### Kaiser Permanente **Research**





### **Care Improvement Research Team**

Kaiser Permanente Southern California



CIRT is part of Research & Evaluation's Division of Health Services Research & Implementation Science, pictured here in May 2019

The year 2020 propelled everyone to change and adapt. The Care Improvement Research Team was no exception. Michael K. Gould, MD, MS, CIRT's director since its inception, transitioned to a full-time position at the new Kaiser Permanente Bernard J. Tyson School of Medicine. Adam Sharp, MD, MSc, is the new director.

CIRT's vision "to be the model of embedded research" along with the Department of Research & Evaluation's mission to have "a demonstrable positive impact on health and well-being" of our members and communities continue to guide us through these changes. We appreciate the continued support and executive sponsorship of Nancy Gin, MD, regional medical director for Quality and Clinical Analysis, and Benjamin Broder, MD, PhD, assistant medical director for Quality and Clinical Analysis, for the Southern California Permanente Medical Group.

Now more than ever, we have an opportunity to apply science and lead by example. In 2020, CIRT expanded opportunities for embedded research projects to scientists and physicians throughout Kaiser Permanente Southern California with a call for proposals. Heading into 2021, priorities included understanding and improving outcomes related to the COVID-19 pandemic and improving equity, inclusion, and diversity.

### **COVID-19 Projects**

An example of CIRT's unique ability to adapt to the needs of Southern California Permanente Medical Group physicians and Kaiser Permanente Southern California members are a series of new rapid-cycle COVID-19 studies, conducted collaboratively with the support of Bechien Wu, MD, MPH, and the Regional Research Committee in 2020. The following are COVID-19-specific CIRT projects with accompanying key findings and impact.

# Patients suspected for COVID-19 at elevated risk for adverse events: The COVAS Score

– Adam Sharp, MD, MS

#### Background: COVID-19 can

result in life-threatening critical illness, but most patients recover without medical treatment. An understanding of which patients are at greatest risk, and who may safely recover at home, is needed



to inform clinical decisions about hospitalization.

#### Key results:

• Investigators derived and validated the COVAS Score (Comorbidities, Obesity (BMI), Vital signs, Age, and Sex) score to predict a patient's' risk of needing critical respiratory care within 7 days.

#### Patients suspected for COVID-19 at elevated risk for adverse events

#### continued

- The score performed well among 26,600 emergency department patients with COVIDlike symptoms (AUC 0.89, Brier Score 0.03).
- After the initial rollout, investigators adjusted how vital signs were scored (worst instead of first) in order to improve its performance.
- They further validated the score among patients in both the emergency department (n=18,379) and urgent care (n=7,792) who had been tested for COVID-19. The score demonstrated continued high performance (ED AUC=0.87 & UC AUC=0.83).

**Impact:** The COVAS score was implemented into Kaiser Permanente HealthConnect<sup>®</sup>, Kaiser Permanente's electronic health record system. The tool includes thresholds—developed with input from clinical leaders—to identify patients who may be at low, moderate, or high risk. Individual patient scores guide clinical decisions for patients in emergency department and urgent care settings throughout the region.

# Estimating prognosis for hospitalized patients with COVID-19 and acute respiratory failure

– Michael K. Gould, MD, MS

**Background:** COVID-19 patients with acute respiratory failure, including those who receive mechanical ventilation, have high mortality. Being able to accurately estimate prognosis can help physicians communicate with



families and inform decisions about withholding or withdrawing life-supporting therapies at various time points during hospitalization.

**Key results:** Researchers derived a simple model to accurately estimate prognosis and risk of death on day 8 of invasive mechanical ventilation for patients with respiratory failure due to COVID-19.



Similar models to estimate prognosis on Day 1 of high-frequency noninvasive ventilation or invasive mechanical ventilation were less accurate, especially in the validation sample. The Day 1 invasive mechanical ventilation model overestimated the likelihood of death for patients in higher risk categories.

**Impact:** A novel model was developed to more accurately estimate prognosis for patients with respiratory failure due to COVID-19. The team implemented the Day 8 model in Kaiser Permanente HealthConnect® early in 2021.

# Early Deterioration Index for hospitalized patients (COVID-EDI)

– Claudia Nau, PhD

**Background:** Some COVID-19 patients who require ICU admission decline rapidly. A decision support tool that identifies patients at high and low risk of deterioration can facilitate communication with families and



inform clinical care decisions by identifying low-risk patients that may be considered for discharge and high-risk patients that should be considered for monitoring and mitigating risk of deterioration.

#### Early Deterioration Index for hospitalized patients (COVID-EDI)

continued

**Key results:** The team used machine learning and regression modeling to develop a risk score that predicts the risk of a patient requiring ICU level of care, mechanical ventilation, high-flow oxygen, or possibly dying within 72 hours. COVID-EDI significantly outperforms existing published models to identify high- and low-risk patients. It only contains 7 variables and can be easily integrated into electronic health record systems such as Kaiser Permanente HealthConnect.

**Impact:** A high-performing model was developed to identify patients at risk of early deterioration from COVID-19. The team implemented the COVID-EDI model in Kaiser Permanente HealthConnect in the first quarter of 2021.

#### Risk of severe morbidity and mortality of coronavirus disease 2019 (COVID-19) among patients taking antihypertensive medications

– Jaejin An, PhD

**Background:** The COVID-19 pandemic has generated concerns that use of angiotensin-converting enzyme inhibitors (ACEIs) or angiotensin receptor blockers (ARBs) may be associated with increased risk of COVID-19



infection or disease severity. The team studied the risk of COVID-19 infection and the risk of severe morbidity and mortality among a racially and ethnically diverse group of patients with hypertension.

