

Research and Academics in KP California Emergency Medicine

Quarterly Report: 2021 Q1

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Hot Off the Press^a

TPMG (Northern CA)

Ballard DW. Should you read the notes your doctor writes about you? Open notes are now the law of the land: A physician's perspective. *Psychology Today Blog*. Posted 2021 Apr 4.

Essay: <https://www.psychologytoday.com/us/blog/standing-strong/202104/should-you-read-the-notes-your-doctor-writes-about-you>

Ballard DW. Long-haul COVID: A contested illness is born. *Emerg Med News*. 2021;43(3):1,5.

Full-text: https://journals.lww.com/em-news/Fulltext/2021/03000/Medically_Clear_Long_Haul_COVID_A_Contested.12.aspx

Ballard DW. Should people be able to choose which vaccine they receive? The ethical and practical case for offering the public a choice of vaccines. *Psychology Today Blog*. Posted 2021 Feb 26.

Essay: <https://www.psychologytoday.com/us/blog/standing-strong/202102/should-people-be-able-choose-which-vaccine-they-receive>

^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

Kharbanda AB, Vazquez-Benitez G, **Ballard DW**, **Vinson DR**, Chettipally UK, Dehmer SP, Ekstrom H, Rauchwerger AS, McMichael B, **Cotton DM**, **Kene MV**, Simon LE, Zhu J, Warton EM, O'Connor PJ, Kharbanda EO. Effect of clinical decision support on diagnostic imaging for pediatric appendicitis: A cluster randomized trial. *JAMA Netw Open*. 2021;4(2):e2036344.

Full-text: <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2776046>

Tavender E, **Ballard DW**, et al, Babl FE; Paediatric Research in Emergency Departments International Collaborative (PREDICT). Review article: Developing the Australian and New Zealand Guideline for mild to moderate head injuries in children: An adoption/adaption approach. *Emerg Med Australas*. 2021;33(2):195-201

Article: <https://onlinelibrary.wiley.com/doi/10.1111/1742-6723.13716>

Babl FE, Tavender E, **Ballard DW**, et al, on behalf of Paediatric Research in Emergency Departments International Collaborative (PREDICT). Australian and New Zealand Guideline for mild to moderate head injuries in children. *Emerg Med Australasia*. 2021;33(2):214-231.

Full-text: <https://onlinelibrary.wiley.com/doi/10.1111/1742-6723.13722>

Press Release: <https://medicine.unimelb.edu.au/school-structure/critcare/news-and-events/paediatric-head-injury-guidelines-for-australia-and-new-zealand>

Durant EJ, **Vinson DR**. Imaging in suspected ureteral colic: Creating new decision rules based on multispecialty consensus. *Am J Emerg Med*. 2021 Mar 15 [Epub ahead of print].

Preview: <https://www.sciencedirect.com/science/article/abs/pii/S0735675721002266>

Kene MV, Arasu VA, Mahapatra AK, Huang J, Reed ME. Acute kidney injury after CT in emergency department patients with chronic kidney disease: a propensity score-matched analysis. *West J Emerg Med*. 2021 Apr 2 [Epub ahead of print].

Full-text: <https://escholarship.org/uc/item/4wg1k7kc>

Corre A, Dandekar S, **Lau C**, Ranasinghe L. A case report of pediatric ovarian torsion: The importance of diagnostic laparoscopy. *Clin Pract Cases Emerg Med*. 2021;5(1):109-112.

Full-text: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7872599/>

Mark DG, Huang J, **Kene MV**, **Sax DR**, **Cotton DM**, **Lin JS**, **Bouvet SC**, **Chettipally UK**, **Anderson ML**, **McLachlan ID**, Simon LE, Shan J, Rauchwerger AS, **Vinson DR**, **Ballard DW**, Reed ME. Prospective validation and comparative analysis of coronary risk stratification strategies among emergency department chest pain patients. *J Am Heart Assoc*. 2021;10(7):e020082.

Full-text: <https://www.ahajournals.org/doi/10.1161/JAHA.120.020082>

DOR Spotlight: <https://spotlight.kaiserpermanente.org/emergency-patients-with-chest-pain/>

Mark DG, Hung YY, Salim Z, Tarlton NJ, Torres E, Frazee B. Third-generation cephalosporin-resistance and associated discordant antibiotic treatment in emergency department febrile urinary tract infections. *Ann Emerg Med*. 2021 Mar 27 [Epub ahead of print].

