Abstracts From the 2022 Health Care Systems Research Network (HCSRN) Annual Conference

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LATE-BREAKING ABSTRACTS

MENTAL HEALTH

Risk of Moral Injury Among Deployed Veterans: Implications for Health Care and for Public Health

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Background: The impact of “moral injury” (MI) among veterans, defined as actions in combat that violate a veteran’s moral beliefs and result in psychological distress, has been a concern among health care providers for decades.

Methods: We studied MI among 1032 deployed veterans who were outpatients in a large multihospital system in Pennsylvania. The study included all service branches, Guard/Reserve members, and non-VA service users. Our hypothesis was that high MI veterans would have mental disorders and suicidal thoughts controlling for other risk factors. Our secondary hypothesis was that MI would be associated with other psychopathologies, including chronic pain, sleep disorders, fear of death, and use of alcohol/drugs to cope postdeployment.

Results: Most veterans were deployed to Vietnam (64.1%), while others were deployed to post-Vietnam conflicts in Iraq and/or Afghanistan (19.5%) and elsewhere. Altogether, 95.1% of the veterans were male and their mean age was 61.6 (standard deviation: 11.8) years. Among the veterans, 24.4% had high combat exposure, 10.9% had posttraumatic stress disorder, and 19.8% had major depressive disorder. Additionally, 11.7% had a history of suicidal thoughts. Based on the Moral Injury Events Scale, 23.2% had high MI, with a score above the 75th percentile. Findings show that high MI among veterans was associated with current global mental health severity and recent mental health service use, but not suicidal thoughts. In addition, MI was linked to chronic pain, sleep disorders, fear of death, high anomie, use of alcohol/drugs to cope postdeployment, and poor reported unit morale during deployment.

Conclusion: Veterans with high MI are more likely to have mental health disorders and psychopathology years after deployment. These findings are relevant for health care providers and those working with veterans and other high-risk groups. Further research is advised related to screening, assessment, treatment, and prevention of MI among veterans and other risk groups after severe trauma exposures.

Randomized Trial of Population-Based Outreach to Lock to Live, a Web-Based Decision Aid for Safe Storage of Firearms in Patients With Suicide Risk

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Background: Most patients with suicide risk don’t receive recommendations to reduce access to firearms from outpatient clinical providers due to a variety of barriers (eg, lack of provider time, training). Lock to Live (L2L) is a web-based decision aid that incorporates patients’ values into recommendations for safe storage of firearms. This randomized trial evaluated whether an invitation to visit L2L, using Epic’s bulk messaging, for patients with moderate-high suicide risk identified with a validated prediction model impacted firearm storage behaviors.

Methods: Invitation messages were sent to patients in the 75th–99.5th risk percentiles for suicidal behavior within 3 months from a prediction model. Half were randomized to receive L2L+survey (intervention) and half received survey only (control). Survey respondents were assigned to 1 of 5 groups based on the Stages of Change model: precontemplative (do not believe in safe storage), contemplative (believe in safe storage but not doing it), thinking of changing storage, preparation (planning to change storage), or action (safely storing). Data were analyzed using chi-squared, logistic, and multinomial logit models to test for differences between intervention and control groups.

Results: We invited and randomized 21,131 patients to visit L2L over a 6-month period; 25% responded to the anonymous survey. Among respondents, 44% had access to a firearm and 81% of...
these did not use any safe storage behaviors. Intervention patients were more likely to be categorized as thinking, preparation, or action compared to controls (odds ratio: 1.30 [1.07–1.58]; P=0.009). When examining action (safe storage) alone, there were no statistically significant differences between intervention and control groups.

**Conclusion:** Efficiently sending an invitation message through the electronic health record to visit L2L encouraged patients with suicide risk to consider safer firearm storage practices, but a stronger intervention is needed to change behavior. Future studies should evaluate whether this low-cost intervention primes patients to follow safe storage recommendations from providers.

**Adaptation of a Transdiagnostic Intervention for Anxiety and Depression for Youth in Low-Resource Community Health Clinics**

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**Background:** Anxiety and mood disorders are highly prevalent mental health problems in youth; untreated, they lead to impairment in relationships and education as well as increased risk for mood disorder, suicidal behavior, and substance abuse. Less than 25% of anxious/depressed youths report any service use for these disorders. Also, there are considerable socioeconomic and racial/ethnic disparities in receipt of treatment. For example, Latinx youths are less likely than non-Hispanic Whites to be identified and treated, despite suffering from similar or higher rates of anxiety/depression. Evidence-based programs that can be delivered within primary care have the potential to increase access and reduce disparities.

**Methods:** We report on two pilot studies using mixed methods to adapt a transdiagnostic face-to-face intervention, STEP-UP, for use in low-resource community health clinics (CHC). First, we adapted the intervention to a digital platform. Next, we tested it in a CHC setting. Last, we adapted the intervention to be provided to Latinx families who prefer to speak Spanish. Our evaluation included interviews with clinical staff (n=3), surveys with CHC providers/leaders (n=15), and open-pilot intervention sessions with youth and parents (n=21 dyads).

**Results:** Video sessions were delivered with minimal technical difficulty. Families were able to access content from their homes on a range of devices (e.g., laptop, smartphone). Parent and youth satisfaction were high, families indicated they would recommend the program, and youths evidenced substantial improvement in anxiety symptoms. Safety-net clinic providers and leaders have completed surveys (n=15) about the fit, acceptability, and feasibility of STEP-UP, indicating high levels of need and fit. Family and provider suggestions led to additional adaptation of STEP-UP, including delivery of STEP-UP through interpretation services for Latinx families who prefer to participate in Spanish.

**Conclusion:** Youth in community health clinics have significant unmet need for mental health care. Offering efficacious digital programs in CHC could improve access and youth functioning.

**IMPLEMENTATION SCIENCE**

**Systematic Surveillance of Patient-Reported Symptoms of Viral Respiratory Tract Infectious Syndromes in Diverse Populations**


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**Background:** Patient-reported outcome measurements (PROMs) have been shown to accurately measure patients’ health status and improve care. FLU-PRO® Plus (Evidera) is a validated 34-item PROM designed to capture patients’ viral respiratory symptoms across 14-days. We aimed to describe the feasibility and patient characteristics associated with completing Day 1 FLU-PRO Plus in three integrated health systems during the COVID-19 pandemic.

**Methods:** Our pilot prospective observational cohort study evaluated patient-reported respiratory symptoms among adults (≥18 years of age) who were: 1) enrolled in 1 of 3 integrated health systems (HealthPartners Institute [HP], Kaiser Permanente Georgia [KPGA], or Kaiser Permanente Mid-Atlantic States [KPMAS]); and 2) diagnosed with/had positive lab results for either influenza-like illness or COVID-19 or had 2+ viral respiratory symptoms at recruitment. We contacted eligible patients via email and/or phone within 72 hours of meeting eligibility criteria. Multivariable logistic regression determined the associations between patient characteristics and our primary outcome of completing Day 1.

**Results:** Among 15,650 eligible patients (9582 at HP, 1740 at KPGA, 4328 at KPMAS), we successfully contacted 8410 (54%). Among those successfully contacted, the median age was 46 (interquartile range: 33, 59) years, 59% were female, 47% had White race, and 70% were diagnosed with COVID-19. A total of 317 patients completed Day 1. Females (odds ratio [OR]: 1.76, 95% CI: 1.37–2.25; reference: male) and age of 35–64 years (OR: 1.50, 95% CI: 1.12–2.00; reference: age of 18–34) had higher odds of completing Day 1, while Black participants (OR: 0.29, 95% CI: 0.22, 0.40; reference: White) had lower odds of completing Day 1. There was no difference in odds of completing Day 1 for COVID-19 patients (OR: 1.12, 95% CI: 0.87–1.44) compared to patients with influenza-like illness.

**Conclusion:** Although out multisite pilot found disparities in Day 1 completion, FLU-PRO Plus may successfully assist health systems to track patients’ symptom progression using successful implementation strategies to leverage its benefits while minimizing burden on patients and health systems. Future studies are needed to further examine utilization and possible disparities.
**Systematic, Data-Based Method for Prioritizing Investments in Health Care Delivery Implementation, Innovation, and Improvement**

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**Background:** Integrated health care delivery systems invest considerable staff time and funds in efforts to improve health care system performance through innovation, implementation, and improvement. Decisions to allocate resources to improvement efforts are largely ad-hoc and judgment-based, guided by general awareness of quality and outcome gaps and opportunities for improvement but with only limited reliance on data and systematic assessment and prioritization. This presentation describes a new approach for identifying and prioritizing opportunities to improve care across clinical conditions or across care phases and processes for a given condition.

**Methods:** The prioritization method, as applied to multiple care processes within a given condition, adapts and extends existing approaches for a) systematically identifying all care phases and processes for a clinical condition, b) comprehensively characterizing each care phase and process on key priority-relevant dimensions — eg, prevalence, burden (physical and psychological health, cost, etc), current gaps in quality, value, and equity, opportunities for improvement, the cost and likely success of improvement efforts, and availability of infrastructure and resources to support improvement — and c) gathering and synthesizing diverse stakeholder ratings of importance and priority for all improvement opportunities based on the matrix of opportunity characteristics.

**Results:** The new prioritization process allows health system leaders to explicitly address racial, ethnic, and gender inequities, cost and value, safety and quality benefits vs harms and costs, and other factors, supporting more rational resource allocation decisions and explicit tradeoffs among competing factors.

**Conclusion:** Growing recognition of quality, safety, equity, and outcome gaps in health care delivery — and recognition of limitations in staff, funding, and capacity to address these gaps — mandate the use of systematic, evidence-based methods for prioritizing investments. The approach described here is currently in use to prioritize improvement investments in selected disease domains within Kaiser Permanente Southern California and has broad applicability to other settings.

**CANCER**

**Black Americans’ Perceptions of Communication and Other Factors During Oncology Care Virtual Visits**

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**Background:** During the COVID-19 pandemic, many oncology practices began offering virtual visits via video or telephone. How such visits are perceived by Black patients, who have historically faced access barriers and poorer cancer outcomes, is not known. We elicited Black patients’ perceptions of and experiences with oncology virtual visits.

**Methods:** We conducted in-depth, semi-structured telephone interviews with Black adults receiving oncology care for head and neck cancer, prostate cancer, and multiple myeloma between June 1, 2019, and March 20, 2021, from two U.S.-based academic health systems. The interview guide elicited virtual visit perceptions and experiences within predefined themes (eg, ease of use, usefulness, communication quality, appropriateness). Interviews were audio-recorded, transcribed, and coded for a priori themes and new ones identified during data immersion. Two trained research assistants coded transcripts, using Atlas.ti software for data management.

**Results:** A total of 49 adults completed an interview between September 2021 and February 2022 (n=16 for head and neck cancer, n=16 for prostate cancer, and n=17 for multiple myeloma). Mean age was 63 (range: 39–75) years, with 53% male and 77% ever having a virtual visit. Participants indicated communication with their doctor and privacy was comparable between in-person and virtual visits but expressed feeling less human connectedness during virtual visits. They cited convenience advantages (eg, being home, flexibility when physicians run late, and reduced travel barriers); however, they also reported preferring in-person visits due to wanting doctors to conduct physical examinations or needing in-person testing. Participants described wanting a choice regarding visit type and valued it when physicians articulated the option to conduct an in-person visit (ie, patient-centeredness in scheduling). To overcome technical barriers to virtual visit attendance, patients received assistance from adult children, physicians, and other support.

**Conclusion:** We identified barriers to and facilitators of virtual visit use among Black patients receiving cancer care.

**CHRONIC CONDITIONS, MULTIMORBIDITY, and AGING POPULATIONS**

**Trends in Second-Line Diabetes Medication Prescribing in Older Adults from 2018 to 2020**

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**Background:** Increasing evidence supports the use of sodium glucose-like transporter-2 (SGLT2) inhibitors and glucagon like peptide-1 (GLP1) agonists as second-line therapy after metformin for type 2 diabetes in most older adults. We sought to examine second-line drug therapy trends within a 3-year period among patients with type 2 diabetes seen in one integrated care delivery network.

**Methods:** Using electronic medical record (EHR) information including medication orders, we conducted a cross-sectional analysis of second-line diabetes orders, defined as the first nonmetformin diabetes medication prescribed between 2018 and 2020 in adults 65 years of age or older with a diagnosis of type 2 diabetes. We grouped medications into their associated classes and used descriptive statistics to summarize prescribing by medication class and year and used the Cochran Armitage trend test to evaluate trends over time.

**Results:** Overall, 1914 patients were prescribed a second-line diabetes medication for the first time between 2018 and 2020.
Patients had a mean age of 71.1 years (standard deviation: 6.5), and 97% were Caucasian. Over 3 years, 32% of orders were for sulfonylureas, 24.6% for SGLT2 inhibitors, 21.6% for DPP4 inhibitors, 9.1% for GLP1 agonists, and 9.1% for insulin. SGLT2 inhibitor prescribing significantly increased over time (19% in 2018 to 29% in 2020; P<0.001), while the use of GLP1 agonists increased over time but not significantly (30% vs 35%; P=0.19). In contrast, use of sulfonylureas decreased over time, though not significantly (36% vs 31%; P=0.06), as did insulin (10% vs 8%; P=0.36) and DPP4 inhibitors (24% vs 19%; P=0.05).

**Conclusion:** Sulfonylureas remain the most prescribed second-line type 2 diabetes medication class despite American Geriatrics Society Beers Criteria recommendations opposing them and increased evidence supporting newer medication classes, particularly among patients with additional comorbidities. Opportunity exists to improve the prescribing of second-line diabetes medications.

## COVID-19

### Disparities in Weight Changes in Youths During the COVID-19 Pandemic-Related Lockdown

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**Background:** The COVID-19 pandemic has dramatically altered many aspects of life across all sectors of the population, including children and adolescents. This study aimed to evaluate whether changes in weight among school-aged youth in California before and after the pandemic lockdown varied by race/ethnicity and social factors.

**Methods:** After including 191,509 youth (5–17 years of age) who were enrolled at Kaiser Permanente Southern California, mixed-effects models stratified by age group were fitted to estimate changes in distance from the median body mass index (BMI)-for-age and obesity prevalence between March 2020 to January 2021 (lockdown) compared to the same period prepandemic.

**Results:** Excess pandemic weight gain was higher among Black and Hispanic 5–11-year-olds than among White and Asian youth; this difference was most pronounced in youth 5–11 years of age. In 5–11-year-olds, distance from the median BMI-for-age increased by 1.73 kg/m² (95% CI: 1.62, 1.83) in Hispanic youth and 1.69 kg/m² (95% CI: 1.46, 1.91) in Black youth during the lockdown, compared to 1.17 kg/m² (95% CI: 1.04, 1.30) in non-Hispanic White youth. Prevalence of obesity increased by 6.7% and 8.1% for Hispanic and Black 5–11-year-olds, respectively, compared to 5.1% for White youth. Excess weight gain also was higher in youth with fewer neighborhood parks and those with state-subsidized health insurance.

**Conclusion:** The COVID-19 pandemic lockdown led to excess body weight, particularly for Black and Hispanic youth, those from low-income families, and those with limited access to neighborhood parks. Immediate surveillance and investment are needed to monitor these trends and to develop interventions to ameliorate this excess weight gain.

### DATA SCIENCE, INFORMATICS, and MODELS

**Can We Use Machine Learning to Remove Outdated Medications From a Patient's Medication List?**

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**Background:** Medication reconciliation, or reviewing a patient’s medication list during a visit, is critical for patient safety but has been described as a time-consuming task for providers. Removal of medications that are no longer accurate could possibly be assisted by a machine learning (ML) algorithm. Our objective was to explore the feasibility of this concept using simple models.

**Methods:** We examined medication reconciliation records (in the electronic health record) from outpatient visits in 2015–2021, including whether the provider removed the medication from the patient’s list. Data from the top 100 most frequently removed medications were then merged with 220 other variables, including age, sex, insurance, days on medication, diagnoses, department visited, and medication details (eg, subclass). These data were divided into training and test sets using an 80%/20% split, and 4 types of machine learning models were tested to predict which medications should be removed from the patient’s list: a null model, K-nearest neighbors, logistic regression with linear discriminant analysis, and a simple artificial neural network (ANN) with 2 layers × 20 neurons. We measured their accuracy and positive predictive value for correctly identifying which medications should be removed.

**Results:** A total of 151 million medication reconciliation records were examined, with 6% of medications being removed by the provider during outpatient visits. When we focused on only the top 100 most frequently removed medications, this reduced the dataset to 564,932 medications, 22.8% of which had been removed. After training, the best model, ANN, achieved 76.8% accuracy and 56.4% positive predictive value for correctly identifying medications that needed to be removed.

**Conclusion:** While not performing well enough to support total automation of this task, these promising results suggest that a machine learning tool could be useful to assist or nudge providers to notice medications on a patient list that have a greater than 50% chance of being no longer accurate.

### MATERNAL, CHILD, and FAMILY HEALTH

**Effect of Body Mass Index With That of Obstructive Sleep Apnea on Preeclampsia Outcome**

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**Background:** The objective of this study was to examine associations of the joint effect of prepregnancy body mass index (BMI) and obstructive sleep apnea (OSA) on preeclampsia.

**Methods:** A retrospective cohort study of singleton pregnancies delivered in all Kaiser Permanente Southern California hospitals during 2010–2020 (n=342,349) was conducted. Preeclampsia and OSA were ascertained from clinical diagnosis codes from electronic health records. BMI (calculated as kg/m²) was categorized as...
normal (18.5 to 24.9), overweight (25 to 29.9), and obese (30 or greater). Data were analyzed using logistic regression to estimate adjusted odds ratios (OR) and 95% confidence intervals.

**Results:** Compared to women with normal BMI in their pregnancy, overweight women (OR: 1.6, 95% CI: 1.5–1.7) and obese women (OR: 2.5, 95% CI: 2.4–2.6) were at increased risk of preeclampsia. Compared to a pregnancy without OSA, a pregnancy with OSA was associated with increased risk of preeclampsia (OR: 2.3, 95% CI: 1.0–5.5) independent of prepregnancy BMI. Compared to women with normal BMI without the diagnosis of OSA in their pregnancy, overweight women (OR: 5.0, 95% CI: 2.9–7.4) and obese women (OR: 3.7, 95% CI: 3.0–4.5) with the diagnosis of OSA were at increased risk of preeclampsia.

**Conclusion:** Although obesity and OSA are independent risk factors for preeclampsia, study findings suggest that there is no joint effect of obesity and OSA on the risk of preeclampsia. Overweight women at risk of preeclampsia should be advised of a markedly stronger risk for preeclampsia when both conditions occur together. Weight management, as well as diagnosis and treatment of OSA in obese women, may reduce the risk of developing preeclampsia.

**PATIENT, CLINICIAN, and HEALTH SYSTEM ENGAGEMENT**

**Prevalence of Medication- or Pharmacy-Related Abstracts at the Health Care Systems Research Network’s Annual Conference Over Three Years**

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**Background:** On February 2, 2022, the Health Care Systems Research Network (HCSRN) Pharmacy Interest Group held its inaugural meeting with the stated purpose to “explore topics and collaborate on subjects related to pharmacy services and the continuum of medication use process.” In support of this new interest group, we conducted a review of recent HCSRN abstracts related to medications and pharmacy.

**Methods:** All HCSRN abstracts published from 2019 to 2021 (n=424) in the Journal of Patient-Centered Research and Reviews were eligible for inclusion. Three members of the 4-person review team independently read all abstracts for relevancy to the Pharmacy Interest Group charter. Abstracts identified as relevant by at least 1 of the 3 reviewers (n=147) were compiled into a spreadsheet; 44 (~30%) of these 147 abstracts were collectively reviewed for relevancy by the team. One member of the team then independently identified the remaining 103 abstracts as relevant, irrelevant, or “unsure.” Unsure abstracts were again collectively reviewed by the team to create the final list of pharmacy-related abstracts. Abstracts were classified among 8 categories of pharmacy research that were developed though an iterative process informed by research areas identified in the Pharmacy Interest Group charter.

**Results:** In all, 104 abstracts (24.5%) were related to pharmacy research. These 104 abstracts comprised 75 different institutions, including 27 lead institutions. Of all 75 institutions, 18 are currently HCSRN members. Most of the nonmember institutions were academic (n=36). All abstracts received a primary category, and 27 abstracts received a secondary category. The most common category of pharmacy-related research was pharmacoepidemiology (n=34).

**Conclusion:** Approximately 1 in 4 HCSRN abstracts are related to pharmacy research, and most HCSRN members have published pharmacy-related research within a 3-year timeframe. Many nonmember institutions also present pharmacy-related research at HCSRN conferences. This review underlies the interest in pharmacy-related research within the HCSRN and supports the relevance of a Pharmacy Interest Group.

**POPULATION HEALTH IMPROVEMENT**

**HealthPartners’ Dynamic Simulation Model for Colorectal Cancer Screening: Importance of the Long View in Evaluating Strategies to Increase Screening**

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**Background:** Many health systems strive to increase colorectal cancer (CRC) screening rates yet fall short of the National Colorectal Cancer Roundtable’s annual goal of screening 80% of Healthcare Effectiveness Data and Information Set (HEDIS)-eligible patients. Selecting the most efficient and effective strategies for closing these care gaps is difficult because the relationship between plan interventions and both short- and long-term outcomes is unclear. This obscurity is due to complexity rooted in differences between HEDIS-qualifying screening modalities, delayed benefits of screening, and changes in individual risk of CRC over time. Dynamic simulation models can aid decision-making in complex systems by doing the forecasting calculus that unaided human brains cannot and by providing visual representation of system dynamics, thereby facilitating identification of key system drivers.

**Methods:** We built an initial agent-based dynamic simulation model that simulates a population of patients and providers within a health system. Patients have opportunities for CRC screening, including referral from providers. Within patients, polyps may form, grow, and become cancerous. The model operates over a 30-year time horizon. Outputs include the HEDIS CRC screening measure, resource utilization, CRC morbidity and mortality, and life-years gained/lost.

**Results:** Simulations: 1) highlighted the strengths of colonoscopies as a preferred screening modality; 2) revealed problems using the HEDIS CRC screening measure to evaluate long-term success; and 3) revealed the significance of data gaps, especially longitudinal data on year-to-year compliance with fecal immunochemical test (FIT) kit and FIT DNA screening modalities, gaps which thwart long-term strategic analysis.

**Conclusion:** Due to the delay between screening and adverse outcomes associated with undetected colorectal cancer, decisions based on analysis of outcomes limited to the short-term (a handful of years) could easily turn into public health disasters over 10 to 20 years. Therefore, there is an urgent need to address the problems we identified with use of the HEDIS CRC screening measure and to fill the data gaps in longitudinal CRC screening adherence.
ORAL and POSTER PRESENTATIONS

COVID-19

Analysis of Emotional Responses to the COVID-19 Pandemic Using the Pandemic Emotional Impact Scale

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Background: The Pandemic Emotional Impact Scale (PEIS) is a 16-item psychometric survey instrument developed in April 2020 and included in a larger survey administered to 1500 adults whose distribution mirrored the U.S. population on key demographics. Factor analysis was performed, and two underlying dimensions emerged from PEIS survey data: emotional effects and pragmatic worries.

Methods: Between September 2020 and May 2021, the Center for Health Research at Kaiser Permanente Northwest (KPNW) conducted a Centers for Disease Control and Prevention-funded COVID-19 surveillance project in which the PEIS was included as part of the study protocol, with one objective being confirming the original factor analysis in our respondent population. Inclusion criteria for the main study included adult KPNW members who had indications of COVID-19 and received an order for a SARS-CoV-2 lab test from a medical provider but did not complete the test within 48 hours. Participants were offered the opportunity to complete a lab test at home.

Results: A total of 519 KPNW members completed the PEIS survey. After statistically confirming the data were suitable for factor analysis, we tried replicating the original factor analysis using principal components analysis with Varimax rotation. Our data yielded a substantially different solution. Because we were unable to confirm the original research's 2-factor solution with our data, we decided to update the factor analysis to a more robust methodology using principal components analysis with oblique minimum rotation, a method that relaxes the factor orthogonality requirement of Varimax rotation. The 3 factors that emerged from the survey data were emotional (eigenvalues of >1 and together explained over 64% of the variance. There were no obvious complex variables (ie, items with high factor loadings on more than 1 factor). The factors were also coherent, indicating underlying psychometric dimensions named by the authors: 1) the pandemic weighs on my mind, 2) gloom and doom, and 3) the pandemic is cramping my lifestyle.

Conclusion: While the two sets of data yielded different results, the PEIS is a useful instrument to gather respondent mindsets about dealing with the pandemic. These divergences may indicate the ability of the PEIS to be adaptable to differences in time frames and populations.

Survey-Based Patient-Reported Outcomes Measure (FLU-PRO® Plus) Discriminates Between COVID-19 and Influenza-Like Illness


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Background: FLU-PRO® Plus (Evidera) is a patient-reported symptoms survey designed to capture distinct patterns in intensity and frequency of viral respiratory symptoms. This study evaluates whether FLU-PRO Plus responses could distinguish between symptoms of COVID-19 and other influenza-like illness (ILI).

Methods: Patients with a diagnosis or positive lab test of either COVID-19 or ILI were recruited via phone or email to complete FLU-PRO Plus for up to 14 consecutive days. Symptomatic participants that completed the first survey were included in the analytic sample. The 34-item FLU-PRO Plus measures severity/frequency of symptoms, including the loss of smell and taste. Exploratory factor analysis was used to reduce these 34 items to 3 factors expressed as “symptom scales.” Concurrent validity of the scales was evaluated with simultaneously collected quality-of-life measures. To determine diagnosis discrimination, the 3 scales were used as independent variables for logistic regression predicting COVID-19 diagnosis.

Results: A total of 314 patients completed Day 1 FLU-PRO Plus, of which 65% had a COVID-19 diagnosis. Three symptom scales of 5 items each were identified: general body, tracheal/bronchial, and nasopharyngeal. The factor loadings for each of the 15 items were positive, indicating increased symptom presence/frequency/severity contributed to higher factor scores. The 3 scales were correlated with multiple quality-of-life measures (\(r\) ranged from 0.16 to 0.56). Higher scores for the general body and nasopharyngeal scales were associated with increased odds of COVID-19 diagnosis compared to ILI (odds ratio: 1.40, 95% CI: 1.08, 1.81 for general body; odds ratio: 1.61, 95% CI: 1.24, 2.09 for nasopharyngeal). Lower tracheal/bronchial scores were associated with lower odds of a COVID-19 diagnosis (odds ratio: 0.58, 95% CI: 0.45, 0.76).

Conclusion: The 3 symptom scales identified using FLU-PRO Plus responses successfully discriminated between patients with COVID-19 and those with influenza-like illness. Future studies could refine the symptom scales to build predictive diagnostic models and prescribe target interventions in clinical practice.

Qualitative Findings on Vaccine Acceptability and Readiness Among Dentists

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Background: In response to the global pandemic caused by COVID-19 and enhance efficient distribution of vaccines, federal legislation was passed to authorize dentists to administer vaccines. Dental providers can play a significant role in vaccine delivery, but this potential has not been well studied. The Coronavirus Vaccine Acceptability and Readiness Among Dentists (CARAD) study used a mixed-methods approach to evaluate dentists’ interest and capacity to participate in a COVID-19 vaccine delivery program. We conducted semi-structured interviews among dental practitioners to better understand their perspectives on acceptability, appropriateness, and feasibility of vaccine delivery.

Methods: The study is being conducted in the Western Region of the National Dental Practice-Based Research Network (NDPBRN). Based on literature review and feedback from dentists, in-depth, semi-structured interview guides were developed. Recruitment emails were distributed to 702 practitioners in the region, inviting...
them to participate in a 30-minute phone interview conducted by qualitative research staff. Eligibility for participation included being enrolled in the NDPBRN and a currently practicing dental practitioner (dentist or hygienist). Of the 702 outreach attempts, 57 expressed an interest in participating.

**Results:** Interviews were completed with 31 practitioners (dentists and hygienists). All received compensation for their participation. Interviews were audio-recorded, transcribed, and coded using NVivo software (QSR International). We combined inductive and deductive approaches to developing a code book. A little over 50% of the participants were women, and about 50% identified as non-Hispanic White. Most practitioners were based in private practice and urban settings. Three main themes were identified regarding practitioners’ perceptions for the potential implementation of vaccine administration in their dental settings: 1) placing a high value in contributing to public health disease prevention efforts; 2) workflow, resources, and staffing considerations were important; and 3) a lack of clarity surrounding existing legislation and associated reimbursement models.

**Conclusion:** Findings from this study will inform next steps for implementing the integration of vaccine administration in dental settings.

**Patient-Reported Experience in Telemedicine and In-Person Oncology Visits During the COVID-19 Pandemic**

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**Background:** Telemedicine continues to be one delivery modality for cancer care during the COVID-19 pandemic, but little is known about patient satisfaction with telemedicine compared to in-person oncology visits.

**Methods:** This retrospective observational study combined patient surveys and electronic health records from a large health system serving a diverse patient population in Northern California. We analyzed surveys of oncology visit experience from March 2020 to July 2021. Patients assessed rating of the provider, provider communication/medical history knowledge, timely appointment, and care coordination. The top-box rating was used as a binary outcome for each variable. Multivariate logistic regression examined associations between care delivery methods and patient-reported experience, controlling for patient demographic characteristics, comorbidity, insurance type, and accounting for clustering within patients.

