

Research and Academics in KP California Emergency Medicine

Quarterly Report: 2023 Q2

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Hot Off the Press^a

TPMG (Northern CA)

Ballard D, Vinson D. New strategies show promise for concussion. *Emerg Med News*. 2023;45(6):16-17.

Link: https://journals.lww.com/em-news/Fulltext/2023/06000/New_Strategies_Show_Promise_for_Concussion.12.aspx

Casey SD, Rouleau SG, Vinson DR, Roubinian NH. Letter to the editor: Clinical controversies in the management of acute pulmonary embolism. *Expert Rev Respir Med*. 2023 May 18. Online ahead of print.

Link: <https://doi.org/10.1080/17476348.2023.2214733>

Westafer LM, Jessen E, Boccio E, Zampi M, **Casey SD**, Lindenauer PK, **Vinson DR.** Barriers and facilitators to the outpatient management of low-risk pulmonary embolism from the emergency department. *Ann Emerg Med*. 2023 Apr 12. Online ahead of print.

Link: <https://doi.org/10.1016/j.annemergmed.2023.02.021>

^a Publications, including abstracts and educational works, are organized by the region of the leading TPMG/SCPMG emergency physician author, whose name is the first one in bold font. We also highlight all KP EM co-authors. Included are activities undertaken *during* PMG employment. Updates for coming quarterlies can be sent to David R. Vinson, KP CREST Network: david.r.vinson@kp.org

Nadir NA, Winfield A, Bentley S, Hock SM, Backster A, Bradby C, Rotoli J, Jones N, Falk M. Simulation for diversity, equity and inclusion in emergency medicine residency training: A qualitative study. *AEM Educ Train*. 2023;7(Suppl 1):S78-S87.

Link: <https://doi.org/10.1002/aet2.10870>

Chen TH, Bentley SK, **Nadir NA**, Beattie LK, Lei C, Hock SM, Munzer BW, Moadel T, Paetow G, Young A, Stapleton SN. Workshop in Simulation Debriefing for Educators in Medicine: Creation, implementation, and evaluation of a debriefing curriculum for novice simulation educators. *AEM Educ Train*. 2023;7(Suppl 1):S58-S67.

Link: <https://doi.org/10.1002/aet2.10869>

Sax DS, Warton EM, Sofrygin O, **Mark DG**, **Ballard DW**, **Kene MV**, **Vinson DR**, Reed ME. Automated analysis of unstructured clinical assessments improves emergency department triage performance: a retrospective deep learning analysis. *J Am Coll Emerg Physicians Open*. 2023;4:e13003.

Link: <https://doi.org/10.1002/emp2.13003>

Vinson DR, Campbell AR, Qiao E. Atrial fibrillation triggered by cold drinks: increasing clinician and patient awareness [letter]. *Proc (Baylor Univ Med Cent)*. 2023;36(4):540-541.

Link: <https://doi.org/10.1080/08998280.2023.2207478>

SCPMG (Southern CA)

Dalla Betta MB, **Esener D**, **Swanson W**, Kaddis A, Aguayo Romero F, Fields JM. The frequency of POCUS in the treatment of sepsis in the emergency department: a retrospective cohort study. *POCUS J*. 2023;26;8(1):71-80.

Link: <https://doi.org/10.24908/pocus.v8i1.15683>

Weekes AJ, Raper JD, **Esener D**, Davison J, Boyd JS, Kelly C, Nomura JT, Thomas AM, Lupez K, Cox CA, Ockerse PM, Leech S, Johnson J, **Abrams E**, Murphy K, O'Connell NS. Comparing predictive performance of pulmonary embolism risk stratification tools for acute clinical deterioration. *J Am Coll Emerg Physicians Open*. 2023;4(3):e12983.

Link: <https://doi.org/10.1002/emp2.12983>

Kei J, **Mebust DP**. Comparing direct and video laryngoscopy skills between resident and attending emergency physicians. *Perm J*. 2023 May 26. Online ahead of print.

Link: <https://doi.org/10.7812/tpp/23.007>

Silver D, **Esener D**, **Rose G**. The authors reply: Iatrogenic infection risk when performing sciatic nerve hydrodissection. *Am J Emerg Med*. 2023;69:214.

Link: <https://doi.org/10.1016/j.ajem.2023.03.044>

Abstracts, Society for Academic Emergency Medicine, Austin, TX, May 2023

- **Bouvet S**, Zhang JY, Rauchwerger AS, Somers MJ, Merchant M, **Sax DR**. Validation of the Oakland Score among emergency department patients with lower gastrointestinal bleeding. *Acad Emerg Med*. 2023;30(S1):367-368 [abstract 792].
- **Casey SR**, Zekar L, Somers MJ, Westafer LM, Reed ME, **Vinson DR**. Bilateral emboli and tachycardia predict hospitalization of patients with low-risk pulmonary embolism. *Acad Emerg Med*. 2023;30(S1):329 [abstract 706].
- **Choy RC, Lin J, Scott C, Lorenzen B**. Volume of crystalloid fluid resuscitation and mortality in patients with COVID-19. *Acad Emerg Med*. 2023;30(S1):85-86 [abstract 168].
- Kea B, Warton M, Kinney E, Kutz C, **Ballard DW**, Reed ME, **Vinson DR**. Stroke prophylaxis action after US emergency department diagnosis and discharge of atrial fibrillation patients. *Acad Emerg Med*. 2023;30(S1):15-16 [abstract 18].
- **Mark DG**, Horton BH, Reed ME. Increased use of computed tomographic cerebral angiography vs lumbar puncture for headache workups: 2015-2021. *Acad Emerg Med*. 2023;30(S1):38 [abstract 65].
- Zhang JY, Warton M, **Sax DR**, Rauchwerger AS, Vitale-McDowell TJ, McGauhey KR, **Ballard DW, Kene MV**, Reed ME. Automated measures of mis-triage to assess accuracy of the Emergency Severity Index among pediatric patients. *Acad Emerg Med*. 2023;30(S1):233 [abstract 491].
- **Vinson DR**, Warton M, Hofmann ER, Durant EJ, Rauchwerger AS, Zhang JY, Reed ME, Mark DG. Co-administering long-acting oral with intravenous bolus rate reducers in treating rapid atrial fibrillation. *Acad Emerg Med*. 2023;30(S1):63 [abstract 119].
- Rouleau SG, Balasubramanian MJ, Antognini TX, Huang J, Reed ME, **Vinson DR**. Surveillance for low-risk patients with subsegmental PE: prevalence and eligibility. *Acad Emerg Med*. 2023;30(S1):328-329 [abstract 705].

Links to the KPNC abstracts can be found on [the KP CREST publications page](#).

Interview with Dana Sax, KP CREST Steering Committee Member

[5 Questions for . . . Dana Sax](#) Kaiser Permanente physician researcher focuses on improving emergency medicine for patients and providers.

Just Launched or Added

1. Extending IV Tenecteplase Beyond 4.5-hour Window for Patients with Acute Ischemic Stroke

Principal Investigator: Mai N. Nguyen-Huynh (Neurology, Walnut Creek; DOR, Oakland) and Jeffrey Klingman (Neurology, Walnut Creek)

Co-investigators: **David R. Vinson** (Roseville/Sacramento); Anne C Kim (Radiology, Walnut Creek) Molly Burnett (Neurology, Oakland); Sheila Chan (Neurology, Redwood City); Patricia Zrelak (Nursing Research); Catherine Lee (DOR); Joeffrey R. Hatton (Hospital Quality and Operations); Hemali Sudhalkar (Adult Hospital Medicine, San Jose).

Sites: KP Northern California

Funding: The Permanente Medical Group's Delivery Science Program

Summary: This retrospective cohort study will answer this question: In a real-world practice setting, what are the effects on stroke care processes and clinical outcomes when IV tenecteplase (TNKase) is used to treat patients with potential acute ischemic stroke presenting with wake-up stroke or within 4.5 to 9 hours from last known well?

Status: The new pathway began June 1.

Ongoing Research Projects^b

1. Evaluation of ligamentous injury in traumatic knee injuries using bedside point-of-care ultrasound (POCUS) in the ED

Principle Investigator: **Eric Abrams** (SD)

Co-investigators: Gabriel Rose, Dasia Esener

Site: San Diego

Summary: ACL tears are a common pathology following knee injuries presenting to the ED. However, typical imaging modalities used during the ED visit, including x-ray and POCUS, are not reliable or accurate in the diagnosis as compared to MRI. MRI is performed after the index ED visit on an outpatient basis in accordance with an orthopedics follow up appointment. Our group will evaluate whether the presence of a knee effusion, as detected on POCUS examination, increases the likelihood of ligamentous injury (ACL) after acute knee injury. Patients will be scanned by one of the ultrasound faculty or fellows during their visit and outpatient follow up imaging and orthopedics visit summary will be referenced as the gold standard.

Status: Enrollment has begun.

2. Evaluation of the clinical impact and safety of focused transesophageal echocardiography during resuscitation of critically ill patients in the ED and ICU

Principal Investigator: Benjamin Abella (University of Pennsylvania)

KP Co-Investigator: **Eric Abrams** (San Diego)

^b Active studies are organized alphabetically by the leading TPMG or SCPMG emergency physician investigator, whose name is in bold font.

Site: San Diego

Summary: This is a multi-center, prospective study evaluating clinical outcomes in critically ill patients in the ED who undergo a transesophageal echocardiogram (TEE) by an emergency medicine clinician.

Status: Enrollment is currently underway.

3. Evaluation of physician-performed musculoskeletal ultrasound after implementation of QR code digital reference cards in the ED: the “Musculoskeletal Ultrasound Assist in Demand” (MSKAiD) project

Principal Investigator: **Kate Anderson** (San Diego)

Co-investigators: Gabriel Rose, Eric Abrams, and Dasia Esener (San Diego)

Study Site: San Diego

Summary: EM physician-performed musculoskeletal (MSK) ultrasound (diagnostic and procedural) is part of the core applications of point of care ultrasound training during residency per national society guidelines. However, EM physicians often defer performing MSK ultrasound-guided diagnostics and procedures in favor of other imaging modalities or consultant management, due to low comfort and/or experience with MSK ultrasound. This prospective study will evaluate physician comfort level pre- and post-implementation of rapid reference QR digital cards placed on every point of care ultrasound machine within the ED. Further, we will assess the number of non-ultrasound fellowship trained physician-performed MSK ultrasound (diagnostic and/or procedural) prior to and following QR code card placement.

4. Creation of a high-fidelity 3D simulation model for performance of POCUS guided lumbar puncture and erector spinae block

Principal investigator: **Kate Anderson** (San Diego)

Co-investigators: Gabe Rose, Dasia Esener, Drew Silver, and Eric Abrams (San Diego)

Site: San Diego

Summary: We plan to create a semi 3D printed back (lumbar) and create a ballistics gelatin in-molding to simulate the vertebrae and erector spinae muscles. We will have residents perform an LP as well as the erector spinae block under ultrasound guidance and measure pre- and post-procedural confidence.

5. Post-acute sequelae of SARS-CoV-2 infection (PASC) in adult KPNC members

Principal Investigators: **Dustin W. Ballard** (San Rafael) and Mary E. Reed (DOR).

