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Study Objective: To determine the timing of humoral antibody (IgM, IgG) development following SARS-CoV-2 mRNA vaccinations and assess factors influencing antibody (Ab) production.

Methods: Ranging in age 23-100 years, 77 persons living or working in an assisted living facility were tested for IgG and IgM just prior to receiving their 1st dose of the Pfizer-BioNTech mRNA vaccine on 01/17/2021. Re-testing occurred on Day 14, Day 21 (before dose 2), Day 28 and Day 42 (7 days and 21 days after dose 2). Medical histories, including underlying conditions and medications, were collected confidentially. Testing involved point-of-care lateral flow chromatography devices (under emergency use authorization as reported in our previous research on PCR+, humoral Ab persons) using fingerstick samples. The lateral flow assay antigens included a recombinant nucleocapsid protein and a spike protein (S) conjugated with colloidal gold. Readings were recorded 15 min. after obtaining blood samples.

Results: On the day of dose 1, one person had a faint IgM reading (and a known past history of COVID-19) and 3 others demonstrating detectable Ab were asymptomatic and had no known prior illness. None of these four persons were PCR+ at the time of assay and their Ab profiles all further evolved following vaccination. Consistent with the original Pfizer clinical trial, on Day 14, 27 (69%) of the 39 persons <70 years old (yo) already were demonstrating a degree of new Ab production while 84% of the 38 persons >70 had no detectable Ab. However, by Day 21, just prior to receiving the second dose of vaccine, 100% of persons <60 yo had detectable Ab except for two persons taking immunosuppressants. In each successive decade of age, a progressively smaller % of persons showed Ab production (eg, among those >90 yo, 80% tested Ab negative). Seven days after the second dose, however, 100% of persons <80 yo had become Ab positive (except 2 taking immunosuppressants). Whereas only 89% of those in their 80s (n=18) and 78% of those in their 90s had IgG detected seven days after their second dose, by day 42, only two persons remained Ab negative (one taking immunosuppressants and the other was >95 yo). Semi-quantitative results indicated strong Ab responses for 100% of those <80 yo on Day 42. Also, as previously demonstrated, the point of care chromatography device used for the assays had reproducible results and there was persistent Ab detection in all persons once they had turned positive.

Conclusions: Age and immunosuppressant conditions impact the timing and degree of Ab production following mRNA vaccination. Contrasted with our prior Ab study findings regarding native COVID-19 disease in which some persons < 50 yo manifesting milder disease do not generate IgG/IgM, the current study did demonstrate that younger persons uniformly have a rapid onset of strong IgG development after mRNA vaccination, even before their second dose. While very elderly persons and those taking immunosuppressants generally had undetectable IgG production after the first dose of vaccine, almost everyone developed strong responses, regardless of age, within a week following dose two. Antibody development became even more evident and robust 21 days after the second dose of the vaccine.

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Implementation of a COVID-19 Vaccine Emergency Department Education Program for Underserved Communities: A Pilot Quality Improvement Project

Bischof JJ, Schoeffler A, Bashian E, Callender N, Fuentes A, Geyer E, More A, Webb T, Kriak K/ The Ohio State Wexner Medical Center, Columbus, Ohio, The Ohio State University College of Medicine, The Ohio State University College of Medicine, The Ohio State University College of Medicine, The Ohio State University College of Medicine, The Ohio State University College of Medicine, The Ohio State University College of Medicine, The Ohio State University Wexner Medical Center

Background: The COVID-19 pandemic has been one of the greatest modern health challenges to date. The administration of COVID-19 vaccines, rapidly and widely across all communities, is key to halting the spread of the virus. One significant challenge in promoting a large-scale immunization program is the threat of vaccine hesitancy, particularly in underrepresented minority communities (URM).

Study Objective: This project aimed to assess reasons for local vaccine hesitancy in an urban emergency department (ED) and to provide targeted education on the safety and efficacy of the COVID-19 vaccines to patients.

Methods: An interprofessional team was formed of medical students, physicians, social workers, and community outreach coordinators to develop an educational intervention addressing COVID-19 vaccine safety for eligible patients receiving treatment in the ED at an urban academic affiliated community hospital with over 70% of patients coming from underserved URM backgrounds. A survey was conducted to elucidate their concerns surrounding the COVID-19 vaccine. Upon completion of the survey, up-to-date safety information was provided by trained medical students and a follow-up survey was conducted to assess the impact of the quality improvement education intervention.