Abstract: [https://www.annemergmed.com/article/S0196-0644\(21\)00031-7/fulltext](https://www.annemergmed.com/article/S0196-0644(21)00031-7/fulltext)

Roubinian NH, Dusendang JR, **Mark DG**, **Vinson DR**, Liu VX, Schmittiel JA, Pai AP. Incidence of 30-day venous thromboembolism in adults tested for SARS-CoV-2 infection in an integrated health care system. *JAMA Intern Med*. 2021 Apr 5 [Epub ahead of print].

Full-text: <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2778371>

Press Release: [Blood clot risk low in non-hospitalized COVID-19 patients](#)

Zwillenberg M, Tang E, **Quaas J**. Neuraminidase inhibitors for treatment of influenza. *Acad Emerg Med*. 2021 Feb 26 [Online ahead of print].

Link: <https://onlinelibrary.wiley.com/doi/10.1111/acem.14241>

Vinson DR, **Ballard DW**, **Mark DG**. Overcoming barriers to outpatient management of emergency department patients with acute pulmonary embolism. *Acad Emerg Med*. 2021;28(3):377-378.

Full-text: <https://doi.org/10.1111/acem.14210>

Walker G. Calculated decisions: Sgarbossa criteria for myocardial infarction in left bundle branch block. *Emerg Med Pract*. 2021;23(Suppl 1):CD1.

Walker G. Emergentology: Every system is perfectly designed to get the results it gets. *Emerg Med News*. 2021;43(1):1,35.

Essay: https://journals.lww.com/em-news/Fulltext/2021/01000/Emergentology_Every_System_is_Perfectly_Designed.2.aspx

Walker G. Emergentology: A letter to my future COVID-19 self. *Emerg Med News*. 2021;43(2):24.

Essay: https://journals.lww.com/em-news/Fulltext/2021/02000/Emergentology_A_Letter_to_My_Future_COVID_19_Self.18.aspx

Walker G. Emergentology: EM is the same (lots of emergencies) but different (no COVID-19) in New Zealand. *Emerg Med News*. 2021;43(3):14,15

Essay: https://journals.lww.com/em-news/Fulltext/2021/03000/Emergentology_EM_is_the_Same_Lots_of.19.aspx

SCPMG (Southern CA)

Correa C, **Onishi S**, **Abrams E**. Testicular torsion in monorchism diagnosed with point-of-care ultrasound: A case report. *Clin Pract Cases Emerg Med*. 2021;5(1):82-84.

Full-text: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7872624/>

Kawatkar AA, Sun BC, **Sharp AL**. Early noninvasive cardiac testing in emergency department patients-Reply. *JAMA Intern Med*. 2021 Mar 8 [Epub ahead of print].

Full-text: <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2777335>

Wassie M, Lee MS, Sun BC, Wu YL, Baecker AS, Redberg RF, Ferencik M, Shen E, Musigdilok V, **Sharp AL**. Single vs serial measurements of cardiac troponin level in the evaluation of patients in the emergency department with suspected acute myocardial infarction. *JAMA Netw Open*. 2021;4(2):e2037930.

Full-text: <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2776718>

Natsui S, Sun BC, Shen E, Redberg RF, Ferencik M, Lee MS, Musigdilok V, Wu YL, Zheng C, Kawatkar AA, **Sharp AL**. Higher emergency physician chest pain hospitalization rates do not lead to improved patient outcomes. *Circ Cardiovasc Qual Outcomes*. 2021;14(1):e006297.

Abstract: <https://pubmed.ncbi.nlm.nih.gov/33430609/>

Jones SMW, Banegas MP, Steiner JF, De Marchis EH, Gottlieb LM, **Sharp AL**. Association of financial worry and material financial risk with short-term ambulatory healthcare utilization in a sample of subsidized exchange patients. *J Gen Intern Med*. 2021 Jan 19. Online ahead of print.

Abstract: <https://pubmed.ncbi.nlm.nih.gov/33469762/>

In Preparation^b

1. Identifying barriers and facilitators to the outpatient management of low-risk pulmonary embolism from the emergency department

Principal Investigator: Lauren Westafer (University of Massachusetts Medical School)

Co-Investigators: **David R. Vinson** (Roseville/Sacramento), Peter Lindenauer and Mihaela Stefan (University of Massachusetts Medical School)

Summary: This is a prospective, qualitative study using semi-structured interviews of emergency physicians in varied practice settings with two aims: (1) To identify barriers and facilitators to the decision to discharge low-risk patients with acute PE from the ED; and (2) To develop and refine a set of implementation strategies for improved uptake of outpatient management of low-risk PE based on the barriers and facilitators identified in Aim 1.