Co-investigators: Jacek Skarbinski (Infectious Disease, Oakland), Edward J. Durant (Modesto/Manteca), David R. Vinson (Roseville/Sacramento), Dustin G. Mark (Oakland/Richmond), Marc Siqueiros (Internal Medicine, Santa Clara), Madhavi Cholletti (Internal Medicine, Campbell) and Daniel DiLena and Adina S. Rauchwerger, the KP CREST Network

Sites: KP Northern California

Funding: The Permanente Medical Group's Delivery Science Program

Summary: This retrospective cohort study will evaluate the incidence, temporal trends, characteristics, and predictors of PASC encounters among adult KPNC members between 11/1/2020 and 7/1/2022. The cohort will include patients with prior SARS-CoV-2 infection and identify those with a confirmed PASC diagnosis. We will use predictive analytic techniques to examine predictors of PASC diagnoses and associated encounters among all KPNC members with known prior SARS-CoV-2 infection, testing the hypothesis that COVID-19 vaccination is protective. We will also evaluate PASC patient clinical characteristics, including recidivism, temporal trends, and utilization metrics such as specialty and diagnostic (imaging and laboratory) referrals. This study will add to our understanding of the natural history, utilization, and short-term and longitudinal outcomes of PASC patients in KPNC and will inform clinical practice recommendation revisions and referral criteria.

Status: We have made great progress on data collection and are beginning work on the first large manuscript that will address predictors of PASC. Daniel DiLena is leading a small side project on anosmia.

6a. Infant Fever STEWARD Project (STandardizing Emergency Work-up Around Risk Data): ORIGINAL

Principal Investigators: **Dustin W. Ballard** (San Rafael) and Tara Greenhow (Pediatric infectious disease; San Francisco)

Co-Investigators: KP CREST Network, Adam L. Sharp (DRE^c and Los Angeles), and Pediatric Hospitalists Bev Young and Tran Nguyen

Funding: Garfield Memorial Fund

KP Study Sites: KP Northern California and KP Southern California

Summary: We first defined retrospective incidence rates of clinical and utilization outcomes in two cohorts (age 7-90 days, and 91-365 days) presenting to the emergency department (ED) in Kaiser Permanente Northern California (KPNC) and Kaiser Permanente Southern California (KPSC) with fever. We have deployed these incidence data in a structured electronic clinical decision support (CDS) module that promotes American Academy of Pediatrics guidelines and prospectively collects data. We are collecting real-time patient-specific clinical data in a structured fashion based on age strata and offer CDS links to Peds HBS/Peds ID-approved guideline documents/flowcharts. CDS content and evaluation emphasize utilization outcomes.

Status: The CDS module is in use across most KPNC facilities, by which we are collecting prospective data on the management of neonatal fever. Our first manuscript was published in

^c DRE = KPSC Department of Research & Evaluation (Pasadena); DOR = KPNC Division of Research (Oakland)

JACEP Open (Clinical management and outcomes for febrile infants 29-60 days evaluated in community EDs), our second manuscript in *Pediatrics* (Using AAP guidelines to manage febrile infants without C-reactive protein and procalcitonin), our third in *Perm J* (CA-FIRST Algorithm Development in a Learning Health System). Our fourth is undergoing peer-review (An all-inclusive model for predicting invasive bacterial infection in febrile infants aged 7-60 days). We will give an oral presentation at the American College of Emergency Physicians Research Forum, Philadelphia, PA, October 2023: Risk of serious bacterial infections in febrile infants aged 7-90 days with COVID-19.

6b. California Febrile Infant Risk Stratification Tool (CA FIRST) Study: EXPANSION

Principal Investigators: **Dustin W. Ballard** (San Rafael) and Tara Greenhow (Pediatric Infectious Disease, San Francisco)

Co-Investigators: KP CREST Network, Bev Young and Tran Nguyen (Pediatric Hospitalists, Roseville), Patrick Van Winkle (Pediatric Hospitalist, Anaheim), Margaret Stone (Pediatric Infectious Disease, Woodland Hills), Sonya Negriff (Research Scientist, Dept of Research and Evaluation, Pasadena)

Funding: Garfield Memorial Fund

KP Study Sites: KPNC and KPSC

Summary: Our CA FIRST protocol for the management of febrile infants was structured on the validated Roseville protocol and modified in light of the recent American Academy of Pediatrics (AAP) guidelines. With broad multispecialty endorsement, the protocol has been accepted by physician leadership in both KP Northern and Southern CA and posted on the Clinical Library. In an earlier GMF-supported study, we designed, built, and implemented a structured electronic clinical decision support module to bring the CA FIRST protocol to emergency physicians across KPNC. This new study has three aims to further the scope of our work: We will (1) retrospectively validate the CA FIRST protocol in a large cohort febrile infants in KPSC and compare its performance with the AAP guidelines; (2) prospectively evaluate the performance of the CA FIRST protocol in KPNC for key safety and diagnostic outcomes; and (3) expand decision support in KPNC to promote best practices regarding optimal ordering of chest x-rays, urinalysis and culture, and lumbar punctures in febrile infants <90 days of age.

Status: We are defining our variables.

7. Non-endoscopic management of acute esophageal food impaction in the ED

Principal Investigator: Linda Lee (Gastroenterology, Sacramento)

Co-Investigators: **Sean C. Bouvet** (San Francisco) and Dan Li (Gastroenterology, Santa Clara)

Funding: KP Northern California Community Health Program

KP Study Sites: KP Northern California

Summary: Esophageal food impaction is one of the most common gastrointestinal emergencies. These patients usually require urgent endoscopy in the ED to remove the impacted food and avoid esophageal necrosis or perforation. Research regarding non-endoscopic management remains limited and the current endoscopy guidelines are over 10 years old. If non-endoscopic treatments can successfully treat patients with esophageal food impaction, it can avoid the risk, time, and expense of endoscopy. In this study, we will assess the rate of successfully resolving food impaction without endoscopy, the predictors and efficacy of non-endoscopic therapy, and the incidence of adverse events related to treatment type.

Status: We have begun data collection.

8. Risk stratification of ED patients with lower GI bleeding: identifying patients who may be safe for outpatient management

Principal Investigator: **Sean C. Bouvet** (San Francisco)

Co-Investigators: T.R. Levin (Gastroenterology, Walnut Creek), **Dana R. Sax** (Oakland/Richmond), Mary E. Reed and Adina S. Rauchwerger (DOR) and the CREST Network

Sites: KP Northern California

Funding: KP Northern California Community Health Program

Summary: Emergency physicians evaluate approximately 10,000 adults annually in our 21 EDs with a diagnosis of lower gastrointestinal bleed. There is a recently validated tool, the Oakland score, to risk-stratify *hospitalized* patients to identify those at low risk who may be eligible for expedited discharge with close outpatient follow-up. This tool, however, has not been assessed on an ED population. This retrospective cohort study will evaluate a cohort of 20,000 ED adults with a diagnosis of lower gastrointestinal bleed in 2019-2020 and identify the frequency of adverse events. Performance metrics of the Oakland Score will be calculated at different point thresholds. If the score performs well in this population with sufficient sensitivity, it will set the stage for a prospective validation study.

Status: We presented an abstract to the Society of Academic Emergency Medicine annual meeting in Austin, Texas, in May 2023, and are working on the ms.

9. Heart failure clinical outcomes following telehealth vs in-person primary care visits

Principal Investigator: **Scott D. Casey** (Delivery Science Fellow, DOR; Vallejo and Vacaville)

Co-investigators: Dana R. Sax (Oakland/Richmond), Mary E. Reed and Jie Huang (DOR)

Sites: KP Northern California

Funding: Agency for Healthcare Research and Quality

Summary: Patients with heart failure (HF) are a medically and socially complex population with frequent ED visits. The impact of telemedicine on the downstream emergent care needs for this population is unknown. In this retrospective analysis of primary care visits for HF in KP Northern California, we will compare ED use for patients with HF following a primary care visit utilizing telehealth technology (video or telephone) compared to a traditional face-to-face in-office visit for HF patients seen by a primary care physician with chief complaint related to their underlying HF.

Status: Manuscript in preparation.

10. Implementation of ED heart failure clinical decision support: a usability study and sociotechnical analysis

Principal Investigator: **Scott D. Casey** (Delivery Science Fellow, DOR; Vallejo and Vacaville)

Co-Investigators: Mary E. Reed (DOR) and Dana R. Sax, Dustin G. Mark, and Chris H. LeMaster (Oakland/Richmond), Robert P. Norris (Sacramento/Roseville), and Jesse Gaskin (TPMG Consulting Services)

KP Study Sites: KP Northern California

Funding: Division of Research Health Care Delivery and Policy Section Award

Summary: This qualitative study will assess the usability of an acute heart failure (AHF) clinical decision support system (CDSS) as well as the socio-technical environment of the tool by interviewing and surveying emergency physicians. The results of the study will be used to identify barriers and facilitators to CDSS utilization in emergency physicians' daily clinical practice and will inform KPNC system-wide AHF CDSS implementation across all 21 ED as part of an existing Delivery Science funded project.

Status: Manuscript undergoing peer-review.

11. Traditional ACLS training vs TeamSTEPPS plus ACLS training: a comparison of outcomes

Principal Investigator: **Charles Chiang** (San Diego)

Co-Investigators: Marlene M Alfaro, Adam Schwartz, Peter Sacci, Sari Lahham, Ian Chong, Daniel Lee (all San Diego)

Site: San Diego

Summary: This is a prospective observational study to evaluate the effectiveness of ACLS simulation + TeamSTEPPS training compared with standard AHA didactic ACLS training received by emergency and family medicine residents. Residents that have undergone prior didactic ACLS training and are "ACLS certified" undergo a simulated cardiac arrest case in the simulation lab. Residents are then trained via simulation and TeamSTEPPS methodology on running cardiac arrest cases and are later run through another cardiac arrest simulation. Observational variables collected and compared include time to recognition of arrest, time to initiation of CPR, time to defibrillation, time to epinephrine, among others. Subjective data surveys are also collected pre- and post-simulation training.

Status: Data have been collected and are now undergoing analysis.

12. Association of volume of early fluid resuscitation with adverse outcomes in patients with COVID-19

Principal Investigator: **Kristel Choy** (San Diego)

Co-Investigators: Christopher Scott and Brent Lorenzen (San Diego)

Site: San Diego

Summary: This retrospective study is evaluating the association of volume of early fluid resuscitation with subsequent adverse outcomes in patients hospitalized with COVID-19.

Status: Data collected and analyzed. We presented an abstract to the Society of Academic Emergency Medicine annual meeting in Austin, Texas, in May 2023.

13. The effect of electronic assignment of patients to physicians in the ED on operational metrics

Principal Investigator: **Andrew Ciennik** (San Diego)

Co-Investigators: Brent Lorenzen, Adam Schwartz, Tom Hauck, Charles Chiang (San Diego)

Summary: Retrospective, before and after, observational study of the association of an implementation of an electronic chart assignment system on multiple commonly used metrics of ED throughput. The implementation was associated with multiple significant improvements. Some metrics were slightly worse and overall patient volumes were greater in the post-intervention period, perhaps suggestive of pressures that limited potential gains.

Status: Abstract presented in October at the 2021 Research Forum of the American College of Emergency Physicians. Full manuscript is in preparation.

14. How do physicians consider cost in comparison with other factors when prescribing medications to patients discharged home from the ED?

Principal Investigator: **Chad Correa** (San Diego)

Co-Investigators: Brent Lorenzen (San Diego)

Summary: This is a cross-sectional survey study assessing how physicians considered cost compared to other factors when prescribing common classes of medications from the ED. Physicians at a variety of practice sites and with varying levels of experience were included. Two-way ANOVA showed that class of medication was associated with the level of importance ascribed to various factors influencing choice of medication prescriptions. The considered factors were also associated with differences in the importance of these factors. There was significant interaction between class of medication and category of factor considered. In general, physicians were less likely to consider cost compared to other factors.

Status: Abstract presented in October at the 2021 Research Forum of the American College of Emergency Physicians.