**Results:** Of 11,447 surveys, 20% were telemedicine visits. Telemedicine visits had more “best” ratings than in-person visits for medical history knowledge (85% vs 75%) and timely appointment (83% vs 79%) and fewer “best” ratings for provider (71% vs 77%), prescription discussed (72% vs 76%), and medical question answered (64% vs 66%). Ratings were similar between the two groups in provider explaining (88% vs 88%) and provider listening (90% vs 91%). Patients with telehealth visits reported more satisfaction with their providers on knowing their medical history (odds ratio [OR]: 1.88, 95% CI: 1.38–2.56) and ability to obtain timely appointments (OR: 1.18, 95% CI: 1.04–1.34). In contrast, telemedicine patients were less likely to rate their providers as highly as patients with in-person visits (OR: 0.76, 95% CI: 0.68–0.85) and medical questions answered (OR: 0.85, 95% CI: 0.75–0.96).

**Conclusion:** While delivering similar quality in terms of provider’s ability to explain and listen to medical conditions, telemedicine and in-person visits offer their own advantages like more provider knowledge of medical history in telemedicine and more medical questions answered with in-person. Further studies are needed to explore patient preference and an optimal balance of telemedicine and in-person visits for cancer care.

**Association Between 10-Year Atherosclerotic Cardiovascular Disease Risk Score and COVID-19 Complications and Mortality: Analysis of Data From the National COVID Cohort Collaborative**

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**Background:** The SARS-CoV-2 outbreak is challenging to health systems due to its high complication rates. Complications and mortality seem to be higher among patients with underlying conditions, including atherosclerotic cardiovascular disease (ASCVD). Less is known about patients at risk of ASCVD who have not yet developed an event.

**Methods:** This is a retrospective analysis of data from the National COVID Cohort Collaborative (N3C) evaluating the risk of mortality within 3 months and other COVID-19 complications by 10-year ASCVD risk score. Patients were included if they had a COVID-19 positive test between January 2020 and October 2021, were free of ASCVD events prior to test date, and had available data to calculate the score. Scores were categorized into low (<7.5%), moderate (7.5%–20.0%), or high risk (≥20.0%) of developing ASCVD. Odds of mortality comparing ASCVD risk scores is presented as odds ratio (OR) and 95% confidence intervals.

**Results:** Of 126,082 patients (from 39 U.S. health systems) were included. Mean age was 51 ± 15.9 years, 59% were females, 70% reported White race, and 80% reported not being Hispanic/Latino. Only 7% were hospitalized at the time of testing. Unadjusted analyses indicated a clear dose response relationship between ASCVD risk and mortality. Compared to low risk, those at moderate risk had 4.80 greater odds (95% CI: 3.77, 5.51) of mortality; those at high risk had 17.05 greater odds (95% CI: 14.40, 20.19).

**Conclusion:** Analysis from this large and diverse cohort indicates that patients free of ASCVD events but at risk of developing an event based on the 10-year ASCVD risk score are significantly more likely to die compared to patients at low risk of developing ASCVD. This is concerning especially given the high prevalence of patients at risk of ASCVD in the United States and worldwide, many of whom remain undiagnosed, adding further challenges during this epidemic.

**Reasons for Moving From COVID-19 Vaccine Hesitancy to Vaccine Acceptance: Results From a Qualitative Study**

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**Background:** Understanding factors that influence individuals to get vaccinated against COVID-19 is crucial to achieving herd
Supplement

Methods: In January 2021, we conducted an online survey using the Prolific data panel. Respondents were classified as vaccine‐hesitant if they responded “no” or “not sure” to the question “Do you intend to be vaccinated against COVID-19?” In late May 2021, we conducted a follow‐up survey, assessed vaccination status/ intent, and interviewed initially hesitant respondents who had since been vaccinated or planned to be vaccinated. Interviews explored factors affecting vaccination decision and were coded using thematic analysis.

Results: A total of 22 interviews were conducted; 13 interviewees were female, 15 were Black, 4 were Latino, 3 were White, and mean age was 38.5 years. All but one interviewee had received at least one dose of the COVID‐19 vaccine before the interview; that interviewee intended to get vaccinated soon. Most interviewees decided to get vaccinated after seeing or hearing from others, particularly family and friends, who got vaccinated. For many, protecting others at increased risk for COVID-19 was a strong motivator; many interviewees did not perceive themselves to be at risk of COVID‐19. Some interviewees were prompted by practical issues like convenient vaccine access, a desire to return to normal activities, and work/ travel requirements. While many became reassured of vaccine safety, a few remained hesitant “up to the day that [they] got the vaccine.” Others seemed fatalistic and got vaccinated to “get it over with.” Regarding influential information sources, interviewees reported exposure to information from various sources but many “[look] it with a grain of salt” and stressed the importance of making their own decision.

Conclusion: Our findings suggest that the importance of social influences, practical issues, and the benefit of protecting others should be considered in designing strategies aiming to reduce vaccine hesitancy.

Factors Associated With Outpatient Acute Kidney Injury in Patients With COVID-19

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Background: Acute kidney injury (AKI) is a complication that occurs in 24%–57% of patients hospitalized with COVID-19. However, AKI occurring outside of the hospital (outpatient AKI [AKI‐OPT]) remains underexamined, and the impact of COVID-19 on AKI‐OPT is currently unknown. We used longitudinal data to describe factors associated with AKI‐OPT in patients with COVID-19.

Methods: We conducted a retrospective cohort study using health data from adult patients diagnosed with or who tested positive for COVID-19 between March 1, 2020, and January 31, 2021. Patients with AKI‐OPT were defined as having a 50% or greater increase in serum creatinine levels after their COVID-19 index date compared to a baseline measurement taken less than 1 year prior to index date. We used logistic regression to assess the association of demographics (age, race, sex), social (neighborhood deprivation index [NDI]), and clinical factors (comorbidities, body mass index, blood pressure, and estimated glomerular filtration rate) with AKI‐OPT.

Results: Among the 6821 patients included in the study sample, 59.5% were female, 14.9% were White, 42.2% were Black, and mean age was 53.8 years. AKI‐OPT was identified in 429 (6.29%) COVID-19 patients with a mean (standard deviation) serum creatinine change of 0.42 (0.23) compared to -0.01 (0.13) in the non-AKI‐OPT group. In multivariable adjusted models, female COVID-19 patients had 31% lower odds of AKI‐OPT (odds ratio: 0.69, 95% CI: 0.56, 0.86) compared to males; and COVID-19 patients living in the most socially deprived neighborhoods (highest NDI tertile) had 39% higher odds of AKI (odds ratio: 1.39, 95% CI:1.04, 1.84) compared to the least deprived neighborhood.

Conclusion: Low area-level socioeconomic status was a major risk factor for AKI‐OPT following COVID-19 in a population of insured patients with access to health care. This represents a new addition to a growing number of COVID-19-related health outcomes with inequities rooted in the social determinants of health.

Social Determinants of Health and COVID-19 Experiences impacting COVID-19 Vaccine Uptake, Safety, and Efficacy Concerns Among the Black Community

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Background: Despite COVID-19 disproportionality impacting Black communities, vaccine hesitancy may be higher in this group owing to longstanding and enduring systemic racism. In this study, we determined whether Black (vs White) adults within a Georgia integrated health system were more or less likely to report vaccine hesitancy, report concerns about vaccine safety, and efficacy.

Methods: We invited all adult members (≥18 years of age) at Kaiser Permanente Georgia, with a positive COVID-19 diagnosis between March 2020 and April 2021 to participate in a cross-sectional COVID-19-specific survey (n=17,608 eligible members) sent between June 2021 and August 2021. Participants self-reported race (White, Black) and were asked their willingness to receive a vaccine, concerns about vaccine efficacy, and vaccine safety. Descriptive statistics and chi-squared tests were calculated. Multivariable logistic regression models will be used to assess the association between race and three vaccine-specific outcomes (uptake, safety concern, efficacy concern), adjusted for age, education, and income.

Results: In total, 481 adults (response rate of 2.73%) completed the survey. Mean age was 51.6 (standard deviation: 13.2) years, 30.2% were male, and 38.6% reported Black race. A total of 294 (76.0%) participants reported having received or planning to receive the COVID-19 vaccine: 69.6% Black adults vs 80.1% White adults (P= 0.09). Significantly more Black adults (46.7%) reported concerns about the COVID-19 vaccine safety compared to White adults (26.7%); P<0.001. When asked about their concern whether the COVID-19 vaccine will work, significantly more Black adults (65.2%) reported efficacy concern compared to White adults (35.8%); P=0.001.

Conclusion: Our preliminary results show that among adults diagnosed with COVID-19, Black adults were less likely to have received or plan to receive the COVID-19 vaccine and more likely to have concerns regarding the vaccine safety and efficacy, as compared to White adults. Further analysis of these data is needed to explore how social determinants of health may affect these differences.
Impact of the COVID-19 Pandemic on Incidence Rates of Outcomes of Interest in Vaccine Safety Studies

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Background: The COVID-19 pandemic caused an abrupt drop in in-person health care (inpatient [IP], emergency department [ED], outpatient [OP]) and an increase in telehealth care. These changes pose challenges in vaccine safety studies that identify outcomes from in-person encounters. The objective of this study was to examine the changes in incidence rates of selected outcomes during the COVID-19 pandemic.

Methods: We assembled a cohort of members from 8 sites in the Vaccine Safety Datalink from January 1, 2017, through December 31, 2020. Using ICD-10 diagnosis codes or laboratory criteria, we identified 21 incident outcomes in IP/ED/OP settings and expanded to telehealth setting. We defined 4 periods in 2020: January–February (prepandemic), April–June (early pandemic), July–September (middle pandemic), and October–December (late pandemic). We defined 4 corresponding periods within each year from 2017 to 2019. We calculated incidence rates, conducted difference in difference analyses, and reported ratio of incidence rate ratios to examine changes in incidence rates from January–February to pandemic periods after adjusting for changes across similar periods in 2017–2019.

Results: Among >10 million members, regardless of settings and after adjusting for changes during 2017–2019, we found that incidence rates of outcomes, including acute disseminated encephalomyelitis, encephalitis/myelitis/encephalomyelitis/meningoencephalitis, and thrombotic thrombocytopenic purpura, were not impacted significantly by the pandemic (P≥0.05 for all). Incidence rates decreased, at least in the early pandemic period during 2020, for acute myocardial infarction, anaphylaxis, appendicitis, Bell’s palsy, convulsions/seizures, Guillain-Barre syndrome, immune thrombocytopenia, narcolepsy/catatlexy, hemorrhagic stroke, ischemic stroke, and venous thromboembolism (P<0.05 for all). Some events of Bell’s palsy, immune thrombocytopenia, and narcolepsy/catatlexy occurred in the telehealth setting during 3 pandemic periods, while few did before the pandemic.

Conclusion: Rates of outcomes during the pandemic were impacted and should not be used as historical background rates in vaccine safety studies. Telehealth setting should be considered for vaccine studies involving Bell’s palsy, immune thrombocytopenia, and narcolepsy/catatlexy.

Epidemiology of COVID-19 in Pregnancy by Race and Ethnicity: Consideration of an Equitable Vaccination Strategy

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Background: COVID-19 has disproportionately impacted minoritized populations, in general, with greater risk of infection and associated morbidity and mortality. However, the epidemiology of COVID-19 among pregnant women by race and ethnicity is not well described. We used data from Sutter Health, a large health system in northern California, to estimate prevalence and spread during pregnancy and recommend a vaccination approach based on minimizing adverse outcomes to promote vaccine equity.

Methods: Beginning in May 2020, all patients delivering babies at Sutter Health were tested (molecular) for COVID-19 at the time of admission. For the subset of women who delivered their babies from October to December, we combined these results with antibody tests results, using samples drawn at delivery. For each racial/ethnic group, we estimated prevalence of COVID-19 and used logistic regression to adjust for known sociodemographic and comorbid risk factors. We also tested for IgG/IgM to provide insight into the timing of infections.

Results: Among 17,446 women delivering from May to December, 460 (2.6%) tested positive (molecular). Hispanic women were at 2.6 times the odds of being actively infected as White women (odds ratio [OR]: 2.6, 95% CI: 2.0–3.3). August and December were the highest-risk periods for active infection (OR: 3.5, 95% CI: 2.1–5.7 and OR: 6.1, 95% CI: 3.8–9.9, compared to May, respectively). Among 4500 women delivering babies from October to December, 425 (9.4%) had either a positive molecular or antibody test, ranging from 4.0% (Asian) to 15.7% (Hispanic). Adjusting for covariables and in comparison with White patients, odds of infection was similar for Black and Asian patients, with Hispanic at 2.4 (95% CI: 1.8–3.3) times the odds.

Conclusion: COVID-19 prevalence was higher among Hispanic women at delivery and in the last trimester than their White counterparts. Although prevalence also was greater for Black patients, the differences were explained by other risk factors. In contemplating an equitable vaccination strategy, resources should be directed to increase vaccination rates among Hispanic women in early stages of pregnancy.

From Vaccine Hesitancy to Vaccine Acceptance: Who Changes and Why?

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Background: COVID-19 vaccines have been widely available for adults in the United States since April 2021, but uptake remains suboptimal. We characterized adults who were initially vaccine-hesitant but went on to be vaccinated and identified influential factors with the goal of identifying strategies to promote COVID-19 vaccine uptake among hesitant adults.

Methods: In January 2021 we conducted an online survey via Prolific assessing intent to be vaccinated against COVID-19, COVID-19-related knowledge and attitudes, and respondent characteristics. Approximately 6 months later we administered a follow-up survey assessing vaccination status and the vaccination decision. We examined associations between respondent characteristics and vaccine acceptance for two levels of hesitancy separately (initially not sure vs initially planned not to vaccinate) using chi-squared statistics and t-tests. We analyzed reasons for getting vaccinated using thematic analysis.
Clinicians With Caregiving Responsibilities Need More Support During the COVID-19 Pandemic: Results From Two Surveys in a Large Health System

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Background: This study assessed how clinician well-being and needs changed during the pandemic and explored differences between clinicians with and without caregiving responsibilities.

Methods: Two surveys were distributed in summer and fall 2020 to clinicians in Sutter Health-affiliated medical groups across Northern California, asking burnout, support needed, and work challenges (work safety, loss of income, caregiving). Clinicians responding to both surveys were included in the analysis. Bivariate analyses and multilevel logistic models were conducted. Results reported are statistically significant at P<0.05.

Results: A total of 1250 (27.9%) clinicians responded to both surveys. Overall, the burnout rate slightly increased over time (30.7% to 33.6%), but the proportion concerned about work safety (86.1% to 25.9%) and loss of income (70.1% to 54.6%) decreased. Of 1250, 78% of respondents reported having caregiving responsibilities. Among clinician caregivers, the proportion reporting that caregiving impacted work was stable (33.6% vs 33.8%) over time. Clinicians reported decreases for personal protective equipment (34.3% to 22.1%) and flexible schedules (34.1% to 24.4%), but increasingly wanted support for remote access (21.7% to 28.2%) and mental health (12.2% to 16.4%). Model results revealed clinician caregivers were more likely to have worse well-being or need additional support than those without caregiving responsibilities. Among clinician caregivers, females (odds ratio [OR]: 6.96) and physicians (OR: 13.31 vs nonphysicians) were more likely to report burnout; female (OR: 2.25), younger (OR: 6.25, <45 years vs 45+ years), and part-time clinicians (OR: 2.15) had higher odds of reporting that caregiving impacted work; females desired more mental health support (OR: 2.61) and flexible schedules (OR: 2.30); and increased work challenges were associated with higher odds of reporting burnout over time. Group differences and longitudinal associations were largely reduced among clinicians without caregiving responsibilities.

Conclusion: Clinician well-being and needs changed during the pandemic, and clinicians with caregiving responsibilities appear to be disproportionally impacted. Identifying opportunities to better support clinicians is critical.

Parental Perception of Pediatric COVID-19 Vaccination

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Background: COVID-19 vaccinations for children 12–15 and 5–11 years of age were approved in May 2021 and October 2021, respectively. Prior to the pandemic, 20% of parents reported being vaccine-hesitant. We characterized parental intent to vaccinate children against COVID-19 in a mixed-methods, cross-sectional analysis.

Methods: We administered an online survey to 280 parents of children (<18 years old) in June–July 2021 as part of a larger, nationwide study collecting data on COVID-19 vaccination intent. Parents reported intent to vaccinate their children (yes/unsure/no) and responded to open-ended questions about their views on getting their child vaccinated. Descriptive statistics were used to assess the association between vaccine intent and parent characteristics. Qualitative results were analyzed using thematic analysis. We excluded parents of already-vaccinated children, and those who did not respond to the open-ended question.

Results: The final population (N=259) was 60% female, 31% Black, and 23% Hispanic, with 51% vaccinated for COVID-19 and 41% intending to vaccinate their children. Preliminary results suggest parents’ COVID-19 vaccination status was the strongest predictor of intent to vaccinate children (63% of vaccinated parents vs 20% of unvaccinated parents; P<0.001). Parent receipt of flu vaccine also predicted intent to vaccinate children (57% of vaccinated vs 28% unvaccinated parents; P<0.001). Parents’ comments about child vaccination revealed parents not intending to vaccinate their child (n=67) did not trust the vaccine (22%), believed children were not at risk from COVID-19 (21%), and feared side effects (15%). Parents unsure about vaccinating their child (n=86) intended to wait for more data (20%) and were uncertain about vaccine safety (10%). Parents intending to vaccinate their child (n=106) would do so to protect their child (36%) and to protect others (26%).

Conclusion: To encourage pediatric COVID-19 vaccination, targeted efforts — including tailored messaging — will be required to build trust with hesitant parents.

Evaluating the Change in Hemoglobin Levels Following a COVID-19 Hospitalization in Adult Members Within a Southeastern U.S. Integrated Health System

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Background: Between August 2020 and November 2021, over 3.2 million Americans were hospitalized with COVID-19. Anemia has
Previously been shown to increase the risk for severe illness and pneumonia in people hospitalized with COVID-19. We examined the prevalence of anemia post-COVID-19 hospitalization and determined if length of stay was associated with post-COVID-19 anemia.

**Methods:** We evaluated 316 Kaiser Permanente Georgia adults (≥18 years old) hospitalized with COVID-19 at Emory University Hospital between March 1, 2020, and August 23, 2021, with measured hemoglobin at discharge and at least one other point in time during 180-day posthospitalization follow-up. Anemia was defined as hemoglobin of <13 g/dL for men and of <12 g/dL for women at 5 follow-up periods: 14, 30, 60, 90, and 180 days posthospitalization. Length of stay was defined as ≤5 days or >5 days. We estimated the prevalence of anemia at each follow-up period and used unadjusted logistic regression to assess the association between length of stay and risk of anemia.

**Results:** Our study population was 46.4% men, and 55.1% self-reported Black race. At 14, 30, 60, 90, and 180 days posthospitalization, respectively, a total of 31.0%, 27.3%, 19.7%, 28.1%, and 42.3% completed follow-up hemoglobin labs; prevalence of anemia was 57.9%, 58.5%, 58.8%, 49.5%, and 49.3%, respectively. Adults with length of stay of ≤5 days (vs >5 days) had higher odds of posthospitalization anemia at 14 days (odds ratio [OR]: 2.96, 95% CI: 1.33, 6.59), 30 days (OR: 6.46, 95% CI: 2.60, 16.07), 60 days (OR: 3.00, 95% CI: 1.07, 8.40), and 90 days (OR: 2.42, 95% CI: 1.07, 5.47). At 180 days, length of stay was not associated with anemia (OR: 0.63, 95% CI: 0.33, 1.23).

**Conclusion:** Preliminary findings show almost half of adults hospitalized with COVID-19 had anemic hemoglobin levels up to 180 days posthospitalization. Length of stay was significantly associated with anemia 90 days posthospitalization. Future analyses will adjust for possible confounders and examine other subgroups with high post-COVID-19 hospitalization risk.

**HEALTH EQUITY & SOCIAL NEEDS**

**Impact of Race and Ethnicity Among Hyperkalemic Patients Seen in the Emergency Department in a Large Midwestern Health System**

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**Background:** Hyperkalemia (serum potassium of >5.0 mEq/L) is a common diagnosis in the emergency department (ED). Previous studies suggest associations between race and ethnicity among patients with hyperkalemia, yet it remains unclear if these factors impact ED outcomes. The aim of this study was to evaluate race and ethnicity among patients with hyperkalemia and ED outcomes.

**Methods:** Electronic health records of patients (≥18 years) seen in the ED between January 1, 2015, and December 31, 2020, with an elevated serum potassium (≥5.0 mEq/L) ≥24 hours within an ED visit to 1 of 26 hospitals of a large health system spanning Illinois and Wisconsin, were extracted. Generalized estimating equations were used to evaluate race and ethnicity and dichotomous outcomes (admitted and intensive care unit [ICU] stay) and linear mixed models were used to evaluate length of stay (LOS). Models were adjusted for serum potassium, age, sex, insurance, diabetes, and hypertension diagnoses.

**Results:** The cohort included 45,073 patients and 68,045 unique ED visits. Most patients (95%) had ≤6 ED visits; 19% of patients were Black (n=8352), and 9% identified as Hispanic/Latino (n=5940). Most patients (78%) were publicly insured. More than half of ED patients were admitted (68%), and 10% had an ICU stay. Black patients were less likely to be admitted (odds ratio:0.91, 95% CI: 0.89, 0.92) compared to White patients. Hispanic/Latino patients (odds ratio: 1.14, 95% CI: 1.05, 1.24) were more likely to have an ICU stay compared to non-Hispanic/Latino patients. Black patients were associated with longer LOS (β: 32, 95% CI: 20, 42) compared to White patients. Hispanic/Latino patients were more likely to have a longer LOS (β: 49, 95% CI: 36, 64) compared to non-Hispanic/Latino patients.

**Conclusion:** More than half of patients with hyperkalemia were admitted. Black patients were less likely to be admitted, and Hispanic/Latino patients were more likely to have an ICU stay and longer LOS. Therefore, existing disparities among patients with hyperkalemia may be amplified in the ED.

**Depression and Anxiety in the Native Hawaiian/Pacific Islander Population**

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**Background:** There is limited information on the prevalence of mental health conditions among Native Hawaiians and Pacific Islanders (NHPI). Traditionally in psychiatric and substance abuse research, NHPI have been grouped with Asians under one racial category, but this aggregation does not provide accurate estimates of health for NHPI. In 2014, the National Center for Health Statistics conducted the NHPI National Health Interview Survey (NHIS). This survey asked questions about feelings of depression and anxiety. Therefore, the analyses presented in this study estimate the prevalence of depression and anxiety symptoms among NHPI persons living in all 50 states and the District of Columbia and identifies factors associated with having these symptoms.

**Methods:** Sample: The Division of Health Interview Statistics at the National Center for Health Statistics used a single year of the U.S. Census Bureau’s American Community Survey (ACS) as a frame for a follow-back survey of addresses in the ACS with 1 or more NHPI residents. Overall, the population was young, with 62.1% of the cohort 18–44 years of age. Measures: Dependent variables included anxiety symptoms and depression symptoms. Independent variables included demographics, health behaviors, health status, and health care utilization. Data analysis: All analyses were performed using SAS 9.4 software (SAS Institute Inc.).

**Results:** The overall prevalence of any anxiety symptoms (mild, moderate, or severe) in this analysis was 62.5%, while the prevalence of any depression symptoms (mild, moderate, or severe) was 39.2%.

**Conclusion:** By examining the relationship of demographic, clinical, and behavioral factors with anxiety and depression symptom severity, this study provides insight into factors that should be included in holistic approaches to improving the health and well-being of NHPI persons living across the United States.

**Reach of an Initiative in the Health Care Setting to Screen and Refer Patients for Social Needs**

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Background: Kaiser Permanente (KP) invested in a closed-loop social needs referral platform, linking clinical care to social care through data integration with community-based partner organizations (CBOs). The Thrive Local Community Network makes rapid, secure referrals between health care providers and CBOs and tracks referral outcomes. This presentation will describe the reach of the initiative after 22 months of implementation and identify characteristics of individuals who consent to receive services but do not successfully move through the system to receive services for 1 or more needs.

Methods: The study population consists of KP members referred for social needs from February 2020 to December 2021. Data were collected along a care cascade from screening to consenting to receiving services to receiving a referral and to having a need addressed. Descriptive statistics and chi-squared analyses are being used to assess differences across each phase of the cascade.

Results: Females made up 62% of those with a need and 48% of resolved referrals. Those under age 50 made up 51% of those with a need but only 23% of resolved referrals. Individuals who make it through the cascade to have a need resolved are more likely to have chronic comorbidities. Those on Medicaid made up 29% of those with needs and 21% of resolved referrals. Final results will include data through December 2021 and represent multiple regions.

Conclusion: These results identify sequential drop-offs in the cascade where certain populations are less likely to move through the cascade to receive services and have a need resolved. As health care organizations continue to implement social care interventions, there is a need to understand the characteristics of individuals who do not successfully move through the care cascade so tailored interventions can be developed to help ensure individuals receive services.

Analysis of Neurogastrointestinal and Motility Disorders From a National Pediatric Database: Exploring National Demographic Access and Outcomes

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Background: Pediatric neurogastroenterology and motility (PNGM) has developed significantly in the last decade. PNGM disorders impose a significant impact on health-related quality of life and cost of health care. Prevalence of PNGM diagnoses appears to be rising, but a detailed understanding of the overall disease burden across demographic groups is unknown. Our objective is to characterize the incidence and demographic characteristics of patients with PNGM conditions and the trends of inpatient motility tests using the Kids Inpatient Database (KID).

Methods: We used HCUP-KID national database for the years 2003–2016 to perform a trend analysis in U.S. hospitalizations for ICD-9-CM and ICD-10-CM-identified PNGM studies in patients less than 18 years of age with elective admission and a length of stay of <3 days. The hospitalization rates were analyzed by year, hospital region, facility type and patient sociodemographic characteristics. Multivariable logistic regression was used to examine factors influencing the receipt of motility studies.

Results: There was an overall increase trend in hospitalizations, rates of PNGM studies, and median hospital charges from 2003 to 2016. Patients with private insurance and living in high-income zip codes were more likely to receive a PNGM study compared to those with governmental insurance and lower income area. Except for 2016, the Midwest had the highest hospitalization rate. Although race was not found to influence the receipt of the study, a major difference in the length of stay was noted across the regions.

Conclusion: Our study found that there are gender, income, insurance, and regional differences in the rates of inpatient PNGM studies and an increased trend in hospital total charges for PNGM services. Our observation that reimbursement patterns and surrogate income markers associated with practice patterns is concerning and deserves more detailed analysis. Future analysis should include ambulatory PNGM services to understand combined inpatient and outpatient procedures trend.

Health Care Intervention to Reduce Time in Jail and Support Community Re-Entry for People With Serious Mental Illness

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Background: The Polk County Jail Diversion (PCJD) Program in Iowa intervenes after incarceration to provide care coordination services for individuals with serious mental illness. Led by a community mental health agency, the PCJD aims to minimize time spent in jail and reduce recidivism by establishing health and social services upon re-entry into the community. Since the program began in 2008, it has been well received and garnered statewide recognition, but a comprehensive evaluation has not been done until the current study.

Methods: A mixed-methods approach combined interviews (N=19) and longitudinal recidivism data to understand the factors contributing to the program's effectiveness, challenges encountered, and opportunities to incorporate evidence-based practices. This presentation focuses on the qualitative results, as quantitative analysis is currently underway. Jail diversion program staff provided a list of professionals with roles in the jail diversion program, including attorneys, judges, probation officers, jail staff (eg, nurse, behavioral health counselor), substance use specialists, case managers, and social service providers, who comprised the interview sample.

Results: Results from interviews with jail diversion staff and network of collaborators indicate that the program fills gaps between the criminal justice, mental health, and social service systems by providing services for the unmet needs of participants, which included transportation (eg, to probation appointments, court ordered treatment, pharmacy), social support, stable housing, and access to community resources (eg, food pantries, mental health providers, clothing, benefit enrollment [ie, Medicaid]). Interviewees almost unanimously reported that high demand for specialized mental health services in the criminal justice system justified recommendations for increased investment.

Conclusion: Results of the interviews had several implications for policy and practice, including intervening prior to arrest, especially for common charges for people with mental illness (eg, trespassing, disorderly conduct, assault at group homes) and increased competency in mental health care across judicial system staff at all levels.
Co-Occurrence of Social Risk Factors and Associated Outcomes Among Patients With Heart Failure

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Background: Among patients with heart failure, individual social risk factors (SRFs) are associated with poorer outcomes. The objective of our study was to address gaps in our understanding of the co-occurrence of multiple SRFs among patients with heart failure.