^b Funding in place, if applicable, but approval is pending by our respective Institutional Review Boards.

Just Launched

1. Right ventricular dilatation on computed tomography pulmonary angiography in adults with acute pulmonary embolism

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

Co-Investigators: Bahman Sayyar Roudsari (Radiology, Modesto), **David R. Vinson** (Roseville/Sacramento), Darcy Engelhart and Sarah Fetterolf (CA Northstate Univ Coll of Medicine), and Judy Shan (DOR, CREST)

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

KP Study Sites: KPNC

Summary: The retrospective cohort study will first evaluate the accuracy of pre-med and medical students in identifying right ventricular strain on CT imaging. With imaging results in hand, we will then determine the marginal prognostic value of CT-defined strain on short-term outcomes of ED patients with acute PE discharged home within 24 hours of ED registration.

2. 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 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.

3. Reducing variation in hospitalization and processes of care in ED patients with atrial fibrillation: a stepped wedge cluster randomized trial

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

Co-Investigators: Alan Go (DOR), Matthew D. Solomon (Cardiology, Oakland), Site Leads of the KP CREST Network across the region

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.

4. The outpatient management of emergency department patients with acute pulmonary embolism or deep vein thrombosis: recommendations of a multidisciplinary expert panel

Principal Investigator: Chris Kabrhel (Mass General)

Co-Investigators: Rachel P. Rosovsky (Mass General), Stephen Wolf (Denver Health), Alice M. Mitchell (Indiana University), AnnaMarie Chang (Jefferson University), Jackeline Hernandez Nino (Indiana University), and **David R. Vinson** (Roseville/Sacramento)

Funding: American College of Emergency Physicians

Summary: We were tasked with writing recommendations for the outpatient management of emergency department patients with acute pulmonary embolism or deep vein thrombosis. We are creating a smart phone app to accompany the report.

Ongoing Research Projects^c

1. How effective are code leaders at determining high-quality cardiopulmonary resuscitation?

Principal Investigator: **Steve A. Aguilar** (San Diego)

Study Site: San Diego

Summary: This is a prospective study where participants will be shown two separate randomly selected 1-minute videos from a cohort of four. Two of the videos will show examples of high-quality chest compressions while one will display a rate superseding current guidelines and the final will show poor chest recoil with a compressor partially leaning on the chest during

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

compressions. We hypothesize that participants will generally be poor assessors of high-quality chest compressions and hope that findings will generate interest in the importance of high-quality chest compressions during codes.

Status: Data collection complete. Manuscript written. Preparing for submission.

2. Does ACLS instruction utilizing high-fidelity simulation and detailed video debriefing improve performance during critical scenarios?

Principal Investigator: **Steve A. Aguilar** (San Diego)

Co-Investigators: Mark Meyer, Charles Chiang, So Onishi, and Mark Lettinga (all San Diego)

Study Site: San Diego

Summary: This is a non-randomized, pre/post study to determine if a new method of teaching ACLS improves performance during critical scenarios. Participants in an ACLS course are being taught using new AHA-approved simulation curriculum. Performance at baseline and post-debriefing are measured using specific tools to evaluate performance in a cardiac arrest scenario.

Status: The data are collected. Analysis is underway.

3. Infant Fever STEWARD Project (STandardizing Emergency Work-up Around Risk Data)

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

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

Funding: Garfield Memorial Fund

KP Study Sites: KPNC and KPSC

Summary: **In Phase 1**, we will define 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. **In Phase 2**, we will deploy this incidence data in a structured electronic clinical decision support (CDS) module that promotes American Academy of Pediatrics guidelines and prospectively collects data. We will collect 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 will emphasize utilization outcomes.

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

Status: Data collection is underway. The CDS module is being piloted in Roseville, Sacramento, and San Rafael EDs.

4. Sustainability of electronic clinical decision support system effects: an evaluation of two use cases

Principal Investigator: **Dustin W. Ballard** (San Rafael)

Co-Investigators: David R. Vinson (Roseville/Sacramento), Mary E. Reed, DrPH (DOR), and the KP CREST Network

Funding: KP Northern California Community Benefit Program

KP Study Sites: KP Northern California

Summary: Evidence supporting the effectiveness of electronic clinical decision support systems (CDSSs) is accumulating across condition-specific indications but is lacking in regard to the sustainability of CDSS-impacted practice change. We will assess the sustainability of CDSS-enabled practice change across two distinct ED use cases: 1) site-of-care treatment decisions for patients with acute pulmonary embolism (PE) and 2) imaging guidance for children with blunt head trauma. These are two distinct CDSS interventions encompassing different intervention time periods (2012-2014 vs. 2014-2015), patient populations (adult vs pediatrics), intervention sites (7 vs. 10), and interfaces (Epic flowsheet vs. RISTRA web services).

