

glaucoma in this dataset and performed a genome-wide association study (GWAS) adjusting for age, sex, and significant Principal Components and stratifying by self-reported race (White / Black). RESULTS/ANTICIPATED RESULTS: Of 8179 respondents passing quality filters, 6409 (78.40%) were white and 985 (12.05%) were black. Self-reported glaucoma prevalence was 7.85% and 16.34% in white and black respondents, respectively. White respondents had a mean age of 76.97 (SD 7.53) and were 57.25% female. Black respondents had a similar mean age of 74.96 (SD 7.27) and were 62.54% female. More than 87% of both groups were assessed in 2012. Preliminary GWAS analyses did not replicate known glaucoma loci and no variants attained genome-wide significance. A suggestive variant ( $p < 1e-05$ ) in the black population was within 10kb of a known locus, rs1196998. Future analyses will evaluate genetic association with combinations of glaucoma and comorbidities. DISCUSSION/SIGNIFICANCE OF IMPACT: Glaucoma risk is higher in minority groups than in whites, and the majority of reported genetic studies of glaucoma have been performed in individuals of European descent. It is imperative to better understand the role of genetics, environment, and health behavior in glaucoma risk. Further, understanding common mechanisms underlying diseases that co-occur with glaucoma could illuminate novel disease mechanisms that can be targeted for early intervention and/or treatment.

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### Characterizing the top 100 articles in benign prostatic hyperplasia literature using bibliometric analysis

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OBJECTIVES/SPECIFIC AIMS: The prevalence of BPH, coupled with associated disability ranging from quality of life impairments to hospitalization, has spurred decades of research into its pathophysiology, diagnosis, treatment, and outcomes. For these reasons, we conducted a study to characterize the current landscape of BPH literature, including the most commonly cited articles impacting the field. METHODS/STUDY POPULATION: We used the Web of Science™ databases to conduct a bibliometric analysis of the top 100 leading BPH articles. Bibliometric analyses are quantitative approaches examining the impact of academic literature. We used the following search terms: 'benign prostatic hyperplasia' and 'benign prostatic enlargement.' We identified and characterized the 100 most-cited BPH articles including their citations, journal, author, year, and country through September 2018. RESULTS/ANTICIPATED RESULTS: The top 100 BPH articles were published between 1978 and 2012. The number of citations ranged from 143 to 2,158 across 26 different journals, including 9 urology-specific journals. The Journal of Urology (5-year impact factor: 4.91) was the most published journal with 26 articles, followed by European Urology (5-year impact factor: 15.66) with 16, and Urology (5-year impact factor: 2.39) with 13. The oldest 10 articles in the top 100 mainly focused on BPH etiology/pathogenesis, while the newest 10 articles mainly focused on medical treatment. The 1990's was the most productive decade accounting for nearly half of the top 100 articles (n=46). Eight authors had two or more first author publications, and 8 institutions had five or more publications in the top 100. Thirteen different countries were represented in the top 100 articles, with the US (n = 64), Italy (n=7), and Germany (n=5) being the most common. The articles were published in the

following Web of Science Categories: Urology & Nephrology (n=68), Medicine, General & Internal (n=15), and Endocrinology & Metabolism (n=7). DISCUSSION/SIGNIFICANCE OF IMPACT: This study represents the first bibliometric analysis of the leading 100 BPH articles impacting the academic literature. The literature focus has evolved from BPH pathogenesis/etiology to treatment, and was primarily published in 3 specialty journals. Our findings highlight the most impactful BPH literature, and may be used to guide research and funding priorities for this increasingly common condition.

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### Genetic variants in gestational diabetes mellitus

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OBJECTIVES/SPECIFIC AIMS: This study aims to identify genetic biomarkers of GDM and facilitate the understanding of its molecular underpinnings. METHODS/STUDY POPULATION: We identified a cohort of mothers diagnosed with GDM in our longitudinal birth study by mining Electronic Health Records of participants utilizing PheCode map with ICD-9 and ICD-10 codes. We verified each case using ACOG's GDM diagnosis criteria. RESULTS/ANTICIPATED RESULTS: Whole genome sequencing (WGS) data were available for 111 confirmed cases (out of 205) and 706 controls (out of 1,429) from different ancestries (412 EUR, 256 AMR, 56 EAS, 26 SAS and 18 AFR; 49 OTHER). SAS had the highest incidence of GDM at 38.46% and EUR had the lowest at 6.55%. We performed logistic regression using computed ancestry, age and BMI as covariates to determine if any variants are associated with GDM. The top variant (rs139014401) was found in an intron of DFFB gene, which is p53-bound and regulates DNA fragmentation during apoptosis. We will investigate the robustness of 49 identified variants and will separate the cohort by ancestry to detect population-specific differences in the top loci. DISCUSSION/SIGNIFICANCE OF IMPACT: Identification of molecular biomarkers in GDM across different ancestral backgrounds will address a gap in current GDM research. Findings may enhance screening and enable clinicians to identify those at risk for developing GDM earlier in the pregnancy. Early management of mothers at risk may lead to better health outcomes for mother and baby.