Methods: Our cohort included patients ≥18 years old living in southeast Minnesota with a heart failure diagnosis between January 2013 and June 2017 (n=2973). Patients were mailed surveys to assess SRFs and demographics. We merged the survey data with 1) electronic health record data to identify additional diagnoses and outcomes of all-cause emergency department (ED) visits and all-cause and cardiovascular-specific hospitalizations, and 2) patient address data to identify area deprivation index (ADI) and rurality. SRFs included education, health literacy, social isolation, ADI, and rurality. We evaluated the association of SRFs with outcomes separately and as the count of SRFs using Andersen-Gill models to account for recurrent events. We controlled for other demographics, the Charlson Comorbidity Index, and key comorbidities.

Results: The cohort had a mean age of 73.7 years, was 54.6% male, and was 94.5% White. When modeling SRFs individually, having high school education and high social isolation were consistently associated with higher rates of all-cause ED visits (hazard ratio: 1.35 [95% CI: 1.26, 1.44] for high school and 1.23 [1.14, 1.33] for high social isolation) and hospitalizations (1.31 [1.20, 1.44] and 1.23 [1.10, 1.37]). When modeling the count of SRFs, the strength of the association tended to increase with greater numbers of SRFs for both all-cause ED visits (1.53 [1.34, 1.75] for 3 SRFs vs none) and hospitalizations (1.57 [1.30, 1.89] for 3 SRFs vs none).

Conclusion: Among patients with heart failure, low educational attainment, social isolation, and an increasing count of SRFs had the strongest associations with outcomes. The findings suggest that having multiple co-occurring SRFs is associated with worse outcomes; these patients may benefit from emerging social needs interventions or referrals to community-based organizations.

Sociodemographic Predictors of Length of Stay in the Neonatal Intensive Care Unit

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Background: Infants who spend time in neonatal intensive care units (NICUs) are significantly more likely to be diagnosed with neurodevelopmental disorders. Gestational age and length of stay have been associated with poorer neurodevelopmental outcomes. However, recent research suggests that aspects of the NICU environment may also contribute to poorer neurodevelopmental outcomes. In the interest of reducing length of exposure to a NICU environment, it is important to determine whether nonphysical (ie, sociodemographic) factors are associated with an increased length of NICU stay.

Methods: We obtained de-identified electronic health data from a Level III NICU (January 2017–November 2019) for all infants hospitalized for >1 week (n=185, 56% male). We completed a backward selection regression to explore the relationship between length of stay and sociodemographic variables (eg, insurance, race, language, interpreter service), controlling for gestational age (mean: 33 weeks, standard deviation: 3.9 weeks).

Results: Infant gestational age at birth was the strongest predictor of length of stay (P<0.01, b=−0.69). Health insurance status and interpreter services also were significant predictors of length of stay. Infants whose mothers had private insurance were significantly more likely to be hospitalized longer than infants whose mothers had public insurance (P=0.04, b=−0.11). Infants whose caregivers required interpreting services were significantly more likely to have longer stays than infants whose caregivers did not require interpreting services (P=0.02, b=−0.12). Maternal race and mother’s preferred language were not significantly associated with duration of infant hospitalization.

Conclusion: Interestingly, both sociodemographic risk (ie, interpreter required) and protective factors (ie, private insurance) were significantly associated with an increased length of stay — even after controlling for gestational age. Given the possible iatrogenic effects of the NICU environment, it is important to further evaluate factors such as health insurance status and language barriers and their relationship to length of stay.

Advancing Health Equity Using a Participatory Approach to Community-Integrated Care in Health-Related Social Needs Interventions

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Background: Health-related social needs (HRSN) are a determinant of health outcomes at the individual and health system levels. Health systems can use community-integrated care interventions to help HRSN seekers navigate complex systems to find useful programs. With community partners, Essentia Health launched one such intervention named “Resourceful” in March 2021. The Resourceful platform integrates findhelp.org with Essentia Health’s electronic health record to enable information, communication, and referrals for HRSN services among health care providers, community-based organizations (CBOs), and HRSN seekers. This study’s objective is to identify critical elements for the continued improvement in Resourceful processes, implementation, and evaluation from the perspective of HRSN seekers.

Methods: Following a community-based participatory design, qualitative data were collected from 11 community team members over 8 virtually conducted, 90-minute focus group sessions between August 2021 and November 2021. Sessions were designed to build group trust, share how Resourceful worked, and gather data. Data were generated from facilitator notes paraphrasing participant discussions about the ideal use and impact of Resourceful responding to hypothetical HSRN scenarios created from patterns of the platform’s use after launch. Data were analyzed for each scenario via multiple rounds of thematic analysis (ie, investigators synthesizing these from their
independent findings, presenting to focus group for feedback, investigators refining and re-presenting findings until consensus reached by focus group). Interview recordings/transcriptions were not used to facilitate participant comfort and openness in discussions; therefore, data trustworthiness was established following techniques outlined by Krefting.

**Results:** Analysis revealed 4 critical elements: 1) strengthening trust among stakeholders (ie, HRSN seekers, CBOs, and health systems); 2) robust communication and integration among stakeholders; 3) “helpful help” for HRSN seekers; and 4) HRSN seeker-centered approaches.

**Conclusion:** Findings highlight key considerations for development and evaluation of the Resourceful platform around the development of logic models, selection of meaningful measures (eg, HRSN seeker-reported experience, CBO-reported outcomes, health care utilization/expenditures, stakeholder incentive alignment), training, and workflow design.

**Preliminary Results From the Bariatric Experience Long Term (BELONG II): A Qualitative Study**

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**Background:** Severe obesity has increased in prevalence in the past decades. Bariatric surgery is one of the most effective treatments for severe obesity. There is limited research on why there are disparities in weight loss after bariatric surgery for racial and ethnic minority patients. The objective of this presentation is to describe the preliminary results and themes that emerged from in-depth qualitative interviews with post-bariatric surgery patients for the Bariatric Experience Long Term (BELONG II) study which aims to better understand the experiences of racially and ethnically diverse patients who have undergone weight loss surgery.

**Methods:** In-depth qualitative interviews were conducted with post-bariatric surgery patients (n=60). Our team used a purposive sample based on several key variables of interest including gender, race, and percentage weight loss to facilitate recruitment of a diverse sample and capture the range of experiences among participants. Interviews were 60–120 minutes and facilitated using a structured interview guide focused on patients’ postsurgery experiences and interactions with the health system.

**Results:** This presentation highlights findings related to participant interactions with health care providers and the health system. Some patients felt doctors and the health system well prepared them for the physical aspects of surgery, but many noted a lack of weight loss maintenance and mental health support. Some participants, especially racially diverse and female patients, described highly stigmatizing interactions within the health system or with providers including negative or discouraging comments about bariatric surgery such as, “It’s the easy way out.”

**Conclusion:** Our findings point to opportunities to improve experiences for patients post-bariatric surgery. Interview participants wanted additional opportunities to receive support for their long-term success after surgery. Specific recommendations included more thorough follow-ups, mental health support, weight loss maintenance, and peer support.
the independent association of social isolation with memory loss adjusting for demographic, health-related variables, and utilization in the 12 months prior to the survey.

Results: We found that patients experiencing social isolation “sometimes” were more likely to have memory loss (odds ratio: 2.45, 95% CI: 2.32–2.60; P=0.0304) compared to those who “rarely or never” experienced social isolation. Those who experienced social isolation “often or always” were more likely to have memory loss (odds ratio: 5.21, 95% CI: 4.77–5.69; P=0.0001) compared to those who “rarely or never” experienced such isolation.

Conclusion: In this study, self-reported social isolation is associated with increased levels of memory loss. Further research is needed to determine how addressing social isolation needs within large health systems can potentially delay onset of memory loss.

Factors Associated With Adherence to Medical Appointments Among Patients Undergoing Bariatric Surgery

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Background: Although bariatric surgery is an effective treatment for severe obesity, weight loss success is associated for several factors, including adherence to medical appointments. Health literacy (ability to use health information for decision-making), health numeracy (ability to understand health-related numerical information), and global cognitive functioning can impact postsurgical weight loss outcomes. Understanding whether these variables impact adherence to medical appointments among bariatric surgery candidates can inform future interventions.

Methods: Patients (N=210) who completed a presurgical psychosocial evaluation as part of the required workup process prior to undergoing bariatric surgery at a major metropolitan health system were included in this study. Patients completed measures of health literacy ( Rapid Estimate of Adult Literacy in Medicine), health numeracy (Brief Medical Numbers Test), and the Montreal Cognitive Assessment. All canceled, completed, “no-showed,” and missed (no-showed or canceled) medical appointments within 2 years presurgery were tallied, and the number of completed and missed bariatric-only appointments within 1 year after surgery were tallied. Percentages were derived from the total of patients’ pre- and postsurgical appointments.

Results: The majority of patients were female (84.8%), underwent sleeve gastrectomy (74.6%), and identified as either White (49%) or Black (42.4%). Presurgery, the percentage of no-shows was associated with lower cognitive functioning (P=0.043) and health numeracy (P=0.045), and missed appointments also were associated with lower cognitive functioning (P=0.038). Postsurgery, the percentage of missed appointments was associated with lower health literacy (P=0.054). The percentage of total no-shows was associated with lower health numeracy (P=0.053) and lower cognitive functioning (P=0.035), and the percentage of total missed appointments was also linked with lower cognitive functioning (P=0.017).

Conclusion: Individuals with inadequate cognitive functioning, health literacy, and/or health numeracy are more likely to not attend medical appointments. Facilitating adherence to medical appointments may improve weight and health outcomes, which would be beneficial to examine through future research.

Evolving Model Paradigms for Predicting Health Literacy

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Background: Overemphasis on demographic characteristics in health literacy (HL) predictive models may unintentionally marginalize population subgroups they are intended to help. As health systems evolve since the originally proposed HL models, opportunities exist to redefine HL models to reflect contemporary thought, practice, and data availability.

Methods: Observational, cross-sectional data from the Kaiser Permanente Research Bank (KPRB) health survey (2015–2021) were used to construct predictive HL models. Health literacy was estimated in the KPRB survey using common screening questions reported in the literature. Characteristics representing 5 unique information chunks were used in modeling: 1) demographic traits; 2) reading skills and social media use; 3) household/socioeconomic factors; 4) physical health, stress, and discrimination; and 5) social support. An analytical sample was constructed by extracting all participants with inadequate HL and a corresponding randomly drawn participant cohort with adequate HL in a 1:2 ratio. Multivariable logistic regression models were deployed stepwise to identify information chunks with the most robust predictive capacity for low HL.

Results: As constructed, 33.3% of the analytical sample (n=13,551; mean age: 58.8 ± 16.6 years; 65.8% White; 57.7% female; 51.9% bachelor’s degree or higher) had inadequate HL. Multivariable analyses identified self-reported reading skills and social media use as the information chunk having the highest area under the receiver operating characteristic curve (AUROC of 0.794), accuracy (0.796), sensitivity (0.581), positive predictive value (0.751), and negative predictive value (0.812). Demographic traits had the second highest AUROC (0.747) and accuracy (0.725), although sensitivity was low (0.387). Household/socioeconomic factors and social support had the lowest AUROC at 0.651 and 0.623, respectively.

Conclusion: Traditional sociodemographic factors used historically to identify those at-risk of inadequate HL may not be the most ideal. Direct questioning of reading ability and social media use instead of sociodemographic predictions may be more effective and less culturally insensitive than historical approaches.

ADDITION SCIENCE / SUBSTANCE USE

Academic Detailing for Opioid Prescribing: Using Educational Outreach to Reduce Opioid Prescribing Rates

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Background: The opioid epidemic remains a significant public health problem in the United States. Overdoses involving opioids killed nearly 47,000 people in 2018. Arkansas is the second-highest opioid prescribing state. Arkansas’ rate in 2017 was 106.1 prescriptions per 100 persons, and 93.5 in 2018, nearly double the U.S. average of 51.5. In 2019, Arkansas’ rate improved to
80.9, yet 40 of 75 counties continued to prescribe at a rate greater than the national average. This ongoing research uses educational interventions through academic detailing (AD) outreach that has been developed by University of Arkansas for Medical Sciences (UAMS) and provided to rural primary care providers (PCPs) in Arkansas counties with the highest opioid prescribing rates and opioid-overdose deaths. Our overarching goal of the program was to provide 1:1 in-person, evidence-based education to increase PCP knowledge of alternative and multidisciplinary pain care and treatment while reducing opioid prescribing when possible.

**Methods:** We provided AD education to 103 PCPs from June 21, 2019, to November 26, 2019, in 16 counties.

**Results:** PCPs were asked to complete a postvisit survey evaluating the success of the educational outreach. The majority of PCPs surveyed felt their AD session disseminated useful information. Of the 30 survey responders, 22 (73%) implemented changes to their pain management approach as a result.

**Conclusion:** Many PCPs in rural areas reported barriers to acquiring patient resources, including lack of local access to nonpharmacological multidisciplinary practitioners, lack of adequate transportation, and financial limitations. Providers in rural communities struggle to apply the evidence-based, multidisciplinary approach to pain management when access to such treatment disciplines and modalities are limited or nonexistent. In 2020, the COVID-19 pandemic halted in-person visits, and the AD team modified its methods with alternative correspondence. This AD research will continue through November 2022.

**Substance Use Disorder Treatment Completion and Transitions Across the Continuum of Care**

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**Advocate Aurora Research Institute, Advocate Aurora Health, Milwaukee, WI**

**Background:** Substance use disorder (SUD) affects over 14% of the U.S. adolescent/adult population, including many families and every community. SUD is a chronic disease requiring long-term and varying treatment acuities, yet only 8%–10% of individuals receive treatment. Treatment programs include inpatient, residential, partial hospitalization, intensive outpatient (IOP), and outpatient. Matching a patient’s treatment program to their current acuity produces better outcomes and reduces costs. Further, patients have better outcomes if they complete their current treatment and then step down to the next appropriate level of care. The purpose of this study was to assess program completion, transition, and outcomes across a SUD treatment continuum of care and identify variables predicting outcomes.

**Methods:** Data were extracted from the electronic health records for all adult patients entering SUD treatment across all 5 SUD treatment levels from 2017 to 2019 at a single behavioral health center located in the Midwestern United States. Data were extracted for 6125 unique adults.

**Results:** Many patients (22%–40%) did not complete their treatment program. After discharge, patients often did not step down in care, especially after discharging from inpatient or IOP programs. Of patients who did step down, the majority did so within 14 days postdischarge. Predictors of successfully completing treatment and stepping down in care included gender (female), race (White), insurance type (commercial), and mental health/substance use diagnosis (alcohol). After discharge, 22%–35% of patients relapsed (ie, returned to a higher level of care) within 6 months.

**Conclusion:** Patients with SUD should ideally complete treatment and step down to the next level of care; however, relatively few do, suggesting opportunities to improve care by implementing interventions for increasing transitions. Of patients who do step down, 67%–90% do so within 14 days of discharge, suggesting a target window in which patients may be more receptive to stepping down in care and thereby more amenable to interventions targeted at increasing step-downs.

**Perspectives From Patients at High Risk for Problems With Opioids About Discussing Opioid Risks With Primary Care Clinicians**

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**Background:** Medications like buprenorphine are available and effective for the treatment of opioid use disorder (OUD). However, only about 1 in 5 people with OUD receive these treatments. Evidence suggests that people with OUD may be more willing to seek treatment in primary care settings than specialty drug or alcohol treatment centers. However, patients and clinicians describe discussions around potential opioid risks as challenging. The objective of this study was to learn patient perspectives on discussing opioid risks with primary care clinicians (PCCs).

**Methods:** Data from semi-structured qualitative interviews were collected from 20 adult patients (mean age: 53.5 years, standard deviation: 12.2; 95% White, 65% male) identified as high-risk for problems with opioids (OUD diagnosis [n=8] or 3 opioid prescriptions in past year [n=12]) at an integrated health system in the Upper Midwest. Interviews were designed to better understand patient views about conversations on opioid risks with PCCs and perceptions of OUD screening and treatment in primary care. Data were analyzed using an inductive thematic analysis, and exemplar quotes were used to represent findings.

**Results:** Six themes emerged: 1) Archetypes of patient relationships with opioids may be useful for navigating patient-clinician conversations about opioid risks; 2) Patients have diverse preferences for how conversations about opioids are conducted (eg, clinician demeanor, terminology); 3) Primary care is an appropriate setting for opioid risk discussions; 4) Many patients have limited awareness of the availability of overdose rescue medications or medications for OUDs; 5) Handouts are acceptable if they come from the clinician; and 6) Patients may develop archetypes about clinicians’ willingness to prescribe opioids.

**Conclusion:** Results suggest that patients generally perceive discussing opioid risks with PCCs as acceptable under two conditions — that patients perceive the PCC as trustworthy and compassionate and that clinicians tailor the conversations to patients’ specific needs.
Health Services Utilization by Patients on Buprenorphine or Long-Term Opioids During the Early Months of the COVID-19 Pandemic

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Background: The COVID-19 pandemic disrupted in-person medical visits and may have resulted in decreased access to care. Barriers in access are especially concerning for people who rely on treatments that are heavily regulated and require in-person care. Two such groups are people using buprenorphine for opioid use disorder and people on long-term opioid therapy for chronic pain. We evaluated access changes among these groups during the early months of the COVID-19 pandemic and compared them to people with two chronic conditions with no or fewer regulations on access to medications: heart failure and severe mental illness.

Methods: We conducted a descriptive analysis using administrative claims data of commercial insurance and Medicare Advantage enrollees from the OptumLabs Data Warehouse to evaluate changes in utilization and telemedicine use during the early months of the COVID-19 outbreak. We compared changes in health care use in 4 cohorts before (January 2018–December 2020) and after COVID-19.

Results: All 4 cohorts had similar patterns in utilization and telemedicine use in the early COVID-19 period. Specialties with moderate (oncology, cardiology) and large (emergency medicine, orthopedics) decreases in utilization had smaller shifts from in-person to telemedicine. In contrast, specialties with greater shifts to telemedicine (family practice, mental health, and pain medicine) had smaller or no declines in utilization compared to before COVID-19. Pain medicine showed the greatest differences between the cohorts: the buprenorphine and long-term opioids cohorts had similar or increased use of pain medicine, whereas heart failure and severe mental illness cohorts had modestly reduced use of pain medicine. Utilization rates largely returned to pre-COVID-19 levels by July 2020.

Conclusion: The availability of telemedicine in the early period of the pandemic may have helped patients retain access to needed services; it will be important to maintain this access after the pandemic.

Effectiveness of a Brief Intervention to Reduce Unhealthy Alcohol Use in Adult Primary Care Patients With and Without Depression

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Background: Unhealthy alcohol use is common among people with depression and is associated with adverse outcomes. Randomized trials have demonstrated efficacy of screening and brief intervention (BI) in reducing drinking in adult primary care patients, but evidence of effectiveness of BI among patients with depression is lacking. We examined 1) the effectiveness of alcohol BI on change in alcohol use, and 2) whether that was moderated by depression.

Methods: Using electronic health records at Kaiser Permanente Northern California (KPNC), we identified 312,056 adult primary care patients who screened positive for unhealthy drinking between 2014 and 2017; patients were screened as part of a systematic KPNC program of alcohol screening, brief intervention, and referral to treatment (SBIRT). Among them, 9% had comorbid depression (based on ICD diagnosis in the prior year) and 48% received a BI. A structural marginal modeling approach with inverse probability weighting was used to estimate the causal effects of BI on 12-month drinking outcomes and to examine the moderating impact of depression after adjusting for receipt of specialty alcohol use disorder treatment.

Results: We found small but robust average BI effects on all 4 12-month drinking outcomes. Although the BI by depression interaction was not significant, receiving BI resulted in significantly greater reductions in heavy drinking days (mean difference: -0.28 [95% CI: -0.47, -0.09]), drinking days per week (-0.04 [-0.07, -0.01]), drinks per drinking day (-0.05 [-0.08, -0.02]), and drinks per week (-0.15 [-0.28, -0.03]) for those without depression, but not for those with depression (-0.16 [-0.85, 0.52], -0.02 [-0.12, 0.08], -0.06 [-0.16, 0.03], and -0.18 [-0.61, 0.26], respectively).

Conclusion: While BI improved drinking outcomes on average, greater effect heterogeneity was observed among patients with depression, underlining the importance to identify BI effect moderators for this subgroup. People with depression may need additional treatment to help reduce unhealthy drinking.

Behavioral Health Outcomes Among Adults Over Age 50 Who Use Cannabis: A Matched Case-Cohort Study

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Background: Past research suggests that cannabis use is associated with various behavioral health outcomes, but limited work has focused on older adults. The current study utilized a matched case-cohort design to compare behavioral health outcomes between older adults with identified cannabis diagnoses and matched controls.

Methods: Patients 50+ years of age were identified using ICD-10 diagnostic codes for cannabis use, abuse, and dependence using electronic health record data from an integrated health system (Kaiser Permanente Hawaii). Those with cannabis diagnoses between 2016 and 2018 (n=275) were matched to nonusing controls (n=275) based on age and sex and compared on the following behavioral health outcomes occurring 2 years after case identification: major depressive disorder/episode, any anxiety disorder, select substance use disorders (alcohol use disorder, opioid use disorder, and tobacco use disorder), and incidence and frequency of inpatient and outpatient behavioral health visits.

Results: Participants had a mean age of 62.8 (standard deviation: 7.3; range: 51–87) years, and the cohort was comprised of 19.3% Native Hawaiian/Pacific Islander, 24.4% Asian, 47.8% White, and 8.5% Other/Unknown. Compared to controls and adjusting for covariates as possible, participants with a cannabis diagnosis had significantly greater risk of major depressive disorder/episode (adjusted odds ratio [OR]: 10.86; P<0.0001), any anxiety disorder (adjusted OR: 7.08; P<0.0001), alcohol use disorder (OR: 12.60; P<0.0001), opioid use disorder (P<0.0001 by McNemar’s test), and tobacco use disorder (adjusted OR: 2.72; P<0.0001). Cannabis diagnosis did not predict risk of any or number of inpatient behavioral health hospitalization(s) (P>0.05). Cannabis diagnosis was associated with any future outpatient behavioral health visit
Supplement

generally rely on International Classification of Diseases (ICD) opioid use disorder (OUD). EHR algorithms identifying OUD research may be limited for underdiagnosed conditions, including

Background:

Using Electronic Health Records Validation of a Case Definition for Opioid Use Disorder

Conclusion:

18.2%; P<0.01), versus usual care.

(4.9% vs 7.8%; P<0.05) or inpatient hospitalizations (13.3% vs P<0.001) and a lower percentage had addiction medicine visits of those in the SBIRT group had psychiatry visits (47.4% vs 39.9%; P<0.001) and a lower percentage had addiction medicine visits (4.9% vs 7.8%; P<0.05) or inpatient hospitalizations (13.3% vs 18.2%; P<0.01), versus usual care.

Conclusion: Providing SBIRT in pediatric primary care use may have enduring effects on substance use and health care utilization.

Validation of a Case Definition for Opioid Use Disorder Using Electronic Health Records

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Background: The utility of electronic health records (EHR) for research may be limited for underdiagnosed conditions, including opioid use disorder (OUD). EHR algorithms identifying OUD generally rely on International Classification of Diseases (ICD) diagnostic codes, which lack specificity (eg, for OUD severity) and incorporate prescription opioid orders, potentially excluding OUD developed via illicit opioids. This study aimed to use additional diagnostic and medication information in EHR to create a valid case definition for OUD developed via prescribed or illicit opioids.

Methods: ICD codes, associated diagnosis text, and medication orders for individuals with an outpatient, inpatient, or emergency department encounter between 2012 and 2020 were extracted from Geisinger’s EHR. We searched for relevant keywords (eg, opioid, heroin) in diagnosis text and categorized text into indicators with hypothesized varying strength of evidence for OUD. We examined indicator frequency, temporal distributions, and overlap, and reviewed clinical encounter notes. We developed a case definition for strong evidence of OUD based on having 1 of 4 inclusion criteria: multiple OUD indicators, single indicator, multiple treatment medication orders (eg, buprenorphine), or single order. To evaluate criterion validity, we conducted chart review, categorizing patients’ OUD severity as mild, moderate, or severe based on clinical diagnostic criteria. Positive predictive values were calculated for general OUD (any severity) and moderate/severe OUD. Patient selection for chart review (n=50 per criterion) was stratified by time (2012–2016, 2017–2020) to evaluate secular trends in diagnostic practices.

Results: Of 56,594 individuals with any OUD indicator, 13,767 (24%) met the case definition for strong evidence of OUD. Demographic differences (sex, age, race, rurality) were observed between cases and noncases and across the 4 criteria. Positive predictive values for the criteria ranged from 0.96 to 1.00 for general OUD and from 0.40 to 0.84 for moderate/severe OUD and revealed differences over time.

Conclusion: The case definition successfully identified general OUD but requires additional information to identify moderate/severe OUD.

Two Measures for Assessing Severity and Monitoring Opioid Use Disorder Symptoms Over Time: Results From the Mi-CARE Pilot Interview Study

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Background: Measurement-based care (MBC) is considered central to collaborative care but is not typically used for opioid use disorder (OUD), and no consensus exists about the optimal measure. The ideal measure for OUD would be brief, reflect symptom severity, and detect change over time. This study assessed two candidate OUD MBC measures: a 7-item short form of the PROMIS substance use measure adapted for opioids — ie, the “opioid use monitor” (OUM) — and an 11-item DSM-5 “opioid symptom checklist” (OSC).

Methods: A total of 49 Kaiser Permanente Washington primary care patients with depressive symptoms (ie, PHQ-9 score of ≥10) and OUD were recruited for a longitudinal interview study; 37 completed the OUM (scored 0–28) and 45 completed the OSC (scored 0–11). Measures were administered online or by phone at baseline and at 3 follow-ups, occurring about every 2 weeks. Baseline descriptive statistics and change scores (follow-up minus baseline score) were calculated.

Results: For the OUM, scores ranged from 0 to 26 with a mean (standard deviation) of 7.2 (7.4). The median score was 5, and
Patients' Self-Perception of Opioid Use and Associated Communication Preferences in Primary Care

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Background: Consequences of opioid use and misuse worsen with one American dying of drug overdose every 5 minutes. Primary care providers are poised to address access to life-saving treatments, like naloxone and buprenorphine, but barriers exist. Understanding these barriers can inform the implementation of Opioid Wizard, an opioid risk assessment tool, at an integrated health system in Pennsylvania.

Methods: Semi-structured qualitative interviews were conducted with 26 primary care patients between July and August 2021 (mean age: 48.6 years, standard deviation: 12.79; 100% White; 34.6% male) to understand patients' perspectives on communication of opioid risks in primary care. Participants were identified as current or previous opioid users, having a diagnosis of opioid use disorder (OUD), or at risk for OUD. A rapid-analysis approach was used to draw themes from interview data, paired with patient data from the electronic health record, including OUD diagnoses and opioid prescriptions, to inform the implementation of Opioid Wizard. Results were stratified by patient's self-perceived categories of opioid use.

Results: Overall, 11 patients described themselves as not addicted to opioids, 6 as dependent, 4 as addicted, and 5 in recovery. Discrepancies existed between patients' self-perception of their opioid use and their physicians' perception as measured by OUD diagnoses and prescriptions for OUD in the electronic health record. Patterns of interview question responses varied across the 4 self-perception categories, particularly in terms of communication preferences and perceptions of relationship with primary care physicians.

Conclusion: Patients who use opioids, have an OUD diagnosis, or are at risk of developing OUD may disagree with their clinicians' diagnosis, which can negatively affect communication and patient-clinician relationships. We structured the clinician training on Opioid Wizard, an opioid risk assessment tool, to provide communication strategies to clinicians to support empathetic and nonjudgmental communication with patients who screen at high risk for OUD.

Digital Therapeutics for Substance Use Disorders in Primary Care: Evaluation of a Quality Improvement Pilot for the DIGITS Implementation Trial

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Background: reSET® and reSET-O® are the first U.S. Food and Drug Administration-authorized prescription digital therapeutics (PDTs) for substance use disorders and opioid use disorder, respectively. These include two efficacious treatments for substance use disorders: community reinforcement approach and contingency management. More information is needed on how to optimally engage primary care clinicians in prescribing and patients in using these treatments. We conducted and evaluated a pilot implementation of reSET/reSET-O in primary care to inform the DIGITS Trial.

Methods: Researchers partnered with Kaiser Permanente Washington clinical leaders on a quality improvement pilot of reSET/reSET-O involving 2 clinicians in 2 primary care clinics (February 2021–May 2021). Goals were to iteratively refine clinical workflows and a standard implementation strategy including clinician training and performance monitoring. We evaluated the pilot's achievements, lessons learned, barriers and facilitators, and implementation strategy. Fieldnotes and minutes from meetings, trainings, and clinician check-ins were analyzed using rapid qualitative methods.

Results: In the 12-week pilot, mental health clinicians who practiced in primary care prescribed reSET/reSET-O to 13 patients; 62% (n=8) of patients activated their prescription. The implementation strategy was applied as planned. Improvements were made to workflows, performance monitoring reports, training materials, electronic health record tools, and data management. Clinicians' technology skills, prior training in substance use disorders, reliance on standard procedures and electronic medical record systems, and performing small tests of change aided implementation. Clinicians were satisfied with having a PDT to enhance patient care and with the implementation support received from researchers and clinical leaders. However, they noted that staff shortages, limited time with patients, and capacity for follow-up appointments were barriers.

