participants were diagnosed with Long Covid, and where they received Long Covid treatment. RESULTS/ANTICIPATED RESULTS: Of 1124 participants, 98 (8.7%) report having a healthcare provider make a diagnosis of long covid. By arm, 6.9% (39/564) of metformin participants report having a diagnosis for long covid as compared with 10.5% (59/560) of matched placebo controls. The absolute reduction attributable to metformin was 3.6% (95%CI, 0.3% to 7.0%; P=0.031) with a relative risk reduction of 34% (95% CI, 3% to 55%). The metformin cost per long covid case averted was $28 (95%CI, $15 to $306). 10-month follow-up data will be available at the time of presentation as well as an analysis of baseline factors associated with the development of Long-Covid, independent of treatment allocation in the trial. DISCUSSION/SIGNIFICANCE: Metformin reduced the incidence of clinician-diagnosed long covid by 34% in a double-blind randomized placebo-controlled trial, and previous research published in-vitro activity by metformin against SARS-CoV-2 and other RNA viruses. Further investigation of metformin as early treatment for SARS-CoV-2 is warranted.

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Preliminary Results: Prevalence and Pathophysiologic Mechanisms of Amenorrhea Among Women Survivors of the 2014–2016 Ebola Outbreak in Sierra Leone

Crystal Zheng, Robert Garry, John Schieffelin
Tulane University School of Medicine

OBJECTIVES/GOALS: 1. Establish the prevalence of amenorrhea among women Ebola survivors of reproductive age. 2. Determine whether amenorrhea in Ebola survivors is associated with hyperthyroidism, primary ovarian failure, and/or low weight METHODS/STUDY POPULATION: This study will enroll a cohort of 150 women Ebola survivors and 150 uninfected controls from Kenema, Sierra Leone. Participants will complete women's health questionnaires with detailed menstruation history and provide blood samples. Serum levels of thyroid stimulating hormone, follicle stimulating hormone, and albumin will be measured in order to explore the role of thyroid dysregulation, ovarian failure, and low weight in amenorrhea associated with prior Ebola infection. RESULTS/ANTICIPATED RESULTS: Enrollment for the study is still in progress. As of November 14, 2022, 68 female Ebola survivors of reproductive age and 124 uninfected controls have been enrolled. Among this preliminary group, there is a high baseline level of menstrual irregularities in both survivors and controls. Prior to the Ebola outbreak, 97% of all participants reported less than 6 periods per year and 59% reported periods lasting 3 days or less. The prevalence of missed periods increased after the Ebola outbreak in both groups. Four Ebola survivors (5.9%) reported missing periods before infection, compared to 16 (23.5%) survivors after infection. Two uninfected controls (1.6%) reported missing periods before the Ebola outbreak, compared to 12 (9.7%) after the outbreak. DISCUSSION/SIGNIFICANCE: The next steps of this project are to complete enrollment, conduct data analysis, and perform laboratory studies. An enhanced understanding of amenorrhea is needed to develop novel medical interventions, to inform healthcare guidelines and policies, and to develop personalized treatment strategies to better care for women who have survived Ebola.

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Social Anhedonia in the Daily Lives of People with Schizophrenia: Examination of Anticipated and Consummatory Pleasure*

Danielle B. Abel[1], John Schieffelin[2], Kyle S. Minor[2,3]
[1]Indiana University [2]Purdue University, Indianapolis [3]Indiana University