Results: A convenience sample of 58 subjects (76% URM) cited a variety of concerns surrounding the COVID-19 vaccine. The three most common reasons for declining vaccines were potential side effects (67.3% of respondents said they were concerned to extremely concerned), the concept that COVID-19 vaccines are neither effective nor safe (64.5% said they were concerned to extremely concerned), and the risk of developing COVID-19 infection from vaccine (58.8% said they were concerned to extremely concerned). While this project remains ongoing, this information was used to address these concerns directly with patients, answer questions, clarify information, and encourage patients to get their vaccines. Through the education program, vaccine hesitancy scores improved by an average of 29% indicating an increased likelihood they will get vaccinated in the future. 38% of patients receiving education agreed to sign up for a vaccine appointment during survey interview.

Conclusion: The ED often serves vulnerable patient populations. As such, its role in public health in these communities cannot be underestimated. This pilot quality improvement project is a novel method that hospital systems can use to develop and implement public health education programs to address specific community needs through the ED. These results show that ED health care providers have the ability to provide measurable change in attitudes about vaccine safety.

Social Determinants of Health and COVID-19 Infection in North Carolina: A Geospatial Analysis

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Study Objectives: The COVID-19 pandemic has demonstrated that social determinants of health (SDOH) are profoundly linked to the spread and outcomes of COVID-19. However, the relationships between these SDOH and COVID-19 spatial outbreaks have yet to be determined. We conducted spatial analyses with geographic information systems (GIS) mapping of county-level SDOH and regional COVID-19 infection outbreaks to demonstrate the most impactful SDOH and to provide a pragmatic visual guide to prevent future outbreaks.

Methods: We analyzed the geospatial associations of COVID-19 infections and SDOH to identify areas of overlap. Our sample comprised all patients in a North Carolina health care system’s registry who tested positive for COVID-19 from March 2020-February 2021. Patients’ addresses were geo-referenced and analyzed by Kernel Density Estimation (KDE) to identify population-dense outbreaks of COVID-19 (hotspots). A set of 12 SDOH variables for each county were collected from the American Community Survey (ACS-5) and the Economic Research Service. Principal Component Analysis was applied to SDOH variables in order to reduce dimensions down to 3 geographical SDOH categories: Protective SDOH, High-Risk SDOH and Increased Vulnerability for Infection (Table 1). Using Multivariate Clustering Analysis (MCA), three clusters of census tracts were categorized according to SDOH indicators: decreased social disparities (DSD), equivocal social disparities (ESD) and increased social disparities (ISD) (Image A). Kruskal-Wallis and Dunn’s Post-Hoc adjusted with Bonferroni were utilized to verify any difference in the proportion of patients residing in the different clusters (significance p<0.05).

Results: A total of 13,733 patients were included in the study. The patients predominantly reside in Durham County (55.4%), are women (56.9%), and between 40 and 69 years old (41.9%). Further, patients are predominantly white (38.7%), non-Hispanic (79.6%), and single (49.6%). The concomitant analysis of KDE and MCA showed an overlap of COVID-19 hotspots with areas of ISD (Image B). The MCA revealed that there are 308 census tracts constituted by six counties, in which 40 form ISD clusters (vs. 109 ESD; vs. 159 DSD). In addition, ISD clusters have the highest rates of infection, with 179.8 patients per 10,000 (vs. 81.7 ESD; vs. 60.1 DSD). The ISD cluster was the most densely populated and was significantly more densely populated from the ESD and DSD clusters (p=0.01).

Conclusion: In this sampling of COVID-19 patients, a disproportionate amount of patients come from areas with increased social disparities, suggesting further research and health policy will need to be directed towards addressing negative and vulnerability SDOH to curtail pandemic-related outbreaks.

A Geospatial Analysis of Social Disparities

Image A: Multivariate Clustering Analysis of Social Disparities; Image B: Geospatial Map Overlay of Kernel Density Estimation of Hotspots with Multivariate Clustering Analyses of Social Disparities