15. Evaluation of potential triage criteria to improve recognition of posterior circulation stroke

Principle Investigators: **Justin D'Avanzo** and **So Onishi** (San Diego)

Co-investigators: Tom Hauck (Department of Research and Evaluation), Melody Yturralde and Sheryn Shahwan-Solorzano (both RNs) and Will Neil (Neurology, San Diego)

KP Study Site: KP San Diego

Summary: Posterior circulation ischemic stroke (PCS) can result in severe morbidity and increased mortality. Determining missed opportunities in the recognition of PCS at ED triage may help with early recognition and intervention to improve patient outcomes. This retrospective cohort study identified ED patients with PCS. We then applied a hypothetical triage protocol based on patient's age (age ≥ 60 years), presenting blood pressure ($\geq 140/90$ mmHg) and chief complaint of dizziness described as vertigo, imbalance, and/or ataxia to determine if this protocol would have identified missed PCS. A total 125 cases had a discharge diagnosis of PCS, 97 cases presented to the ED outside of the Code Stroke window. Of the 28 cases that did present within the Code Stroke window, Code Stroke activation occurred in 17 cases. 11 cases of PCS presented to the ED within the Code Stroke window but Code Stroke was not activated in triage. Of these 11 cases of missed PCS in triage, hypothetical triage protocol would have recognized PCS in 5 cases. Delayed presentation of patients with PCS makes early recognition and treatment of PCS difficult. Increased awareness of PCS, together with possible screening tools based on patient's age, presenting blood pressure, and chief complaint may help with early recognition and intervention for ED patient with PCS.

Status: Analysis is complete. Manuscript in process.

16. Evaluation of proficiency in performing transesophageal echocardiography in an EM Residency Program

Principal Investigator: **Olga Diaz** (San Diego)

Co-Investigators: Dasia Esener, Gabriel Rose, and Eric Abrams (San Diego)

Study Site: San Diego

Summary: Limited transesophageal echocardiography (TEE) performed by ED trained physicians is rapidly becoming the standard of care in the evaluation of critically ill patients who present to the ED. To date, abilities (and retention) to perform this exam has not been evaluated in emergency resident physicians. This study evaluates the retention of TEE knowledge and aptitude in emergency medicine residents after a didactic and hands-on experience on a high-fidelity TEE trainer.

Status: Abstract was presented at the American College of Emergency Physicians Research Forum in San Francisco in October 2022.

17. CT Use Reduction in Ostensive Ureteral Stone (CURIOUS): retrospective validation of clinical decision rules to predict complicated ureteral stone

Principal Investigator: **Edward J. Durant** (Modesto/Manteca)

Co-Investigators: Annie Ma (UC Davis), Vignesh Arasu (Radiology, Vallejo), Raymond Bernal (Urology, Manteca), Mary E. Reed and E. Margaret Warton (DOR), Aidan Campbell (NYU), Zev Minow (Kaiser Central Valley), Cynthia Kim (California Northstate University), and David R. Vinson (Roseville/Sacramento) of the KP CREST Network.

Funding: KP Northern California Community Health Program

KP Study Sites: KPNC

Summary: Computed tomography (CT) is considered the gold standard for diagnostic imaging in suspected renal colic. Several researchers have attempted to develop clinical decision rules to predict ureteral stones without the use of CT. The main drawback of these clinical decision tools is that they were not designed to predict complications from stones, such as the need for admission or urologic intervention. In this retrospective study, we sought to derive clinical decision rules to guide imaging decisions based on the patient's risk of complicated stones. To our knowledge, ours is the first study specifically designed to derive clinical decision rules to predict clinically important stones in patients with suspected renal colic. If validated, these rules could be used to guide imaging decisions, expedite ED throughput, save resources, reduce radiation exposure, and provide a model for other EDs to follow.

Status: We published our methods paper in *Am J Emerg Med*. We presented abstracts in 2022 at the American College of Radiology annual meeting in Washington, DC, and the Society of Academic Emergency Medicine annual meeting in New Orleans. Our prediction rule manuscript was recently published in *AJEM*: CT Use Reduction In Ostensive Ureteral Stone (CURIOUS). We are now undertaking a secondary analysis to evaluate how the magnitude of hydronephrosis correlates with clinically important ureteral stones.

18. Right ventricular dilatation on CT pulmonary angiography in adults with acute pulmonary embolism

Principal Investigator: **Edward J. Durant** (Modesto/Manteca)

Co-Investigators: Joshua Chang (KP IM resident, Oakland; now at Stanford doing a fellowship), Bahman Sayyar Roudsari (Radiology, Modesto), **David R. Vinson** (Roseville/Sacramento), Darcy Engelhart and Sarah Fetterolf (CA Northstate Univ Coll of Medicine, now at NYU), and Judy Shan (CREST and UCSF)

Funding: Kaiser Permanente Northern California Graduate Medical Education, Kaiser Foundation Hospitals

KP Study Sites: KPNC

Summary: The retrospective cohort study evaluated the accuracy of pre-med and medical students in identifying right ventricular strain on CT imaging compared with a radiology gold standard.

Status: We presented abstracts at the American College of Radiology annual meeting in Washington, DC, and the Society of Academic Emergency Medicine annual meeting in New Orleans. The ms is in press with the *Journal of Medical Education and Curricular Development*.

19. Evaluation of normal reference ranges for ultrasound measurements of hip joint in elderly patients

Principal Investigator: Felipe Aguayo Romero (Baylor)

Co-Investigators: **Dasia Esener, Gabriel Rose, William Swanson, and Eric Abrams** (San Diego)

Site: San Diego

Summary: Ultrasound can be used to evaluate for effusion of the hip joint which may be useful in screening for septic arthritis or occult injury. The current reference range for this measurement is based on decades old ultrasound machine technology when hip joint capsule size was used as a surrogate for presumed presence of hip effusion. The primary objective of this study is to determine whether the current reference range for this measurement is accurate and is sufficiently specific for abnormal hip joint capsule size in the elderly population.

Status: Abstract was presented at the Research Forum of the American College of Emergency Physicians meeting in San Francisco in October, 2022.

20. The frequency of point-of-care ultrasound (POCUS) use in the treatment of ED patients with sepsis

Principal Investigator: **Dasia Esener** (San Diego)

Co-Investigators: Bryan Dalla Betta and William Swanson (San Diego)

Study Site: San Diego

Summary: Retrospective analysis of point of care ultrasound use within the emergency department amongst patients with sepsis. Analysis included types of studies utilized, use patterns and change in use over time. Analysis of this cohort of septic patients found a significant increase in the use of POCUS during the four-year study period. This increase is attributable to more diagnostic and resuscitative exams being performed.

Status: Abstract presented in October at the 2021 Research Forum of the American College of Emergency Physicians. The manuscript has been submitted for peer-review.

21. Disposition and management of ED patients with CT interpretation suggestive of stercoral colitis

Principal Investigator: Joseph Gerondale (Resident, San Diego)

Co-Investigators: Christian Agatep (student, KP School of Medicine), Anthony Ton (Radiology, San Diego), Adam Schwartz and Brent Lorenzen (San Diego)

Study Site: San Diego

Summary: Retrospective analysis of patients seen in KP Southern California EDs over a 13-month time period with CT scans suggestive of stercoral colitis. Described clinical characteristics and disposition decisions for these patients. Identified factors associated with mortality and 72-hour return ED visits.

Status: An abstract has been submitted for presentation at the American College of Emergency Physicians Research Forum, Philadelphia, PA, October 2023.

22. Risk of short-term vital sign deterioration in low-risk pulmonary embolism patients presenting to the ED with normal initial vital signs

Principal Investigator: **Erik R. Hofmann** (South Sacramento)

Co-Investigators: David R. Vinson (Roseville/Sacramento), Edward Durant and Liga Yusvirazi (Modesto/Manteca)

Funding: Kaiser Permanente Northern California Graduate Medical Education, Kaiser Foundation Hospitals

Study Site: KP Northern California

Summary: This retrospective cohort study is evaluating the prevalence of ambulatory ED patients with acute pulmonary embolism (PE) and normal initial vital signs who develop abnormal vital signs within 6 hours of ED arrival and cross the threshold from low to high-risk PE based on the PE Severity Index with associated ICU admission and 30-day adverse events.

Status: Analysis is complete. We are working now on the manuscript.

23. National survey on airway management practices among US emergency medicine residency programs

Principle Investigator: **Jonathan Kei** (San Diego)

Co-investigators: Nathan Jang, Matthew Silver (San Diego)

Study Sites: EM residency programs nationwide

Summary: Airway management practices have changed dramatically over the past 10 years with the widespread use of new technology, pharmacology, and difficult airway techniques. This study is a survey focused on emergency medicine residency programs in the United States. Residency Program Directors were asked to answer 19 questions related to airway management techniques and how they are taught at their institution. Temporal trends will be described and analyzed.

Status: An abstract has been submitted for presentation at the American College of Emergency Physicians Research Forum, Philadelphia, PA, October 2023.

24. Multicenter study evaluating airway management practices among community ED in Southern California.

Principle Investigator: **Jonathan Kei** (San Diego)

Co-investigators: Travis M Eurick (San Diego)

Study site: San Diego

Summary: There have been several studies published evaluating airway management practices among academic and trauma centered EDs in the United States through the NEAR (National Emergency Airway Registry) database. But to date, there has not been similar research focused on community based EDs. This is a retrospective study evaluating thousands of intubations performed across 12 community EDs in Southern California. Trends in intubation techniques, pharmacological choices, first pass success rates, the use of airway adjuncts, and use of advanced airway management techniques including surgical airways will be explored.

Status: Data collection is underway.

25. Assessing the optimal hand placement for cardiopulmonary resuscitation (CPR) by finding the point of maximal compression of the left ventricle on CT imaging

Principle Investigator: **Jonathan Kei** (San Diego)

Co-investigators: AJ Mannarino, Steve Aguilar, Lauren Van Woy (San Diego)

Study site: San Diego

Summary: Traditional CPR techniques advise performers place their hands on the mid sternum. Recent studies using transesophageal echo during CPR suggest that traditional hand placement is actually compressing the left outflow tract which can hinder forward movement of blood from the heart. A more optimal approach would be to move the hands more inferior and left lateral to fully compress the left ventricle. This study uses CT chest scans to identify the direct center of the left ventricle and then measures how far this point of optimal maximum compression is to the traditional location of hand placement. This study will provide

recommendations for optimal hand placement during CPR based on gender and body mass characteristics in hopes of improving future outcomes in patients with cardiac arrest.

Status: An abstract has been submitted for presentation at the American College of Emergency Physicians Research Forum, Philadelphia, PA, October 2023.

26. Optimizing quality and safety in the era of COVID-19: Virtual care first utilization and outcomes for potentially emergent conditions among KPNC members

Principal Investigators: **Mamata V. Kene** (San Leandro/Fremont) and **Dana R. Sax** (Oakland/Richmond)

Co-Investigators: Adina S. Rauchwerger, Judy Shan, Jennifer Zhang, Mary E. Reed (DOR), Dustin G. Mark (Oakland/Richmond), Dale M. Cotton (South Sacramento), Dustin W. Ballard (San Rafael), and David R. Vinson (Roseville/Sacramento) of the KP CREST Network

Funding: Garfield Memorial Fund

KP Study Sites: KP Northern California

Summary: KPNC rapidly increased virtual care services (video and telephone visits) and decreased in-person visits in March 2020 during the recognized arrival of the COVID-19 pandemic. How this shift in site of care affected downstream ED and hospital utilization and subsequent clinical outcomes has not been well described. In this retrospective cohort study, we will evaluate the safety and efficiency of virtual care first by examining three high-risk conditions that often require ED evaluation and hospitalization: chest pain, abdominal pain, and respiratory illness. Analysis of care-seeking behavior, utilization (telephone, video, in-person and ED visits) and outcomes for these complaints (that include likely COVID-19 illness as well as those occurring independent of SARS-CoV-2) will allow us to assess the safety and efficiency of current virtual care workflows while identifying potential opportunities to optimize outcomes and resource utilization.