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### Glycemic Control and Diabetic Peripheral Neuropathy Among Patients on Prescription Opioid Pain Medications in Western New York: Using Data Analytics for Quality Assessment

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OBJECTIVES/SPECIFIC AIMS: I would like to make clinicians aware about prescription opioid use and glycemic control among patients with diabetes. This is a quality of care issue that increases the disease burden for two conditions opioid dependence and diabetic complications. Big data analytics can bring out this quality of care issue and help in changing clinical practice through precision medicine METHODS/STUDY POPULATION: This is a population

health study of patients on prescription opioid pain medications in Erie county medical center and local out patient clinic. The electronic data from the hospital records and Outpatient were collected, merged and de identified. The database was saved in a protected environment and made accessible to researchers through a secure login. The data was queried for the number of patients with diabetes. The glycohemoglobin levels were collected and then the analysis was made RESULTS/ANTICIPATED RESULTS: It was found that only 63 of the 89 patients with DPN and 156 of the 570 patients without DPN had any measurement of HbA1c in our data. It was found that 86 out of 156 patients without DPN had suboptimal glycemic control with a glycohemoglobin level > 7% while 36 out of 63 patients with DPN had a glycohemoglobin > 6.7%. The odds of patients with DPN having poor glycemic control is 0.57 while the odds of having poor glycemic control without DPN is .55. The relative risk being 1.03. DISCUSSION/SIGNIFICANCE OF IMPACT: Our population study revealed suboptimal glycemic control among a large set of patients in Western New York with a diagnosis of diabetes mellitus and a concurrent prescription for an opioid pain medication. A significant percentage of patients in our study population with a diagnosis of DPN might benefit in terms of decreased painful symptoms of neuropathy from monitoring and attempting to improve glycemic control. Additionally, in our patient population, there were no patients with diabetic peripheral neuropathy prescribed pregabalin or duloxetine, the first-line FDA-approved medications for painful DPN. Based on our population study, the quality of care for diabetic patients with DPN who are prescribed opioid pain medications should be monitored closely. First-line, FDA approved anticonvulsants and antidepressants should be considered for the treatment of painful symptoms when necessary. Attention should be directed towards monitoring and improving glycemic control in patients without DPN receiving opioid pain medications to attempt to prevent or delay the microvascular complications of diabetes, including the onset of painful peripheral neuropathy.

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### Measuring the Autonomic Nervous System for Translational Research: Identification of Non-invasive Methods

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OBJECTIVES/SPECIFIC AIMS: The objective of this study is to identify and categorize non-invasive measurement methods for autonomic nervous system (ANS) symptoms that develop in hypoglycemic episodes. METHODS/STUDY POPULATION: We first reviewed literature for hypoglycemia symptomatology. We then performed a selective literature review of Google Scholar, PubMed and Scopus for an ANS symptom and/or synonyms and the words 'sensor' or 'detection', e.g. 'sweat sensor' and 'tremor detection', studies utilizing non-invasive measurements in DM, and datasets of non-invasive measurements in DM. Measurement methods were then organized based on the ANS symptoms and existing metadata models for harmonizing sensors and surveys. RESULTS/ANTICIPATED RESULTS: We identified several measurement methods to for ANS symptoms during hypoglycemic events: thermometer, accelerometer, electrocardiogram (ECG), galvanic skin response (GSR), image processing, infrared imaging, thermal actuator, and ecological momentary assessment (EMA). The stage of implementation varied across the measurement methods from under development, to use in research and clinical settings, and even commercially available

consumer products. Measurement methods that could be worn as wrist-band wearables or as film-based epidermal sensors would be capable of automatically gathering data with little to no effort required of the person wearing the device. Image-based methods would require the individual to actively engage in generating a photograph for analysis. In the case of EMA's, a message containing a question is sent to the individual, often via text message, soliciting short and immediate responses. It is anticipated that one sensor alone would not be sufficient to measure ANS responses to hypoglycemia, but rather several data points would be required. For example, if the GSR was the only signal, sweat in response to vigorous exercise or a warm environment would inject noise into the signal. Including the accelerometer data would allow for the identification of body movement which would indicate exercise, while an ECG signal could confirm the exercise. DISCUSSION/SIGNIFICANCE OF IMPACT: Impaired awareness of hypoglycemia (IAH) is a complication that develops in about 30% of type 1 DM and 10% type 2 DM populations. In individuals with intact awareness of hypoglycemia, the ANS leads to symptoms which includes: shaking, trembling, anxiety, nervousness, palpitation (i.e. change in heart rate and/or function), clamminess, sweating, dry mouth, hunger, pallor (i.e. drop in blood flow and/or skin-surface temperature), and pupil dilation. IAH is defined as the onset of hypoglycemia before the appearance of autonomic warning symptoms. IAH is caused by repeated exposures to low blood glucose levels, which reduces the body's ability to sense hypoglycemia, and therefore it is difficult for patients to recognize and self-treat. Individuals with IAH are six times more likely to experience severe hypoglycemia, an emergent condition which can lead to unconsciousness, seizure, coma, and death. Clinical investigators are developing interventions that aim to improve awareness of hypoglycemia. Surveys, observations by clinicians, and laboratory tests, often carried out in highly controlled in-patient settings, are currently used to assess the severity of IAH and the ANS's ability to respond to hypoglycemia. In other disease states, for example heart disease and Parkinson's disease, electrocardiograms and accelerometers have been used to assess heart function and tremor, respectively. However, there is currently a barrier to examining the efficacy of IAH interventions in real world settings as there are no established objective and non-invasive means to measure ANS symptoms due to hypoglycemia. This work encompasses the first important step necessary to direct translational researchers interested in testing the efficacy of IAH interventions and developing diagnostic tools for IAH in real-world studies outside the clinic. Next steps include evaluating these sensors and specifying EMA surveys, designing studies, and integration and assimilation of these data streams to identify true events of IAH by leveraging informatics platform such as the Utah PRISMS Informatics Ecosystem. Investigators would then be able to conduct studies that aim to develop and validate models that take sensor and EMA data as the input to detect and assess the severity of IAH.

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### Readability of online patient education materials on gynecologic malignancies from major medical associations

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OBJECTIVES/SPECIFIC AIMS: Patients are increasingly using online materials to learn about gynecologic cancer. Recent studies demonstrate that 85-96% of patients with a gynecologic malignancy