OBJECTIVES/GOALS: Social anhedonia is considered a key feature of schizophrenia that leads to social withdrawal. Research in general anhedonia suggests those with schizophrenia exhibit deficits in anticipated (predicted), but intact consummatory (in-the-moment), pleasure. This study will determine if these temporal differences apply to daily social anhedonia. METHODS/STUDY POPULATION: This project will use experience sampling methods (ESM) to measure real-world social pleasure in people with schizophrenia and healthy controls. Using electronic surveys, participants will predict social activities they plan to do throughout their day and report anticipated pleasure for each. Then, in subsequent surveys, participants will report their consummatory social pleasure shortly after engaging in each of these activities. We will use a time-lagged approach to match anticipated/consummatory pleasure ratings for specific social events and compute a difference score to determine discrepancy. Multi-level modeling will be used to determine if clinical status (schizophrenia/control) predicts anticipated pleasure, consummatory pleasure, and/or their discrepancy. RESULTS/ANTICIPATED RESULTS: Data collection for this project was recently completed. The schizophrenia and control groups (n = 30 per group) were demographically matched for age, sex, race, and ethnicity. Data processing and analyses are currently underway. We hypothesize that, in line with laboratory research in general anhedonia, those with schizophrenia will exhibit deficits in anticipated, but not consummatory, social pleasure throughout their daily lives. Moreover, when anticipated and consummatory pleasure ratings for the same social activities are matched, we expect those with schizophrenia to exhibit larger discrepancies between predicted and in-the-moment pleasure. DISCUSSION/SIGNIFICANCE: This project serves as a critical intermediate step to bridge the gap between laboratory research and patient treatment. ESM bypasses limitations of laboratory studies and increases ecological validity. Results will provide a nuanced understanding of social anhedonia and help identify precise targets to treat social withdrawal in schizophrenia.

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Establishing a histologically defined NAFLD cohort in the Million Veteran Program for further genetic analyses

Samiran Mukherjee, Marijana Vujkovic, Kyong-Mi Chang
University of Pennsylvania

OBJECTIVES/GOALS: Research in Non Alcoholic Fatty Liver Disease Genetics is ongoing. In this project, we aim to: 1.Identify and describe a histological NAFLD Cohort in the MVP Biobank by extracting liver biopsy proven NAFLD patients using natural language processing (NLP) 2.Confirm previously defined NALFD

https://doi.org/10.1017/cts.2023.157

genetic loci (via look up-GWAS) in the histological NLP cohort METHODS/STUDY POPULATION: We will utilize the Million Veteran Program Biobank where a total of 10,959 subjects have been identified using liver biopsy reports in the EMR via CPT codes. Cases will be based on i) steatosis, steatohepatitis, inflammation or fibrosis in liver biopsy reports with ii) exclusion of other causes of liver disease. Controls will be comprised of the general VA population. In collaboration with the Applied NLP and Precision Medicine groups at the VA Informatics and Computing Infrastructure(VINCI); we will attempt to create and validate a histological cohort of NAFLD in the MVP database by: 1)Annotation of biopsy reports for the NLP algorithm 2)Automation/training of the NLP algorithm We will then perform a multi-ancestry genetic lookup of previously established genetic loci among the cases identified. RESULTS/ANTICIPATED RESULTS: Recently published data: the MVP NAFLD research led by Dr. Chang and Dr. Vujkovic had first validated a proxy NAFLD phenotype based on chronic alanine aminotransferase elevation (cALT). A GWAS was then performed using this phenotype which revealed 77 loci of genome-wide significance including 10 established NAFLD- and 52 ALT-associated SNPs were identified. Replication in external Liver Biopsy and Imaging Cohorts validated 17 SNPs of which 9 were novel. Preliminary data on Liver Biopsy reports: Using CPT codes for Liver Biopsy we estimated a total of 10,959 unique patients and 18,812 notes in the MVP biobank. We anticipate 2,000-3,000 NAFLD cases (based on the prevalence of NAFLD in the general population). Initial review reveals 90% concordance between analysts for the purposes of developing an NLP. DISCUSSION/SIGNIFICANCE: NAFLD is a major cause for morbidity and mortality in liver disease. Gold standard for diagnosis is based on biopsy. GWAS studies with biopsy proven phenotypes are limited. The study will aim to isolate a histologically defined NAFLD cohort in MVP to conduct further GWAS that can provide new clinically relevant knowledge for future research.