Conclusion: Offering PDTs for substance use disorders, including opioids, in primary care appears feasible, provided clinicians receive adequate training and systemwide support. The DIGITS Trial will provide data on the potential benefits and cost-effectiveness of additional clinic and patient-level implementation strategies.

Use of a Best Practice Alert to Convey Education on Safe Opioid Storage and Disposal Within Primary Care

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Background: Safe storage and disposal of opioids is recommended to prevent diversion and misuse. The extent of provider education on safe storage and disposal is low. Best practice alerts (BPA) may be an efficient and sustainable method to improve provider-facilitated education of medication storage and disposal.

Further exploring and expanding a BPA to convey education on safe opioid storage and disposal within primary care could be useful.
Methods: Using a stepped-wedge design, primary care providers prescribing a new opioid prescription were exposed to a BPA reminding to educate on proper medication storage and disposal. Impact of the BPA on clinicians and patients was assessed through data collected from a BPA report and patient surveys 30 days postprescription. Providers exposed to the BPA were invited to participate in semi-structured interviews.

Results: From May 2020 through April 2021, a total of 683 patients completed surveys from among 1142 eligible (60% response rate). Providers indicated they educated on storage or disposal in 439 of 484 (91%) alerts. Patients reported higher provider-directed education during the active BPA versus baseline for disposal (38% vs 23%, relative risk reduction: 1.65, 95% CI: 1.29–2.26) but not storage disposal (36% vs 28%, relative risk reduction: 1.28, 95% CI: 0.99–1.64). Notably, only one provider clicked on the embedded links within the BPA to information of medication storage and disposal. Providers interviewed indicated they were already providing education but thought the BPA could be improved by explicitly stating the education points to provide.

Conclusion: A BPA delivered at the time of new opioid prescribing in primary care does improve patient recollection of disposal education provided. Further analysis will seek to understand if this increased transfer of education increases patient behaviors of safe opioid storage and disposal.

CHRONIC CONDITIONS, MULTIMORBIDITY, and AGING POPULATIONS

Women’s Weight-Related Health Behaviors and Strategies During Childbearing Years

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Background: Few studies have focused on weight loss strategies in women of reproductive age. The objective of the current study was to determine what weight loss strategies women of reproductive age use and examine the differences in those who had weight loss surgery (WLS) compared to nonsurgical weight loss (NSWL).

Methods: Data from the National Health and Nutritional Examination Survey (2013–2018) was used to construct a cohort of participants who were female, were of reproductive age (20–44 years old), and had attempted weight loss in the past 12 months. Variables examined included dietary quality, physical activity level, weight loss behaviors, pregnancy history, and members of household. Data were analyzed using SAS 9.4 software (SAS Institute Inc.).

Results: Overall, most participants utilized healthy weight loss behaviors and did so at high rates (≥3 behaviors). Those who underwent WLS reported 95% lower odds (odds ratio: 0.05, 95% CI: 0.01–0.18) of engaging in healthy weight loss behaviors compared to the NSWL group. There were no differences in unhealthy weight loss behaviors between the groups. Those who underwent WLS reported worse dietary quality compared to those who engaged in NWLS (F=4.08; P=0.04), but there were no differences in total caloric intake. Further, all women who underwent WLS had previously given birth, and having children in the household was associated with lower physical activity levels (odds ratio: 0.53, 95% CI: 0.33–0.85).

Conclusion: When attempting to lose weight, women of reproductive age reported engaging in healthy weight loss behaviors more so than unhealthy weight loss behaviors. A history of WLS lowered the odds of engaging in healthy weight loss behaviors and reported dietary quality. A majority of the women seeking weight loss had experienced childbirth, but having a child did not produce significant differences, save for lowered physical activity levels.

Adult Vaccinations and Risk for Dementia

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Background: Common adult vaccination is associated with a lower risk for dementia. Receiving multiple vaccines, versus only one vaccine type, may be associated with greater reduction in dementia risk. We determined if patients who received both herpes zoster (HZ) and tetanus, diphtheria, pertussis (Tdap) vaccinations had lower risk for dementia as compared to those who received only one or neither vaccination.

Methods: In a retrospective cohort design, we tested hypotheses using Veterans Health Administration (VHA) medical record data (October 1, 2008–September 30, 2019) with replication in MarketScan® commercial and Medicare claims (January 1, 2009–December 31, 2018). Patients were eligible if they were ≥65 years of age and free of dementia for 2 years prior to index date (n=80,070 in VHA; n=129,200 in MarketScan). At index, patients were categorized into 1) had both HZ and Tdap vaccinations, 2) HZ only, 3) Tdap only, and 4) neither. Generalized boosted propensity scores and inverse probability of treatment weighted for confounding. Cox proportional hazard (MarketScan) models estimated the association between vaccination status and incident dementia. Sensitivity analysis adjusted for healthy adherer bias (medication adherence) and neighborhood socioeconomic status. The association between vaccination and incident back pain was used as a negative outcome control.

Results: VHA patients’ mean age was 76.8 ± 7.6 years, 4.4% were male, and 90.9% were White. MarketScan patients’ mean age was 70.5 ± 5.9, and 65.4% were female. In both cohorts, having both HZ and Tdap vaccinations, as compared with no vaccination, was significantly associated with lower dementia risk (VHA hazard ratio: 0.50, 95% CI: 0.43–0.59; MarketScan hazard ratio: 0.58, 95% CI: 0.38–0.89). Incident dementia was lower in patients with both vaccinations vs only one vaccination type. Results were consistent in sensitivity analyses. Negative control supported unique vaccination-to-dementia relationship.

Conclusion: Multiple, as opposed to single, vaccination is associated with lower risk for dementia. This is consistent with a nonspecific association between vaccination and incident dementia.

Utility of Different Approaches to Characterizing Multimorbidity Burden in Adults With Heart Failure

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Background: The optimal approach to assessing treatment effectiveness among patients with multimorbidity using real-
world data is uncertain. We assessed two different approaches to characterize multimorbidity burden in examining the association of beta-blocker use (new user) with clinical outcomes in a large population of adults with heart failure (HF).

**Methods:** We conducted a community-based retrospective cohort study among adults with HF from 4 integrated health care delivery systems. Multimorbidity burden was characterized by either 1) simple counts of chronic conditions, or 2) a novel weighted multiple chronic conditions score. We assessed the utility of these different approaches to characterizing multimorbidity burden in examining all-cause mortality, hospitalizations for HF, and all-cause hospitalizations associated with beta-blocker use in adults with HF.

**Results:** Among 9988 adults with HF not using beta-blockers within 1 year prior to their HF diagnosis date (new user), mean age was 76.4 years, 48.7% were women, 75.3% were White, and mean (standard deviation) follow-up was 3.3 (3.0) years. The median number of chronic conditions was 8, and the median number for the weighted score was 18. In comparing the two approaches to characterizing multimorbidity, the multivariable associations between receipt of beta-blockers with all-cause death or being hospitalized for HF or any cause were similar regardless of the approach used to characterize multimorbidity burden.

**Conclusion:** Simple counts of chronic conditions performed similarly to a novel weighted score in predicting outcomes employing real-world data to examine the outcomes associated with beta-blocker therapy in adults with HF. Our findings challenge conventional wisdom that more complex measures of multimorbidity are necessary to characterize patients in studies employing observational methods to assess therapeutic effectiveness.

*What Is Essential for Conducting Clinical Trials in Nursing Homes? Results of a Stakeholder Survey*

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**Background:** The U.S. clinical research enterprise in nursing homes was unprepared to mount clinical trials in nursing homes to address urgent questions relevant to prevention and treatment during the COVID-19 pandemic. We identify priorities essential for establishing a supportive environment for future clinical trials in nursing homes.

**Methods:** A cross-sectional online survey was administered to a purposive sample of nursing home stakeholders with expertise in practice, research, policy, and caregiving. Respondents rated the importance of attributes of nursing home researchers, facilities, nursing home leaders, and residents, with all-cause hospitalizations associated with beta-blocker use in adults with HF.

**Results:** The attributes rated as most essential for conducting successful efficacy and effectiveness trials in nursing homes are research team attributes, ie, that researchers recognize regulatory constraints, understand and adapt to nursing home workflow, and work collaboratively with nursing home leaders to identify priorities. Diversity emerged as essential for effectiveness trials; important dimensions included resident race, ethnicity, and income as well as nursing home urban/rural location, quality ratings, geography, staffing ratios, size, and profit status. Caregivers and residents advocated stressing the importance of communication among participants, researchers, and nursing home leadership and staff at all stages of a trial.

**Conclusion:** Developing a robust U.S. clinical research enterprise in nursing homes capable of efficiently mounting clinical trials will require a reimagining of the relationships that exist between researchers, facilities, nursing home leaders, and residents, with a research infrastructure specifically focused on supporting and fostering these connections.

*Prevalence and Associated Risk Factors of Hepatitis B and C Viruses in Hemodialysis Units in Al-Anbar Province, Iraq*

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**Background:** Hepatitis C virus (HCV) and hepatitis B virus (HBV) infections are significant cause of morbidity and mortality in hemodialysis patients across the globe. This study aimed to estimate the prevalence of HBV and HCV infection in hemodialysis centers in Al-Anbar governorate, Iraq, and to identify associated risk factors among vulnerable patients.

**Methods:** This is a retrospective study was conducted in Al-Anbar governorate, Iraq, from September 2019 through January 2020 and included all patients attending the region’s three main hemodialysis centers. Patient records were reviewed for data collection and included patient age, gender, duration of dialysis, number of sessions per week, history of blood transfusion, history of renal transplant, history of multicenter dialysis, length of time on hemodialysis, comorbidities, and laboratory screening results of HBV and HCV.

**Results:** A total of 245 hemodialysis patients were enrolled in this study, and the overall rates of HBV and HCV infection were 5.3% and 20%, respectively. The highest rates of HBV infection were reported for Al-Amiriya General Hospital dialysis center (7.5%), patients over 70 years old, those receiving multicenter dialysis, those with longer time on hemodialysis, those with history of previous renal transplant, and those with previous blood transfusion. The highest prevalence rate of HCV infection was found in Al Ramadi teaching hospital dialysis center (22.5%), patients who were 40–49 years old, males, those receiving multicenter dialysis, those with longer time on hemodialysis, those with history of previous renal transplant, and those with previous blood transfusion. In addition, hemodialysis patients with a history of diabetes and hypertension were more prone to both HBV and HCV infections.

**Conclusion:** The longer history of hemodialysis as a predictor of both HBV and HCV infection indicates a possibility of nosocomial transmission due to subpar infection control practices. Furthermore, the prevalence of HBV and HCV are high in hemodialysis patients, indicating a health care delivery problem that needs to be addressed.
Emergency Department Visits in Parkinson’s Disease: The Impact of Comorbid Conditions

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Background: Older adults have complex, often overlapping, medical conditions that require careful management and lead to high emergency department (ED) usage compared to other age groups. Parkinson’s disease (PD), a neurodegenerative disorder primarily observed in older age groups, is one such condition that not only manifests a wide range of symptoms but also can be comorbid with other chronic diseases. This study examines the reasons for ED visits in a cohort of patients with Parkinson’s disease to identify comorbidities that increase the risk for requiring emergency medical care.

Methods: Using data from the Optum® deidentified electronic health record data, years 2008–2018, patients with Parkinson’s disease were identified based on ICD-9/10 diagnosis codes. We identified all ED visits occurring after the first diagnosis code for Parkinson’s disease. Comorbid conditions were classified using the Agency for Healthcare Research and Quality’s Clinical Classification Software.

Results: The most common reasons for ED admission were injuries such as fractures and contusions, diseases of the circulatory system, and general signs and symptoms including abdominal pain, malaise, and fatigue. Analysis of the relationship between comorbid conditions and ED admissions is ongoing.

Conclusion: Clarifying the complex medical needs of patients with Parkinson’s disease is the first step to further individualize care, which may reduce ED visits in this population, improve quality of life, and lessen the footprint on the health system.

Factors Associated With Medication Adherence in Patients With HIV and Comorbid Conditions Before and During the COVID-19 Pandemic

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Background: As life expectancy increases in people with HIV (PWH), polypharmacy for chronic comorbidities poses an increasing challenge to an already complex medical condition. Given limited access to in-person care, the COVID-19 pandemic likely exacerbated medication adherence challenges in PWH with other chronic conditions. We sought to discern factors associated with medication adherence in PWH with comorbidities of type 2 diabetes mellitus, hypertension, and/or hyperlipidemia during COVID-19 in an integrated health system.

Methods: Demographic, insurance, and medication dispensing records for a continuously enrolled cohort from an established registry of adult (≥18 years old) PWH during a 37-month observation period (September 2018–September 2021) were extracted from the Kaiser Permanente Mid-Atlantic States electronic health record. Monthly proportion of days covered (PDC) was measured for medications in 3 categories: diabetes, renin-angiotensin antagonists (RASMs), and statins. Combined (overall) PDC reflected a patient’s medication coverage for each applicable chronic condition on a given day. Multivariable population-averaged panel general estimating equations were used to calculate adjusted odds ratios (aOR) and evaluate factors associated with PDC as continuous and dichotomous measures (0.80 for diabetes, RASMs, statins, and combined; 0.90 for antiretroviral medications). Significance was defined at P<0.05.

Results: Majorities of the study cohort (n=470) were 51–64 years old (58.5%), Black (72.6%), male (71.1%), and enrolled in a commercial insurance product (65.1%). For overall PDC, higher adherence (PDC of ≥0.80) was associated with age of 51–64 (aOR: 1.22; P=0.01) and 65+ (aOR: 1.29; P=0.02; ref: 18–50 years) and being enrolled in Medicare (aOR: 1.32; P=0.01; ref: commercial). Lower adherence (PDC of <0.80) was associated with Black race (aOR: 0.52; P=0.01; ref: White), being enrolled in Medicaid (aOR: 0.61; P=0.01; ref: commercial), and taking medications for 2 chronic conditions (aOR: 0.72; P<0.001; ref: 1) or 3 chronic conditions (aOR: 0.58; P<0.001; ref: 1).

Conclusion: Opportunity exists to improve medication adherence in non-White populations, those enrolled in Medicaid, and those taking medications (beyond antiretrovirals) for multiple chronic conditions.

Exploring Geospatial Relationships Between Neighborhoods and Knee Osteoarthritis Pain: A Pilot Study

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Background: Osteoarthritis is among the most common causes of pain and disability worldwide. In particular, the prevalence of knee osteoarthritis is on the rise, with rates of total knee arthroplasty (TKA) increasing. While many treatments are available, they often lack efficacy or are risky. Walking is a simple and efficacious approach, however, neighborhood characteristics may limit patients’ ability to leverage their neighborhood for walking, such as lack of infrastructure or presence of crime. This study investigates whether increasing pain scores, the primary driver of TKA, are clustered in neighborhoods of St. Louis, Missouri.

Methods: This cross-sectional study collected data from adults (45–90 years of age) with clinician-diagnosed knee osteoarthritis and no history of TKA. Participants were identified via electronic health record data pull and recruited by mail to complete an online or paper survey. Exposure was neighborhood, identified by geocoded participant address. Outcome was geospatial distribution of knee osteoarthritis cases by participant-reported average pain scores over prior week via analogue score (0–10). Geospatial analysis was done via one-directional distribution ellipse measuring spatial concentration or dispersion. The analysis was stratified by racial self-identification (White or Black).

Results: This pilot analysis included 30 complete cases. Mean age was 62.5 years. Participants were 67.5% female and 61% White. Mean pain score was 5.4 ± 2.6. Stratified analysis by race found Black participants had significantly higher mean pain scores than Whites (7.7 vs 4.5; P<0.001). Among Black participants, higher pain scores were concentrated in low-income areas, while White participants were spatially diffused based on 1 standard deviation ellipse.

Conclusion: These pilot data indicate higher pain scores are clustered in lower-income neighborhoods. Stratification by racial
identity reveals differential clustering of high pain scores. These findings warrant larger spatial analysis with detailed exploration of neighborhood characteristics and are substrate to begin partnering with communities.

**Member Experience With Medically Tailored Meals Supplemental Benefit After Hospitalization**

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**Background:** Nutrition is critical for the management of certain diet-sensitive conditions. We sought to describe the experience of Medicare Advantage plan members with heart failure who received home-delivered medically tailored meals (MTM) after being hospitalized within Kaiser Permanente Southern California. Since this was the first time a meals benefit is being offered to all eligible Medicare Advantage plan members, it was important to identify opportunities to improve the implementation of the benefit.

**Methods:** We recruited patients who had received MTM (n=557) from January 1, 2021, to August 28, 2021, to complete email or phone surveys. Survey questions probed the following domains prioritized by the program leaders: satisfaction with delivered meals, areas for improvement or unmet needs, and food insecurity. Surveys were administered in English or Spanish. Thematic analysis of open-ended responses was informed by grounded theory.

**Results:** In all, 156 patients (mean age of 79 ± 9 years, 54% female, 20% Hispanic, 8% Spanish-speaking) completed the survey. Nearly one-third reported food insecurity, and more than half reported fair or poor health (mean Elixhauser comorbidity score of 11.5 ± 3). Patients reported that the delivered meals met (49%) or exceeded (25%) their expectations. Most agreed that the delivered meals were very (29%) or extremely (45%) helpful, and 42% said it changed their perception of what a healthy meal is and how to prepare their meals. Patients also provided insights into ways to improve the delivered meals: prescribe meal plans based on individual patient health needs and allow patients to switch between meal plans to maximize patient satisfaction.

**Conclusion:** We found that most patients appreciated the delivered meals and found them helpful in their recovery after being hospitalized. There are opportunities for improvement that would improve patient satisfaction and enhance the success of meal delivery implementation and expansion.

**Reasons for Not Completing Remote Chronic Pain Self-Management Interventions: Results From the RESOLVE Study**

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**Background:** RESOLVE is a multisite comparative effectiveness trial to evaluate cognitive behavioral therapy-based interventions for chronic pain (CBT-CP) offered via remotely delivered interventions. Similar content is delivered through two modalities: web-based or telephone/video coaching. To enhance participant retention, we explored reasons for not completing the interventions.

**Methods:** We surveyed 14 participants who never completed any web-based intervention sessions and conducted qualitative interviews with 14 participants who partially completed the web-based or coach-led intervention. Responses were summarized using content analysis and descriptive statistics.

**Results:** Survey respondents (N=14) were 60 years old, on average, and mostly female (10 of 14). Interview participants (N=14) were equally balanced by intervention modality and study site, also mostly female (10 of 14), and had an average age of 61 years. Survey respondents’ top reason for not using the web-based intervention was lack of time due to other commitments (6 of 14) or not realizing how much time the intervention would take (3 of 14). Secondary reasons included reactions to the intervention content (8 of 13) and problems or concerns with the web-based intervention (7 of 13). Interview results were similar, with time-related constraints and life events the primary drivers of disengagement (11 of 14). Secondary reasons for interviewee disengagement included finding the content not relevant or helpful (7 of 14) and technology difficulties (5 of 14). All interviewees stated that, upon enrollment, they hoped to learn something new to help with their pain management, including nonpharmacological pain management options. Most interviewees found some element of the intervention helpful (10 of 14) and were still using some of the skills they learned (8 of 14).

**Conclusion:** Individuals who did not complete our intervention had initial motivations for participation that were aligned with study goals. However, time constraints, technological barriers, and a perception that the intervention content was not relevant were common reasons for disengagement. Enrollment materials are being revised to clarify the content and expected time commitment for the intervention.

**Recruitment of Patients and Caregivers After Live Discharge From Hospice: Challenges and Lessons Learned**

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**Background:** Hospice has been shown to improve end-of-life outcomes, yet with eligibility limited to a 6-month prognosis, the hospice system is not structured to meet longer-term needs. When discharges occur before death, patients and families are left to manage care needs previously provided by hospice. The aim of this study is to describe patient and caregiver outcomes for patients encountering live discharge from hospice (when the patient outlives this prognosis and hospice services are removed). This abstract presents preliminary results on the recruitment process for this difficult-to-access population.

**Methods:** The initial protocol proposed to recruit patients and caregivers directly from partner hospice agencies upon decertification. The study includes both patients and caregivers, interviewed via Zoom to complete a survey assessing current health, utilization of health care services, quality of life, transitions of care, and caregiver well-being. After the intake interview, participants are to be followed for up to 6 months with interviews at 0, 3, and 6 months.

**Results:** Data collection for the study is currently underway. Direct recruitment through referrals from hospice agencies upon decertification proved to be an inadequate strategy to accrue the necessary sample despite strong connections with local hospice
associations and national hospice agencies. A new recruiting partnership with a large university-affiliated hospice using the electronic health record (EHR) to identify eligible patients was recently approved and provided an initial 80% increase in referrals to date. While we expect a lower yield of enrolled participants through EHR methods compared to clinician and self-referral, we anticipate this additional method to boost our overall sample considerably.

**Conclusion:** Despite existing relationships with hospice networks, we found recruiting patients and caregivers through direct referral insufficient for our study. Identification and outreach using existing information available in the EHR is a promising strategy for identifying and recruiting hard-to-reach populations.

**Quadratus Lumborum Block for Geriatric Hip Fracture Surgeries: A Component of a Perioperative Surgical Home Program**

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**Background:** Reducing preoperative waiting time (PWT) and anesthesia selection such as regional anesthesia can decrease postsoperative morbidities, mortalities, and care cost as well as improve patient satisfaction. However, the anesthetic risk of either general or spinal anesthesia may simply be too high, as an independent factor, for urgent geriatric hip fracture repair. In this case series, we studied the efficacy of quadratus lumborum block (QLB) on PWT, pain, and effectiveness as a primary surgical anesthesia for hip fractures in the elderly as a component of our Perioperative Surgical Home (PSH) hip fracture pathway.

**Methods:** Within February 2018–2020, 27 geriatric hip fracture cases were retrospectively reviewed in our PSH pathway in which QLB was utilized as primary anesthetic in a single medical center. These emergent geriatric hip fracture surgeries included 20 cephalomedullary nails, 1 femoral neck pinning, 3 hemiarthroplasty, 2 percutaneous screw, and 1 total hip replacement. The QLB was performed preoperatively with 20–50 ml of 0.2%–0.5% ropivacaine or bupivacaine for varying rationales. Intraoperatively, monitored anesthesia care was performed with target-controlled propofol infusion for mild to moderate sedation. We measured PWT (ie, emergency room admission time to surgery start time), length of stay (LOS), and pain score in the postanesthesia care unit.

**Results:** PWT ranged from 3.1 to 66.3 hours (average of 17 hours, median of 13.5 hours), average LOS was 4.0 days (range: 2.5–7.0), and average pain score was 1.1 (range: 0.0–6.8) in recovery, and no LOS was prolonged due to inadequate pain control or delirium. Of the 27 patients, 26 were able to complete their procedure in stable and comfortable conditions successfully with a QLB and monitored anesthesia care. This study was approved by the institutional review board before its commencement. No outside funding was obtained.

**Conclusion:** In anesthesia, the PSH has become pivotal in a patient-centered, physician-led multidisciplinary approach. All patients in our series underwent successful surgery and discharge. One patient was converted to general anesthesia. The QLB is a well-tolerated low-risk procedure that can facilitate early surgery and reduces the need to wait for anticoagulation reversal. It is especially beneficial in patients in whom general or neuraxial anesthesia may be relatively contraindicated.

**MENTAL HEALTH**

**Evaluation Protocol for a Telehealth, Pharmacist-Led, Collaborative Care Program for Individuals With Severe and Persistent Mental Illness**

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**Background:** Severe and persistent mental illnesses (SPMI) afflict 7 million U.S. adults. Firstline pharmacological treatment requires regular clinical contact to optimize medications, support adherence, and screen for common physical health risks, a challenging demand given the shortage of psychiatrists nationwide. In fall 2020, Kaiser Permanente Northern California (KPNC) launched a novel telehealth collaborative care program led by clinical pharmacists within 6 initial service areas. Herein, we describe a protocol evaluating program effects on clinical and care quality outcomes.

**Methods:** Eligible participants will be KPNC members with schizophrenia, schizoaffective disorder, or bipolar disorder who were contacted by program clinical pharmacists during January 1, 2021–June 30, 2021. A 2:1 matched comparison group of contemporaneous KPNC members will be drawn from nonprogram service areas. Participant matching will use high-dimensional propensity scores accounting for potential confounds. Study outcomes will be 12-month electronic health record-documented medication adherence (based on pharmacy dispensings), psychiatric status (eg, self-reported suicidal ideation), health screening (eg, hemoglobin A1c labs), and service utilization (eg, emergency department visits). We hypothesize that program participation will be associated with improved clinical outcomes and reduced high-resource utilization relative to the comparison group.

**Results:** A total of 968 adult KPNC members with SPMI were contacted by program clinical pharmacists during the eligibility window; mean age was 45.5 years, 60% were women, 54% were White, 20% were Hispanic, 10% were Asian, and 9% were Black. Two-thirds had bipolar disorder, 73% were prescribed an antipsychotic medication, 41% had baseline prescriptions for ≥3 psychotropic medication classes, and 49% had low baseline medication adherence. Nearly one-third had past-year emergency department visits. We will draw the comparison group from among >11,000 eligible KPNC members from service areas that have not yet implemented the program.

**Conclusion:** A new telehealth-based, clinical pharmacist-led collaborative care program seeks to overcome the barriers found in traditional psychiatric care to improve care quality and clinical outcomes for individuals with SPMI.

**Geographical Clustering of Crime and Mental Health Indicators Utilizing Novel Prototypes**

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**Background:** There is substantial research on the correlation between crime rates and depression. However, limited research has accounted for both geography and racial/ethnic disparities in the association between crime victimization and negative mental
How Patients Answered "Do you have access to guns? (yes/no)" Prior to Suicide Death

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Background: Major medical associations recommend health care providers counsel patients at risk of suicide to limit firearm access; however, no national practice recommendations exist for standardized firearm access assessment.

In 2015, Kaiser Permanente Washington [KPWA] added the question, “Do you have access to guns? (yes/no),” to a standard mental health [MH] monitoring questionnaire to support suicide risk identification and safety planning with patients receiving MH or substance use disorder [SUD] care in primary care, urgent care, and MH specialty settings. This study evaluated whether and how suicide decedents answered the firearm access question in the year prior to death to inform practice improvement opportunities.

Methods: Washington State death records and electronic health record data identified KPWA patients receiving ambulatory care within a year of suicide death (January 1, 2016–December 31, 2019). We described patient and process outcomes of clinical workflows supporting firearm access assessment, including proportions of patients who: 1) had a MH/SUD diagnosis, 2) received the firearm question, 3) answered the firearm question, and 4) reported firearm access. We stratified findings by firearm suicide versus suicide by other means.

Results: During the observation period, 236 patients died by suicide, 114 (48%) of those by firearm. Among the latter group, 67 (59%) suicide decedents had a MH/SUD diagnosis, 41 (36%) received the firearm question, 38 (33%) answered, and 17 (15%) reported access. Among the other 122 suicide decedents, 84 (69%) had a MH/SUD diagnosis, 51 (42%) received the firearm question, 44 (36%) answered, and 2 (2%) reported access.

Conclusion: This evaluation underscored key opportunities to optimize firearm access assessment. First, only assessing patients with MH/SUD diagnoses likely resulted in missed opportunities, particularly among firearm suicide decedents. Second, most suicide decedents answered the firearm access question when they received it, but more than half who answered reported no access and subsequently died by firearm suicide, highlighting potential opportunities for increasing patient-centeredness of screening and improving trust and dialogue between provider and patient.

Prepregnancy Weight Loss Associations With Prenatal and Postpartum Mental Health Conditions

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Background: Obesity is a risk factor for adverse maternal outcomes in the 85% of women who become pregnant by age 44. Women experiencing obesity are advised to lose weight prior to pregnancy to help alleviate pregnancy and postnatal complications, including the development of mental health conditions. Evidence from the general population suggests that losing weight can protect against the development of mental health conditions, but no study has examined this association during and after pregnancy. This study aimed to determine if patients who experience successful weight loss (losing ≥5% of one’s body weight) in the year prior to pregnancy versus those who do not have a lower risk for new-onset prenatal and postpartum mental health conditions.

Methods: Using data from a Midwestern hospital system, a cohort was created of women, 20–44 years of age, who had experienced a birth between January 1, 2012, and June 30, 2021, and had at least 2 recorded weights and no depression or anxiety diagnosis in the year prior to pregnancy. Two groups were created: those who successfully lost ≥5% of their prepregnancy weight (FPWL) and those who did not lose weight (NWL). Chi-squared tests were used to determine whether differences were present between the groups regarding prenatal and postnatal mental health condition development.

Results: Results found that during the prenatal period, FPWL were less likely to develop depression compared to NWL ($\chi^2=8.01; P=0.01$). This difference disappeared postpartum. No significant differences were found in anxiety development between FPWL and NWL.

