well as blood pressure-, lipid-, and glucose-lowering medications. RESULTS/ANTICIPATED RESULTS: After stringent Bonferroni correction for multiple testing, four TMA-associated metabolites as well the TMA score were significantly associated with diastolic function. TMAO was inversely associated with IVRT (ß = −0.002 (0.00); p-value = 2.00E-03). Betaine (ß = 0.40 (0.08); p-value = 2.10E-07), carnitine (ß = 0.30 (0.07); p-value = 7.80E-05), dimethylglycine (ß = 0.27 (0.07); p-value = 3.00E-04), and the TMA score (ß = 0.10 (0.02); p-value = 3.40E-05), were positively associated with the septal E/e' ratio. No significant associations were observed between metabolites or metabolite composite scores from the TMA pathway and the E/A ratio or DT. DISCUSSION/SIGNIFICANCE OF IMPACT: This is the first population-based study to assess the role of TMA-associated metabolites in left ventricular diastolic function. Betaine, carnitine, dimethylglycine, and a metabolite score combining serum metabolites from the TMA pathway were positively associated with the septal E/e' ratio, suggesting that a higher concentration of TMA-associated metabolites correlates with impaired diastolic function. These results suggest that both individual and grouped metabolites from the TMA pathway may serve as early biomarkers for pre-clinical diastolic dysfunction, an important causal factor for HFpEF. Future longitudinal, multi-omic studies incorporating microbiome, metabolomic and dietary analyses are needed to characterize the risk of ventricular diastolic function and HFpEF in the setting of exposure to TMA-associated metabolites.

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Sex Differences in Vitamin D and Urinary Stone Disease

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OBJECTIVES/SPECIFIC AIMS: More men than women develop urinary stones and their prevalence alters in women with menopause suggesting a steroidal influence. In men the incidence of stones is highest during July and August suggesting that environmental factors such as Vitamin D (VitD), a steroid, may affect stone formation. Previous studies have found differences in the development of stones between men and women; however, the reasons for sex differences in stone formation and type remain unclear. METHODS/STUDY POPULATION: We examined VitD levels in men and women (n = 18,753) that had no diseases based on a lack of an ICD-9 or ICD-10 code in their electronic medical record. We found that normal, healthy women had significantly higher levels of sera VitD compared to men (p = 6x10-6). We then examined whether sex differences existed for key endpoints/data from the Mayo Clinic Urinary Stone Disease (USD) Registry, which has around 1,600 urinary stone patients that are well-phenotyped according to sex, age and stone type. RESULTS/ANTICIPATED RESULTS: Control women were found to have higher sera VitD levels than men, but the sex difference no longer exists in kidney stone disease patients. When we further separated by race, we found that differences in VitD levels reappeared; this suggests that race also plays a role in sera VitD variances. DISCUSSION/SIGNIFICANCE OF IMPACT: We are developing a disease severity score, which we will use to correlate to sera VitD levels in patients according to sex, age and race. Future analyses will take into account whether subjects had VitD and calcium supplementation. This project begins to explore the mechanism behind the sex differences known to exist in urinary stone disease, which is critically needed to provide improved diagnosis and therapy for this debilitating disease.

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Temporal Trends and Outcomes of Opioid Abuse among Adolescents & Young Adult Sickle Cell Disease Patients

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OBJECTIVES/SPECIFIC AIMS: In this study, we aim to describe temporal trends in opioid abuse among adolescents and 11-21years and young adults 22-35years with Sickle cell disease hospitalized for sickle cell crisis. We also aim to evaluate clinical and healthcare utilization outcomes of opioid abuse in the same population. In addition, we hope to assess for difference in effect by age category. METHODS/STUDY POPULATION: Our study is a cross-sectional study of data secondarily sourced from the 2007-2014 National Inpatient Sample(NIS), a component of the Healthcare Utilization Project (HCUP). Variables were identified using ICD-9-CM codes. We selected inpatient stays for patients aged 11-35 years admitted for sickle cell crisis. Opioid abuse was the primary outcome of interest. Secondary outcomes were inpatient mortality, total charge, length of stay and select clinical outcomes. We analyzed our data for trends and outcomes. We performed trend analysis of prevalence rates between 2007-2014 by age categories. Propensity-Matched Score regression models were deployed to assess for associations between opioid abuse and outcomes while adjusting for relevant covariates. Sub-group analysis of opioid abuse by age was assessed for outcomes of interest. Trend analysis was performed on Joinpoint Software v4.6.0, (National Cancer Institute, NIH, Bethesda, MD). Outcome analysis was performed on SAS v9.4 (SAS Institute, Cary, NC). Statistical significance was set at 95% and p-value of 0.05, two-tailed. RESULTS/ANTICIPATED RESULTS: Of 86,827 inpatients admitted for sickle cell crisis, 2,363 (2.73%) had a diagnosis of opioid abuse while 84,464 (97.27%)did not abuse opioids. 27,004 (31.01%) of admitted patients were 11-21 years while 59,823 (68.99%) were 21-35 years. We found statistically significant APCs (Annual Percentage Change) showing increasing trends in both age categories for years under review, (18.47% [95% CI 15.39-21.63]; p-value <0.001 in young adults vs. 10.31% [95% CI 3.58-17.49]; p-value 0.009 in adolescents). The difference in APCs between both age categories were also significant (−8.16% [95% CI [−14.26-2.05]; p-value 0.009). There were no parallelism or coincidence in the trend lines. Opioid abuse was found to be associated with significantly longer length of stay (7.74 vs 6.05 days), higher total charge ($40,797 vs $32,164), (aOR 1.44; 95% CI [1.19-1.75]) seizures, sepsis (aOR 1.62; 95% CI [1.35-1.94]) and pulmonary hypertension (aOR 1.36; 95% CI [1.12-1.66]). No significant association was found for inpatient mortality, transfusion, cardiac dysrhythmias, pulmonary embolism and acute kidney injury. Significant interaction existed between opioid abuse and age for total charge (for $41,869 vs $29,371 among adolescents & $40,632 vs $32,550 among young adults; interaction p-value 0.03). DISCUSSION/SIGNIFICANCE OF IMPACT: Trends show a significant increase in the prevalence of opioid abuse among adolescents and an increasingly higher prevalence when adolescents transition to young adults. Opioid abuse among sickle cell patients is associated with significant poor healthcare resource utilization and clinical outcomes. Public health

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