Ultimately, our current understanding of how safely these urgent conditions can be managed virtually is limited, and the insights gathered herein will help shape care delivery during the continued pandemic and beyond, into the transformed landscape of healthcare delivery following the comprehensive disruptions of 2020.

Status: Analysis is ongoing. We presented an abstract in October 2022 at the American College of Emergency Physicians Research Forum: Short-term ED encounters following primary care telemedicine visits in the era of COVID-19. We are preparing the ms.

27. Spinal epidural abscess: an evaluation of frequency of and risk factors for delay in diagnosis

Principal Investigator: **Mamata V. Kene** (San Leandro/Fremont)

Co-Investigators: Sarabeth M. Macey (EM resident, Stanford); Erik R. Hofmann (South Sacramento), Meena Ghiya (South San Francisco), Edward J. Durant (Manteca/Modesto), Sean C. Bouvet (San Francisco)

Funding: The KPNC Graduate Medical Education Program, Kaiser Foundation Hospitals

KP Study Sites: KPNC

Summary: Spinal epidural abscess (SEA) is a rare condition with increasing incidence that if not promptly diagnosed and treated can lead to permanent and devastating neurologic disability. Accurate diagnosis requires mobilization of magnetic resonance imaging (MRI), a relatively scarce resource in emergent situations, and transfer for surgical intervention. The clinical presentation of SEA can vary, however, and many patients have multiple visits before a diagnosis is established. Delays in diagnosis, the most common complaint in SEA malpractice claims, are costly, with awards ranging from several hundred thousand dollars to multiple millions, due to the high morbidity. This retrospective cohort study will identify incidence of and factors associated with potential delay in diagnosis of SEA.

Status: We presented an abstract in October at the American College of Emergency Physicians Research Forum. The manuscript is in process.

28. Utilization of CT pulmonary angiograms for PE evaluation: predictors of higher yield and comparison to national rates

Principal Investigator: **Mamata V. Kene** (San Leandro/Fremont)

Co-Investigators: Dana R. Sax (Oakland/Richmond), David R. Vinson (Roseville/Sacramento), Mary E. Reed (DOR), and the KP CREST Network, along with Vignesh Arasu (Radiology, Vallejo)

Funding: KP Northern California Community Health Program

KP Study Sites: KP Northern California

Summary: This retrospective cohort study will evaluate the yield of CT pulmonary angiography (CTPA) in KPNC ED patients from 2012-2018 compared to national averages. We hypothesize that the CTPA yield will be higher in KPNC compared with non-integrated delivery systems, and will identify provider-, facility- and patient-level factors associated with CTPA use and yield rates. We will also apply natural language processing (NLP) techniques to identify whether risk stratification tools were documented in the record. The results of this study will inform future design of prospective clinical decision support for PE diagnostics that will facilitate risk stratification tool use prior to imaging ordering in hopes of optimizing CTPA use, with improvements in patient care, resource use, and department throughput.

Status: We presented an abstract of our NLP work at the 2020 Society for Academic Emergency Medicine. Analysis continues. We hope to submit the manuscript soon.

29. Effects of a Prolonged IT Disaster on a County's EMS System and Patient Transport Metrics

Principal investigator: **Brent Klaphor** (KP San Diego)

Co-investigators: Chris Scott (KP San Diego) and Joshua Smith (San Diego County EMS Office)

Site: KP San Diego

Summary: We partnered with San Diego County EMS to investigate the response to a 2021 IT disaster which affected a local hospital system and county-wide EMS operations.

Status: A research abstract will be presented at the 2023 conference of the National Association of EMS Physicians in Tampa in January. The manuscript is underway.

30. A review of pediatric cardiac arrest and termination of resuscitation protocols across California

Principal investigator: **Brent Klaphor** (KP San Diego)

Co-investigators: Michelle Safferman, Erin Noste, J. Joelle Donofrio-Odmann, and Katherine L. Staats (all UCSD)

Site: KP San Diego

Summary: This research project was a partnership with UCSD faculty to review the current state of California local EMS agency protocols on guidance for rapid transport vs. “stay and play” on-scene resuscitation and termination of resuscitation protocols for pediatric cardiac arrest.

Status: A research abstract was presented at the 2023 conference of the National Association of EMS Physicians in Tampa in January. The manuscript is underway.

31. Patterns and impact of chemical restraint use for ED patients with acute psychiatric distress

Principal Investigator: **Suzanne C. Lippert** (Oakland/Richmond)

Co-Investigators: **Mamata V. Kene** (San Leandro/Fremont), Juleon W. Rabbani and Adina S. Rauchwerger (DOR)

Sites: KPNC EDs

Funding: KP Northern California Community Health Program

Summary: Neither use patterns, nor outcomes associated with nonconsensual chemical restraints (receiving IM sedating medications) in the ED have been investigated through a disparity lens. This retrospective cohort study will include adults (and subgroup analysis limited to patients with insurance) aged 18-64 years presenting to the ED for acute psychiatric crisis from 2017-2021. We will describe patient characteristics associated with receiving chemical restraint. We also will describe the frequency of adverse outcomes occurring after chemical restraint administration during the index ED visit and delineate patient characteristics associated with adverse outcomes. We hope to better understand chemical restraint use patterns to inform the development of standardized practices for patients presenting in acute psychiatric crisis. Without standardized criteria for using chemical restraints, implicit bias may lead to different use patterns and different risks of adverse events in particular subgroups of our patients.

Status: We are writing the ms. We will give an oral presentation at the American College of Emergency Physicians Research Forum, Philadelphia, PA, October 2023.

32. Trends in the use of CT cerebral angiography for ED patients with headache

Principal Investigators: **Dustin G. Mark** (Oakland/Richmond) and Mary E. Reed (KPNC Division of Research)

Sites: KP Northern California

Funding: The Rapid Analytic Unit of The Permanente Medical Group's Delivery Science Program

Summary: Some ED headache presentations are suspicious for aneurysmal subarachnoid hemorrhage. In many cases, a negative non-contrast CT scan is insufficient to exclude the diagnosis. Further testing may be indicated, but the next best test is debated: lumbar puncture or CT cerebral angiography? This retrospective cohort study will include ED patients with a chief complaint of headache and a negative non-contrast cranial CT. We will examine rates of subsequent secondary investigations (lumbar puncture or CT cerebral angiography). Results will characterize objective trends in clinical practice and suggest whether decision support may be useful.

Status: We have completed analysis and presented an abstract to the Society of Academic Emergency Medicine annual meeting in Austin, Texas, in May 2023.

33a. Chest pain STEWARD (STandardizing Emergency Work-up Around Risk Data) investigation

Principal Investigator: **Dustin G. Mark** (Oakland/Richmond) and Mary E. Reed (DOR)

Co-Investigators: KP CREST Network

Funding sources: TPMG DARE's Delivery Science Grant Program and the Lokahi Foundation

Study Sites: KP Northern California

Summary: The prospective component leveraged findings from the published retrospective study to provide point-of-care clinical decision support via the RISTRA platform to ED physicians, while dually serving as a prospective data collection tool to validate findings from the retrospective study.

Status: Six studies have been published: (1) Performance of coronary risk scores in patients with CP in the ED (*JACC*); (2) 60-day major adverse cardiac event rates in ED CP patients with non-low modified HEART risk scores (*Am J Emerg Med*); (3) The performance of a retrospective method to determine risk score classification for ED patients with possible ACS (*Acad Emerg Med*); (4) Prospective validation and comparative analysis of coronary risk stratification strategies among emergency department chest pain patients (*J Am Heart Assoc*). (5) Graded coronary risk stratification for emergency department patients with chest pain: a controlled cohort (*J Am Heart*

Assoc). (6) Higher intensity of 72-hour non-invasive cardiac test referral does not improve short-term outcomes among emergency department patients with chest pain (*Acad Emerg Med*).

33b. Validation of a novel algorithm for ED patients with possible acute coronary syndromes following the transition to a high-sensitivity troponin (hsTn) assay

Principal Investigators: **Dustin G. Mark** (Oakland/Richmond) and Mary E. Reed (Division of Research)

Co-Investigators: Keane K. Lee (Cardiology, Santa Clara), Dana R. Sax (Oakland/Richmond), Dustin W. Ballard (San Rafael), Mamata V. Kene (San Leandro/Fremont), David R. Vinson (Roseville/Sacramento)

Funding: The Permanente Medical Group Delivery Science Program

KP Study Sites: KP Northern California

Summary: As part of a multidisciplinary hsTn implementation workgroup, we designed the “KPNC hsTn diagnostic algorithm” for evaluation of possible non-ST elevation acute coronary syndromes (NSTEMI-ACS) using Access hsTnI values. Our research questions are: 1) is the KPNC hsTn diagnostic algorithm internally valid, and 2) will adoption of hsTn impact resource utilization within KPNC? Our aims are to: 1) assess the predictive accuracy of the KPNC hsTn diagnostic algorithm among ED patients with possible NSTEMI-ACS for a composite outcome of 30-day myocardial infarction (MI) or death and 2) examine associations between hsTn adoption within KPNC and hospital admission rates, ED length of stay, and downstream cardiac testing among ED patients with possible NSTEMI-ACS. We hypothesize that 1) the algorithm will accurately identify patients at very low risk (< 0.5%), low risk (1-2%), intermediate risk (10-20%) and high risk (>60%) of 30-day MI or death; and 2) that hsTn adoption will not affect hospital admission rates but will be associated with decreases in ED length of stay and downstream cardiac testing as well as lower 30-day MI or death amongst discharged patients.

Status: We launched the new tool in early 2023. We have a ms in press with *JACC Adv*: Mark DG, Huang J, Lee K, Sax DR, Kene MV, Ballard DW, Vinson DR, Reed ME. Diagnostic performance of high-sensitivity cardiac troponin I in a multicenter US emergency department cohort.

34. Objective cardiac testing following ED evaluations for chest pain: associations between emergency physician-associated referral for non-invasive cardiac testing and 2-year adverse outcomes

Principal Investigators: **Dustin G. Mark** (Oakland/Richmond)

Co-investigators: Jamal Rana (Cardiology, Oakland), Mary E. Reed, Jie Huang, and Adina S. Rauchwerger (DOR and the KP CREST Network)

Sites: KP Northern California

Funding: KPNC Community Health Program

Summary: We will investigate whether emergency physician-level variation in non-invasive cardiac test (NICT) referral (exercise electrocardiography, myocardial perfusion, stress echo or CT coronary angiography) following ED encounters for chest pain, where AMI has been excluded, correlates with the incidence of major adverse cardiac events (MACE) within the following 2 years. This investigation will be conducted using an existing dataset of ED chest pain patients (totaling 281,454 patients) presenting to KPNC EDs between 2013 and 2019. We hypothesize that patients evaluated by emergency physicians in the highest NICT referral intensity tertile will have a lower incidence of MACE within 2 years as compared to patients evaluated by physicians in the lowest NICT referral intensity tertile. We further hypothesize that stratified analyses will reveal this association to be principally driven by patients at high coronary risk, with no residual significant difference in the incidence of 2-year MACE incidence among low or intermediate-risk patients. These findings would impact practice within EDs, cardiology lab services, nuclear medicine and hospital-based medicine.