Conclusion: Results indicate that losing weight prior to pregnancy may be protective against the development of prenatal depression. Postpartum, mothers may experience increased pressure to lose weight again, leading to increased feelings of depression. Weight loss was not associated with anxiety in either period, suggesting that weight may not be a source of mothers’ anxiety.
Patient and Provider Characteristics of Digital Mental Health App Referrals for Adults in an Integrated Health System

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Background: Digital mental health applications (DMHAs) are novel adjunctive mental health care treatments. Some DMHAs use mindfulness and meditation (MM) and others incorporate cognitive behavioral therapy (CBT), which may influence integration into a therapeutic plan. As an initial step to understanding DMHA use, this research describes patient, provider, and encounter characteristics for patients referred to 1 or more DMHAs in a U.S.-based integrated health system.

Methods: Encounter data for DMHA referrals in Kaiser Permanente Mid-Atlantic States during December 2019–July 2021 for adults (≥18 years of age) were extracted from electronic health record. Referrals were grouped into 3 mutually exclusive referral clusters: MM-only DMHAs, CBT-only DMHAs, and MM+CBT DMHAs (combination). Initial referrals for each DMHA type were described. Multivariable, multinomial logistic regression contrasted referral characteristics among the DMHA clusters controlling for within-cluster correlation.

Results: A total of 35,344 initial DMHA referrals for 20,334 unique patients were identified, with 45.7% having 2 or more DMHAs referrals. MM-only DMHAs were most commonly referred (57.7%), followed by MM+CBT (39.2%), and CBT-only (3.1%). Of the MM+CBT DMHAs, 86.7% were ordered on the same day. Generally, DMHA referral clusters reflected patients who were White (41%–45%), in the 31–50-year age range (40%–41%), and female (69%–73%). More than 50% of referrals had a primary mental health diagnosis. Nonphysician mental health providers initiated most referrals (66%–86%) via video-based visits (71%–85%). Compared to MM-only DMHA referrals, CBT-only referrals differed significantly by race, encounter chief complaints, primary diagnoses, provider type, service area, and visit mode (P<0.01 for all). MM+CBT DMHA referrals, as compared to MM-only referrals, differed significantly by age, race, encounter chief complaints, primary diagnoses, provider type, service area, and visit mode. Lastly, when MM+CBT DMHA referrals were compared to CBT-only DMHA referrals, they differed significantly by race, sex, provider training, service area, and visit mode (P<0.01 for all).

Conclusion: Observed patient demographic and provider variations in DMHA referral patterns support the need to further investigate whether patterns reflect optimal use.

Patterns of Digital Mental Health App Referral for Adults in an Integrated Health System During the COVID-19 Pandemic

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Background: Although digital mental health apps (DMHAs) are not a substitute for in-person care, they can serve as an important step in the care process for individuals at risk for mental health problems. Indeed, DMHAs represented a novel solution to increase care access when in-person encounters were limited during COVID-19. This research describes the patterns of initial DMHA referrals during the COVID-19 pandemic in a large integrated health system.

Methods: Encounter data for DMHA referrals from December 2019 to July 2021 for adult patients (≥18 years of age) were extracted from the Kaiser Permanente Mid-Atlantic States electronic health record. Monthly initial referral counts were clustered as mindfulness and meditation [MM] DMHAs (ie, Calm, headspace, myStrength) and cognitive behavioral therapy (CBT)-based DMHAs (ie, SilverCloud, Thrive, and whil), summed, and reported monthly. Cross-sectional interrupted time-series regression models were estimated for the 20-month observation period to compare monthly referral count trends for the prepandemic (December 2019–February 2020), early pandemic (March 2020–September 2020) and extended pandemic (October 2020–July 2021) periods overall and by DMHA clusters.

Results: In all, 35,348 initial referrals for DMHAs for 20,334 unique patients were identified during the observation period. Time-series models estimated the overall baseline month (December 2019) referral counts as 221.17 for MM DMHAs, 54.83 for CBT-based DMHAs, and 276.00 for DMHAs overall. During the prepandemic period, monthly referrals increased significantly (P<0.05) at monthly rates of 87.5 for MM DMHAs, 3.5 for CBT-based DMHAs, and 91.00 for DMHAs overall. Monthly referrals also increased significantly (P<0.05) during the early pandemic period at rates of 225.25 for MM DMHAs, 62.39 for CBT-based DMHAs, and 287.64 for DMHAs overall. No significant trends were observed during the extended pandemic period.

Conclusion: Regardless of DMHA cluster, monthly referrals rapidly accelerated during the early months of the COVID-19 pandemic with a subsequent leveling during the extended pandemic period. Future work will explore user experience, persistence, and impact of DMHA use to further explain utilization patterns.

Cancer and Mental Health Diagnoses in the Year Preceding Suicide

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Background: Patients with cancer are known to be at increased risk for suicide, but little is known about the interaction between cancer and mental health diagnoses, another well-documented risk factor.

Methods: Electronic medical records from 9 health systems participating in the Mental Health Research Network were aggregated to form a retrospective case-control study, with ICD-9 codes used to identify diagnoses in the 1 year prior to death by suicide for cases (n=3330) or matching index date for controls (n=297,034). Conditional logistic regression was used to assess differences in cancer and mental health diagnoses between cases and controls, controlling for sex and age.

Results: Both cancer and mental health diagnoses were significantly independently associated with suicide. Cancer types with lower 5-year survival rates were associated with significantly greater relative risk, while cancer types with survival rates of >70% conferred no increased risk. For patients with the mental health diagnoses most strongly associated with suicide (alcohol use disorder, psychoses, and personality disorders), the additional risk conferred by a
cancer diagnosis was less than would be expected if the risks were multiplicative, ie, the interaction term for cancer and mental health was negative for these conditions. For patients with depression, anxiety, or adjustment disorders, receiving this diagnosis after a cancer diagnosis was associated with significantly increased risk above the risk of the diagnosis itself.

**Conclusion:** Patients who are diagnosed with cancer that has a 5-year survival rate of <70% are a group at elevated risk for suicide, and patients who received a diagnosis of anxiety or depression after their cancer diagnosis are at especially high risk. Health care-based interventions may be tailored to these target populations. Additional research is needed to assess the role of preexisting mental health conditions, as these data were limited to recent diagnoses in just the year prior to death.

**Outcomes of Implementing Universal Suicide Screening Among Youth in a Large Integrated Health System’s Hospitals**

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**Background:** Suicide is a leading cause of death in the United States, especially for youth under 25 years old. Sutter Health launched systemwide standardized general population screening using the Columbia Suicide Severity Rating Scale (C-SSRS) across hospitals in July 2019. This study analyzed implementation of C-SSRS on youth ranging from 10 to 24 years old.

**Methods:** Using electronic health records for patients seen in acute care hospitals (July 1, 2019–December 31, 2020), we described rates of suicide screening, detection, and documented subsequent psychiatric care among youth (10–24 years of age) using chi-squared tests. Results reported are statistically significant at P<0.05.

**Results:** In all, 84,949 of 106,623 (79.7%) youth were screened by C-SSRS, and 5193 of 84,939 (6.1%) had suicidality (low-risk: 25%, moderate-risk: 13.5%, high-risk: 61.5%). 15–17-year-olds had the highest proportion expressing suicidality (11.6% vs 7.5% for 10–14-year-olds and 4.2% for 18–24-year-olds). Of those expressing suicidality, more 10–17-year-old youth were at the highest risk level (10–14: 65.2%, 15–17: 66.6%, 18–24: 55.6%). Compared to male youths, female youths had higher rates of screening (81.5% vs 77.3%) and suicidality (6.8% vs 5.1%) and a larger proportion at the highest risk level (63% vs 58.8%). Of youth with suicidality, 66% had documented psychiatric care within 90 days postscreening (ie, transfer to psychiatric units, discharge to psychiatric hospitals, psychiatric consultation or referral), which increased by risk level (low: 47.6%, moderate: 54.6%, high: 76%). Compared to adults (>24 of age), youth had the lower screening rate (79.7% vs 84.9%), the higher rate of expressing suicidality (6.1% vs 1.9%), and more people with the highest risk level (61.5% vs 45.2%).

**Conclusion:** Younger and female youth had higher rates of expressing suicidality and with greater associated risk (eg, expressing intent and plans for suicide). High rates of suicidality at the highest risk level suggest a need for more resources both in acute care and community settings aimed at youth with suicidality.

**Substance Use and Depressive Symptoms in Young People During the COVID-19 Pandemic**

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**Background:** Individuals globally were affected by the pandemic in myriad ways, including social isolation and economic hardship, resulting in negative impacts on mental health and substance use among many adults. Young people have been subjected to extraordinary changes as well but have received limited attention from research.

**Methods:** Electronic health records from a large U.S. health system were used to compare self-reported substance use and depressive symptom data in youth 13–18 years of age (N=178,255) collected at annual pediatric well visits pre- (March 1–December 31, 2019) and post-pandemic onset (March 1–December 31, 2020). We also examined self-reported alcohol use and alcohol problems (ie, unhealthy drinking and alcohol use disorders) among young adult patients 18–34 years of age (N=83,122) over the same periods.

**Results:** Compared to the year prior to the pandemic, after pandemic onset, significantly more adolescents reported alcohol use (7.75% vs 7.42%; P=0.02), depressive symptoms (30.03% vs 24.06%; P<0.001), and suicidality (1.76% vs 1.30%; P<0.001), whereas marijuana use decreased slightly (6.20% vs 6.45%; P=0.04). Young adults showed an initial drop in unhealthy drinking postpandemic onset, followed by a marked increase in the late summer/early fall of 2020, which peaked in September 2020 (807.4 vs 678.9 cases of alcohol problems per 100,000 members, and 491.4 vs 358.7 cases of unhealthy drinking per 100,000 members, respectively, compared to September 2019 (P<0.001 for both). No significant differences were observed in alcohol use disorder diagnoses.

**Conclusion:** Adolescents reported increased alcohol use and feelings of sadness and suicidality, perhaps related to less contact with peers, whereas young adults initially showed a dip in drinking, followed by a sharp increase — peaking about 6 months into the pandemic — compared to the previous year. Findings suggest considerable behavioral health burden among young people resulting from the pandemic and the imminent need for youth-serving systems to prepare to address these concerns as people begin to seek care.

**Use of Apps for Care of Suicidal and Depressed Youth: Mental Health Provider Perspectives**

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**Background:** Depression in adolescence is common, impacting about 16% of youth 12–17 years of age, yet less than half receive any type of treatment. National surveys report that approximately 1 in 5 youth had seriously considered suicide in the past year, and close to 9% of had made at least 1 suicide attempt. Lack of treatment is due in part to barriers to accessing mental health services such as cost, lack of available providers, and wait times. Partly in response to these challenges, there has been rapid growth in mobile technology, such as smartphone apps, that address mental health concerns like depression. While these apps have the potential to improve care for youth with depression, less is known about how apps are being integrated into mental health treatment.
Methods: We conducted qualitative interviews with mental health providers (n=10) from 6 different states to explore provider opinions about and use of mental health apps with patients. Purposive sampling was utilized, and providers were sent email invitations to participate. Inclusion/exclusion criteria were that participants were licensed mental health providers and that they consented to participating. Interviews were recorded and transcribed. Data management and analysis was conducted using Atlas.ti qualitative software. We used a combination of deductive and inductive codes to conduct a thematic analysis of provider experiences.

Results: Preliminary analyses suggest that most providers have used apps to some extent with patients, but few have integrated apps into routine treatment of patients. Initial themes included 1) importance that apps are evidence-based, 2) concerns about patient privacy, and 3) role of apps within therapy. Most providers are interested in expanding the use of evidence-based apps.

Conclusion: Use of mental health apps is growing, yet much more information is needed about how apps can best be used within mental health treatment.

Impact of Workplace Flexibility and Supportive Work Environments on Employment Outcomes for Parents of Children With Autism Spectrum Disorders

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Background: Maintaining employment and adequate work productivity can be challenging for parents of youth with exceptional health care needs, such as those with autism spectrum disorder (ASD). This study examined the impact of workplace flexibility and support on employment outcomes for parents of children with ASD and compared them to two groups: parents of youth with asthma, and parents of youth without chronic health conditions (control).

Methods: Data come from the r-Kids study, which enrolled 1461 families (n=564 ASD, n=468 asthma, n=429 control). Youth ranged in age from 3 to 16.5 years and were predominantly male (79%, due to matching with ASD youth); more than 50% of the sample comprised people from racial or ethnic minority groups. Employment outcomes included hours worked in a typical week, hours missed from work, and the impact of a child’s health on workplace productivity. We used structural equation modeling with direct maximum likelihood estimation to examine whether workplace flexibility and support were directly and indirectly associated with employment outcomes.

Results: Structural equation modeling showed that offering greater work flexibility was associated with lower parenting stress and better work outcomes for all 3 groups of parents (ASD, asthma, control). For example, offering flexible work time to employees was associated with a significant decrease in parenting stress (β=−0.139; P=0.037), and lowered parenting stress was associated with better workplace productivity (β=−0.221; P=0.001). A better work environment reduced parenting stress (β=−0.088; P=0.042), was directly associated with less time missed from work (β=−0.152; P=0.001), and was the strongest predictor of better employment outcomes for all groups (ASD, asthma, control).

Conclusion: Parents of children with ASD were more likely to have negative impacts on employment compared to other parents. Results suggest that encouraging employers to provide flexibility and foster a supportive workplace could help parents of children with exceptional needs to maintain employment and succeed at work.

Anxiety in Parkinson’s Patients: What’s Time Got to Do With It?

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Background: Parkinson’s Disease (PD), a progressive neurodegenerative disease characterized by motor and nonmotor symptoms, affects over 10 million people worldwide. Many patients with PD experience comorbid anxiety, which has been previously correlated to reduced quality of life. Anxiety can manifest at any time during the course of PD. This study examines patterns of anxiety diagnosis and treatment in patients with PD, with respect to relative time of anxiety diagnosis, using electronic health records.

Methods: Data were obtained through Optum® using ICD-9 and ICD-10 diagnosis codes to determine PD status and anxiety status. Among individuals with anxiety, the time of index anxiety diagnosis was compared with the index date of PD diagnosis to designate those diagnosed with anxiety prior to PD and on or after PD. Both nonpharmacological and pharmacological treatment modalities were examined. Individuals were considered to have received treatment by documenting either mode of treatment at any time on or after anxiety diagnosis.

Results: Of the patients with PD sampled, 33% were diagnosed with anxiety, 52% of whom documented a diagnosis of anxiety prior to PD. Overall, 69% documented some sort of treatment. Time of diagnosis had a moderate effect on receipt of treatment, with 79% of those diagnosed with anxiety prior to PD receiving some treatment while only 59% of those diagnosed with anxiety on or after PD received any treatment (P<0.001; Cramer’s V: −0.22). Patterns of pharmacotherapy were consistent across groups regardless of time of diagnosis.

Conclusion: Anxiety is present in about one-third of patients with PD. Patients diagnosed with anxiety on or after PD diagnosis less frequently receive treatment compared to those with an anxiety diagnosis prior to PD. Further study is required to explore the effects of comorbid depression, progression of motor symptoms, and longitudinal effect of anxiety and its treatment on quality of life.

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Research Project Management Strategies Utilized in a Large, Multisite Lung Cancer Screening Consortium

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Background: As research is increasingly conducted through multi-institutional consortia, scientific research teams are developing infrastructure to increase effective collaboration, communication,
and coordination. The National Cancer Institute has awarded several large, complex, multisite studies and research centers that require comprehensive processes and strategies to support their successful management. The goals of the Lung Population-based Research to Optimize the Screening Process (PROSPR) Research Center (Lung PRC) in its first 3.5 years was to build a large, harmonized data repository to leverage for analysis of high-impact observational studies.

Methods: Our research team drew from lessons learned in prior consortium experiences and established team science strategies to develop infrastructure to support our aims. Herein, we describe and report on processes implemented to support our consortium in achieving its scientific goals.

Results: Infrastructure included governance, administrative, and data cores with distributed leadership. Governance processes were documented at study initiation, including a single institutional review board, reciprocal data use agreement, and an intellectual product review process. Administrative core processes integrated project management tools and data capture platforms with strategies to optimize collaboration and efficiency and drive scientific progress. Data core utilized similar strategies to effectively lead data capture, harmonization, and the provision of analytical datasets. In the first 3.5 years of this consortium, approximately 570 unique variables were harmonized for more than 2.1 million individuals from 5 heterogeneous health systems to create a pooled data repository, from which 13 analytic datasets were generated and transferred within the Lung PRC, resulting in 31 published manuscripts or abstracts. Two data transfers were completed for use within the PROSPR consortium.

Conclusion: Centrally administered evidence-based governance policies, administrative functions, and data core processes provided an effective infrastructure that, coupled with collaborative processes employed by the Lung PRC research team, helped to successfully build our large data repository, establish confidence and trust among stakeholders, and achieve our research goals.

“A lot of people are going to need this!”: Acceptability of a Financial Navigation Pilot Intervention for People With Cancer

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Background: Financial hardship from cancer care is prevalent and associated with adverse quality of life, treatment adherence, and survival. The CAFE study is a randomized control trial testing a personalized financial navigation intervention to reduce financial hardship for people diagnosed with cancer within two integrated health care settings.

Methods: We conducted a pilot study to explore the acceptability of phone-based financial navigation. Participants were recruited within 120 days of their cancer diagnosis. After the 6-week financial navigation intervention, we conducted phone interviews with 12 participants (6 at each site). Interviews explored the acceptability and helpfulness of the phone-based financial navigation intervention and identified areas of improvement for the main randomized control trial.

Results: Participants were mostly male (n=7) with an average age of 62.1 (range: 38–82) years. Cancer types included brain, breast, and prostate. All 12 participants viewed the program as an acceptable, important, and needed service. The majority (92%, 11 of 12) stated knowing exactly “who” to contact for financial questions or concerns was very helpful. Additionally, 75% (9 of 12) indicated that even with no current need for financial navigation, just having the conversation to raise awareness, organize their thinking, and discuss their cost-of-care plan was beneficial. Almost half (42%, 5 of 12) described receiving or being made aware of resources they would not have known otherwise (eg, medical financial assistance, transportation support). Participants felt supported by the financial navigators and appreciated their level of knowledge, friendliness, professionalism, and efficient follow-through regarding participants’ questions or concerns. Suggestions for improving the CAFE financial navigation program included: timing the initial outreach to be closer to the initial cancer diagnosis; clarifying recruitment materials; offering personalized resources when possible (eg, local, community-based); and increasing the duration of the navigation service beyond 6 weeks.

Conclusion: Learnings from the pilot have improved the financial navigation intervention for the randomized control trial currently underway.

Comparison of Biological Effective Doses From Permanently Implanted Cesium-131-Embedded Collagen Tile Brachytherapy and Stereotactic Radiosurgery/Radiotherapy

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Background: This study aimed to compare biological effective dose (BED) to brain tissue from low-dose-rate brachytherapy using collagen tile applicator embedded with cesium-131 seeds (GammaTiles [GT], GT Medical Technologies) to BED from standard-of-care stereotactic radiosurgery (SRS) and stereotactic radiotherapy (SRT) protocols.

Methods: For 9 patients who received GammaTiles, physical dose was calculated on postoperative computed tomography using AAPM TG-43U1 formalism. Dose in each voxel was converted to BED using linear/quadratic model (α/β of 10) that accounts for isotope half-life (9.7 days), cellular repair half-life (1.5 hours), and tumor doubling time (5.4 days). Minimum BED covering 90% (BEDGT90%) and 95% (BEDGT95%) of clinical treatment volumes (CTV), defined as tissue adjacent to surgical cavity with margins of 1, 2, 3, 4, and 5 mm, were calculated. BED corresponding to prescription doses from SRS (12–20 Gy), 3-fraction SRT (27 Gy), and 5-fraction SRT (30 Gy) were calculated using linear/quadratic model (α/β of 10) accounting for number of fractions and dose/fraction. BEDGT90% and BEDGT95% were compared to BEDs from SRS/SRT.

Results: BEDs corresponding to 1-, 3-, and 5-fraction SRS/SRT prescription doses were 26.4–60, 51.3, and 48 Gy, respectively. For CTVs with margins of 1, 2, 3, 4, and 5 mm, mean BEDGT90% across all patient models was 101.5 ± 46.6, 87.6 ± 36.1, 76.5 ± 30.7, 65.9 ± 25.2, and 57.5 ± 21.4 Gy, respectively. Mean BEDGT95% as a function of margin was 87.9 ± 37.5, 77.6 ± 32.5, 67.8 ± 27.7, 58.5 ± 23.1, and 48.2 ± 18.4 Gy, respectively.

Conclusion: BEDGT90% exceeded that of single-fraction SRS for CTVs up to 4 mm and those of 3- and 5-fraction SRT for CTVs up to 5 mm. Similarly, mean BEDGT95% exceeded that
of single-fraction SRS for CTVs up to 3 mm and those of 3- and 5-fraction SRT for CTVs up to 5 mm. Margins typically used in SRS/SRT range from 2 to 3 mm; this analysis demonstrates BED coverage offered by GammaTiles therapy is equivalent or superior to that of SRS/SRT.

Using Novel Typology to Analyze the Geographical Distribution of Cancer Burden in Missouri

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Background: Missouri’s rural cancer death rates are significantly higher than the Healthy People 2020 target rate of 161.4. More specifically, rural areas in Missouri continue to face many care challenges like the shortage of and access to health care providers. Yet, very few studies have specifically focused on geographic cancer burden and associated risk factors according to a rural-urban continuum, which is the objective of this study.

Methods: This cross-sectional spatial study was based on a total of 939 zip codes from the 2020 Missouri ZIP Health Rankings Project, which is a collaboration between researchers at the Washington University School of Medicine, the Hospital Industry Data Institute, and the data company of the Missouri Hospital Association. Also, U.S. Department of Agriculture’s Rural-Urban Continuum Codes (RUCC) data was used to create a new spatial typology based on 4 levels (urban core, suburban, large rural, and small-town/rural). Descriptive statistics, maps, and associations were generated using R software.

Results: Overall cancer rates, as well as specific cancer rates, were higher in suburban, large rural, and small-town/rural areas as compared to urban core areas. This was accompanied by the similar geographical distribution of disadvantaged socioeconomic factors, less availability of health care workers, and higher hospital utilization. More specifically, colorectal, breast, lung, lymph, skin, cervical, and urinary cancers were all higher in suburban, large rural, and small-town/rural areas when compared to urban core areas.

Conclusion: The burden of cancer and associated risk factors are higher in rural zip codes. This study provides context for using a granular analysis of rurality and urbanity to help community stakeholders and health care industry professionals to gain insights into the geographical and related social and health continuum of rural/urban distribution. Findings from this study can aid in the development of tailored interventions and policies for those with high cancer burdens.

The Kaiser Permanente Research Bank Cancer Cohort: A Collaborative Resource to Improve Cancer Care and Survivorship

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Background: The Kaiser Permanente Research Bank (KPRB) is collecting biospecimens and surveys linked to electronic health records (EHR) from approximately 400,000 adult Kaiser Permanente members. Within the KPRB, we developed a cancer cohort to address issues related to cancer survival and to understand how genetic, lifestyle, and environmental factors impact cancer treatment, treatment sequelae, and prognosis. We describe the cancer cohort design and implementation, describe cohort characteristics after 5 years of enrollment, and discuss future directions.

Methods: Cancer cases are identified using rapid case ascertainment algorithms, linkage to regional or central tumor registries, and direct outreach to Kaiser Permanente members with a history of cancer. Enrollment is primarily through email invitation. Participants complete a consent form and survey and donate a blood or saliva sample. All cancer types are included.

Results: As of December 31, 2020, the cohort included 65,225 cancer cases (56% female, 44% male) verified in tumor registries. The largest age subgroup was diagnosed at 60–69 years old (31%), and 83% are non-Hispanic White participants. There are 10,076 (16%) participants diagnosed with cancer at a young age (18–49 years), 4208 (7%) Hispanic participants, 3393 (5%) Asian participants, and 2389 (4%) Black participants. The median survival time is 14 years. Biospecimens (saliva or blood) are available on 98% of the cohort.

Conclusion: The KPRB Cancer Cohort is designed to improve our understanding of treatment efficacy and factors that contribute to long-term cancer survival. The cohort’s diversity with respect to age, race/ethnicity, and geographic location will facilitate research on factors that contribute to disparities in cancer survival.

Depression, Anxiety, and Loneliness Among Individuals With a History of Cancer During the COVID-19 Pandemic

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Background: Cancer survivors may be disproportionately impacted by the mental health consequences of the COVID-19 pandemic. The primary objective of this study was to compare the odds of depression, anxiety, or loneliness between subsets of cancer survivors during the COVID-19 pandemic.

Methods: The Kaiser Permanente Research Bank (KPRB), a large U.S. biobank, sent electronic surveys from May 2020 to January 2021 to approximately 270,000 participants to assess the impact of the COVID-19 pandemic on mental health. Virtual Data Warehouse and tumor registry data were used to collect information on cancer history. The surveys collected data on depression using the Patient Health Questionnaire-2 (PHQ-2), anxiety using the Generalized Anxiety Disorder-2 Item (GAD-2), and loneliness using the Three-Item Loneliness Scale. Analysis excluded those who had an invasive cancer diagnosis within 12 months prior to initial COVID-19 survey completion. Logistic regression models were used to test the association of depression, anxiety, and loneliness between subsets of cancer survivors during the COVID-19 pandemic.

Results: Overall, 48% of KPRB participants responded to the surveys, including 16,231 cancer survivors. Most survivors were 65–79 years of age (50%), female (63%) and White, non-Hispanic (82%). Male survivors had lower odds of depression, anxiety, and loneliness compared to female survivors (adjusted odds ratio [aOR]:...
Conclusion: The impact of the COVID-19 pandemic on mental health outcomes in cancer survivors varied across demographic groups, with higher impacts occurring in women, those who smoke cigarettes, and those with multiple comorbidities.

Implementation of Patient-Reported Outcome Measures in a Racially and Socioeconomically Diverse Population of Patients With Cancer

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Background: Patient-reported outcome measures (PROMs) are symptom-reporting mechanisms that have been demonstrated to improve quality of life, decrease acute care events, and improve survival in patients with metastatic solid tumors. However, their use has been predominantly restricted to clinical trials, in which most patients are White and have high socioeconomic status (SES) factors. This study aims to describe implementation of a PROMs program in a racially and socioeconomically diverse population of patients with cancer.

Methods: Four National Institutes of Health’s Patient-Reported Outcome Measurement Information System (PROMIS) questionnaires (pain interference, fatigue, physical functioning, depression) were assigned to all patients with a diagnosis of cancer undergoing a visit with an oncologic provider at a large urban health system. Patients were offered questionnaires remotely on a patient-facing electronic interface and at the time of the visit. Results were captured in the electronic health record system for physician review during each visit. Patient demographic, disease, and treatment characteristics were collected. ZIP Code Tabulation Areas (ZCTA)-based SES variables were obtained.

Results: A total of 1666 cancer patients completed PROMs from August 2020 to June 2021. The most common disease sites were breast (n=490, 29.4%), head and neck (n=219, 13.1%), and lung (n=192, 11.5%). Mean age was 64.3 (standard deviation: 12.4) years. A large majority of patients was White (n=1138, 68.3%) or Black (n=397, 23.8%). Private insurance coverage was most common (n=789, 47.4%). PROMs were completed remotely by 34.5% patients (n=575). ZCTA-level SES data demonstrated that 26.9% patients (n=448) lived in an area with 20% of households below the poverty line and that 29.3% patients (n=488) lived in an area with ≥20% of the population completing less than a high school diploma.

Conclusion: This study demonstrates that PROMs can be successfully implemented in a racially and socioeconomically diverse population within a vertically integrated health system outside of clinical trials contexts.

Patient Experiences of Online Family History Collection to Determine Inherited Cancer Risk in a Large Comparative Effectiveness Implementation Trial

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Background: All relevant medical organizations recommend family history assessment to identify patients at risk for hereditary cancer. Yet, primary care settings inconsistently capture family history information. Online patient-completed data collection modalities exist, but little is known about their acceptability. We present qualitative data from a large, population-based study conducted at Kaiser Permanente Northern California on patient experiences with providing online family history for inherited cancer risk.

Methods: The Family Study is a randomized comparative effectiveness implementation trial currently assessing 3 methods of capturing family cancer history: 1) data collection as part of routine care; 2) patient completion of a brief online risk assessment; and 3) patient completion of a 3-generation pedigree. Participants in arms 2 and 3 completed an open-ended survey question about their experience with the online risk assessment. Five team members, including 2 patient co-investigators, developed a codebook of themes derived from the Theoretical Framework of Acceptability and discussed preliminary coding until consensus was reached on coding procedures and thematic definitions. In total, the team independently coded a random sample of open-ended responses (n=200), with equal representation from arms 2 and 3.

Results: On average, study participants were 54 years of age, 67% female, and 37% White. We identified the following themes from participants' responses: the online assessment was easy to complete, even if it took time to gather the required information; providing the information and receiving the risk assessment results was considered valuable; concerns included data use and privacy as well as appropriate capture of the nuances of family cancer history.

Conclusion: These preliminary findings suggest that online hereditary cancer risk assessment is acceptable to patients and may be feasible on a large, population-based scale. Future research should identify strategies to address patient-level barriers to providing family history information, trusting risk assessment results, and alleviating concerns about privacy and data use.