Status: Data collection for the pediatric arm is complete and we have presented an abstract at the 2020 Pediatric Academic Societies meeting and the American College of Emergency Physicians Research Forum. A manuscript is undergoing peer-review. Data collection for the PE arm is beginning.

5. Understanding the factors affecting hospital performance in out-of-hospital cardiac arrest: A mixed-methods study

Principal Investigator: Bryn Mumma (UC Davis)

Co-Investigators: **Sean Bouvet** (Walnut Creek) and the KP CREST Network

Funding: NHLBI at the NIH

KP Study Sites: The 7 PCI Facilities in KP Northern California

Summary: Out-of-hospital cardiac arrest (OHCA) is the most common cause of death from cardiac disease. Among patients who are resuscitated and survive to hospital admission, survival to hospital discharge ranges from 14% to 42% and varies significantly by region and hospital, indicating that hospital factors play a critical role. To improve outcomes, the American Heart Association recommends regionalized care at cardiac resuscitation centers that are closely aligned with STEMI centers. Our preliminary data from the 2011 California Office of Statewide Health Planning and Development (OSHPD) database show that treatment at a STEMI center is associated with both survival and good neurologic recovery at hospital discharge. We also found that rates of

good neurologic recovery ranged from 39% to 67% ($p < 0.0001$) after adjusting for patient and hospital factors. The reasons for this variability are unknown. The goal of this proposal is to identify elements of clinical care and organizational culture for patients resuscitated from OHCA that are associated with good neurologic recovery.

Status: The study's first paper (independent of KP) was published in *Resuscitation*: <https://www.ncbi.nlm.nih.gov/pubmed/30590071> KPNC is participating in the physician survey element of the project, the data collection of which is now complete.

6. Characteristics of COVID-19 patients evaluated in the ED

Principal Investigators: **Dale M. Cotton** (South Sacramento) and Mary E. Reed (DOR)

Co-Investigators: Liyan Liu (DOR), Mamata V. Kene (San Leandro/Fremont), Dustin W. Ballard (San Rafael), Dustin G. Mark and Dana R. Sax (Oakland/Richmond), Erik R. Hofmann (South Sacramento), David R. Vinson (Roseville/Sacramento), Meena Ghiya (South San Francisco), Edward J. Durant (Manteca/Modesto), Sean C. Bouvet (Walnut Creek/Deer Valley), James S. Lin (Santa Clara), Ian D. McLachlan (San Francisco), Scott D. Casey (EM resident, UC Davis), with the CREST Network

Funding: TPMG's Rapid Analytics Unit

KP Study Sites: KPNC

Summary: This retrospective cohort study will describe the characteristics and management of a consecutive series of ED patients across the region who tested positive for SARS-CoV-2 in the first weeks of recognized disease in California. The results of this study will contribute to a better understanding of this patient population at a critical juncture of their care.

Status: We are completing the manuscript and will submit it soon.

7. Cannabinoid Hyperemesis Syndrome in the ED: characteristics and determinants of length of stay

Principal Investigator: **Dale M. Cotton** (South Sacramento)

Co-Investigators: Caleb D. Sunde, Erik Hofmann, Steven R. Offerman and Carissa Shenko (South Sacramento), David R. Vinson (Roseville/Sacramento), E. Margaret Warton, Mary E. Reed, and Cynthia I. Campbell (DOR), and the KP CREST Network

Funding: KPNC Community Benefit Program

KP Study Sites: KPNC

Summary: This is a retrospective observational study of patients explicitly identified by diagnosis as having Cannabinoid Hyperemesis Syndrome (CHS) during an Emergency Department (ED) encounter in KPNC. We will describe patient demographics, cannabis use, treatments received,

resource utilization, and length of stay (LOS) for ED visits given a diagnosis of CHS in 2016-2019. We will examine which factors, including treatment medications, influence ED LOS. Since a minority of CHS patients are explicitly coded as CHS during their encounter, we will also develop case-ascertainment strategies to find CHS patients who do not carry an explicit diagnosis.