Status: Undergoing analysis

35. Point of care ultrasound for the evaluation of low-risk chest pain in the ED

Principal Investigator: **Gabriel Rose** (San Diego)

Co-Investigators: Dasia Esener and Eric Abrams (San Diego)

Study Site: San Diego

Summary: Prospective observational study to determine the diagnostic value of POCUS and CXR in the evaluation of adults with low-risk chest pain presenting to the ED. Inclusion criteria are adult patients presenting to the emergency department with a complaint of chest pain determined to be low-risk based on a HEART score of 5 or less. We hypothesize that an integrated POCUS protocol performs with greater sensitivity and equal specificity compared to CXR for narrowing the diagnosis of these patients. We also hypothesize that POCUS would significantly shorten patient length of stay in the emergency department.

Status: Enrollment is underway.

36. POCUS for detecting retinal detachment vs vitreous hemorrhage in ED patients

Principal Investigator: **Gabriel Rose** (San Diego)

Co-Investigators: Dasia Esener and Eric Abrams (San Diego), Greg Dorilus (KP Downey)

Study Site: San Diego

Summary: In this study we will retrospectively evaluate the sensitivity and accuracy of POCUS for retinal detachment and vitreous hemorrhage by emergency physicians vs ophthalmologists for retinal detachment and vitreous hemorrhage

Status: Data collection underway.

37. ED utilization of ultrasound versus computed tomography for patients with suspected renal colic

Principal Investigator: **Gabriel Rose** (San Diego)

Co-investigators: Eric Abrams, Dasia Esener, and William Swanson (San Diego)

Study Site: San Diego

Summary: This retrospective study will evaluate patients presenting to the ED with possible renal colic. They will be categorized as either “low risk” or “high risk” patients who would be eligible for either CT or ultrasound, respectively. With this study we hope to identify a population of patients thought to be low risk who could safely undergo an ultrasound-first approach to the diagnosis of renal colic.

Status: Data collection is underway.

38. RISTRAGE: Standardizing ED triage

Principal Investigator: **Dana R. Sax** (Oakland/Richmond)

Co-Investigators: Dustin G. Mark (Oakland/Richmond), Dustin W. Ballard (San Rafael), Mamata V. Kene (San Leandro/Fremont), David R. Vinson (Roseville/Sacramento), Mary E. Reed and Adina S. Rauchwerger (DOR) of the KP CREST Network

Funding: The Lokahi Foundation

KP Study Sites: KP Northern California

Summary: Patients presenting to most EDs in the US and to all EDs in KPNC are triaged by a standardized protocol into one of five levels of acuity. About 10% of patients who are initially triaged to a lower acuity group (usually with a significant wait time in a low acuity unit) are later found to have a more serious condition that should have had a higher triage classification. This is a significant quality problem which causes delay in diagnosis and treatment and preventable adverse outcomes. The consequence of this triage error is the need for additional patient hand-offs, avoidable rework, excessive resource use, patient dissatisfaction, and significantly increased liability risk. This study will determine the characteristics of patients who are mis-triaged to a lower acuity level and then identify a data-driven computer-based process to improve triage accuracy. Phase I is a retrospective analysis that will be followed by Phase II real-time building, testing and implementing a machine-based learning triage instrument in our EDs for integration into KP HealthConnect.

Status: We presented an abstract at the American College of Emergency Physicians Research Forum in October 2022 and another at the Society of Academic Emergency Medicine annual

meeting in Austin, Texas, in May 2023. Our first paper was just published in *J Am Coll Emerg Physicians Open*: Automated analysis of unstructured clinical assessments improves emergency department triage performance: a retrospective deep learning analysis.

39. Assessing frequency and predictors of under- and overtriage of pediatric ED patients

Principal Investigators: **Dana R. Sax** (Oakland/Richmond)

Co-Investigators: **Mamata V. Kene** (San Leandro/Fremont), **Jenna Timm and Eloa Adams** (Oakland/Richmond), Tina Vitale-McDowell and Katie Rose McGauhey (ED RNs, Oakland), Mary E. Reed, E. Margaret Warton, and Adina S. Rauchwerger (DOR) and the KP CREST Network

Sites: KPNC

Funding: KP Northern California Community Health Program

Summary: ED triage systems exist to sort patients based on acuity and expected resource use. We seek to understand current triage practices of pediatric ED patients across KPNC. The study will include over one million ED patients <18 years old seen between 2016-2020. Based on input from a panel of physician and nurse experts in pediatric emergency medicine, general emergency medicine, and pediatric critical care and through iterative chart review, we will develop and clinically validate a classification algorithm to identify cases of significant mis-triage based on resource use and critical illness. We will then apply this algorithm to our full study population to estimate the frequency of significant under- and overtriage. Lastly, we will identify patient characteristics (presenting complaint, demographic data, co-morbidities, medications, and prior healthcare utilization) and setting characteristics (including time and day of visit and pediatric capabilities of facility) that are associated with mis-triage. Knowledge gained from this study will provide insight on current pediatric ED triage practices and highlight opportunities to improve triage accuracy across KPNC.

Status: We presented an abstract Society of Academic Emergency Medicine annual meeting in Austin, Texas, May 2023.

40. Emergency department triage of high-risk conditions

Principal Investigators: **Dana R. Sax** (Oakland/Richmond)

Co-Investigators: Dustin G. Mark (Oakland/Richmond), Tina Vitale-McDowell and Aaron Beardsley (RNs, Oakland), Oleg Sofrygin, Mary E. Reed, E. Margaret Warton, Adina S. Rauchwerger (DOR) and the KP CREST Network

Sites: KPNC

Funding: The Lokahi Foundation

Summary: This retrospective cohort study will tap into the large database of all ED encounters from 2016-2020 and study patients with three potential high-risk conditions: acute coronary

syndrome, aortic dissection, and subarachnoid hemorrhage. We will describe the frequency of under-triage among patients who present to a KPNC ED with one of these diagnoses, assess patient- and setting-level characteristics associated with under-triage, including presenting complaint, triage nurse free test documentation of triage assessment, patient demographics (gender, race, age, primary language, socioeconomic/ education level at county level), co-morbidity score, time of day/day of week, and facility where patient received care. Lastly, we will assess delays in care associated with under-triage of patients with possible acute coronary syndrome, aortic dissection, and subarachnoid hemorrhage, including time to initial EKG, room, placement of relevant laboratory, imaging orders, and therapeutic orders, and placement of relevant specialty consults.

Status: Data collection in process.

41. KP-specific heart failure risk prediction: KPNC Standardizing Emergency Work-ups Around Risk Data (STEWARD) heart failure project

Principal Investigator: **Dana R. Sax** (Oakland/Richmond) and Mary E. Reed (DOR)

Co-investigators: Dustin G. Mark (Oakland/Richmond), Jamal Rana (Oakland), Mamata V. Kene (San Leandro/Fremont), David R. Vinson (Roseville/Sacramento), Dustin W. Ballard (San Rafael), and the KP CREST Network, with collaborators from Vanderbilt.

Funding: TPMG DARE's Delivery Science Grant Program

Study Sites: KP Northern California

Summary: There are over one million ED visits across the U.S. each year for acute heart failure (AHF), with an average admission rate of 84%. EDs play a major role in the care of AHF patients through symptom management, coordination of care, and risk stratification to identify sicker patients needing admission. We recently developed a clinical decision support tool to help predict AHF disease severity and in collaboration with Vinnie Liu and the Hospital Advanced Analytics Team and the HealthConnect team; the tool is now built into our EHR and ready to provide real-time risk estimates and clinical decision support. We also collected qualitative data through interviews and surveys with frontline ED providers, IT leadership, and operational and clinical leads to identify barriers and opportunities for implementation of the risk tool. We worked with cardiology and hospital-based specialist leads to develop care pathways based on patient risk.

We began a pilot study of the risk tool and paired decision support in two EDs (Oakland and Richmond) in January, which will run for about 3-4 months. During this pilot, we will assess the feasibility of an EHR-linked clinical decision support system to extract heart failure-relevant data and efficiently present these to ED providers, assess provider uptake of the tool, and assess the safety of patients identified as low risk and discharged home. During and after the pilot study, we will analyze the data, collect feedback from providers via interviews and surveys, and update the tool as needed prior to regional implementation and prospective evaluation, which we hope to launch this fall.

Status: We presented an abstract at the 2020 American College of Cardiology meeting and published our first ms in *ESC Heart Fail*: Outcomes among AHF ED patients by preserved vs reduced ejection fraction. Our second ms was published in *JACEP Open*: Risk adjusted 30-day mortality and serious adverse event rates among a large, multi-center cohort of ED patients with acute HF. Our third ms was published in *Diagnostics*: Barriers and opportunities regarding implementation of a machine-learning-based acute heart failure risk stratification tool in the emergency department.

42. Assessment of sociodemographic disparities in management of ED patients with acute abdominal pain

Principal Investigator: Zeenat Khan, [KPNC Patient Safety Fellow](#)

Co: Investigators: **Dana R. Sax** (Oakland/Richmond) and Lue-Yen Tucker (Division of Research)

Funding: KPNC Graduate Medical Education and the Office of Risk Management and Patient Safety.

Sites: KPNC

Summary: In this retrospective, data-only cohort study of adult emergency department patients with acute abdominal pain from 2019-2020, we sought to evaluate if specific sociodemographic characteristics are associated with a decreased likelihood of receiving an opioid pain reliever as part of acute pain management. After controlling for confounding variables, including severity of illness, co-morbidities, vital signs, pain score, ED disposition, as well as multiple patient sociodemographic variables, we found that Asian, Black, and Hispanic patients (compared to White patients), non-English primary language speakers (compared to English language speakers), patients > 75 years (compared to 18-30 years), and non-KP members (compared to KP members) had lower odds of receiving an opioid pain reliever.

Status: Data analysis is complete. We presented an abstract at the Institute for Healthcare Improvement Scientific Symposium in 2021 and another at the American College of Emergency Physicians Research Forum in October: Assessment of sociodemographic disparities in ED pain management. We are currently exploring strategies to standardize pain management and will soon pilot test these strategies in the Oakland and Richmond EDs.

43. Improving Care by Defining the Role of Electronic Health Record-Based Alerts In a Fully Integrated Health Care Delivery System for Worsening Heart Failure (IDENTIFY-WHF)

Principal Investigators: Andrew P. Ambrosy (Cardiology, San Francisco) and Alan S. Go (Division of Research)

Co-investigators: **Dana R. Sax** (Oakland/Richmond), Justin J. Slade, Van N. Selby, Jana Svetlichnaya, Ankeet S. Bhatt, and Edward J. McNulty (Cardiology, San Francisco), Amir W. Axelrod (Cardiology, Vallejo), Sirtaz Adatya and Keane K. Lee (Cardiology, Santa Clara), Harshith R. Avula (Cardiology, Walnut Creek), and Howard H. Dinh (Cardiology, South Sacramento)

Funding: The Permanente Medical Group Delivery Science Program

KP Study Sites: KP Northern California

Summary: IDENTIFY-WHF is a prospective, virtual, parallel-group, randomized, quality improvement intervention of EHR-based alerts for WHF to improve the adoption of goal-directed medical treatments (GDMTs) within KPNC. Approximately 1,000 participants will be identified at KP San Francisco and Santa Clara Medical Centers during an index hospitalization or ED visit for WHF and randomized 1:1 to the intervention or usual care, stratified by service area and left ventricular ejection fraction (LVEF) category. Best practice alerts will be sent to the treating outpatient provider(s) and include (1) the most recent LVEF, vital signs, and laboratory values, (2) current GDMT, and (3) eligible GDMT. Eligible GDMT will be based on regional standards and national HF guidelines and will include the Class (Strength) of and Level (Quality) of Evidence. The primary outcome is the proportion of adults experiencing WHF with an increase in the number of prescribed GDMT classes at 30 days post-discharge from the hospital or ED.

Status: We are collecting data.