Contemporary Research Challenges

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Development and content validation of a tool to assess quality of primary care practice

Carolyn A. Berry, Lorraine Kwok, Margaret Paul, Stephanie L. Albert, Saul Blecker, Donna Shelley
New York University Grossman School of Medicine

OBJECTIVES/GOALS: Primary care practices struggle to identify which combination of care structures and processes need to be implemented to improve practice performance and subsequently, patient outcomes. The goal of this study is to develop and validate a tool to assess care structures and processes that are associated with better quality and patient outcomes. METHODS/STUDY POPULATION: Data from a scoping review, Delphi study, and qualitative interviews with high-performing primary care practices contributed to the development and content validation of the Tool for Advancing Practice Performance (TAPP). From these sources we identified 314 items representing care structures (e.g., care team makeup, use of electronic health records) and processes (e.g., care coordination, panel management). We developed criteria for deleting and rescuing items and received input from our expert panel to refine the pool of items. We eliminated items that were redundant and lacked clarity/specificity. The tool was further modified based on feedback from cognitive interviewing and pilot testing with practice managers, quality improvement leaders, and physicians from primary care practices. RESULTS/ANTICIPATED RESULTS: The pool of 314 items was winnowed to 188 after applying criteria for deleting and rescuing items. During the expert review, 70 items were eliminated and 8 new items were added, resulting in a working tool of 126 items. We conducted eight cognitive interviews with the 126-item tool and received feedback on the content, item structure, and language, which led to the elimination of 13 items that were poorly or incorrectly understood by respondents. We also modified the language of 23 items for clarity. After cognitive interviewing, the resulting tool comprised 113 items. Fifteen practices piloted the tool and no additional items were eliminated. We modified the instructions for completing the tool and resolved technical issues related to online administration. DISCUSSION/SIGNIFICANCE: TAPP is a novel tool for assessing care structures and processes that are associated with better quality and patient outcomes in primary care settings. The tool can be used by researchers and primary care clinicians to identify areas for improvement in practice performance and patient outcomes related to chronic disease prevention and management.

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Effect of probiotic supplementation on intestinal permeability in subjects with overweight and obesity: A systematic review of randomized controlled trials

Zachary DiMattia[1], Janhavi Damani[1], Connie J. Rogers[2]
[1]Penn State University, [2]University of Georgia

OBJECTIVES/GOALS: Obesity is associated with gut dysbiosis, inflammation, and increased intestinal permeability. Probiotic consumption may reverse these outcomes. The goal of this study is to evaluate the evidence linking probiotic consumption to changes in intestinal permeability in subjects with overweight or obesity. METHODS/STUDY POPULATION: Articles were searched in Pubmed, Web of Science, and CAB Direct through February 2022 using search terms: intestinal permeability, overweight or obesity, and probiotic supplementation. 694 articles were exported, and 289 duplicates were identified. Titles and abstract were screened in the 405 remaining references by two investigators to determine eligibility. Eligible studies had data extracted on study participant characteristics, probiotic strain used, probiotic dosage, length of intervention, and intestinal barrier outcomes. Results were summarized in tabular form based on intestinal permeability response to probiotics. Quality of the studies was assessed based on Cochrane–Risk of Bias' tool (RoB2). RESULTS/ANTICIPATED RESULTS: Thirteen eligible studies were identified. Probiotic genera included Akkermansia, Bifidobacterium, Lactobacillus, Streptococcus, Lactococcus, and Bacillus. Single strain probiotics were used in 3 studies, while the other 10 used multi-strain formulas. Dosage and length of probiotic supplementation ranged from 2.4 x 10^7 to 5 x 10^10 CFU/person/day and 3 to 26 weeks, respectively. The most widely used gut permeability outcomes were serum lipopolysaccharide (LPS) (n=10) and mixed sugar solution consumption with urine analysis (n=6). Five of the 10 studies reported decreases in serum LPS following probiotic consumption, while the other 5

https://doi.org/10.1017/cts.2023.157