) with active EMG noted during emptying. Pelvic floor physical therapy was the most common intervention recommended, followed by beta-3 agonists for overactive bladder symptoms.

Conclusion: Our study shows that LUTS are prevalent in patients with hEDS, with findings suggesting pelvic floor and muscular dysfunction as primary contributors rather than classic bladder pathology. These results support a pelvic floor-focused approach to evaluation and management in hEDS patients.

Claude Smith Black, MD, Award for Outstanding Work in Research

Intersecting Burdens: Exploring Social Drivers of Food Insecurity in Congestive Heart Failure Patients in Northwest Indiana

Shivam Bhargava, Jonathan Guerrero, Baraka Muvuka

Introduction: Congestive heart failure (CHF) affects 6.7 million Americans, costing over \$30 billion annually. CHF is targeted by the Hospital Readmissions Reduction Program due to 30-day readmission rates of 20-25%. Food insecurity disproportionately affects those below the poverty line and is associated with increased CHF morbidity and mortality. In Northwest Indiana (NWI), nearly 100,000 individuals experience food insecurity. There is limited research on intersections between food insecurity and other Social Determinants of Health (SDOH) in CHF patients. This study investigated SDOH and clinical factors associated with food insecurity in CHF patients.

Methods: This retrospective cross-sectional study analyzed data from CHF patients screened for food insecurity through EPIC-based SDOH screenings at 3 urban hospitals in NWI between January 2021 and March 2025. Descriptive, bivariate (Chi-Square and Mann-Whitney U, $p < 0.05$), and multivariate (logistic

regression; $p < 0.05$) analyses were conducted using IBM SPSS V. 31.0. The study was exempted by Indiana University (IRB #14040).

Results: The sample consisted of 11,874 CHF patients, with 5.1% experiencing food insecurity. Among patients with food insecurity, 35.4% were Black, 59% had high housing risk, and 71.2% reported stress. Bivariate analysis revealed significant associations ($p < 0.05$) between food insecurity and age, ethnicity, race, language, veteran status, insurance type, family income, financial resource risk, housing risk, intimate partner violence risk, stress, transportation needs, cumulative social risk, hospital, smoking, suicide risk, and BMI. In multivariate analysis, medium (OR = 4.61) and high (OR = 5.05) financial resource risk, high housing risk (OR = 3.24), stress (OR = 6.54), and unmet transportation needs (OR = 3.22) were associated with higher odds of food insecurity.

Conclusion: This study highlights the intersection of food insecurity and other SDOH among CHF patients. Findings will inform an ongoing community-health system-academic partnership to explore lived experiences of food insecurity and connect hospitalized CHF patients with medically tailored community food sources.

**Hazel and Tommy Thompson
Cardiac Research Scholarship**

Generation of Affinity Reagents for the Study of Photoreceptor Neurons

Ameë Punater, Kaitlyn Shook, Sanae Imanishi, Yoshikazu Imanishi

Background: Photoreceptor cells are highly polarized neurons with distinct compartments essential for visual function. Their outer segments contain specialized ciliary membranes, called disks, that detect photons. Actin contributes to disk morphogenesis, while rhodopsin, a transmembrane photopigment, is a major component of disks involved in phototransduction. Conventional fluorescence microscopy (200-300 nm resolution) is suboptimal for visualizing these subcellular structures (5–100 nm). The goals of this project are to enhance fluorescence microscopy resolution and refine protein labeling strategies to visualize actin and rhodopsin dynamics during disk formation. By generating recombinant affinity reagents (nanobodies and class-switched IgG), we aim to probe actin filaments in photoreceptor outer segments.

Methods: The DNA sequences encoding actin nanobody and its derivative were PCR-amplified and incorporated into the PET22B vector. Genetically modified nanobodies were expressed in BL21 E. Coli for high-yield production, efficient purification, and detection via fluorescent tags or secondary IgG antibodies. In addition, a recombinant monoclonal

antibody against rhodopsin was produced by introducing two expression vectors, coding 1D4 IgG heavy and light chains, to ExpiCHO cells. Western blotting was employed to measure the quality and quantity of these nanobodies and antibodies. These affinity reagents were used for immunofluorescence microscopy of mouse retinal sections with the Nikon AX R NSPARC super resolution confocal microscope.

Results: We successfully produced a recombinant rabbit monoclonal antibody against rhodopsin (1D4 mAb) in ExpiCHO cells. Based on immunoblotting analysis, we estimate approximately 1 mg of antibody is present in 35 ml of culture. The antibody labeled mouse rod outer segment structures, indicating it is specific to rhodopsin. We are currently attempting to express actin nanobodies in E. coli cells for fluorescence imaging.

Conclusion: The successful staining of actin and rhodopsin in the outer segment of photoreceptors help reveal their spatial relationship during disk morphogenesis, highlighting a potential interplay between cytoskeletal elements and membrane proteins. This discovery offers new insight into how photoreceptor architecture is built and maintained, offering a foundation for understanding mechanisms linked to photoreceptor dysfunction and degeneration in diseases including retinitis pigmentosa and other inherited retinal dystrophies.

Excellence Award: Ophthalmology Research

Predicting Deep Vein Thrombosis in Glioblastoma: A Competing Risk Regression Analysis

Tushar Sardesai, Matthew Pease

Background: Glioblastoma multiforme (GBM) patients face a high risk of developing venous thromboembolism (VTE), such as deep vein thrombosis (DVT). VTE is linked to worse survival. Typical DVT treatment is anticoagulation, but 25% of GBM patients suffer major intracranial bleeding within 1 year. This study addresses a research gap by assessing both genetic and clinical variables to predict DVT development in GBM patients. Objective: Identify DVT predictors in GBM using clinical and next-generation sequencing (NGS) data

Methods: This retrospective cohort study analyzed clinical/NGS data from GBM patients at University of Pittsburgh Medical Center from 2008-2020. NGS data included 32 genes. To account for the competing risk of death, common in GBM patients, Fine-Gray CRR (Competing Risk Regression) models were used. An unadjusted cumulative incidence function (CIF) curve

showed lifetime DVT risk. Univariate, multivariate, and backwards stepwise selection CRR analyses were performed to identify significant DVT predictors.

Results: Of 578 patients with NGS data, 87 developed DVT, 367 died, and 124 were censored (lack of follow-up). 1-year cumulative incidence of DVT was 14% with median survival of 10 months. Avastin (bevacizumab) use, increased BMI, and a TP53 mutation were significant predictors of increased DVT risk (p1) in the final stepwise selection model. In a 3- predictor model, Avastin and BMI remained significant, with a 2.48- and 1.03-fold increased DVT risk, respectively. Adjusted CIF curves for Avastin and BMI showed a 5.6% and 2.7% increased DVT risk 1-year post-surgery, respectively. Although TP53 had a p-value of 0.053, its significance in the broader stepwise model indicates predictive power among other variables.

Conclusions: Avastin use, increased BMI, and a TP53 mutation predict DVT risk in GBM patients, supporting a clinical-genetic risk tool for DVT prediction. This combined model can guide clinical trials to include DVT treatment for high-risk GBM patients post-surgery, improving survival.

**William H. and Fern L. Hardiman
Scholarship**

Modeling Inflammaging of the Bone Marrow Microenvironment Stimulates Multiple Myeloma Associated Stem Cells

Krishi Thaker, Piper Wilburn, Noriyoshi Kurihara, Attaya Suvannasankha, Conner Quinlan, Miloš Marinković

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