44. Transgluteal sciatic nerve block for treatment of sciatica in ED patients

Principal investigator: **Drew Silver** (San Diego)

Co-investigators: Gabe Rose, Dasia Esener, Eric Abrams, and Kate Anderson (San Diego)

Site: KP San Diego

Summary: Our goal is to perform a case series of patients undergoing transgluteal sciatic nerve block under ultrasound guidance. In this project, rather than using traditional anesthetic agents, we will target the fascial plane with D5W to perform hydrodissection. Patients will be followed up immediately after the procedure in intervals of 30 min up to 2 hours and subsequently at 24 and 72 hr to assess effect.

Status: Recently launched

45. ACTIV-2/A5401. Adaptive Platform Treatment Trial for Outpatients with COVID-19 (Adapt Out COVID). A multicenter trial of the AIDS Clinical Trials Group (ACTG)

Principal Investigator: David Smith (UC San Diego)

Co-Investigators: **Adam Schwartz** (site lead for KP San Diego), with the help of Paul Dohrenwend, David Neison, Jonathan Kei, Brent Lorenzen, Jeff Lapoint, J. Matt Edwards, Jenny Chua-Tuan, Matthew Silver, Cliff Swap, and Don Mebust

Funding: National Institute of Allergy and Infectious Diseases, Eli Lilly and Company

KP Study Site: San Diego

Summary: Adapt Out COVID will evaluate the safety and efficacy of investigational agents for the treatment of symptomatic non-hospitalized adults with COVID-19. It begins with a phase II evaluation, followed by a transition into a larger phase III evaluation for promising agents. The trial is a randomized, blinded, controlled adaptive platform that allows agents to be added and dropped during the course of the study for efficient testing of new agents against placebo within the same trial infrastructure. The primary outcome measures in the phase II evaluation will be duration of symptoms, loss of detection of SARS-CoV-2 RNA by nasopharyngeal (NP) swab, and safety. The phase III evaluation is a continuation of the phase II trial for agents that meet study-defined criteria for further evaluation and for which sufficient investigational agent is available. The fully powered phase III trial will evaluate the efficacy of each selected investigational agent compared to placebo to prevent hospitalization and death in non-hospitalized adults with COVID-19. <https://clinicaltrials.gov/ct2/show/NCT04518410>

Status: Enrollment currently on hold. Revision of inclusion criteria being considered.

46. A randomized, double-blind, placebo-controlled, phase 2 study to evaluate the efficacy and safety of LY3819253 and LY3832479 in participants with mild-to-moderate COVID-19 illness (BLAZE-1)

Principal Investigator: Daniel M. Skovronsky (Eli Lilly)

Co-Investigators: **Adam Schwartz** (site lead at KP San Diego), with help from Brent Lorenzen, Clifford J Swap, David Neison, Donald P Mebust, Jeff Lapoint, Jenny Chua-Tuan, J Matthew Edwards, Jonathan Kei, Matthew A Silver, and Paul B Dohrenwend

Funding: Eli Lilly and Co.

KP Study Sites: Zion Medical Center, San Diego Medical Center

Summary: This is a phase II randomized, double-blind, placebo-controlled trial for patients with mild to moderate COVID-19. Objectives include, but are not limited to, viral clearance, hospitalization, ED visit and death. The therapeutic is a potent, neutralizing IgG1 monoclonal antibody (mAb) directed against the spike protein of SARS-CoV-2. It is designed to block viral attachment and entry into human cells, thus neutralizing the virus, potentially preventing and treating COVID-19. Treatment arms initially include varying doses of LY3819253. A further amendment included an additional arm with two mAbs. Interim analyses have demonstrated safety and a relative risk reduction for hospitalization/ED visit of 72%.

Status: Results from the interim analysis have been published. Chen P, et al; BLAZE-1 Investigators. SARS-CoV-2 Neutralizing Antibody LY-CoV555 in Outpatients with Covid-19. *N Engl J Med.* 2021; 384:229-237.

47. Utility of fluid resuscitation in low-risk patients with severe sepsis

Principal Investigator: **Todd A. Seigel** (Oakland)

Co-Investigators: Vincent Liu (DOR and Critical Care, Santa Clara) and John Morehouse (Oakland/Richmond)

Funding: KP Northern California Community Health Program

KP Study Sites: KPNC

Summary: This retrospective cohort study from 1/1/2012-12/31/18 will determine whether current protocolled interventions to treat severe sepsis (defined as clinical syndrome of suspected infection and serum lactate values between 2-3.99 mmol/L) in ED can be further refined based upon patients' presenting severity of illness. We hypothesize that patients with severe sepsis and lowest severity of illness (projected mortality less than 3%) will not have additional benefit from ED IV fluid administration. We hope to characterize more refined treatment algorithms for patients with severe sepsis, and specifically aim to demonstrate that current approaches to this heterogenous patient cohort may be resulting in overtreatment.

Status: Data collection is complete. The manuscript will soon be submitted.

48. *Getting busy*: Effect of patient volume on resident point-of-care ultrasound.

Principal Investigator: **William Swanson** (San Diego)

Co-Investigators: Dasia Esener, Gabriel Rose, Eric Abrams, Olga Diaz, and Peter Sacci (all San Diego)

Study Site: San Diego

Summary: The objective of this study was to investigate the impact of patient volume in the emergency department (ED) on the amount of point-of-care ultrasound (POCUS) performed by emergency medicine residents. This study was a retrospective chart review that included 24 emergency medicine residents in the year 2018. Data analysis is finished, and the manuscript is in process for submission. We found that the percentage of POCUS performed by EM residents decreased when the number of patients the residents saw increased on a given shift.

Status: A poster was presented at the March 2022 American Institute of Ultrasound in Medicine annual assembly. Manuscript has been submitted for peer-review.

49. Diagnosing acute pediatric appendicitis: Factors associated with inconclusive ultrasound studies

Principal Investigator: **Lauren Van Woy** (San Diego)

Co-Investigators: Dasia Esener, Olga Diaz, and Peter Sacci (all San Diego)

Study Site: San Diego

Summary: Due to the risk of radiation associated with CT, the American College of Emergency Physicians recommends considering ultrasound as the initial radiologic modality in diagnosing pediatric appendicitis. When ultrasound is inconclusive, children may be observed or further testing such as CT may be undertaken. This can incur cost, prolong time to diagnosis, and expose the child to ionizing radiation. The aim of this study is to identify factors in pediatric patients that are associated with inconclusive ultrasound in diagnosing acute appendicitis in pediatrics.

Status: Two abstracts were presented in October at the 2021 Research Forum of the American College of Emergency Physicians. Full manuscript in preparation.

50. Antenatal pulmonary embolism diagnostics (APED): patients, physicians and diagnostic strategies in the COVID era

Principal Investigator: **David R. Vinson** (Roseville/Sacramento)

Co-Investigators: Luke S. Poth (South San Francisco), Nareg Roubinian (Pulmonology and Critical Care, Oakland), Jeffrey D. Sperling (Maternal and Fetal Medicine, Modesto), Madeline J. Somers and Mary E. Reed (DOR), Lara Zedak and Cydney Middleton (UC Davis EM residents), Sara Woldemariam (KP Oakland OB/GYN resident), Ed Qiao (California Northstate medical student), and the KP CREST Network

Imaging Advisory Panel: Ryan Niederkoher (Nuclear medicine, Santa Clara), Sundeep Nayak (Chest radiology, San Leandro), and Thomas Urbania (Chest radiology, Oakland)

Funding: KP Northern California Community Health Program

KP Study Sites: KP Northern California

Summary: The diagnosis of acute pulmonary embolism (PE) is challenging, more so in pregnancy, where reducing radiation exposure is paramount. Safety concerns drive the American Thoracic Society/Society for Thoracic Radiology guidelines (2011) which were adopted by the American College of Obstetrics and Gynecology, American Society of Hematology, and KPNC. Our multispecialty team will utilize the KPNC Perinatal Obstetric Database to identify approximately 1,400 gravid patients undergoing PE diagnostics through the COVID era. Through this proposal: (1) We will characterize this population and their initial care-seeking behavior. (2) We will describe the prevalence of different diagnostic approaches. (3) We will evaluate the association of predictor variables with the recommended approach, including facility-, physician-, and patient-related factors. Results of this large, contemporary community-based study will fill gaps in the literature and inform next steps within KPNC to direct physician education efforts and improve our antenatal PE diagnostics.

Status: We are abstracting data from health records. We recently published a letter in *JAMA*.

51. Comprehensive primary care clinic-based pulmonary embolism management

Principal Investigator: **David R. Vinson** (Roseville/Sacramento)

Co-Investigators: Erik R. Hofmann (South Sacramento), Suresh Rangarajan (Adult Primary Care) and Dustin G. Mark (Oakland), Dayna J. Isaacs and Elizabeth J. Johnson (UC Davis), Karen L. Wallace (Radiology, San Jose), Jie Huang and Mary E. Reed (ROS) with the KP CREST Network

Funding: KP Northern California Community Health Program

KP Study Sites: KPNC

Summary: The initial site of care of patients with newly diagnosed, acute, symptomatic PE is undergoing a transition away from routine hospitalization for select low-risk patients. Patients with mild symptoms frequently present to their primary care clinicians and have their diagnosis established by pulmonary imaging and some of these are managed without referral to the ED or hospital. This retrospective cohort study will describe and analyze the care of PE patients who are diagnosed and managed in the primary care setting over a 7-year study period (2013-2019).

Status: We have published three cases reports (*European Heart Journal Case Reports, Medicine (Baltimore)* and *Perm J*) and two letters (*N Engl J Med* and *Am Family Physician*). We have presented abstracts at the American College of Physicians regional meeting (Oct 2020), their national meeting (2021), and the 2021 American Thoracic Society meeting. The first manuscript was published in *J Gen Intern Med*. A second ms is underway.

52. Ambulance transport to the ED of patients with acute pulmonary embolism

Principal Investigators: **David R. Vinson** (Roseville/Sacramento)

Co-Investigators: Samuel Rouleau (resident, UC Davis), Aidan Campbell (pre-med research intern, NYU), Jie Huang and Mary E. Reed (KP DOR) and the KP CREST Network

Sites: KPNC

Summary: Arrival at U.S. EDs by EMS is a marker of acuity, associated with three times the rate of hospitalization compared with other transports. But ED EMS arrivals are not a homogenous group. EMS is often engaged because of worrisome symptoms, requiring timely care and transport for ED management. This is usually the case with ambulatory patients who go on to receive an ED diagnosis of acute PE. Some patients arriving at the ED by EMS, however, had just completed an outpatient-based diagnostic evaluation with pulmonary imaging at an off-site radiology clinic. The newly discovered PE may prompt the clinician to call 911 for EMS transport, simply because the diagnosis can be high-risk, even if the patient is not clinically unstable. It is unknown how the origin of EMS transport (radiology vs not) may be associated with subsequent ED/hospital management. We hypothesized (1) that ED patients with acute PE who arrived by ambulance were higher risk than their non-EMS counterparts and (2) that patients coming from off-site radiology were a lower acuity group than those who arrive by ambulance from other origins, as measured by the incidence of expedited discharge (<24h) from the hospital. This secondary analysis of a PE database will help us evaluate these hypotheses.

Status: We presented an abstract at the American College of Emergency Physicians Research Forum in October 2022. We are writing the manuscript now as a brief report and hope to submit in the coming months.