IMPLEMENTATION SCIENCE

How to Design a Pilot for Clinician Uptake: Lessons From Four Pilot Tests of an Obstetrics Support Tool With Diverse Providers and Clinics

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Background: There is a shortage of strategies for designing pilots that promote the necessary intervention uptake and produce high-quality process and outcomes data. The CONTINUE study conducted 4 sequential pilot tests of a tool to compare fit and
feasibility with 4 provider types — obstetricians (OBs), residents, midwives, and nurses. CONTINUE provides guidance on how to design, support, and measure pilot tests in routine care settings.

**Methods:** CONTINUE used both human-centered design and implementation science strategies to integrate a tool into routine OB care. Each pilot was co-designed with patients, providers, site leads, and administrators. Training strategies included providing continuing medical education (CME) credits to OBs and hands-on training sessions for nurses, residents, and midwives. Coaching sessions were provided in specified intervals. Prepilot and postpilot surveys measured implementation outcomes (acceptability, appropriateness, feasibility, fidelity, and sustainability) for providers; patient interviews and surveys captured their pilot experiences. Fidelity was tracked using a composite score of 4 indicators (tool completion, completion with patient, patient review, handed to patient).

**Results:** CONTINUE pilots showed high and rapid rates of tool adoption. Three OBs (N=4), all nurses (N=3), and both midwives (N=2) scored the tool and its implementation as appropriate, acceptable, feasible, and sustainable in their current workflows. Half of the resident OBs (N=10) scored the tool as easy to use, appealing, and satisfactory in content but did not welcome it as part of their workflow (acceptable) or find it applicable to their practice (appropriate) or sustainable. Provider surveys reported high fidelity in tool usage; however, patient interviews documented significant variation by provider. Nurses showed the lowest fidelity in implementation, followed by residents; OBs and midwives showed the highest fidelity in use.

**Conclusion:** Engagement of all stakeholders is critical to pilot designs that minimize barriers and maximize performance. Thoughtful design of training, provider supports, and use of interim check-ins accelerate provider adoption.

**Impact on Shared Decision-Making of an Intervention to De-Implement Opioid Use for Dental Extractions**

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**Background:** Clinical decision support (CDS) is designed to provide clinicians with patient-specific information in a timely manner during a clinical encounter. An objective of this clinical trial was to reduce opioid prescribing for management of postextraction pain and to examine the extent of shared decision-making (SDM) for managing postextraction pain across study arms, which included a CDS and enhanced CDS arm to facilitate SDM between the provider and patient compared with usual care. Objectives of this clinical trial were to reduce opioid prescribing for management of postextraction pain and to examine the extent of SDM for managing postextraction pain across study arms.

**Methods:** In this 3-arm, cluster-randomized trial conducted in the HealthPartners Dental Group, dental providers were randomized to CDS, CDS with patient education (CDS-E), or usual care. Patients completed a modification of the collaboRATE SDM scale, consisting of the mean of 3 items on 5-point rating scales (0 = “no effort was made” to 4 = “every effort was made”). The survey was administered within a 3–6-day window following the dental extraction.

**Results:** A total of 981 eligible patients were sampled, and 492 completed the postextraction survey (response rate 50%). The mean (95% CI) SDM score was 3.2 (3.1–3.4) for CDS, 3.3 (3.2–3.5) for CDS-E, and 3.3 (3.2–3.5) for usual care. Neither CDS (P=0.25) nor CDS-E (P=0.90) differed from usual care in SDM ratings postextraction.

**Conclusion:** The overall level of SDM was high across all 3 arms. The CDS and CDS-E interventions did not increase the level of SDM compared to the usual care arm. When SDM is high in usual care, it may be difficult to make an improvement with CDS and CDS-E. A different result might occur if baseline SDM is low.

**Adherence to Provider Referrals for Lung Cancer Screening With Low-Dose Computed Tomography Before and During COVID-19 Pandemic**

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**Background:** Lung cancer is the leading cause of death from cancer in the United States. Despite Medicare coverage for lung cancer screening (LCS) with low-dose computed tomography (LDCT) beginning in 2015, LCS-LDCT uptake remains low due to complex, multistep processes for patients, providers, and health systems. This study assesses trends in adherence to provider referrals for LCS-LDCT and the multilevel factors influencing completion rate of LCS-LDCT orders before and during the COVID-19 pandemic.

**Methods:** We analyzed electronic health record data from a large health system in Northern California between December 2013 and December 2020. For any patient with LCS-LDCT order, trends in the proportion of screening guideline-eligible vs ineligible patients and screening completion rates were compared. Multilevel factors associated with completion of the LCS-LDCT order were explored using hierarchical generalized linear models.

**Results:** LCS-LDCT orders (N=12,469) increased from 2013 to 2019, dropped dramatically at the start of COVID-19 pandemic, and then slowly increased again in June 2020. The completion rate increased from 0% in December 2013 to approximately 70% in 2018–2019 and then declined to 50%–60% in 2020 during COVID-19 pandemic. The completion rate of LCS-LDCT was lower for ineligible patients. Patients with major comorbidities and those who smoked fewer than 30 pack-years were significantly less likely to complete an order than those without any major comorbidity or who had smoked 30 pack-years or more. Patients who received the LCS-LDCT order at Medicare wellness visits or saw a provider with prior experience with LCS-LDCT were more likely to complete LCS-LDCT orders.

**Conclusion:** Those who received orders at Medicare wellness visits, had no major comorbidities, were heavy smokers, and had providers with prior experience were more likely to complete an order suggesting opportunities to improve LCS-LDCT process and influence clinical practice at patient, provider, and systems levels.

**Implementing a Systemwide Initiative to Hospital Surgeons at a Large Health System: Strategies and Lessons Learned**

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**Background:** Implementation of pragmatic clinical trials in health systems face numerous challenges, requiring significant prelaunch work to ensure success. We describe our experience and lessons learned when implementing monthly prescribing “nudges” (email reports) to individual surgeons on opioid prescriptions exceeding guidelines to reduce postsurgical opioid prescribing in a large health system.

**Methods:** This effort was carried out at Sutter Health, a Northern California health system; 20 hospitals and service lines within hospitals were randomized to 1 of 3 study arms. Prior to implementation in October 2021, the research team spent time focused on engaging and communicating with system and hospital executive leadership to obtain endorsements at all levels while minimizing impact on clinical practice and the blindness requirement of the trial.

**Results:** All eligible hospitals were successfully enrolled in the initiative, totaling 57 service lines and approximately 778 surgeons. The process began with finding a senior hospital executive interested in research to act as the champion to other leadership. Then, beginning with Sutter Health operational leaders (ie, chief quality and safety officer, pharmacy director), we went through an iterative process that included presenting the project, obtaining feedback on how to operationalize the intervention, modifying the report messages, and presenting to the next set of leaders. Before going live, we obtained approval from every hospital’s chief medical executive, chief of staff, and each service line’s executive (active endorsements from 37 hospital-level executive leaders and 24 other high-ranking physicians). Engagement of leadership required significant time and effort over the course of more than a year.

**Conclusion:** Implementation at each local site required senior leadership support at all levels of the organization and an understanding of our organization’s culture and key stakeholders. Active outreach, reliable communication, and willingness to modify the project based on feedback were all necessary for buy-in prior to systemwide implementation.

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**Do Patient Characteristics Influence Use of a Clinical Decision Support Tool?**

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**Background:** Clinical decision support (CDS) tools used for shared decision-making in primary care settings have improved cardiometabolic patient outcomes in multiple studies. However, high CDS use rates in high-risk patients are essential to impact patient outcomes at a population level. Herein, we explore differences in use of an effective and highly used CDS system in patients of varying clinical and demographic characteristics.

**Methods:** The CDS system runs automatically on patients 18–75 years of age at primary care encounters and retains encounter-level data for identifying eligible patients, generating the CDS, and documenting CDS printing. Data are retained within a secure data repository. We used logistic regression and generalized linear mixed models with binomial distributions and logit links to analyze the repository data for differences in print rates based on selected patient characteristics. Crude models (odds ratio [cOR]) used simple logistic regression, and adjusted models (aOR) included random intercepts for department and provider and fixed effects for age, sex, and race categories.

**Results:** Between August 7, 2019, and March 3, 2020, 22,399 patients (mean age 58.5 years, 55% male, 68.4% White, 17.4% Black, 6.7% Asian, and 4.3% Hispanic/Latino) were eligible for CDS at an index encounter. Overall CDS print rate was 74.6% and was lower for females (aOR: 0.91, 95% CI: 0.84–0.99), higher for patients 18–49 years of age than for those 65 and older (aOR: 1.19, 95% CI: 1.06–1.33), and lower for Blacks (cOR: 0.92; 95% CI: 0.85–1.00) and Hispanics (cOR: 0.84, 95% CI: 0.73–0.97) relative to Whites. CDS print rates were significantly higher in those with blood pressure (BP) of <140/90 mmHg (aOR: 2.54, 95% CI: 2.34–2.76) and body mass index (BMI) of <30 (aOR: 1.24, 95% CI: 1.14–1.35) but lower in those without diabetes than with diabetes (aOR: 0.74, 95% CI: 0.67–0.83). Compared to those with 10-year cardiovascular (CV) risk of >25%, CDS printing was higher for CV risk of ≤7% (aOR: 1.60, 95% CI: 1.37–1.87), for CV risk of 7.1%–15.2% (aOR: 1.35, 95% CI: 1.18–1.53), and for CV risk of 15.2%–25.1% (aOR: 1.32, 95% CI: 1.18–1.47).

**Conclusion:** CDS print rates were high overall at 74.6% and high in those with diabetes. However, CDS use was lower than expected in underrepresented patients, women, and those with elevated BP, high BMI, and high CV risk. Results suggest the need to develop effective strategies to increase CDS use for underrepresented and high-risk patients.

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**Implementation Outcomes of a Community Health Worker Program Embedded in High-Need Primary Care Practices in Delaware**

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**Background:** Across health systems, community health workers (CHWs) are increasingly being embedded into care for medically and socially complex patients. We examined implementation, patient-centered goals, and process outcomes of a CHW program embedded in 4 high-need primary care practices in northern Delaware.

**Methods:** The 6-month program was based on the IMPaCT model. Patients with uncontrolled diabetes, hypertension and/or ≥2 emergency department (ED) visits in previous 90 days were eligible. Patient characteristics, program enrollment, visits and completion, patient-centered goals, goal achievement, and patient satisfaction data were collected. We examined enrollment, intervention fidelity and dose, goal achievement, graduation, and satisfaction. Descriptive statistics, t-tests, and chi-squared tests were used to examine outcomes and assess differences across practices and patient groups.

**Results:** Among all contacted patients (N=440), 70% were enrolled. Patients were, on average, 54.1 (standard deviation [SD]: 12.7) years of age, 65.8% female, 69.5% Black/African American, and 8.0% Hispanic/Latinx. The majority (80.7%) had diabetes, 83.6% had hypertension, 25.8% had ≥1 ED visits in prior 90 days, 6.9% had ≥1 hospital admission in prior 90 days, 91.4% (n=275) had an initial CHW visit, and 97.8% set ≥1 roadmap goals. Patients set 5.9 (SD: 3.5) goals and achieved 4.7 (SD: 3.3). Top goal areas included physical health (67.5%), food assistance (10.6%), and individual/family support (5.9%). Among enrolled patients, 24% dropped out or were lost to follow-up; this group was significantly more male...
than completers (51.5% vs 29.5%; P<0.04). Program graduates (62.9%) spent 6.3 months (SD: 1.0) in program and had 17.5 CHW visits (SD: 10.5), about 64.3% of expected visits. Graduates achieved 79.6% of goals set. There were few implementation differences across practices. Mean patient satisfaction score was 9.8 (SD: 0.5) out of 10.

**Conclusion:** This CHW program supported medically and socially complex patients in setting and achieving goals, despite some fidelity challenges and attrition. Furthermore, implementation and patient satisfaction appear to be consistent across practice sites. Additional research to assess patient health and care utilization impacts is underway.

**MATERNAL, CHILD, and FAMILY HEALTH**

**Benefits of Integrating a Patient-Centered Pregnancy Support Tool in Routine Prenatal Care: Patient Perspectives**

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**Background:** Pregnancy care plans are inherently burdensome and often present challenges to adherence, especially for low-income, high-risk patients. The CONTINUE study examined the effects of 1) integrating a patient-centered pregnancy support tool into routine prenatal care to assess where patients need the most support, and 2) whether a patient-centered tool can help offer the support they need.

**Methods:** A pregnancy support tool was developed and distributed to prenatal patients at the beginning of their pregnancy by 1 of 4 provider types: attending obstetricians, obstetric residents, nurses, and midwives. After a 14-week implementation phase, 34 patients were interviewed to assess their experiences with the tool. Patients had to be at least 27 weeks pregnant and use the tool for at least 8 weeks to qualify. To assess tool benefits, the interviewers engaged in a validated human-centered design-based card sort activity in which patients sorted and scored 18 potential benefits of tool use. Scores were analyzed in aggregate, then stratified by patient and provider type, insurance (public/private), risk level (low/high), and parity.

**Results:** The following are tool benefits with the highest patient scores: understanding what happens next (82%), feeling more in control of my pregnancy (76%), and planning ahead/feel less stressed (73%). Scores were highest for these benefits even when stratified by insurance type, risk level, and parity. When stratified by provider type, however, midwifery patients identified “explaining my care plan to others” and “understanding how appointments differ” as additional high-ranking benefits.

**Conclusion:** In every group, the pregnancy support tool’s ability to help a patient understand what comes next in their pregnancy journey was most beneficial. The tool also provided support by allowing pregnant women the ability to plan better, which in turn made them feel more in control of their pregnancy and less stressed. Findings suggest that when providers introduce a user-centered support tool, patient knowledge, agency, and self-efficacy improves. Given the tool’s reported ease of use for both providers and patients, integrating a support tool is a low-burden way for providers to offer additional support to their patients, which is particularly important in low-income, high-risk populations.

**Implementation and Evaluation of an Enhanced Adverse Childhood Experiences Screening and Referral System in Pediatric Primary Care**

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**Background:** Adverse childhood experiences (ACEs) are associated with poor physical and mental health across the lifespan. To combat these negative sequelae, ACEs screening is being recommended in pediatric primary care across California. This study tested a clinically informed individualized approach within Kaiser Permanente Southern California (KPSC) to 1) identify ACEs in children, 2) effectively tailor referrals, and 3) assess the impact of our updated workflow on referral completion.

**Methods:** An updated workflow for ACEs screening and referral was implemented in February 2021 within a single large pediatric primary clinic in KPSC as part of a soft launch for regional rollout. Workflow included: a) referral to a pediatric social worker for any child with an ACEs score of ≥1 and behavioral symptoms; b) psychosocial assessment by a pediatric social worker who determines which (if any) treatment services are needed for the child and/or parent; and c) referral to appropriate services (eg, behavioral health, parenting classes, social services programs). Data on ACEs screening, referrals, and visits were obtained from electronic health records.

**Results:** Between February 12, 2021, and August 31, 2021, 10,232 children were screened for ACEs; 22% screened positive (score of ≥1). Of the 2214 children with a positive score, 130 (7%) were referred to a pediatric social worker while the other 93% received educational materials about ACEs. Of the 130 referred, 123 completed a visit with a pediatric social worker. Of these 123 children, 78 were referred to behavioral health, 38 to parenting classes, and 7 to other community services. Of the 78 referred to behavioral health, 39 (50%) completed a behavioral health visit within 30 days of referral.

**Conclusion:** Overall, the findings support the feasibility of the implementation of ACEs screening in pediatric primary care. Funneling children with positive screening to a pediatric social worker allows for thorough assessment and more individualized referral.

**Predictors of Firearm Injury Among Child and Adolescent Members of a Large Integrated Health System**

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**Background:** Firearm injury and death are serious and persistent public health concerns, as youth in the United States experience firearm injury and death at higher rates than all other high-income countries. Few studies have tested multilevel predictors of firearm injury among pediatric populations and whether these differ based on injury intention (self-inflicted vs non-self-inflicted). To address this gap, the current study examined demographic, individual psychosocial, and neighborhood variables as predictors of firearm injury among a cohort of children and adolescents.
Methods: Data were obtained from the electronic health records of Kaiser Permanente Southern California. The cohort included children (age of 0–17.99 years) with at least 1 visit between January 1, 2010, and December 31, 2018. Poisson regression was used to examined demographic (age, sex, race/ethnicity, Medicaid status), psychosocial (depression, substance abuse, medical comorbidities), and neighborhood variables as risk factors for non-self-inflicted and self-inflicted firearm injury.

Results: For non-self-inflicted injury, significant relative risk (RR) was found for children 12–17 years of age (RR: 37.57, 95% CI: 19.74, 71.53) compared to 0–5-year-olds; other risk factors included male gender (RR: 7.96, 95% CI: 5.21, 12.16), Black (RR: 9.92, 95% CI: 5.81, 16.93) or Hispanic race/ethnicity (RR: 1.84, 95% CI: 1.08, 3.13) as compared to White youth, being a Medicaid recipient (RR: 1.48, 95% CI: 1.10, 1.97), lower neighborhood education (RR: 3.56, 95% CI: 2.28, 5.57), and substance abuse (RR: 7.50, 95% CI: 2.95, 19.08). For self-inflicted injury, only age 12–17 years (RR: 3.35, 95% CI: 1.48, 7.60) and male gender (RR: 11.14, 95% CI: 2.63, 47.26) were associated with increased risk.

Conclusion: The findings contribute to the accumulating evidence for specific demographic, psychosocial, and neighborhood variables that increase risk for firearm injury and help clarify differences in risk variables based on self-inflicted vs non-self-inflicted firearm injury. In particular, these results reinforce the established higher risk for firearm injury among adolescents and males and highlight the need for health systems to consider multidomain factors in screening for firearm injury risk.

A Pilot Study of Risk Behavior Screening During Adolescent Well Visits Using an Electronic Teen Questionnaire (eTeenQ)

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Background: Screening for risk and protective behaviors is recommended during adolescent well visits. This pilot study aimed to describe use of a novel electronic teen questionnaire (eTeenQ) in a large Midwestern health system.

Methods: Patients 12–18 years of age with well visits at 3 primary care pilot clinics were handed an electronic tablet with the eTeenQ preloaded. The eTeenQ includes 23 fixed-response questions. After completing the eTeenQ, 2 additional questions asking permission to store responses in the electronic health record (EHR) and to use responses for research were displayed. During the visit, responses were converted to a provider-display for teens and providers to review together. Responses were stored in REDCap and, for patients who agreed, transferred from REDCap to an EHR flowsheet. Responses to selected eTeenQ questions were reported among those consenting to research. This pilot study was reviewed and approved by the institutional review board.

Results: Between August 17, 2020, and August 27, 2021, among 2816 eligible well visits, 2098 (74%) completed the eTeenQ. Of these, 86% agreed to store responses in the EHR. Of the 1632 who consented for research, 90% reported having one adult they can really talk to, and 93% reported feeling safe in their community; yet, 25% reported someone they lived with had a gun, and 11% reported having had a stressful or scary event that still bothered them. In addition, 16% reported missing 7 or more days of school, and 12% reported their grades were worse than they used to be. Finally, 10% reported they were or wondered if they were gay, lesbian, bisexual, pansexual, asexual, or other, and 3% reported they were or wondered if they were transgender or gender diverse.

Conclusion: Use of electronic tablets for adolescent screening in primary care is feasible for collecting sensitive information in busy primary care settings, with most adolescents agreeing to store their responses in the EHR.

Recruitment of Adolescents With Mild Depression From Primary Care Settings: Lessons Learned From a Multisite Comparative Effectiveness Trial

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Background: Nearly 1 in 5 children have a mental or emotional disorder, such as depression, that increases with age. Adolescents with indicators of mild depression benefit from early diagnoses and treatment. Scalable interventions are needed to increase access to mental health services and integrate depression-prevention, evidence-based interventions in real-world primary care settings.

Methods: Data were derived from a comparative effectiveness trial, Path 2 Purpose (P2P), which evaluates the efficacy of 2 evidence-based cognitive-behavioral prevention programs. P2P actively recruits adolescents with mild depressive symptoms from 4 primary care health systems in Illinois and Kentucky. To date, 19 physicians, nurses, medical assistants, administrators, social workers, and coordinators from 3 primary care health systems have participated in key informant interviews. Interviews are still ongoing. Thematic analyses will be conducted to identify themes and examine patterns in themes’ sequence, distribution, and co-occurrence.

Results: Preliminary analyses demonstrate that primary care staff stakeholders are actively engaged, strongly support P2P, and recognize the need for P2P for their adolescent populations. Participants also reported receiving comprehensive training and support from P2P team. Challenges include an increase in adolescents with moderate-to-severe depression, varying perspectives in the utility and feasibility of integrating recruitment procedures within current primary care practices, and issues with lower-level primary care staff appreciation for recruitment efforts.

Conclusion: This presentation presents the facilitators and challenges to implementing trial recruitment strategies within primary care settings. Results are expected to show how to foster identified facilitators and present strategies to overcome challenges integrating trial recruitment into real-world settings, such as clinic-community partnerships and the development of policies to promote the integration of behavioral-based interventions. The strategies discussed may be extrapolated and adapted to incorporate similar interventions in health system settings.
Pediatric Cefdinir Use in an Integrated Health System Serving Predominantly Rural and Suburban Pediatric Patients

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Background: Cefdinir is an oral third-generation cephalosporin that is commonly used in pediatric patients due to its palatability and dosing schedule. Due to pharmacokinetic concerns and spectrum of bacterial coverage, and based on pediatric guidelines, cefdinir is not recommended as a first-line agent for pediatric upper respiratory infections (URTs) such as sinusitis, pharyngitis, and acute otitis media, lower respiratory infections (LRTIs) such as community-acquired pneumonia, or urinary tract infections (UTIs). While one study has evaluated pediatric cefdinir prescribing using state Medicaid claims, an evaluation of cefdinir prescribing in an integrated health system with public and private insurance types has not been performed.

Methods: We performed a retrospective chart review utilizing our institution’s electronic health record and pharmacy databases to identify cefdinir prescriptions for children 0–18 years old from 2005 to 2020. Cefdinir prescribing was evaluated for the following diagnoses: acute otitis media, sinusitis, streptococcal pharyngitis, community-acquired pneumonia, UTI, and viral respiratory illnesses. We developed logic algorithms based on existing guidelines to categorize cefdinir prescribing as potentially appropriate or inappropriate utilizing diagnoses codes, documented allergies, previous diagnoses, and antibiotic prescribing. A random subset of cefdinir logic categorization was manually verified. Percent of inappropriate prescriptions was compared by location and provider type using chi-squared test.

Results: A total of 95,745 cefdinir prescriptions were prescribed to pediatric patients for the diagnoses of interest, with 55,473 (57%) deemed as potentially inappropriate. Non-pediatric-trained providers represented 61.7% of inappropriate cefdinir prescriptions. Non-pediatric-trained providers were more likely to prescribe potentially inappropriate cefdinir prescriptions than pediatric-trained providers (P<0.001). Inappropriate cefdinir prescriptions were most frequently prescribed in the outpatient setting.

Conclusion: Cefdinir is prescribed frequently in outpatient pediatrics despite lack of first-line indications for URTIs, LRTIs, and UTIs. Inappropriate use of cefdinir should be a focus of pediatric antibiotic stewardship and quality improvement efforts at our institution.

PATIENT, CLINICIAN, and HEALTH SYSTEMS ENGAGEMENT

Patients With ADHD and the Health Care Transition Out of Pediatric Care

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Background: Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder that impacts attention, hyperactivity, and impulsivity. ADHD frequently presents and is diagnosed before the age of 12 years. Pediatricians are often on the forefront of assessing, diagnosing, and treating young patients with ADHD. As adolescents’ transition from pediatric care to adult primary care, they often have difficulty finding new physicians willing to accept patients with ADHD. This time of transition can often lead to gaps in care and access to medication.

Methods: In partnership with Henry Ford Health System’s (HFHS) Department of Pediatrics, we surveyed pediatricians’ regarding medication management and routine health care for adolescents with uncomplicated ADHD transitioning from pediatrics to adult primary care. In 2019, HFHS had a pediatrics department of 69 physicians treating an estimated 2459 children and adolescents with an ADHD diagnosis. We emailed all HFHS pediatric providers an electronic survey to assess their knowledge and attitudes regarding medication management and general health care for adolescents with uncomplicated ADHD transitioning to adult care. A total of 33 HFHS pediatricians (48%) completed the survey.

Results: Preliminary analyses suggest high levels of pediatrician-reported confidence, with 88% of pediatricians reporting confidence in their abilities to make an ADHD diagnosis and 75% confident in their abilities to prescribe medication for ADHD management. Pediatricians reported mostly positive attitudes toward providing medication management as treatment for uncomplicated ADHD. Despite feeling confident about working with adolescents with ADHD, 75% of surveyed pediatricians reported not having enough resources to help those patients transition to adult primary care.

Conclusion: Most pediatricians feel confident in their role to provide care to patients with ADHD; however, surveyed pediatricians reported concern about patients’ transition to adult care and lack of resources to help their patients in that transition. Further policy and implementation strategies could support transition from pediatrics to adult primary care.

Recruiting Biobank Members for Online Surveys: Lessons Learned From Three Pilot Studies

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Background: Biobanks are an important resource for large-scale research studies. Beyond existing health records, demographic and behavioral data are useful for identifying members best suited for study recruitment or for use as predictors of health outcomes. Thus, we conducted 3 pilot studies to collect online survey data from 22,000 randomly selected members of a biobank in the U.S. Northeast.

Methods: We recruited biobank members via email to complete an online survey in all studies. No incentives were offered in the first study. Participants were randomly assigned to 1 of 2 email subject line conditions and 1 of 3 gift card drawings ($25, $250, or no incentive) in the second study. A third study included 4 gift card conditions ($25, $100, $250, or $500) and 2 subject line conditions, along with a control group without incentives. In all studies, recruitment emails were followed by 4 reminder messages.

Results: We observed a participation rate of 5.9% in the first study. We were able to significantly increase participation by offering entry into a gift card drawing (9.3%) and by implementing an email subject line (10.0%) in the second pilot. We achieved the greatest participation when offering a drawing for a $250 gift card (11.4% across the second and third studies), which was nearly double the participation with no incentive offered (6.1% across the second and third studies).
third studies). We did not find a linear trend of greater participation with increasing reward amounts. Participation did not differ based on gender, age, or date of joining the biobank. We observed little negative reaction to recruitment messages, with fewer than 1% unsubscribing from future emails.

**Conclusion:** Offering gift card drawings or using more engaging subject lines was effective in boosting survey participation among biobank members. These results indicate that email is a convenient tool for recruiting biobank members for research studies while posing little risk of member disengagement.

**Association Between Caregiver Health, Preparedness, and Burden With Patient Hospital Utilization in Home Palliative Care**

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**Background:** Community-dwelling older adults use more health care services when their family caregivers have health challenges and/or low caregiving confidence. The purpose of this analysis was to determine whether family caregiver self-rated health, perception of preparedness, and burden at the time of patient admission to home palliative care (HomePal) are associated with downstream patient hospital utilization and other secondary outcomes of time to hospice enrollment and death.

**Methods:** Data for this cohort study (n=441) were drawn from a trial testing two models of HomePal. Caregiver self-rated health (global question), preparedness (measured by the Preparedness for Caregiving Scale, or CPS), and burden (per Zarit-12) were measured at admission to HomePal. Caregivers were categorized as having good/very good/excellent or fair/poor health, scoring above or below the CPS median score of 23, or having no/mild (0–10), moderate (11–20), or high (>20) burden. Proportional hazard-competitig risk models assessed the association between caregiver factors with hospital utilization (emergency department visits, observation, and inpatient stays).

**Results:** Patients whose caregivers reported poor health and low preparedness received more visits by home health aides and social workers, respectively (P<0.05 for both). Adjusted models showed that worse caregiver health (hazard ratio [HR]: 0.69, 95% CI: 0.52, 0.92; P=0.01), low preparedness (HR: 0.73, 95% CI: 0.57, 0.94; P=0.01), and high burden (HR: 0.77, 95% CI: 0.56, 1.06; P=0.10) were associated with lower risk for hospital utilization. There were no significant associations between caregiver factors with time to patient enrollment in hospice or death in adjusted models (P>0.05 for both).

**Conclusion:** Greater in-home supports may achieve quality palliative care that aligns with families’ priorities.

**Making Patient Engagement More Meaningful and Inclusive in Learning Health System Research: Applying the Valuing All Voices Framework**

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**Background:** Engaging patients is widely considered a valuable part of health system research, yet current engagement strategies often exclude underrepresented voices and lack consideration of the role of trauma in lived experience. People with persistent pain often experience stigma within the health system that may be compounded by other aspects of their identity (eg, race or age), which makes it important to engage this population using an inclusive, equity-oriented framework. The specific aim of this work was to engage patients with persistent pain in the co-design of an integrated pain management (IPM) intervention in a learning health system context.

**Methods:** Kaiser Permanente Washington Health Research Institute researchers applied the Valuing All Voices Framework to engage patient partners in designing an intervention to improve care for patients with pain.