Status: We are collecting data.

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

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

Co-Investigators: Dasia Esener, Gabriel Rose, 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: The data are collected. Analysis is underway.

9. Imaging in suspected renal colic: retrospective validation of clinical decision rules to predict uncomplicated 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), and David R. Vinson (Roseville/Sacramento) of the KP CREST Network

Funding: KPNC Community Benefit 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 (CDRs) to predict uncomplicated ureteral stone without the use of CT, but none have been well validated or widely adopted into clinical practice. We seek to remedy this deficit by creating simple CDRs based on recently-published consensus guidelines and to evaluate their performance in a large community-based population using a retrospective cohort design. Our research question is: among non-elderly adults who present to a KPNC ED and undergo CT for suspected ureteral stone, how well does the retrospective application of a new guideline-based clinical decision rule for CT

imaging predict uncomplicated ureteral stone and patient safety outcomes compared with unstructured routine practice? The results will inform the development of a clinical pathway.

Status: We have published our method paper in *Am J Emerg Med* and have begun data collection on the larger study.

10. Incorporation of bedside point of care echocardiogram findings to the Pulmonary Embolism Severity Index (PESI) score

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

Funding: AHRQ Grant

Study Sites: San Diego, Carolinas Medical Center

Summary: A prospective observational study examining the incidence of death or clinical deterioration within five days of acute PE diagnosis and within 30 days of diagnosis. Some evidence suggests that 1/3 of patients with low PESI scores have right ventricular (RV) dysfunction. The goal of this study is to incorporate bedside echo findings of RV dysfunction to the PESI score and follow short-term outcomes.

Status: Enrollment has completed. Data analysis is now underway. Three abstracts have been presented thus far.

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

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: The study is complete and the manuscript has been submitted for publication.

12. The effect of CPR on direct and video laryngoscopy

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

Co-Investigator: Don Mebust (San Diego)

KP Study Sites: KP Southern California

Summary: With more emphasis on continuous CPR per AHA guidelines, this study aims to assess the effect of CPR on direct and video laryngoscopy. Resident and attending physicians will be evaluated (timing, success rates) in the setting of a mannequin model.

Status: The manuscript is written and will soon be submitted.

13. Evaluation of the chief complaint of weakness in the emergency department

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

Co-Investigators: Don Mebust (San Diego), Xinwei Liu (San Diego)

Study Site: KP San Diego

Summary: A chart review study examining the discharge diagnosis, length of stay and ED disposition on all patients that present to an emergency department with CC of "weakness" and how this compares to the rest of the ED patients.

Status: Data collection is complete. Manuscript is being written.

14. 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, 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: KPNC

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: Collecting data

15. 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. Maciey (EM resident, Stanford); Erik R. Hofmann (South Sacramento), Meena Ghiya (South San Francisco), Edward J. Durant (Manteca/Modesto), Sean C. Bouvet (Walnut Creek/Deer Valley)

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: Data collection is complete. The manuscript is being written.

16. Impact of Opioid Safety Initiative Education on ED opioid prescribing

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

Co-investigator: Sunil Bhopale (Redwood City), Mary E. Reed (DOR)

Funding: TPMG's Delivery Science and Applied Research (DARE) Rapid Analytics Unit

Study Sites: KP Northern California

Summary: TPMG implemented an Opioid Safety Initiative (OSI) to steward ED opioid use in 2016. The initiative's intervention was education and ongoing monitoring and feedback via opioid safety champions. The impact of this initiative on long-term outcomes with respect to sustained changes in opioid prescribing has not been fully analyzed. This work will assess the impact of the OSI on opioid prescribing rates, among all ED patients, as well as among vulnerable populations.

Status: Data collection is underway.

17. Utilization of CT pulmonary angiograms for pulmonary embolism 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 Benefit 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. We hope to submit the manuscript soon.

18. The development of a novel virtual online emergency medicine residency curriculum

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

Co-Investigator: Jessica Andrusaitis

Funding: None

Study Site: KP San Diego

Summary: This is a descriptive study on the development of a novel virtual online emergency medicine residency didactic curriculum. Surveys will be utilized to obtain feedback on participation and methods to improve this medium. Various platforms will be tested with the objective of increasing engagement and interactive learning, and then evaluated utilizing survey data/feedback.

Status: Data collection is ongoing.