**Key results:** Neither ACEI nor ARB use was associated with increased likelihood of COVID-19 infection. The decreased odds of COVID-19 infection among adults ages 85 years and older using ACEIs warrants further investigation. Results showed an increased likelihood of COVID-19 infection for those not taking antihypertensive medications compared to those taking calcium channel blockers, beta blockers, or thiazide diuretics. These results reinforce that patients with



hypertension should continue their ACEIs or ARBs as recommended by scientific communities.

**Impact:** The results support our clinicians' decision to prescribe antihypertension medication as appropriate. Patients can confidently continue their ACEIs or ARBs as recommended.

### **Other CIRT projects**

In addition to the COVID-19 portfolio, CIRT initiated other key projects to inform care delivery and improve outcomes and affordability. The following is a list of crucial questions and/or research topics and key results from 2020 CIRT projects:

# Changing to an age-adjusted D-dimer threshold in the emergency department

– Adam Sharp, MD, MS

The team studied whether changes to Kaiser Permanente Southern California laboratory D-dimer thresholds (a laboratory value for patients with suspected pulmonary embolus, or a blockage in a lung artery) for patients over age 50 years affected 30-day patient outcomes or use of advanced diagnostic imaging.

#### Changing to an age-adjusted D-dimer threshold in the emergency department

continued

#### Key results:

- Increasing the D-dimer lab threshold was safe and did not increase 30-day adverse events.
- Use of advanced imaging declined after the intervention, but not significantly, which indicates an opportunity for improvement with future implementation strategies.

#### Optimizing care delivery, quality, and outcomes for people living with dementia and their families

– Huong Nguyen, PhD, RN

This study aims to investigate how home-based primary care and hospital-at-home services are used by a unique and hard to reach population of geographically remote patients with Alzheimer's disease-related dementias and memory loss, and their caregivers.



#### Key results:

- Opportunities exist for cognitive screening of high-risk patients and earlier diagnosis of dementia, but the value for the Kaiser Permanente Southern California health system remains uncertain.
- Earlier diagnosis may translate to increased capitated risk payments that could fund more ancillary support for dementia care.
- There is an opportunity to revamp the approach to the Medicare Wellness Exam for cognitive screening and appropriate follow-through.

### Improving care transitions and reducing readmissions

– Huong Nguyen, PhD, RN

This project is evaluating the effectiveness of interventions/services to improve care transitions and reduce avoidable readmissions. Key research questions include:



Which patients will benefit most (as measured by shorter hospital stays and reduced readmissions) from post-discharge telephone calls and follow-up clinic visits?

In adults discharged for sepsis, is the type of followup care associated with readmission?

#### Key results:

- Associations between completion of follow-up visits and readmission are lessened in those with dementia versus those without.
- Follow-up clinic visits are more strongly associated with lower readmission risk, but telephone visits could serve as a substitute in certain patient groups.
- Greater use of telephone visits improves access and reduces cancellations.
- The pattern of home care service does not seem to matter as much as the in-person follow-up visits by a provider, which Kaiser Permanente Southern California is already doing routinely.

## Access to tailored autism integrated care (ATTAIN) phase III pilot

- Karen J. Coleman, PhD, MS
- Brian Mittman, PhD

This pilot study tested an innovative integrated mental health care model for children with autism spectrum disorder (ASD). The 8-step model aimed to enhance mental health screening in primary care and linkage to mental health services for children with ASD.



#### Key results:

 Annual completion of the pediatric symptom checklist (PSC-17) improves linkage to mental health services. More

automated support is warranted to ensure that PSC-17 screening is completed.

- The pilot provided primary care providers with a new way to talk about mental health.
- Some children with positive PSC-17 scores were not referred for follow-up care, likely because of misunderstanding ASD versus mental health services; already being connected to services or not interested in a new referral; or having screened negative with a different test.

### Prevention of venous thromboembolism in abdominal surgery

– Michael K. Gould, MD, MS

This project builds on ongoing work by the CIRT in collaboration with the Regional VTE Steering Committee to prevent venous thromboembolism (VTE) and improve patient outcomes by extending the data collection and analysis to high-risk abdominal surgery patients.

#### Key results:

- In patients undergoing inpatient abdominal surgery for cancer:
- VTE events were higher than benchmarks from randomized controlled trials, occurring in 44 of 1,872 procedures (2.4%)

- VTE risk seemed to be highest for exploratory (laparoscopy/otomy) procedures (3.5%) and for patients with pancreatic cancer (3.8%)
- Strong VTE risk factors included prior VTE and albumin ≤2.5 gm/dl
- Over 90% of patients received chemical prophylaxis (~5 days or 70% of hospital stay)
- About half of all VTE events occurred more than 30 days post-discharge

### Implementing systematic depression screening in medical oncology

– Erin Hahn, PhD, MPH

Implementing systematic depression screening in medical oncology is an evidence-based guideline-recommended practice. Our recent pragmatic trial found that we can integrate this practice with minimal workflow disruption



while effectively identifying and referring highly distressed patients.

#### Key results:

- The team conducted qualitative interviews and surveys with stakeholders at each oncology department to determine local context and required adaptations of the screening program. These findings informed site-specific workflows.
- The screening intervention was spread across Kaiser Permanente Southern California medical centers and the team is evaluating uptake of the program.
- A proactive office encounter alert has been developed and will be available in 2021 to assist appropriate referral and utilization of behavioral health services based on depression screening scores.

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