**Results:** The IPM team systematically applied the 5 components of the Valuing All Voices Framework and corresponding example strategies to engage 4 patient partners over 18 months: trust — deep listening and responsiveness to feedback; self-awareness — minimizing hierarchy; understanding acceptance — acknowledging differences in lived experience and values; relationship-building — prioritizing time for authentic connection; and education communication — sending weekly emails to build foundational knowledge. Using the framework to ground their collaboration, patient partners and researchers produced patient education handouts, provider scripts, education for care teams on stigma, bias, and racism in pain care, and a self-management toolkit for patients with persistent pain. Patient partner feedback also prompted system changes, including insurance coverage for urine drug screens and copay-free pain management classes.

**Conclusion:** The Valuing All Voices Framework provided a useful model for fostering a strong, equitable partnership between the IPM team and patient partners that produced both resources in the public domain and health system changes. Future research should focus on systematically measuring the impact of the framework from the patient, researcher, and health system perspectives.

**Patient-Reported Outcome Measures Can Advance Population Health, but Is Access to Instruments Equitable?**

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**Background:** Patient-reported outcome measures (PROMs) can engage patients and clinicians to improve health outcomes but have limited population health impact if systematic barriers inhibit access to completion. In a retrospective, single-institution analysis, we evaluated individual (parent/child) and clinic factors associated with parental completion of a locally developed PROM, the Early Healthy Lifestyles (EHL) questionnaire, at Geisinger between 2016 and 2020.

**Methods:** At 14 pediatric clinics, parents presenting their child for regularly scheduled well-child visits (WCV) prior to age 26 months (maximum 9 opportunities) were eligible to complete the 15-item EHL in the patient portal, on a clinic iPad (waiting room), or via staff interview (exam room). EHL items included feeding practices, diet, play time, screen exposure, and sleep. All patients included (ie, parent-child dyads) had at least 3 WCV at study clinics. Completion was categorized at patient (ie, parent-child dyad) and clinic levels. Given that patient- and clinic-level factors may influence completion, we evaluated the interaction between these...
components. Patients who completed EHL for half of WCVs were high-completers; low-completers completed EHL at least once; and non-completers never completed EHL.

**Results:** Clinic location was significantly correlated with completion, leading to the classification of clinics by EHL adoption level based on percentage of high completion: high adoption: >50%; moderate adoption: 10%–50%; and low adoption: <10%. Since individual-level factors had negligible impact on EHL completion within moderate/low EHL adoption sites, the subset of high-adoption sites was used to evaluate whether infant and maternal factors were associated with EHL completion using hierarchical logistic regression (significance at P<0.05). Noncompletion of EHL was significantly associated with infant use of government insurance, >1 clinic site for WCV, non-White birth mother, and body weight of <2500 grams or gestational age of <34 weeks.

**Conclusion:** These results underscore both individual- and system-level factors that influence completion of PROMs and illuminate potential disparities between populations exposed to, completing, and benefitting from these tools.

### TECHNOLOGY and DIGITAL HEALTH

**Learning From COVID-19 to Triage Respiratory-Ccompromised Patients Using Noninvasive Respiratory Volume Monitoring: A Case Series**

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**Background:** As a result of COVID-19-related health care shortages from emergency to critical care, a considerable learning opportunity was presented. Triageing has commonly depended on patient age, comorbidities, respiratory rate, and pulse oximetry. Yet, these factors are limited as indirect measures of ventilation and, therefore, weak indicators of evolving respiratory compromise in viral pneumonia. Minute ventilation (MV) — the product of tidal volume and respiratory rate — offers an objective and comprehensive assessment of respiratory status that can determine early distinctions between hypoventilation and hyperventilation. Respiratory Motion’s ExSpiron™ Monitor (RVM) allows for noninvasive respiratory volume monitoring, which can be used to identify decompensating COVID-19 patients early, thereby allocating resources optimally to ensure appropriate triage and treatment interventions.

**Methods:** This monitor was effectively utilized in 7 patients, and a novel preliminary algorithm to assist practitioners was developed. The RVM was utilized on select patients presenting to the emergency department during the COVID-19 pandemic. The monitor reported real-time noninvasive respiratory volume measurements for effective triage that supported patients’ disease progression.

**Results:** Patients who reported MV between 250% and >300% of “predicted MV” (MVPRED) were admitted to the intensive care unit, where critical care and intubation was eventually required. Patients who reported MV between 100% and 250% of MVPRED were admitted to the regular floor for observation or sent home. Further MV monitoring revealed decreased MV, reduced symptoms, and recovery within 3 to 8 days.

**Conclusion:** ExSpiron, a novel noninvasive respiratory volume monitoring system and supplementary decision-making tool, was successful in identifying disease severity and assisting in triaging resources and patients in the emergency department who presented with respiratory compromise during the COVID-19 pandemic. This technology can be utilizing within and beyond the pandemic for respiratory decompensation and resources allocation. It was effective in 7 patients, and a novel preliminary algorithm to assist practitioners was developed.

**Perioperative Information Delivered by Text Increases Patient Satisfaction and Reduces the Number of Postoperative In-Person Visits**

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**Background:** Virtual care after surgery has become increasingly popular during the current pandemic. Texting information directly to patients before and after surgery may improve patient satisfaction and reduce the need for in-person postoperative visits.

**Methods:** Perioperative care and therapy instructional handouts/videos were developed to support virtual patient care after carpal tunnel release surgery within Kaiser Permanente Southern California (KPSC). Beginning May 1, 2021, texts with virtual content were sent to patients who were scheduled for a carpal tunnel release in KPSC. Texts were sent the day of surgical scheduling, 10 days preop, 2 days preop, the day after surgery, and 5 weeks postop. At 5 weeks postop, a survey was sent to patients. The number of in-person and virtual visits after carpal tunnel release surgery were reviewed at 30, 60, and 90 days after the inception of the text campaign. For comparison, 2019 data was used as a control.

**Results:** From May 1, 2021–June 1, 2021, there were 160 texts sent at the time of surgical scheduling, 99 sent at 10 days preop, 101 at 2 days preop, 88 at 1 day postop, and 89 at 5 weeks postop. Overall, 33 survey responses were received; 91% of respondents were very or somewhat satisfied with the texts they received, and 95% felt the texts increased their knowledge. The percentage of virtual follow-up appointments was greater after use of texts compared to control during the 30-, 60-, and 90-day study periods (25% vs 4%, 29% vs 6%, and 29% vs 5%, respectively). The average number of postop visits also was lower during the test periods compared to control (0.3 vs 1.4, 0.6 vs 3.1, and 0.8 vs 5.0, respectively).

**Conclusion:** Delivering preoperative and postoperative information in the form of handouts and videos via text may improve patient knowledge and satisfaction and result in less need for postoperative in-person visits.

**Age-Associated Technological Barriers to High-Quality Telemedicine**

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**Background:** The rapid uptake of telemedicine during the COVID-19 pandemic has exacerbated the digital divide, with more vulnerable patients having lower utilization rates of video-based telemedicine. Drivers of telemedicine utilization and satisfaction are largely unknown. We studied demographic and socioecological determinants associated with failed video visits becoming phone
calls (conversion) and how that affected patient satisfaction. **Methods:** Satisfaction data for patients older than 18 years was abstracted from all ambulatory clinic surveys at a tertiary care center in the Deep South region from March to October 2020 and compared by patient demographics and visit type (phone, video, or conversion). Primary outcome was satisfaction, defined by the response “Very satisfied.” Secondary outcome was conversion (scheduled video visit reported by the patient to be via phone). Chi-squared, analysis of variance, and logistic regression were used to compare groups. **Results:** Among the 30,576 patients who completed surveys, 17,659 answered the question “Overall, how satisfied or dissatisfied were you with your eMedicine experience?” Satisfaction was high, with 61.1% of patients (n=10,809) answering “Very Satisfied.” Most visits were via video (44.8%) or phone (34.2%), with a minority (21.1%) requiring conversion. Satisfaction was lower for phone visits (59.8%) than video visits (63.8%) but lowest for converted visits (57.0%; P<0.0001). On multivariable logistic regression, lower satisfaction was associated with conversion (conversion:video odds ratio [OR]: 0.77, 95% CI: 0.69–0.86), male sex (OR: 0.81, 95% CI: 0.75–0.89), and department (OR: 0.79 for nonsurgical vs surgical, 95% CI: 0.69–0.91). Conversion was correlated with increased age (1.5% per year; P<0.0001), public insurance (P<0.0001), lower internet availability (0.7% per percent decrease in internet availability; P<0.0001), and lower median income of zip code (7% per $10,000 decrease; P<0.0001). **Conclusion:** Older patients and those with public insurance, lower internet availability, and from lower median-income zip codes are more likely to experience conversion, reflecting the digital divide. Failed video visits, and thus decreased satisfaction, is more prevalent with age, calling for interventions such as patient navigators to increase the accessibility of video-based telemedicine for older patients.

KP.org Secure Feature Use in 2019 Varied by Ethnicity and Language Preference Among Latinx and Chinese Kaiser Permanente Northern California Members

**Nancy P. Gordon, Teresa Y. Lin**

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**Background:** The shift toward use of the patient portal for health care interactions has led to concerns about digital equity, including whether ethnicity and language differences in portal use exist. This study investigated whether Latinx and Chinese adult members who preferred to speak Spanish and Chinese, respectively, were less likely to use the kp.org portal during 2019 than those with English spoken-language preference. **Methods:** We used electronic health record data to examine differences by language and ethnicity in having a kp.org account, having sent ≥1 secure message, and having ≥1 online lab view in 2019, among Latinx and Chinese adults (25–85 years) who were Kaiser Permanente Northern California members during all of 2019. Our sample included 131,908 Latinx adults with Spanish spoken- and written-language preference (Latinx-SS), 12,482 Latinx adults with Spanish spoken- but English written-language preference (Latinx-SE), 34,207 Chinese adults with Chinese spoken- and non-English written-language preference (Chinese-CC), and 8745 Chinese adults with Chinese spoken- and English written-language preference (Chinese-CE). These groups were compared with 352,765 Latinx (Latinx-EP) and 101,050 Chinese (Chinese-EP) with English spoken-language preference.

**Results:** Lower percentages of Latinx-SS and Chinese-CC adults had an activated kp.org account, sent a secure message, and had ≥1 online lab view than Latinx-SE and Chinese-CE adults, respectively, and Latinx-SE and Chinese-CE adults had lower percentages than Latinx-EP and Chinese-EP adults. Differences in secure feature use persisted among those with activated kp.org accounts. Across all language groups, Latinx adults were less likely than Chinese adults to have portal accounts and have used secure features. **Conclusion:** Both spoken- and written-language preferences, as well as ethnicity, should be taken into account when examining how language and ethnicity affect use of digital resources.

Increase in Virtual and Video Visit Use in Q2–4 2020 vs Q2–4 2019 by Race/Ethnicity and Age Among 25–85-Year-Old Members of Kaiser Permanente Northern California

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**Background:** Due to the COVID-19 pandemic, most outpatient visits in Kaiser Permanente Northern California (KPNC) shifted to virtual (phone or video) mode. We investigated uptake of virtual (video and phone) visits during the first 9 months of the pandemic compared to the same period in 2019 among adult demographic subgroups. **Methods:** This cross-sectional electronic health record-based study used data for 1,088,948 White, 160,380 Black, 317,208 Latinx, 130,294 Filipino, 94,705 Chinese, 98,686 South Asian, and 10,278 Vietnamese adults (25–85 years of age) who were KPNC members all of 2019 and ≥11 months of 2020 and whose preferred spoken language was English. We compared percentages with ≥1 clinic or virtual visit and, among those with ≥1 visit, percentages with ≥1 clinic visit, ≥1 phone visit, and ≥1 video visit to occurrence of virtual visit in Q2–4 2019 vs Q2–4 2020 by sex and age group (25–44, 45–64, 65–69, 70–74, 75–79, or 80–85 years) and within racial/ethnic group. **Results:** Across all demographic subgroups, percentages with ≥1 outpatient visit were significantly lower in 2020. Among those with ≥1 Q2–4 visit, percentages with ≥1 clinic visit dropped from more than 90% to 28%–62%, while percentages with ≥1 virtual visit increased from 32%–66% to 75%–93%, and with ≥1 video visit from <2% to 40%–60%, with somewhat smaller increases in percentages with ≥1 phone visit. Among those who had ≥1 virtual visit, 40%–66% had ≥1 video visit in 2020 compared to <1%–5% in 2019. While there were significant racial/ethnic group differences within age/sex groups, these differences generally only ranged from 10–15 percentage points. **Conclusion:** In KPNC, the first 9 months of the COVID-19 pandemic saw an enormous increase in percentages of adults who had an ambulatory encounter via video visit compared to the same period during the previous year, and this increase was observed across all racial/ethnic and age groups.

Difference in Video and Phone Visit Use by Language Preference Among Latinx and Chinese Adults During the First 9 Months of the COVID-19 Pandemic

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Background: During the first year of the pandemic, most outpatient visits in Kaiser Permanente Northern California (KPNC) shifted to virtual (phone or video) mode. This study investigated whether video and phone visit use differed by spoken-language preference and whether differences by language preference were similar for Latinx and Chinese adults.

Methods: We used electronic health record data for Latinx (78,780 Spanish and 210,089 English preference) and Chinese (21,743 Chinese dialect and 47,874 English preference) adults (25–79 years of age) who were KPNC members during all of 2019 and ≥11 months of 2020 and had ≥1 clinic or virtual visit during Q2–4 2020. We compared percentages who during Q2–4 2020 had ≥1 video visit and ≥1 phone visit by language group (English, non-English) within ethnic group and by ethnic group (Latinx, Chinese) within language group. All analyses were conducted by sex and age group.

Results: All 4 groups had lower percentages with ≥1 outpatient visit during Q2–4 2020 than in Q2–4 2019, with the largest drop-offs among Chinese adults <65 years old. Within both language groups, Chinese adults were more likely than Latinx adults to have had ≥1 video visit during Q2–4 2020, while the converse was true for ≥1 phone visit. Within both ethnic groups, preferred non-English speakers were less likely to have had a video visit and more likely to have had a phone visit than English speakers, and among those with ≥1 virtual visit, English speakers were more likely to have had a video visit than non-English speakers. However, within ethnic groups, video visit prevalence by language group was generally ≥10 percentage points.

Conclusion: Non-English speakers are less likely to try video visits than English speakers, but prevalence of video and phone visit use was consistently higher among Chinese than Latinx adults in both language groups.

CARDIOVASCULAR DISEASE

Health Literacy and Treatment Satisfaction in Adults With Venous Thromboembolism

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Background: Venous thromboembolism (VTE) treatment requires management involving frequent patient-provider interactions and close medication monitoring. Patients with limited health literacy (HL) may perceive higher burden and lower benefits associated with treatment, leading to oral anticoagulation nonadherence.

Methods: We studied Kaiser Permanente Southern California members who completed an initial oral anticoagulation treatment course following an incident VTE diagnosis between 2010 and 2018 and completed a survey on oral anticoagulation treatment satisfaction. HL was assessed using a 3-item HL assessment, with each question scored 0–4 and a cumulative score of 3 categorized as inadequate HL. High treatment burden and low treatment benefit were defined as AntiClot Treatment Scale (ACTS) scores below the 25th percentile of the population distributions for ACTS Burdens and Benefits survey scores, respectively. Using Poisson regression, risk ratios (RR) and 95% confidence intervals were calculated for the associations of HL with high treatment burden and low treatment benefits.

Results: Among 1071 patients with VTE, 203 (19.0%) had inadequate HL. Patients with inadequate vs adequate HL were older (49.2% vs ≥75-year-olds vs 27.4%; P=0.001), preferred using a non-English language when talking or learning about their health (10.8% vs 21%; P=0.001), were more likely to have less than high school education (7.9% vs 1.7%; P<0.001), and to have fair or poor self-rated health (44.9% vs 23.7%; P=0.001). After adjustment for age, sex, race/ethnicity, and self-rated health, patients with inadequate HL were more likely to have a higher perceived treatment burden (RR: 1.27, 95% CI: 1.01, 1.60) but no statistically significant difference in low perceived treatment benefits (RR: 1.07, 95% CI: 0.81, 1.40).

Conclusion: Inadequate HL is associated with lower treatment satisfaction as measured by patient perceptions of treatment burden. Ensuring older, less educated, and non-English-speaking patients understand the importance of an optimal approach to manage their anticoagulant regimen may improve treatment perceptions and minimize potential adverse outcomes.

Impact of Social Determinants of Health on Anticoagulant Use Among Patients With Atrial Fibrillation: Systematic Review and Meta-Analysis

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Background: A growing body of literature examining associations between social determinants of health (SDOH) and adverse outcomes in patients with atrial fibrillation now exists; however, little is available on anticoagulant prescriptions and impact of SDOH.

Methods: We searched MEDLINE and Embase databases for relevant noninterventional studies up to January 2021. Studies were included if they reported associations between at least 1 of 14 SDOH domains and receiving an anticoagulant prescription in patients with atrial fibrillation. Two investigators independently screened and collected data. The primary endpoint was anticoagulation prescription. Meta-analyses using random-effects models evaluated associations between SDOH and receiving an anticoagulant prescription.

Results: We included 13 studies, 11 of which were included in meta-analyses that reported on the impact of 9 of the 14 SDOH included in the search. Pooled estimates indicate 0.85 (95% CI: 0.75, 0.97) lower odds of receiving anticoagulant prescriptions among Black compared to non-Black patients (reported in 6 studies); 0.42 (95% CI: 0.32, 0.55) lower odds of receiving anticoagulant prescriptions among patients with mental illness compared to those without mental illness (2 studies); and 0.64 (95% CI: 0.42, 0.96) lower likelihood of receiving oral anticoagulant prescription among employed patients compared to unemployed patients (2 studies). The impact of other SDOH identified in this search was either not statistically significant (many of which trended to lower prescriptions among patients with SDOH) or could not be pooled because it was reported in single studies only or because SDOH definitions varied across studies.

Conclusion: The literature reports on only half of the SDOH domains we searched for, indicating that many SDOH are not routinely assessed. Secondly, social needs impact the decision to
prescribe anticoagulants, confirming the need to screen for and address social needs in the clinical setting to support clinicians in providing guideline-concordant care to their patients.

**Heart Disease and Associated Risk Factors Utilizing Geospatial Analysis Innovative Prototypes**

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**Background:** Cardiovascular diseases (CVD) are the leading cause of death in the United States and globally. Yet, the prevalence of CVD varies among regions and racial groups, prompting questions about which populations and regions are at higher risk. Therefore, this study explored the racial and regional distribution of CVD and associated risk factors, using new prototypes.

**Methods:** In this ecological, cross-sectional study, we created a new prototype using U.S. county data (n=3107) to show that rurality and plurality (major racial group) have a bearing on health outcomes. For location (rurality) data, the U.S. Department of Agriculture’s Rural-Urban Commuting Areas (RUCCA) was used. RUCCA data were regrouped into 1) metropolitan area; 2) nonmetropolitan, adjacent to a metropolitan region; and 3) nonmetropolitan, nonadjacent to a metropolitan region. For plurality, 2020 U.S. Census data was used, whereas 2020 county health ranking data were used to ascertain other health risk factors. Bivariate statistics were created to show the disparities in the prevalence of heart diseases and associated risk factors across rurality and plurality.

**Results:** Health disparities existed along racial and ethnic lines as well as locations. Nonmetropolitan, adjacent to a metropolitan region, and nonmetropolitan, nonadjacent to metropolitan regions, disproportionately showed higher rates of heart disease prevalence. Furthermore, counties with American Indian majorities showed the highest prevalence of cardiovascular deaths, smoking, obesity, uninsured population, and other disadvantaged socioeconomic factors.

**Conclusion:** This research provides new evidence demonstrating the significance of location and plurality and the variations in CVD and associated risk factors among racial groups in the United States. Health care leaders and policymakers should be proactive in developing prevention strategies and tailored interventions to decrease poor health outcomes in vulnerable rural populations.

**Correlation of ASK-12 and Proportion of Days Covered (PDC) Measures Among Patients with Poor Control of Chronic Disease and Low PDC**


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**Background:** Poor medication adherence is common and a known barrier to improving chronic disease outcomes, yet it is frequently not addressed in primary care due in part to lack of assessment tools, insufficient time, and/or inadequate clinician training to address underlying reasons. Objective medication adherence measures derived from dispense information such as proportion of days covered (PDC) are now readily available within electronic health records (EHR), but correlation of PDC with self-reported actionable adherence problems remains uncertain.

**Methods:** A pragmatic randomized trial at 26 primary care clinics in a U.S. Midwest health system identified adult patients at an index visit who were not meeting recommended goals for diabetes or hypertension, or who were on a statin with corresponding medication PDC of <80%. Eligible patients were randomized to either a) usual care, including EHR-linked clinical decision support (CDS) for these conditions; or b) CDS plus medication adherence information and active phone outreach from a pharmacist if adherence issues persisted after 6 months. Eligible patients (n=1178) were surveyed shortly after their index visit to assess medication adherence issues using the validated ASK-12...
instrument. ASK‐12 total and subscale scores were compared with EHR‐derived PDC measures.

Results: The survey response rate was 31% (n=366), with 22% (n=80) of respondents in the diabetes cohort, 32% (n=118) with hypertension, and 46% (n=168) on a statin. We observed no statistically significant linear associations between PDC and the ASK‐12 total score (β=−0.3; P=0.35) or the subscales of inconvenience/forgetfulness (β=−0.6; P=0.27), treatment beliefs (β=−0.1; P=0.86), behavior (β=−0.6; P=0.32), or barriers (β=−0.3; P=0.41).

Conclusion: We did not detect a significant association between patient‐reported adherence behaviors and EHR‐derived PDC measures. The ASK‐12 survey instrument may not be sensitive enough to identify nonadherence or reasons for nonadherence. However, more research is also needed to assess the validity of EHR‐derived PDC measurement to accurately target patients for adherence interventions and assess the impact of those interventions.

GENOMICS and PRECISION MEDICINE

Kaiser Permanente Research Bank Data Analytics Platform Implementation Project: A Suite of Web‐Based Analytic Tools

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Background: The Kaiser Permanente Research Bank (KPRB) contains detailed health information for a large, well‐characterized population of more than 400,000 KP health plan members across the 8 KP regions. The members’ DNA samples are linked to their electronic medical records as well as to survey data, creating a unique data resource. Researchers can access and analyze data of consented participants through the new KPRB Data and Analytics Platform (KDPAP), which will be introduced by the end of 2021.

Methods: KPRB will launch a suite of tools for researchers, including a cloud‐based query tool, genomics database, and analytics platform. This platform will include a set of analytic tools, including JupyterHub, R, Python, Julia, and PLINK. These analytic tools will be paired with a set of more than 70 phenotypic data‐tables and genomic data, with completely new data releases every 6 months.

Results: This system will help develop and expand KPRB’s capacity to support precision medicine/genomics through research to validate the clinical utility of new diagnostic and therapeutic technologies and to test optimal approaches to delivering accessible personalized care by integrating evidence‐based genomics into well‐designed patient‐centered care pathways. It will also provide the ability to securely store, manage, and analyze genomic research data, ie, analysts from different geographies on the same project can share analytic code within the platform instead of having to use secure file transfer and thus cut down on management of data‐sharing agreements.

Conclusion: This step into the future of genomics research and analytics will allow KPRB to remain on the cutting edge of this field and stay in step with other databanks/biobanks across the nation that are moving to cloud‐based data and analytic services. KP’s investment in this project demonstrates a deep commitment to this meaningful and equitable integration of precision medicine into clinical care to improve health care in the United States and beyond.

Should Health Systems Share Genetic Findings With At‐Risk Relatives When Patient Is Deceased? Perspectives From Patients Diagnosed With Lynch Syndrome

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Background: Multiple guidelines recommend systematic tumor screening for Lynch syndrome (LS) among all individuals with colorectal and endometrial cancer so that cascade testing can identify at‐risk relatives. However, an ethical challenge may arise for a health system if the LS‐diagnosed patient (proband) becomes deceased before sharing their diagnosis with at‐risk relatives.

Methods: We conducted telephone interviews across 4 health systems with 23 individuals with a confirmed LS diagnosis to hypothetically explore whether they believe health systems should share genetic findings with at‐risk relatives following the death of a proband. Interviews were recorded and content analyzed.

Results: Interviewees had an average age of 60 years, and most were female (61%) and Caucasian (83%). The majority (96%, 22 of 23) endorsed both the importance of a health system sharing their diagnosis of LS with at‐risk relatives if they were unable to inform them and wanting to be informed by their health system of their potential LS risk if a diagnosed blood relative became deceased before sharing. Sentiments centered on “It’s the right thing to do” and “It’s our right to know.” Interviewees identified the following considerations: need for changes to privacy laws (n=8); possible anxiety in family members (n=5); lack of contact information for relatives (n=3); potential increase in relatives’ insurance rates (n=2); and family members not being on speaking terms (n=1).

Conclusion: Our findings demonstrate strong and consistent desire from individuals who have experience with LS regarding the health system’s role and responsibility to inform at‐risk relatives of genetic findings following the death of a proband and may guide future health system policies.

Patient‐Reported Outcomes Following Genetic Testing for Familial Hypercholesterolemia, Breast and Ovarian Cancer Syndrome, and Lynch Syndrome

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Background: Patient‐reported outcomes (PROs) and PRO measures (PROMs) are real‐world evidence that can help capture patient experiences and perspectives regarding a clinical intervention such as genetic testing. The objective of this study was to identify and capture methods and qualitative PRO themes among studies reporting PROs following genetic testing for familial hypercholesterolemia, breast and ovarian cancer syndrome, and Lynch syndrome.

Methods: A systematic review was conducted via PubMed/ MEDLINE, Embase, and Yale University’s TRIP Medical Databases on articles published by April 2021.
Results: We identified 24 studies published between 1996 and 2021 representing 4279 participants that reported PROs following genetic testing for familial hypercholesterolemia, breast and ovarian cancer syndrome, and Lynch syndrome. Studies collected and reported PROs from validated PROM instruments (n=12, 50%), validated surveys (n=7, 26%), and interviews (n=10, 42%). PRO themes ranged across all collection methods (psychological, knowledge, coping and satisfaction, concern about stigma/discrimination, etc).

Conclusion: Important gaps identified include 1) most studies (n=18, 75%) reported PROs following genetic testing for breast and ovarian cancer, and 2) populations reporting PROs overall were largely of White/Caucasian/Northern European/Anglo-Saxon descent. We offer recommendations and describe real-world implications for the field moving forward.

Feasibility of a Traceback Approach to Facilitate Genetic Testing in the Genetic Risk Analysis in Ovarian Cancer (GRACE) Study

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Background: Genetic testing is clinically indicated for all individuals diagnosed with ovarian cancer. Individuals with a prior diagnosis of ovarian cancer who have not received genetic testing represent missed opportunities to identify individuals with inherited high-risk cancer variants. The Genetic Risk Analysis in Ovarian Cancer (GRACE) study aims to use a “traceback testing” approach to identify individuals with a prior diagnosis of ovarian cancer and offer genetic risk information to them and their family.

Methods: Tumor registry data at two integrated health systems (Kaiser Permanente Northwest and Kaiser Permanente Colorado) were used to identify individuals diagnosed with ovarian cancer from 2008 to 2019 who either did not receive genetic testing, or had genetic testing limited to \(BRCA1\) and \(BRCA2\), and could benefit from more recent testing and testing using a comprehensive panel of cancer risk genes.

Results: Of the 180 eligible individuals contacted for participation, 51 enrolled and consented to testing, reflecting an uptake rate of 28%. Of the 34 participants with genetic testing results, 7 (21%) were found to carry a pathogenic or likely pathogenic variant in a cancer risk gene. The study’s genetic counselor supported these participants in sharing their genetic test results with at-risk relatives to facilitate cascade testing. Of the 20 at-risk relatives eligible for cascade testing, 10 have undergone genetic testing (50% cascade testing uptake), of which 4 have been found to carry the familial variant.

Conclusion: Findings indicate the promise of traceback testing approaches in providing potentially life-saving information to individuals and their family members at increased genetic risk for cancer who may otherwise be missed. Future efforts of the GRACE study will focus on the feasibility of leveraging archived pathology tissue to provide genetic risk information to family members of individuals with a diagnosis of ovarian cancer who are deceased.

Genetic Epidemiology of Opioid Use and Use Disorder in Large-Scale Population-Based Cohorts With Electronic Health Records

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Background: Opioid epidemic is an ongoing national crisis in the United States, and the COVID-19 pandemic is exacerbating the crisis. This study leverages two population-based cohorts (All of Us [AoU] Program and U.K. Biobank [UKB], comprising a total sample size of >800,000) with both genomic data and electronic health records (EHR). Several Health Care Systems Research Network (HCSRN) sites (eg, Henry Ford Health System and HealthPartners) are also participating in recruitment for AoU. We aim to combine genetics and epidemiology to better understand and manage opioid use disorder (OUD).

Methods: We adopted consistent EHR criterions (ICD-9/10 codes, medication treatment, and opioid prescription and use) to define OUD cases and opioid-exposed controls in 2 biobanks. The distribution of OUD case/control status was firstly linked with gender, age, and ancestry and then with genomic markers by genome-wide association study.

