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The FAST PACE Toolkit: A tool to foster state-wide translation science

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OBJECTIVES/GOALS: To create, train, and evaluate the FAST-PACE (Promoting Academic and Community Engagement) Toolkit that catalyzes academic-community translation science teams during a public health emergency. The toolkit is a road map based on the Research Readiness and Partnership Protocol (R2P2), which was developed from the Flint Water Crisis. METHODS/STUDY POPULATION: A literature review was conducted by the Michigan Institute for Clinical & Health Research Community Engagement (MICHR CE) program and the Community-Based Organization Partners (CBOP), to identify important and common elements in disaster response protocols with a set of key interviews (n = 31) to glean perspectives from community leaders. Key findings were extracted and reviewed to generate guidelines and recommendations for the R2P2 protocol. The co-developed FAST-PACE Toolkit launched its expansion statewide to address emergencies and health disparities of communities in crisis. The iterative process consisted of community report-outs, gathering input from stakeholders, via discussion, and evaluation surveys. The feedback was used to develop, enhance, and tailor the toolkit and training content. RESULTS/ANTICIPATED RESULTS: Data from training (n = 8) of the critical elements of the FAST-PACE Toolkit, which provides guidance for academic and community team members that includes 1) assessing community assets and needs; 2) engaging in clear and bidirectional communication; 3) facilitating transparency and equitable partnering; 4) identifying health equity and justice issues; and 5) conducting the evaluation of research. The training will be disseminated in-person and virtually across the state of Michigan resulting in participants sharing community-identified health issues and social determinants of health to assist MICHR CE to suggest resources to address health impacts. DISCUSSION/SIGNIFICANCE OF IMPACT: The FAST-PACE Toolkit borne from the flint water crisis and confounded by other crises used CEnR principles to create a translation science roadmap. It equips communities and collaborating academic institutions across the state to respond to public health crises and fosters equitable translation science partnerships built on respect and trust.

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The effect of providing genetic risk information on lifestyle behaviors in African Americans

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OBJECTIVES/GOALS: The goal of this proposal is to better understand how informing African Americans of their genetic risk affects their behavior as part of a cardiovascular disease (CVD) risk reduction intervention. Aim 1: To determine the effect of genetic risk knowledge on CVD health behavior. Aim 2: To determine the effect of genetic risk knowledge on secondary variables. METHODS/STUDY POPULATION: Method: Fifty participants from the Baton Rouge metropolitan area will be recruited. Participants must be African American adults over the age of 18. Potential participants will be recruited using community-based efforts that have been successful in recruiting this population specifically. Participants will be randomized into one of two groups. Genetically Unblinded Group (GU) will be "genetically unblinded" after baseline orientation. Genetically Blinded Group (GB) will be "genetically blinded" until the end of the study. This study design ensures that we can measure the impact of knowledge of genetic risk on participant behavior. RESULTS/ANTICIPATED RESULTS: Baseline participants' characteristics (body mass index, blood glucose, and cholesterol) will be summarized by intervention group, with counts and percentages for categorical variables and means and 95% confidence intervals for continuous variables. Primary Outcomes: Attendance in intervention sessions will be counted across groups. Effect on genetic risk knowledge will be determined via comparing the difference between the increased healthy lifestyle behaviors at endpoint between Genetically Unblinded (Cases) and Genetically Blinded Groups (Control). Secondary and Tertiary Outcomes: Mean change in secondary outcomes in the GU group will be compared against the mean change in the GB group. Participant's survey responses and changes in physical measurement from baseline to endpoint will be observed. DISCUSSION/SIGNIFICANCE OF IMPACT: This study empowers African Americans in Baton Rouge by providing genetic risk knowledge for cardiovascular disease. By addressing social determinants of health, it promotes behavior change, improves health outcomes, and fosters trust, potentially reducing health disparities and advancing health equity.

Informatics, AI and Data Science

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Optimizing trauma prognostication via machine learning: Automating frailty detection in geriatric trauma patients

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OBJECTIVES/GOALS: This study evaluates the role of visual machine learning algorithms (VMLA) in automating a predictive model of central sarcopenia in geriatric trauma patients based on the psoas:lumbar vertebral index (PLVI) and trauma-specific frailty index (TSFI). METHODS/STUDY POPULATION: 150 trauma patients seen at Jon Michael Moore Trauma Center within J.W Ruby Memorial Hospital in rural West Virginia were included in this investigation across the life spectrum. The VMLA was trained on their standard of care trauma panoramic CT scans. Five expert reviewers segmented bilateral psoas muscles and the L4 vertebrae of each CT image at one slice inferior to the posterior elements of the L4 vertebrae. The data were read into a U-net convoluted neural network as ground truth. Labels were preprocessed to focus on the regions of interest and standardized into four classes: right psoas, left