53. Surveillance in the management of patients with subsegmental pulmonary embolism

Principal Investigator: Maheswari Balasubramanian (Adult Hospital Medicine, Roseville)

Co-Investigators: Tad Antognini (Adult and Family Medicine, Santa Clara), **David R. Vinson** (Roseville/Sacramento), Samuel Rouleau (UC Davis), Jie Huang, Mary E. Reed and Adina S. Rauchwerger (DOR)

Sites: KPNC

Funding: KP Northern California Community Health Program

Summary: The management of ambulatory patients with isolated subsegmental pulmonary embolism (PE) is undergoing seismic shifts. The benefit of routine anticoagulation in select low-risk patients is uncertain and believed by many not to outweigh the known hemorrhage risks. The 2016 and 2021 CHEST guidelines recommended that patients meeting simple criteria should not be anticoagulated but undergo structured surveillance with compression ultrasonography and close follow-up to monitor for emerging venous thromboembolism. The surveillance criteria, however, have been poorly studied. How prevalent is surveillance in the years following the CHEST guidelines and what elements of surveillance are included? How many patients with subsegmental PE would have met CHEST criteria and modifications thereof? The results of our study will fill major gaps in the literature, help inform the development and implementation of a KPNC clinical care pathway and prepare us to participate in future trial validation studies.

Status: We published a case report in *Perm J* and a letter in *Ann Intern Med*. We presented an abstract to the Society of Academic Emergency Medicine annual meeting in Austin, Texas, in May 2023. Our ms is in press with a general medicine journal for August.

54. Criteria for outpatient management of ED patients with acute PE: A Delphi consensus from EARTH

Principal Investigator: Pierre-Marie Roy (Centre Hospitalier Universitaire, Institut Mitovasc, Université d'Angers, France)

Co-investigators: Emergency Advisory and Research board on Thrombosis and Hemostasis (EARTH), including ED PE researchers from Belgium, Canada, England, France, Italy, Spain, Sweden, and United States. EARTH Steering Committee: Pierre-Marie Roy and Delphine Douillet (France), Andrea Penaloza (Belgium), Federico Germini (Canada), Chris Kabrhel, **David R. Vinson (Roseville/Sacramento)**, **Scott D. Casey (DOR Fellow; Vallejo/Vacaville)**, and William "Bo" Stubblefield (United States)

Summary: Using a Delphi method, we will create a set of criteria to aid in the identification of ED patients with acute PE who may be eligible for outpatient care.

Status: We have identified our multispecialty cohort of experts and are creating our candidate criteria for the Delphi process. We had our first in-person meeting in Montreal in June at the annual meeting of the International Society of Thrombosis and Haemostasis.

55. Home treatment of acute PE: a systematic review and individual patient data meta-analysis

Principal Investigators: Pierre-Marie Roy (Angers University Hospital Center, France) and Frederikus A. Klok (Leiden University Medical Center, Netherlands)

Co-investigators (select): D. Luijten, O Sanchez, MV Huisman, F Couturaud, BA Penalzoza, O Hugli, D Jiménez, S Konstantinides, D Aujesky, R Otero, and **David R. Vinson** (Roseville/Sacramento)

Sites: International

Summary: The aim is to evaluate the safety of home treatment in patients with acute pulmonary embolism (PE), focusing on readmission (unscheduled visit to outpatient clinic, ED or hospitalization), major bleeding, recurrent VTE and all-cause mortality, in the overall population as well as in relevant patient subgroups: patients with active cancer, patients treated with varied anticoagulants, patients with prior venous thrombotic disease, symptomatic versus incidental PE, age categories (18-40, 41-60, 61-80, >80), presence of renal insufficiency (eGFR < 60 ml/min), presence of radiological signs of right ventricular overload, presence of echocardiographic signs of right ventricular dysfunction, abnormal versus normal troponin, abnormal versus normal NTproBNP, presence of chronic cardiovascular disease, presence of chronic pulmonary disease, symptomatic or incidental PE, and men versus women.

Status: We presented an abstract at the International Society of Thrombosis and Haemostasis in Montreal in June. Full analysis is underway.

56. Improving management of ED patients with unexplained syncope: prospective validation of the Canadian Syncope Risk Score

Principal Investigators: **David R. Vinson** (Roseville/Sacramento) and Mary E. Reed (KP Division of Research)

Co-Investigators: **Dana R. Sax** (Oakland), Howard Dinh and **Erik R. Hofmann** (South Sacramento), Jie Huang (Division of Research), Annie Ma and Tracy Nguyen (UC Davis EM residency), Leyla Farshidpour (UCSF Fresno) and the KP CREST Network

Sites: Oakland, Richmond, Roseville, Sacramento, and South Sacramento

Funding: The Permanente Medical Group Delivery Science and Physician Researcher Programs

Summary: The Canadian Syncope Risk Score looks promising as an accurate means of risk stratifying emergency department patients with acute unexplained syncope. But it has not been validated in a diverse U.S. population. This prospective study will combine the Risk Score with multispecialty treatment recommendations in a web-based clinical decision support system and

test its discrimination and calibration among 5 KPNC emergency departments. If the tool performs well, we will expand its use across the region.

Status: We implemented our electronic decision-support tool in 5 EDs in early 2022. We are continuing to enroll patients and collect data.

57. Clinical decision support to Optimize Care of patients with Atrial Fibrillation or flutter in the Emergency department: protocol of a stepped-wedge cluster randomized pragmatic trial (O'CAFÉ trial)

Principal Investigators: **David R. Vinson** (Roseville/Sacramento) and Mary E. Reed (Division of Research)

Co-Investigators: E. Margaret Warton, Mary E. Reed, Adina S. Rauchwerger, Jennifer Zhang (DOR), the incredible Site Leads of the KP CREST Network EDs, along with Alan Go (DOR) and Matthew D. Solomon (Cardiology, Oakland). Thanks also to our students for their work on a review of AF guidelines: Disha Bahl (St. George's University School of Medicine), and Leyla Farshidpour (UC Davis School of Medicine), and Jennifer Zhang (DOR research assistant)

Funding: TPMG DARE's Delivery Science Grants Program

KP Study Sites: KPNC

Summary: Atrial fibrillation/atrial flutter (AF) is a clinical and socioeconomic burden to the U.S. healthcare system and will only worsen with the accelerated aging of the KP membership and U.S. population. The greatest driver of AF costs is hospitalization, the vast majority of which occurs through the emergency department (ED). Our prior research has identified suboptimal rate, rhythm, and stroke prevention treatments across Kaiser Permanente Northern California EDs, along with twofold inter-facility variation in hospitalization rates of ED AF patients (30%-60%). This study will evaluate the impact of a web-based clinical decision support tool to improve the ED management of patients with primary AF.

Status: The clinical decision support tool began a staggered roll-out across CREST EDs on October 1, 2021. Enrollment ends April 30, 2023. Our methods paper was recently published in *Trials*. We also are working on a review of AF guidelines to see how they speak to the issues that face emergency physicians in the management of AF. We presented an abstract to the Society of Academic Emergency Medicine annual meeting in Austin, Texas, in May 2023.

58. Understanding Cold Drink Heart: A telephone-based patient survey

Principal Investigators: **David R. Vinson** (Roseville/Sacramento) and Mary E. Reed (DOR)

Co-Investigators: Judy Shan, Jennifer Zhang, Daniel DiLean, and Adina S. Rauchwerger (DOR, CREST)

Funding: TPMG DARE's Physician Researcher Program

KP Study Sites: Sacramento, Roseville, and South Sacramento

Summary: One means of atrial fibrillation (AF) recurrence prevention is the identification and avoidance of factors known to trigger AF. Among these is the rapid ingestion of icy cold drinks and food. Though this environmental precipitant is not well described, one recent survey from UCSF suggests this may be present in as many as 10% of patients with AF. Little research, however, has been undertaken on this condition; the literature is comprised exclusively of case reports. It is into this gap of knowledge that our patient survey speaks. Eligible patients will be identified through enrollment in a parent study of ED AF management. We are including patients with the condition who have written me in response to our prior publications.

Status: Patient enrollment is underway. About 80 patients have participated to date. We have published one letter to the editor and are considering another case report.

59. Optimal anticoagulation strategies for patients with newly detected acute atrial fibrillation

Principal Investigators: Bory Kea (OHSU) and **David R. Vinson** (Roseville/Sacramento)

Co-Investigators: E. Margaret Warton and Mary E. Reed (DOR), Ben Sun (Penn), Rochelle Fu (OHSU), Merritt Raitt (Portland VA Medical Center), and Greg YH Lip (University of Birmingham)

Funding: NIH's National Heart, Lung, and Blood Institute (NHLBI)

Study Sites: KP Northern California

Summary: In this retrospective cohort study of patients with newly-detected AF/FL we will describe the incidence, time lag, and predictors of oral anticoagulation (OAC) prescribing after an ED discharge diagnosis of new AF/FL, determine whether validated outpatient risk stratification scores can identify a subgroup of ED patients discharged with new AF/FL who are at high risk for stroke and death, and compare the rates of these events for patients prescribed ED OACs vs patients not prescribed OACs at their index ED visit. These results will improve our understanding of ED OAC initiation and inform parallel research we are doing (above) on the development of clinical decision support tools and guidelines to aid in management of AF/FL patients in our EDs and inpatient settings.

Status: We presented abstracts at the Society for Academic Emergency Medicine annual meeting, and the American Heart Association meeting in 2019. The manuscript is being written. We presented an abstract to the Society of Academic Emergency Medicine annual meeting in Austin, Texas, in May 2023.

60. A qualitative study exploring the experiences of undomiciled adults seeking care in a large urban ED

Principal Investigators: Nichole Zinn, LCSW (Sacramento) and **David R. Vinson** (Roseville/Sacramento)

Co-Investigators: Qais Alemi, PhD, MPH, MBA (Doctoral Advisor, Department of Social Work and Social Ecology, Loma Linda University)

KP Study Sites: KP Sacramento Medical Center

Summary: Senate Bill (SB) 1152, implemented in 2019, requires hospitals to have a written policy and process for patients experiencing homelessness. Homelessness has increased 67% in Sacramento County since 2019 and almost half of patients experiencing homelessness in Sacramento County have one or more chronic health conditions, mental health issues, and substance use disorders, often using the ED as a safety net. There is a dearth of research regarding the impacts of the bill and no research to date about patients' understanding and view of SB 1152. Our patient survey will provide a descriptive account of patients experiencing homelessness who visit a large urban ED; gain a nuanced understanding of this vulnerable population's needs; examine the impact, if any, that SB 1152 has had on undomiciled patients' well-being; and explore how existing social work interventions implemented in the ED could be augmented/adapted to best serve this population's needs. Our results could inform policy makers and guide social work interventions in the ED for this vulnerable population.

Status: We have begun patient interviews and may expand the study to include various providers.

61. Acute emergency care and outcomes for stroke, myocardial infarction, and surgery during the COVID-19 pandemic in KPNC: Implications for care delivery during COVID-19 recovery phase and future surges

Principal Investigators: Robert Chang (South San Francisco, Vascular Surgery), Mai Nguyen-Huynh (DOR and Walnut Creek, Neurology), Matt Solomon (Oakland, Cardiology), **David R. Vinson** (Roseville/Sacramento)

Co-Investigators: Jeff Klingman, Melissa Meighan, Molly Burnett, Alexander Flint, Xian Nan Tang, Alan Go, Edward McNulty, Jeffrey Douaiher, and Giye Choi

Funding: Garfield Memorial Fund

KP Study Sites: KP Northern California

Summary: We have two aims: (1) To assess the decreased trends in acute presentation to KPNC emergency departments (EDs) for chest pain and acute MI, stroke symptoms, and acute surgical emergencies during the early COVID-19 pandemic, and compare the presenting patient characteristics, processes of care, and short and long-term outcomes (i.e., all-cause mortality, condition-specific outcomes) for patients who presented during the early COVID-19 pandemic to those who presented to the ED before the pandemic; and (2) To evaluate the potential consequences of delayed presentations for chest pain/acute MI, stroke symptoms, and acute surgical emergencies on long-term patient outcomes and healthcare system utilization, by examining the downstream, potential long-term consequences of avoided care.