Results: We identified 12,492 OUD cases (4.2%) and 80,287 controls (26.8%) from ~300,000 AoU participants; in parallel, we only identified 2881 cases (0.6%) and 66,895 controls (13.4%) from ~500,000 UKB participants. Both OUD and regular opioid use are more prevalent (P<0.001) in the United States than in United Kingdom. When zooming into different demographical groups, OUD cases in AoU are significantly more enriched (P<0.001) in male participants, younger age group, and Black populations than those opioid use controls. As a comparison, OUD cases are slightly more enriched (P<0.05) in female participants and older age group in UKB participants. In this discovery genome-wide association study with the UKB White population, we identified 2 genes (PLXNC1 and TBC1D16) harboring suggestively significant signals in association with OUD (P<0.001).

Conclusion: Epidemiology discrepancies between the United States and United Kingdom may be explained by population structure, genetic liability, and health policy difference on opioid. Our EHR-based phenotyping strategy is to be validated using more complete data from HSCRN sites. A multiethnic genome-wide association study in AoU will provide more genomic evidence to better explain OUD development across ancestries.

POPULATION HEALTH IMPROVEMENT

To Scan or Not to Scan: Use of Transient Elastography in an Integrated Health System

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Background: Noninvasive tests, such as Fibrosis-4 score and transient elastography (FibroScan®, Echosens), are standard for diagnosis of nonalcoholic fatty liver disease (NAFLD). There is little evidence demonstrating how use of transient elastography
impacts patient outcomes. We assessed clinical practice and outcomes before and after implementation of a clinical decision support tool (CDST) based on Fibrosis-4.

**Methods:** Inclusion criteria for this retrospective study were persons ≥18 years of age who had FibroScan from January 2015 to December 2017 (pre-CDST) or January 2018 to December 2020 (post-CDST) for NAFLD indication. Data were abstracted using ICD-9, ICD-10, and CPT codes. Data were analyzed with multivariable logistic regression.

**Results:** In 5054 patients meeting eligibility criteria, those without any HPV vaccinations at study index visits (77.5%) had the lowest series completion rate (1%) by 12 months, as compared to those with 1 (8%) and 2 (34%) doses at the index visit. In adjusted analyses, the HPV vaccination series was completed by 12 months in 2.3% (95% CI: 1.6–3.2) of CDS, 1.6% (95% CI: 1.1–2.3) of CDS+SDMT and 2.2% (95% CI: 1.6–3.0) of usual care patients (P=0.827 for CDS vs usual care; P=0.086 for CDS+SDMT vs usual care). At least 1 HPV vaccine dose was received in 13.1% (95% CI: 10.6–16.1) of CDS, 9.2% (95% CI: 7.3–11.6) of CDS+SDMT, and 11.2% (95% CI: 9.1–13.7) of usual care patients (P=0.282 for CDS vs usual care; P=0.191 for CDS+SDMT vs usual care). Females, those seen in urban clinics,
and those with prior doses had significantly higher odds of HPV vaccination at 12 months.

**Conclusion:** We found no significant differences in HPV vaccination rates between CDS intervention arms and usual care. Vaccination rates were low, with some groups more likely to be vaccinated. CDS may need optimization to increase HPV vaccination among young adults.

**Developing a Health Communication Campaign to Improve Patient-Provider Communication: Formative Research Findings**

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**Background:** Patient-provider communication is critical to patient experience and effective care. Yet, opportunities exist to improve patient-provider communication, including promotion of the teach-back method. While interventions to promote teach-back largely focus on providers, promoting teach-back among patients may be beneficial. We conducted a mixed-methods study to better understand facilitators of and barriers to patient-provider communication and to obtain patient feedback on messaging to be used in a systemwide health communication campaign aimed at increasing acceptance of teach-back among primary care patients at a Mid-Atlantic health system.

**Methods:** Surveys and focus groups were conducted with adult patients in their preferred language (n=17 English-speaking, n=11 Spanish-speaking). Patient characteristics and health literacy levels were measured. Patients discussed facilitators and barriers to effective patient-provider communication, rated proposed campaign messages, and provided suggestions for message improvement. Patient characteristics, health literacy scores, and message ratings were analyzed in SPSS software (IBM Corporation), and qualitative thematic analyses of focus groups were completed. Differences between English- and Spanish-speakers were explored.

**Results:** Health literacy scores were significantly lower among Spanish-speakers than English-speakers (13.5 [standard deviation: 3.0] vs 18.5 [standard deviation: 4.5]; P<0.01). Highly rated messages were considered to be clear, direct, and motivating. Poorly rated messages were considered unclear, difficult for different patient groups to understand, and too long. Positive provider behaviors, such as instilling confidence and trust, and the length and consistency of patient’s relationship with a provider were identified as facilitators of communication. Prior experiences of poor communication with a provider, patients’ self-limiting beliefs, and limited relationships with providers were viewed as barriers.

**Conclusion:** Findings indicate a need to improve patients’ health literacy and patient-provider communication. Patients’ feedback on campaign messages were helpful. Factors identified in focus groups include additional areas of intervention, such as provider behaviors, that may be needed to advance patient-provider communication.

**Persistence and Duration of Out-of-Control Biometric Measures in Patients With Cardiometabolic Conditions**

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**Background:** Poorly controlled cardiometabolic biometric measures (eg, blood pressure [BP], hemoglobin A1c [HbA1c], and low-density lipoprotein cholesterol [LDL-C]) are a risk factor for cardiovascular diseases. We studied how long it takes to close these health gaps.

**Methods:** Using electronic health records, we identified the first instance (index date) of a health gap for BP, HbA1c, and LDL-C among Sutter primary care patients with cardiometabolic conditions between October 1, 2015, and December 30, 2020. Medication adherence (proportion of days covered, or PDC) was estimated using medication dispense data at the index date for each health gap. We defined a care gap as present if there was no evidence of treatment intensification to close a health gap within 6 months after the index date. Outcome measure was defined as the first date following identification of a health gap on which a biometric measure was under control. Cox regression modeling was applied to estimate how baseline PDC and care gaps were associated with health gap closure.

**Results:** Overall, 59,086 patients with a BP gap, 39,458 with an LDL-C gap, and 8537 with a HbA1c gap were identified. Among patients with HbA1c gap, 82% achieved HbA1c control during follow-up with a median time to control of 275 days, similar to the time for BP control (223 days) achieved by 90% of hypertensive patients. Only 73% of dyslipidemia patients achieved LDL-C control, with a median time to close of 409 days. Patients with poor medication adherence (0%<PDC<80% or medication not retrieved) were much less likely to achieve biometric control compared to adherent patients, particularly for patients who did not receive a statin (hazard ratio: 0.58, 95% CI: 0.56–0.61). Care gap within 6 months was associated with a high risk of a persistent health gap (hazard ratio: 0.84, 95% CI: 0.78–0.91 for HbA1c; hazard ratio: 0.5, 95% CI: 0.47–0.52 for LDL-C).

**Conclusion:** Poor medication adherence has a greater impact on health gap persistence than medication intensification.

**DATA SCIENCE, INFORMATICS, and MODELS**

**Application of Artificial Intelligence to Predict Mortality in Patients With Stage 4–5 Chronic Kidney Disease**

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**Background:** Patients with advanced (stage 4 or 5) chronic kidney disease (CKD) face unknown progression rates to end-stage renal disease with elevated baseline mortality. Hemodialysis preparation requires surgical planning months in advance, and many patients may pass away before reaching end-stage renal disease. Improved understanding of mortality risk in the near future could help physicians and patients with shared decision-making on the risks and benefits of dialysis versus conservative care.
Methods: Patients from Kaiser Permanente Southern California (KPSC) electronic health records with stage 4–5 CKD between January 1, 2010, and December 31, 2018, were selected for our initial training population. We picked an XGBoost model as it offered the best combination of accuracy and interpretability. Our features included aggregations of demographics, comorbidities calculated based on the Elixhauser comorbidity index, common labs, vitals, and past utilization data. On March 10, 2020, 16,267 patients with stage 4–5 CKD at KPSC were scored with the model. From March 11, 2020, to March 10, 2021, a 1-year prospective study was performed to assess the accuracy of the predictive model. At the conclusion of the 1-year observation, we assessed the model’s predictions against the actual mortality data.

Results: The machine learning mortality model achieved an area under the curve of 0.73 in the prospective study. We computed an optimal cut-point based on the probability prediction threshold that maximized the sum of sensitivity and specificity. At this level, the model achieved an accuracy of 70%, sensitivity of 63%, specificity of 72%, and precision of 25% in predicting 12-month mortality for individuals with advanced CKD (stage 4–5).

Conclusion: Despite unforeseen COVID-19 pandemic, our model achieved predictive accuracy for 1-year mortality in patients with stage 4–5 CKD, prospectively. Machine learning-based probabilistic forecasting can be used to better inform decisions regarding CKD management.

A Data-Based Tool for Planning Study Enrollment

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Background: A necessary part of the grant application process is the completion of OMB form 0925-0770, the planned enrollment form. This form requires applicants to specify the number of men and women they expect to enroll in each of 6 race categories and 1 ethnicity (Hispanic/Latino). While race and ethnicity information is increasingly available at health care providers since the meaningful use incentives were established, most Health Care Systems Research Network sites have significant numbers of patients whose race or ethnicity is unknown. This is a particular challenge in filling out this form, as it does not allow for the existence of unknowns. The proposed poster will detail the development and use of a web-based tool for grant applicants to optimally predict the sex/race/ethnicity breakdowns of the study participants they intend to enroll, and the display prorates out that count to mimic the existing distributions.

Conclusion: The planned enrollment tool has been well received by users and will hopefully get a lot of use into the future.

Quantitative Research on the Potential Conflicts of Interest of Popular Point-of-Care, Evidence-Based Websites: UpToDate and DynaMed

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Background: Prior bioethical research has found financial conflicts of interests (COIs) among biomedical and pharmacology textbooks, psychiatry’s Diagnostic and Statistical Manual of Mental Disorders-5, and clinical practice guidelines. COIs have the potential to negatively impact evidence-based patient care. The primary objective of this study was to quantify potential COIs among content contributors of UpToDate and DynaMed, two popular point-of-care, evidence-based medical websites.

Methods: Articles were chosen from UpToDate and DynaMed using the Centers for Disease Control and Prevention’s leading causes of death. Potential COIs for the article’s contributors were then investigated and recorded using the Centers for Medicare & Medicaid Services Open Payments (CMS OP) database from 2013 to 2018. Financial reporting of CMS OP was cross-referenced with ProPublica’s DollarsforDocs database for accuracy.

Results: Overall, 179 UpToDate and DynaMed content contributors were investigated and 140 received $77.7 million in renumeration from industry. A statistically significant number of UpToDate contributors (n=76, 57.9%) were found to be discordant — self-reporting nothing to disclose while having a CMS OP record (P<0.0005). Although discordance was high among DynaMed contributors (n=35, 83.3%), as well as among its top 10 earners (60%), this was not statistically significant in either case.

Conclusion: Nearly $78 million was paid to physicians who provided content to UpToDate and DynaMed. While this research does not suggest untoward activity, the resulting discordance suggests that point-of-care websites may need to undergo a more thorough self-reporting disclosure process to ensure transparency.

Using Natural Language Processing to Increase Identification of Child Maltreatment in Electronic Health Records

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Background: Child maltreatment (CM) is a critical public health issue, and health systems play an important role in identifying and treating children who experience maltreatment. The Mental Health Research Network quarterly descriptive analyses indicate that there is likely a significant underreporting of CM via diagnosis (ICD) code when compared to national surveillance data. Natural language processing (NLP) may help identify additional youth whose CM is only documented in chart notes but not as an ICD code. Study aims
were to examine whether NLP of chart notes can identify cases of CM not documented by ICD code, the overlap between the coding of child maltreatment by ICD vs NLP, and whether there were any differences by age, gender, or race/ethnicity.

**Methods:** Chart notes of children 0–18 years old seen within Kaiser Permanente Washington (KPWA) from 2018 to 2020 were used to examine a selected set of maltreatment-related terms categorized into concept-unique identifiers (CUI). Manual review of text snips for each CUI was completed to flag for confirmed cases and retrain the NLP algorithm.

**Results:** The NLP results indicated a crude rate of 1.55% to 2.36% (over 2018–2020) of notes with reference to CM. Notably, this is higher than the 0.29% rate found for KPWA using ICD codes alone. Additionally, the highest frequency of CM notes was found for 1–4-year-olds, females, and White youth (although White youth are overrepresented in KPWA membership). Of the total encounters in the study period, only 5% of encounters were identified by both ICD code and NLP; 2% were identified only by ICD code, whereas 62% were identified by NLP but not ICD code.

**Conclusion:** Use of NLP substantially increases the number of children who have been impacted by CM. Accurately capturing this population will improve identification of vulnerable youth at high risk for mental health symptoms.

**METHODS, DESIGN, and ANALYTIC TOOLS**

**Randomized Trial of Phone, Email, or Text Survey Recruitment Strategies for Parents of Children With Autism Spectrum Disorder**

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**Background:** Parents of children with autism spectrum disorder (ASD) can be challenging to recruit for surveys. The purpose of this study was to compare the efficacy of phone, email, or text message recruitment for engaging this population in an online survey of COVID-19 and telehealth. We examined efficacy of the 3 approaches and which were most successful by family demographics.

**Methods:** We randomized 1686 potential survey participants to 1 of 3 recruitment conditions: phone, email, or text. The sample was parents who had a child with ASD from an integrated health system in Southern California. Initially, parents were sent a letter and email about the survey. Then, 2 follow-up contacts were made, either 2 emails, 2 text messages, or 2 phone calls, depending on randomization. Chi-squared tests and logistic regression models were used to identify differences in recruitment efficacy and within demographic subgroups by child race/ethnicity, gender, and age.

**Results:** Phone calls (46.7%) resulted in the greatest survey completion compared to text message (37.1%) and email (17.6%) (P<0.01). Parents who had a male child with ASD were more likely to respond to the survey than parents who had a female child with ASD (81.7% vs 18.3%; P=0.03). Additionally, parents who had a male child with ASD were more likely to complete the survey after a phone outreach than parents who had a female child with ASD (83.6% vs 16.4%; P=0.04).

**Conclusion:** Parents of girls with ASD were challenging to recruit and may be underrepresented in research. Phone call follow-up recruitment was more effective than either email or text for engaging parents in an online survey. Future studies should examine if text message can be effective during initial outreach and other strategies to increase participation of families of girls with ASD in research.

**Racial Disparities in COVID-19 Outcomes and the Utility of Imputation Using Bayesian Improved Surname Geocoding**

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**Background:** Self-reported race data are often missing or unknown. The Bayesian Improved Surname Geocoding (BISG) method uses a person’s last name and geocoded location to link neighborhood race information from the U.S. Census to impute missing race data. We examined the impact of using the BISG method vs self-reported race on the estimation of racial disparities in COVID-19 outcomes in two Kaiser Permanente (KP) regions.

**Methods:** Data on all adult members enrolled as of January 1, 2020, were extracted from KP Georgia and KP Mid-Atlantic States’ data warehouses. Data through March 31, 2021, included self-reported race, BISG-imputed race, age, comorbidities, and health care utilization. Our primary outcome was a confirmed COVID-19 diagnosis; our primary exposure was Black vs non-Black race. The BISG algorithm was optimized to have >80% sensitivity and specificity when classifying members’ race as Black or non-Black. Kaplan-Meier curves revealed 3 pandemic waves (March 2020–June 2020, July 2020–December 2020, and January 2021–March 2021). COVID-19 diagnosis was compared in Black vs non-Black members using Cox regression models weighted by propensity scores. Results were compared in the complete-case sample (using self-reported race) (CCS) and the imputed race sample (IS).

**Results:** There were 589,051 members (49% Black) in the CCS and 667,628 members (45% Black) in the IS. In the CCS, racial disparities in COVID-19 varied over time with a higher risk of diagnosis among Black (vs non-Black) members during the first (hazard ratio [HR]: 1.83, 95% CI: 1.73–1.95) and second COVID waves (HR: 1.35, 95% CI: 1.29–1.41), with no difference during the third wave (HR: 1.00, 95% CI: 0.98–1.03). In contrast, in the IS there was a decreased risk of diagnosis during the first (HR: 0.93, 95% CI: 0.89–0.98) and third waves (HR: 0.87, 95% CI: 0.85–0.89) and slightly elevated risk in the second wave (HR: 1.06, 95% CI: 1.02–1.10) among Black vs non-Black members.

**Conclusion:** Self-reported race data are often missing or unknown in administrative databases. Excluding patients with missing/unknown race from analysis of racial disparities may bias results. The BISG method may be a useful method for imputing unknown/missing race.

**Sensitivity Analysis for a Biased Design Limitation**

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**Background:** In a pharmacoepidemiology study of statin use and multiple myeloma risk at 6 Health Care Systems Research

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Network (HCSRN) sites, marginal structural modeling (MSM) was employed to address the impact of the exposure (statin use) and a confounder (serum cholesterol) when changes in both may influence the outcome as well as each other. Such a dynamic relationship means classic case-control analysis cannot properly control for the confounder. MSM can be analogous to survival analysis with time-varying variables. However, if diagnosis/index time is a matching variable, and control data after the index time is not collected, bias can be expected, since control observations are truncated while case observations are not.

Methods: The issue of truncation and need for MSM was recognized in a nested case-control analysis assessing statin use on multiple myeloma risk using data extracted from the HCSRN Virtual Data Warehouse. To assess the bias due to truncation, sensitivity analysis was undertaken starting with a published multiple myeloma cohort with 2532 cases (47% >70 years old and 55% male) and 9805 matched controls. Hypothetical datasets were generated, with each control observation time extended by 1, 3, 6, 12, or 24 months. Analysis results for the extended datasets were compared to those originally obtained and published for all subjects and 4 subgroups.

Results: We conducted 175 analysis variations. Risk ratio (RR) estimates changed slightly in most but moderately in some. The magnitude of change increased with greater control observation time. The RR estimates decreased up to 8.3% in all patients, 15.9% for those under age 70, and 4.2% for those over age 70. RRs changed about 7.5% for both males and females. The majority (98%) of changes to the 95% confidence intervals of the RRs did not change inclusion of the null.

Conclusion: After accounting for truncated observation of controls, overall conclusions of original analysis remain unchanged.

COVID-19 Vaccine Surveillance Safety in Early Pregnancy: Design Factors Affecting Association Between Vaccine and Spontaneous Abortion

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Background: While COVID-19 vaccination during pregnancy is recommended, continued safety monitoring in near-real-time is needed. Using data from 8 integrated health systems within the Vaccine Safety Datalink (VSD), we previously reported no association of receiving a COVID-19 vaccine in the 28 days prior to a spontaneous abortion (SAB) as compared to ongoing pregnancies over 7 4-week surveillance periods. Early in the surveillance, a protective effect was observed. We extended the scope of this work to evaluate this finding and other design choices.

Methods: We evaluated the association using a case-control design and estimated the odds ratio (OR) adjusted by site, surveillance period, maternal age, race-ethnicity, and supervision of care to describe how surveillance findings vary across cumulative surveillance periods. Additionally, using data from a single VSD, we evaluated several design choices: expanding the exposure window to 42 days; modifying the index date for ongoing pregnancies from last day of the surveillance period to the midpoint; and evaluating the association using a time-dependent exposure model.

Results: A protective effect observed with data through March 3, 2021, when low vaccine uptake was observed (OR: 0.78, 95% CI: 0.69–0.89; n=62,255), attenuated with inclusion of data through May 31, 2021 (OR: 0.99; 95% CI: 0.93–1.06; n=94,490). Analysis for the single site showed a lower OR for a 42-day, as compared to a 28-day window, and an OR closer to the null when using a midpoint index date. Hazard ratio for SAB following a COVID-19 vaccine exposure showed no association (0.97, 95% CI: 0.76–1.23; n=4070).

Conclusion: Timing of the surveillance affected the size of the vaccine-SAB association. However, results were robust to design choices.

HEALTH CARE DELIVERY and COVERAGE

Defining Existing Practices to Support the Sleep of Hospitalized Patients: A Mixed-Methods Study of Top-Ranked Hospitals

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Background: While sleep is critical for health, the hospital is not conducive to patient sleep and few efforts have been made to improve the inpatient sleep environment. Current practices to promote inpatient sleep at highly ranked hospitals are unknown.

Methods: A mixed-methods study of hospital medicine section chiefs at 2020 U.S. News and World Report Honor Roll pediatric and adult hospitals was conducted between June and August 2021 to understand current practices and attitudes toward inpatient sleep. An anonymous survey was distributed to quantify current practices and satisfaction with sleep-friendly institutional efforts. Survey participants were invited to share their institutions’ progress and potential strategies to further improve inpatient sleep during structured qualitative interviews.

Results: Study participants included pediatric (n=10) and adult (n=20) section chiefs. Survey response rate was 77% (23 of 30; pediatric response rate of 80% [8 of 10]; adult response rate of 75% [15 of 20]). While 96% (n=22) of hospitalist leaders rated sleep as important, 44% (n=10) were satisfied with their institution’s efforts to improve patient sleep. Although 91% (n=21) of hospitalist leaders rated sleep equity as important, only 1 institution (4%) had practices in place to address the issue. Less than half (n=11) of institutions reported having sleep-friendly practices. Among these institutions, the most common practices included: reducing overnight vital sign monitoring (91%, n=10), decreasing ambient light (91%, n=10), adjusting lab and medication schedules (73%, n=8), and implementing quiet hours (64%, n=7). Eight hospitalist leaders (27%; 3 of 10 pediatric interviews [30%]; 5 of 20 adult interviews [25%]) participated in interviews. Several themes emerged: the importance of a sleep-friendly culture; environmental changes; modified hospital practices; and external incentives to improve patient sleep.

Conclusion: Hospitalists recognize the importance of improving patient sleep, but few institutions have sleep-friendly practices in place. Most institutions have no sleep health equity practices in place. Building sleep-friendly hospital cultures and establishing best practices should be a priority for clinicians.
Health Care Utilization and Costs After Neonatal Hospitalization Among Commercially Insured Infants

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Background: For every 10 births, 1 infant will have a neonatal hospitalization for complex or noncomplex medical issues. Little is known about health care use and costs in the first year after a neonatal hospitalization. Therefore, the purpose of this study was to evaluate health care use and costs in the 12 months following a neonatal hospitalization.

Methods: We conducted a retrospective cohort study of infants born in the United States between 2015 and 2018 using the IMB MarketScan Commercial Claims and Encounters database. The cohort included neonatal hospitalizations linked to a delivery record, discharged alive from the hospital, and had continuous enrollment for 12 months; these were classified into 2 mutually exclusive diagnosis-based cohorts: 1) noncomplex diagnoses, and 2) complex diagnoses. Primary outcomes were health care utilization (eg, readmission days, emergency department visits, and outpatient visits) and costs (eg, claims and out-of-pocket spending), analyzed using descriptive statistics.

Results: The sample included 24,192 infants, with 41% in the complex cohort. The per-infant hospital readmission rate was lower for noncomplex infants (mean: 0.5 ± 3.4 days vs 7 ± 25.8 days; P<0.001). Complex infants had 1 or more emergency department visits (20% vs 15%; P<0.001). Extremely preterm infants had fewer primary care visits than noncomplex infants (mean: 4 ± 4.7 vs 6 ± 4.5) but more specialist visits (mean: 1.5 ± 2.8 vs 0.5 ± 1.7). Complex infants received more home nursing care (15% vs 3%) and specialized therapy (51% vs 25%). Average outpatient claims for complex infants totaled $15,179 (± $12,766) vs $6578 (± $6854) and out-of-pocket spending totaled $445 ± $559 vs $307 ± $339, respectively.

Conclusion: Infants with complex medical issues utilized more resources and were costliest to insurers and the family. More information is needed about the type of care received and economic impact of indirect costs.

Applying the Consolidated Framework for Implementation Research to a New Medication Therapy Management Program in an Integrated Care Delivery Network

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Background: As part of the Centers for Medicare & Medicaid Services’ Medicare Part D medication therapy management guidelines, qualifying patients should receive a health plan-sponsored comprehensive medication review (CMR). The CMR completion rate for health plans is a metric used to assess Star Ratings, and third-party vendors are available to help health plans achieve the highest rates possible.

Methods: Following the implementation of a new pharmacy service to provide medication therapy management for eligible health plan members by pharmacists in the clinical enterprise, the program underwent review using the Consolidated Framework for Implementation Research (CFIR) to assess the major influencing factors leading up to and including the first 3 months of implementation.

Results: The external (outer) and internal (inner) constructs offered the most impact on the early success and opportunities for program implementation. From the external, the additional workload to identify patients eligible for a comprehensive medication review was not anticipated at the start, as this had been managed by a third party with processes resources in place through contracted vendors. In addition, the pressures to internalize the program grew as third-party costs to meet different program metrics increased. For internal, the separation of health plan and clinical enterprise was a variable not anticipated and influenced the member populations each could encounter. However, because both health plan and clinical enterprise reported through the same pharmacy executive on the organizational chart, it allowed for greater agility with aligning resources and creating necessary operational changes.

Conclusion: CFIR provided the necessary framework to assess a medication therapy management program and identify internal and external variables that most influenced program implementation. Noting these variables will be useful for other integrated care delivery networks to consider should they decide to internalize the medication therapy management process.

EPIDEMIOLOGY and SURVEILLANCE

Benign Breast Disease and Breast Malignancy Timing

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Background: Women with proliferative benign breast disease (BBD) are at higher risk for breast cancer compared to those without BBD; specifically, atypical hyperplasia (AH) and lobular carcinoma in situ (LCIS) subtypes are at highest risk (2.5–4). We sought to categorize BBD subtypes for inclusion in a study to evaluate preventive care and pathology.

Methods: We used the Kaiser Permanente Mid-Atlantic States (KPMAS) Research Data Warehouse (RDW) to search for BBD among female patients with diagnosis dates from January 1, 2004, to January 04, 2020, and ≥30-day membership. We selected patients with ICD codes and filtered diagnosis identifications for benign neoplasm, intraductal papilloma, phyllodes tumor, ductal and stromal hyperplasias, dysplasia, atypical ductal (ADH) and lobular hyperplasias (ALH), and LCIS. We excluded fibroadenoma, sebaceous cysts, and nonspecific carcinoma in situ. We calculated the time between the earliest BBD and malignant disease (DCIS or breast cancer) diagnosis.

Results: We included 8669 unique patients with increased-risk BBD subtypes who were 12–93 years of age (median age: 52) at diagnosis. Patients self-reported race/ethnicity as Black (37.5%), White (28.3%), Asian (6.6%), Hispanic (6.7%), and missing/unknown/other (20.6%). Some patients had more than 1 diagnosis; 47.1% had benign neoplasm, 30.7% LCIS/DCIS, 12.5% intraductal papilloma, 12.9% ADH, 4% LCIS, 1.9% ALH, and the remainder with dysplasia, phyllodes tumor or stromal hyperplasias. There were 5205 (60%) who had no history of DCIS or BC at the time of BBD diagnosis. There were 1894 patients...
with DCIS (26.8% prior, 45.1% concurrent, and 28.1% developed after BBD) and 3884 with BC (42.1% prior, 41.8% concurrent, and 16.1% developed after BBD). Of those who had either DCIS or BC, only 510 of 3975 (12.8%) developed malignancy more than 30 days after the BBD diagnosis.

**Conclusion:** Identifying specific BBD from the electronic health record can be accomplished with ICD codes and filtering on diagnosis identifications. Those with malignant disease were often diagnosed prior to or concurrent with benign disease.

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**Trends in Firearm Injury in a Southern California Health System From 2010 to 2017**

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**Background:** Firearm injury is a public health concern in the United States. The present study aims to examine trends in firearm injuries from 2010 to 2017 in a diverse population of insured residents of Southern California.

**Methods:** Annual prevalence of firearm injuries from 2010 to 2017 was assessed in a retrospective cohort of Kaiser Permanente Southern California members using electronic medical record data. Individuals with at least one health care encounter between January 1, 2010, and December 31, 2017, were included. Poisson regression models were used to assess trends in combined fatal and nonfatal firearm injuries overall and by injury intention (self-inflicted and non-self-inflicted) in 2 age strata, children 0–17 years old and adults 18+ years old.

**Results:** Prevalence of firearm injuries increased over time in adults during the study period, from 5.8 injuries per 100,000 members in 2010 to 11.1 and 10.7 injuries per 100,000 members in 2016 and 2017, respectively. The most profound change was observed in non-self-inflicted injuries among adults between 2010 and 2017, from 3.8 (95% CI: 3.2, 4.4) to 8.3 (95% CI: 7.4, 9.1) per 100,000 members, more than doubling during the study period. There was a significant increasing trend in overall and non-self-inflicted firearm injuries in adults from 2010 to 2017 (P<0.0001 for both), but no significant increase was observed in self-inflicted firearm injuries. The prevalence of overall firearm injuries and intention-specific firearm injuries in children fluctuated over time, but no significant trends were identified during the study period.

**Conclusion:** There was an increasing trend in firearm injuries between 2010 and 2017 among adults, primarily driven by non-self-inflicted firearm injuries; however, injuries among youth showed no change. Continued surveillance is necessary to track these trends, and more research is needed to identify patient and contextual factors that may inform firearm injury prevention efforts and health care interventions to reduce injuries.

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