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psoas, L4 vertebrae, and background. Performance was evaluated using accuracy, Dice coefficient, and F1 score. RESULTS/ANTICIPATED RESULTS: Between our expert reviewer segmentations, we had significant inter-reader reliability with a Kappa greater than 0.8 and a mean standard deviation of the PLVI of 0.10mm^2. Preliminary VMLA testing on a subset of 70 patients yielded a validation accuracy of 88.5%, a Dice coefficient of 0.86, and an F1 score of 0.87 after 20 epochs. There was a moderate interclass correlation between PLVI and TSFI even though the TSFI lacks sensitivity. In fact, the PLVI is a more accurate predictor of frailty in trauma patients based on various outcome measures such as corrected length of stay. Our ongoing efforts are centered around improving the VMLA. DISCUSSION/SIGNIFICANCE OF IMPACT: Our VMLA outperforms the current clinical standard, TSFI. Integration of our VMLA into the clinical workflow has the potential to revolutionize geriatric trauma care by providing rapid, accurate, identification of high-risk frail patients.

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Predicting daily PM2.5 in Mexico City: A hybrid spatiotemporal modeling approach†

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OBJECTIVES/GOALS: In recent years, there has been growing interest in the development of air pollution prediction models, particularly in low- and middle-income countries that are disproportionately impacted by the effects of air pollution. Recent methodological advancements, particularly in machine learning, provide novel opportunities for modeling efforts. METHODS/STUDY POPULATION: We estimate daily ground-level fine particulate matter (PM2.5) concentrations in the Mexico City Metropolitan Area at 1-km2 grids from 2005 to 2023 using a multistage approach. Spatial and temporal predictor variables include data from the moderate resolution imaging spectroradiometer (MODIS), Copernicus Atmosphere Monitoring Service (CAMS), and additional meteorological and land use variables. We employed machine-learning-based approaches (random forest and gradient boosting algorithms) to downscale satellite measurements and incorporate local sources, then utilized a generalized additive model (GAM) to geographically weight predictions from the initial models. Model performance was evaluated using 10-fold cross-validation. RESULTS/ANTICIPATED RESULTS: On average, the random forest, gradient boosting, and GAM models explained 75, 82, and 83% of variations measured in PM2.5 concentrations. PM2.5 levels were generally higher in densely populated urban centers and lower in suburban and rural areas. Important predictors of ground-level PM2.5 included wind (both u and v components), 2-meter mean air temperature, elevation, and the normalized difference vegetation index (NDVI). DISCUSSION/SIGNIFICANCE OF IMPACT: Using novel machine learning-based approaches, we developed robust models with fine-scale spatial (1-km2) and temporal (daily) variations of PM2.5 in Mexico City from 2005 to 2023. The predicted PM2.5 concentrations can further advance public health research on air pollution in Mexico City and beyond.

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Decoding auto-immunity: Uncovering pre-onset infectious disease patterns of idiopathic inflammatory myopathies

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OBJECTIVES/GOALS: Idiopathic inflammatory myopathies (IIMs) are autoimmune diseases influenced by genetic and environmental factors. This study aims to explore infection patterns preceding IIM onset by applying temporal data mining and machine learning to deidentified patient records and corroborate results from molecular analysis. METHODS/STUDY POPULATION: The dataset used in this work was extracted from TriNetX with a focus on patients who have IIM. Risks for developing the outcomes were assessed using case–control cohorts. For each participant, information was extracted about diagnosis code, date of infection, and study visit in which the infection was reported. This data were then temporally encoded and used to generate sequence files for each of the outcomes. Unsupervised temporal machine learning was then preformed on these files to detect frequent subsequences of infections. Python library scikit-learn was used to perform the unsupervised machine learning with k-means clustering. RESULTS/ANTICIPATED RESULTS: The results of this study identify infections associated with the onset of IIM by analyzing temporal infection patterns. Frequent sequences of infections uncovered, with specific patterns linked to different cohorts, offer insights into the etiology of IIM. Common and cohort-specific infection sequences will help validate existing research and provide new avenues for exploring the disease mechanisms. The findings will highlight significant infection patterns, which will inform our understanding of IIM onset across various patient populations. DISCUSSION/SIGNIFICANCE OF IMPACT: The results will provide key insights into pre-symptomatic infection sequences related to IIM onset, enhancing understanding of its etiology and pathogenesis. These findings may aid in developing more precise screening methods for early detection and confirm previous results from analyzing immune signatures of infections in IIM.

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Optimizing AI-physician collaboration for enhanced diagnostic accuracy: A case study on acute respiratory distress syndrome detection using chest X-ray imaging†

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OBJECTIVES/GOALS: The objective of this study is to explore strategies for AI-physician collaboration in diagnosing acute respiratory distress syndrome (ARDS) using chest X-rays. By comparing the diagnostic accuracy of different AI deployment methods, the study aims to identify optimal strategies that leverage both AI and physician expertise to improve outcomes. METHODS/STUDY POPULATION: The study analyzed 414 frontal chest X-rays from 115 patients hospitalized between August 15 and October 2, 2017, at the University of Michigan. Each X-ray was reviewed by six physicians for ARDS presence and diagnostic confidence. We developed a

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