Status: We are undertaking data collection.

62. How fast is fast enough? Assessing door-to-needle times and outcomes of stroke patients receiving acute thrombolysis therapy under the KPNC Stroke EXPRESS program

Principal Investigator: Mai Nguyen-Huynh (DOR and Walnut Creek, Neurology)

Co-Investigators: Xian Nan Tang (Sacramento), Jeff Klingman (Walnut Creek), Janet Alexander (DOR), Alexander Flint (Redwood City), and **David R. Vinson** (Roseville/Sacramento)

Funding: TPMG DARE's Delivery Science Grant Program

KP Study Sites: KPNC

Summary: This cohort study will include consecutive members with acute ischemic stroke treated with intravenous alteplase before (2012-2015) and after (2016-2019) the region-wide implementation of the KPNC Stroke EXPRESS program run by telestroke neurologists. We will evaluate the association between door-to-needle times and 90-day functional outcomes and mortality. We hypothesize that the EXPRESS program significantly improved door-to-needle times and 90-day outcomes. We presented an abstract in February at the International Stroke Conference.

Status: Manuscript composition is underway.

Recent Publications (since Oct 2022)^d

TPMG (Northern CA)

Florin TA, Melnikow J, Gosdin M, Ciuffetelli R, Benedetti J, **Ballard D**, Gausche-Hill M, Kronman MP, Martin LA, Mistry RD, Neuman MI, Palazzi DL, Patel SJ, Self WH, Shah SS, Shah SN, Sirota S, Cruz AT, Ruddy R, Gerber JS, Kuppermann N. Developing Consensus on Clinical Outcomes for Children with Mild Pneumonia: A Delphi Study. *J Pediatric Infect Dis Soc.* 2023;12(2):83-88.

Link: <https://doi.org/10.1093/jpids/piac123>

Ballard D, Vinson D. Medically Clear: Tired? You're probably less empathetic too. *Emerg Med News.* 2022;44(11):20.

Full text: https://journals.lww.com/em-news/Fulltext/2022/11000/Medically_Clear_Tired_You_re_Probably_Less.17.aspx

Casey SD, Zekar L, Somers MJ, Westafer LM, Reed ME, Vinson DR. Bilateral emboli and highest heart rate predict hospitalization of emergency department patients with acute, low-risk pulmonary embolism. *Ann Emerg Med.* 2023 April 5. Epub ahead of print.

Link: [https://www.annemergmed.com/article/S0196-0644\(23\)00123-3/fulltext](https://www.annemergmed.com/article/S0196-0644(23)00123-3/fulltext)

Division of Research Spotlight: [Emergency physicians correctly identify patients with lung blood clots who should be hospitalized](#)

^d A more comprehensive list of publications from the KP CREST Network can be found online: <http://www.kpcrest.net/>

Durant EJ, Engelhart DC, Ma AA, Warton EM, Arasu VA, Bernal RM, Rauchwerger AS, Reed ME, **Vinson DR**. CT Use Reduction In Ostensive Ureteral Stone (CURIOUS). *Am J Emerg Med*. 2023;67:168-175.

Link: <https://www.sciencedirect.com/science/article/pii/S0735675723000943>

Easton-Carr RB, **Durant EJ**, Nguyen AH. Uterine arteriovenous malformation (AVM) - a potentially life-threatening cause of post-partum vaginal bleeding. *Am J Case Rep*. 2022;23:e938559.

Link: <https://doi.org/10.12659/ajcr.938559>

Walia H, Tucker LS, Manickam RN, **Kene MV**, **Sharp AL**, Berdahl CT, Hirschtritt ME. Patient and visit characteristics associated with physical restraint use in the emergency department. *Perm J*. 2023;27(1):94-102

Full text: <https://doi.org/10.7812/tpp/22.089>

Mark DG, Huang J, Sonne DC, Rauchwerger AS, Reed ME; Kaiser Permanente CREST Network Investigators. Mortality following diagnosis of nontraumatic intracerebral hemorrhage within an integrated "hub-and-spoke" neuroscience care model: Is spoke presentation noninferior to hub presentation? *Neurocrit Care*. 2023 Jan 4. Online ahead of print.

Link: <https://doi.org/10.1007/s12028-022-01667-0>

Cornelius AP, Char DM, Doyle C, Noll S, **Reyes V**, Wang J, Mace SE. Disparities in disaster healthcare: A review of past disasters. *Am J Disaster Med*. 2022;17(2):171-184.

Link: <https://doi.org/10.5055/ajdm.2022.0431>

Sax DR, Warton EM, **Mark DG**, **Vinson DR**, **Kene MV**, **Ballard DW**, McGaughey KR, Vitale TJ, Beardsley A, Pines JM, Reed ME, Kaiser Permanente CREST Network. Evaluation of the emergency severity index in US emergency departments for the rate of mistriage. *JAMA Netw Open*. 2023;6(3):e233404.

Link: <https://doi.org/10.1001/jamanetworkopen.2023.3404>

Division of Research Spotlight: [Widely used triage method overestimates severity of a quarter of emergency department patients](#)

Sax DR, Sturmer LR, **Mark DG**, Rana JS, Reed ME. Barriers and opportunities regarding implementation of a machine-learning-based acute heart failure risk stratification tool in the emergency department. *Diagnostics (Basel)*. 2022;12(10):2463.

Link: <https://www.mdpi.com/2075-4418/12/10/2463>

Vinson DR, Rauchwerger AS, **Karadi CA**, Shan J, Zhang JY, Warton EM, **Ballard DW**, **Mark DG**, **Hofmann ER**, **Cotton DM**, **Durant EJ**, **Lin JS**, **Sax DR**, **Poth LS**, **Bouvet SC**, **Gamboa SH**, **Ghiya MS**, **Kene MV**, **Ganapathy A**, **Whiteley PM**, Babakhanian L, Kwok E, Solomon MD, Go AS, Reed ME, & on behalf of the Kaiser Permanente CREST Network. Clinical decision support to Optimize Care of patients with Atrial Fibrillation

or flutter in the Emergency department: protocol of a stepped-wedge cluster randomized pragmatic trial (O'CAFÉ trial). *Trials*. 2023;24(1):246.

Link: <https://rdcu.be/c8TL9>

Vinson DR, Sperling JD, Roubinian NH. Review of pulmonary embolism. *JAMA*. 2023;329(7):593.

Link: <https://doi.org/10.1001/jama.2022.22238>

Vinson D, Ballard D. Medically Clear: Buckle fractures don't need a splint, and, yes, the evidence supports that. *Emerg Med News*. 2023;45(1):4.

Link: https://journals.lww.com/em-news/Fulltext/2023/01000/Medically_Clear_Buckle_Fractures_Don_t_Need_a.5.aspx

Vinson DR, Rangarajan S, **Hofmann ER**. Treatment for patients with acute pulmonary embolism diagnosed in primary care. *Am Fam Physician*. 2022;106(5):online.

Link: <https://www.aafp.org/pubs/afp/issues/2022/1100/letter-acute-pulmonary-embolism.html>

Roubinian NH, **Vinson DR**, Pai AP, Myers LC, Skarbinski J, Lee C, **Mark DG**, Liu VX. Risk of venous thromboembolism in non-respiratory and respiratory presentations of COVID-19 in critically ill patients. *Chest*. 2023 Feb 11 [online ahead of print].

Link: <https://doi.org/10.1016/j.chest.2023.02.008>

Farshidpour LS, **Vinson DR**, **Durant EJ**. Bilateral tubal pregnancies presenting 11 days apart: a case report. *Clin Pract Cases Emerg Med*. 2023;7(1):11-15.

Full text: <https://escholarship.org/uc/item/9qc5s40c>

Roubinian NH, **Vinson DR**, Knudson-Fitzpatrick TW, **Mark DG**, Skarbinski J, Lee C, Liu VX, Pai AP. Risk of posthospital venous thromboembolism in patients with COVID-19 varies by SARS-CoV-2 period and vaccination status. *Blood Adv*. 2023;7(1):141-144.

Full text: <https://doi.org/10.1182/bloodadvances.2022008984>

Am Soc Hematology News: [New Strains, Vaccination Bring Lower Risk of VTE From COVID](#)

Lien IC, **Vinson DR**, Ramalingam ND, Nicole Tran H, Liu TI. A case report of cold drinks and food as a trigger of paroxysmal atrial fibrillation. *Perm J*. 2022;26.22.079.

Full text: <https://doi.org/10.7812/tpp/22.079>

Nguyen THP, Young BR, Alabaster A, **Vinson DR**, **Mark DG**, Van Winkle PJ, **Sharp AL**, Shan J, Rauchwerger AS, Greenhow T, **Ballard DW**. Using AAP guidelines to manage febrile infants without C-reactive protein and procalcitonin. *Pediatrics*. 2023;151(1): e2022058495.

Abstract: <https://doi.org/10.1542/peds.2022-058495>

KP press release: <https://spotlight.kaiserpermanente.org/tests-for-babies-with-fever/>

Kong J, Hardwick A, Jiang SF, Sun K, **Vinson DR**, McGlothlin DP, Goh CH. CTEPH: A Kaiser Permanente Northern California experience. *Thromb Res*. 2023;221:130-136.

Abstract: <https://doi.org/10.1016/j.thromres.2022.09.022>

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Presentations at the American Public Health Association Annual Meeting, October, Boston, MA

Zhang JY, **Kene MV**, Warton EM, Somers MJ, Rauchwerger AS, Reed ME, **Sax DR**. [Patient Characteristics Associated with Telephone and Video Telemedicine Utilization for Adult Patients with ED-Sensitive Conditions in the COVID-19 Pandemic Era.](#)

McLachlan I, McCavitt D, Rant J, Chambers T, Campbell SJ, **Schaulis M**, **Meyer M**, Woody D, Lam M, Wong C. [Offering Patients Supine Vaccination Did Not Decrease the High Syncope Rate at an Urban COVID-19 Mass Vaccination Site](#)

SCPMG (Southern CA)

Weekes AJ, Davison J, Lupez K, Raper JD, Thomas AM, Cox CA, **Esener D**, Boyd JS, Nomura JT, Murphy K, Ockerse PM, Leech S, Johnson J, Abrams E, Kelly C, O'Connell NS. Quality of life one month after acute pulmonary embolism in emergency department patients. *Acad Emerg Med*. 2023 Feb 14 [online ahead of print].

Link: <https://doi.org/10.1111/acem.14692>

Lahham S, Moeller J, Choi H, Fischetti C, Myatt T, Bove N, Saadat S, Mazumder P, Algaze Gonzalez IM, Kurzweil A, Fox JC. Application of Point-of-care Ultrasound for Screening Climbers at High Altitude for Pulmonary B-lines. *West J Emerg Med*. 2023;24(2):359-362.

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Link: <https://doi.org/10.7812/tpp/22.059>

Lewis CC, Jones SMW, Wellman R, **Sharp AL**, Gottlieb LM, Banegas MP, De Marchis E, Steiner JF. Social risks and social needs in a health insurance exchange sample: a longitudinal evaluation of utilization. *BMC Health Serv Res*. 2022;22(1):1430.

Link: <https://doi.org/10.1186/s12913-022-08740-6>

Silver D, Esener D, Rose G. Ultrasound guided transgluteal sciatic nerve hydrodissection for the treatment of acute sciatica in the emergency department. *Am J Emerg Med.* 2023 Feb 28. Online ahead of print.

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Link: <https://doi.org/10.1016/j.ajem.2023.03.044>