19. The approach to pediatric patients with suspected sepsis: a qualitative study

Principal Investigator: Sage Meyers, Children's Hospital of Philadelphia (CHOP)

Co-investigators: **James S. Lin** (Santa Clara), John Morehouse and Jenna Timm (Oakland/Richmond), and the KP CREST Network

Study Sites: Santa Clara, Oakland, Richmond

Summary: We are participating in a multicenter qualitative study to evaluate the perceptions of clinicians (nurses, midlevel providers, physicians) and hospital leaders (quality, patient safety, hospital administration) around the care of pediatric ED patients with suspected sepsis. Interviews will be conducted with participants to characterize assessment of facilitators and barriers to appropriate care. This information will be used to generate a testable hypothesis for potential implementation techniques to improve compliance with sepsis care guidelines.

Status: Interviews are complete. Analysis is underway.

20. Changes in ED patient volumes and acuity associated with the COVID-19 pandemic

Principal Investigator: **Brent Lorenzen** (San Diego)

Co-Investigator Adam Schwartz (San Diego)

Funding: none

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

Summary: Retrospective data analysis of patient volumes, admission rates, acuity as measured by ESI score, and EMS arrivals. Compared 28-day period following the California state “stay at home” order to a control period, the comparable 28-day period from 2019. Compared to the year prior, daily patient volumes decreased by 42% and the proportion of ED patients admitted to the hospital increased from 16.6% to 21.6%.

Status: Accepted for publication in *The Permanente Journal*

21. In-hospital mortality among patients with non-traumatic intracranial hemorrhage: In a hub-and-spoke model of neuroscience care, are outcomes non-inferior following presentation to a spoke versus a hub medical center?

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

Co-Investigators: Chris Sonne (Radiology, Oakland), Mary E. Reed and E. Margaret Warton (DOR), and David R. Vinson (Roseville/Sacramento), of the KP CREST Network

Funding: KPNC Community Benefit Program

KP Study Sites: KPNC

Summary: KPNC provides neuroscience care using a hub-and-spoke model, where several hub hospitals serve as referral centers of neuroscience excellence, inclusive of dedicated neuroscience intensive care units staffed by board-certified neurointensivists. Within KPNC most patients with

non-traumatic ICH are cared for in hospitals lacking neuroscience units, relying on remote neuroscience consultation and reserving transfer for patients likely to require neurosurgical interventions, in part given the limited census capacities of the neuroscience centers. The comparative efficacy of this care model (against default care of non-traumatic ICH within neuroscience centers) is unknown. To help address the knowledge gap, we propose to compare mortality rates between patients with non-traumatic ICH presenting KPNC medical centers without neuroscience units (spokes) versus those with neuroscience units (hubs). To adjust for case mix we will use several strategies including adjustment for predicted mortality using hierarchical multivariable regression analyses and propensity score adjustment for hub presentation. We hypothesize that observed mortality will be similar between patients with non-traumatic ICH who present to neuroscience hub medical centers compared with non-neuroscience spoke medical centers within an integrated care delivery system.

Status: Just beginning.

22. Dissemination and implementation of a shared decision-making strategy in ED patients with possible acute coronary syndrome: the patient-centered chest pain pathway

Principal Investigators: Erik Hess (Univ of Alabama, Birmingham; Mayo Clinic) and **Dustin G. Mark** (Oakland/Richmond)

Co-Investigators: Dustin W. Ballard (San Rafael), David R. Vinson (Roseville/Sacramento), Adina S. Rauchwerger (DOR), and the KP CREST Network

Funding: Patient-Centered Outcomes Research Institute (PCORI)

KP Study Sites: Oakland, Richmond, and San Rafael

Summary: This project will engage patients and key stakeholders in refining and embedding the Chest Pain Choice decision aid in routine emergency care. We will identify key barriers and facilitators to broad uptake of Chest Pain Choice that will result in a bundled pathway-driven strategy ready for implementation in 6 U.S. EDs representing 3 large integrated systems. The project will assess the extent to which the decision aid reaches all eligible patients, safely improves the patient experience of care (increase patient knowledge, increase patient satisfaction, decrease decisional conflict), and affects 30-day healthcare utilization.

Status: The shared decision-making tool has been implemented and we are evaluating factors associated with its uptake in clinical care. Data collection has recently completed. Analysis is nearly complete. The manuscript will soon be submitted for peer-review.

23. 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 is leveraging 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. The period of implementation of our electronic clinical decision support tool across 13 CREST EDs completed at the end of 2019.

Status: Three studies have been published: Performance of coronary risk scores in patients with CP in the ED (*JACC*), 60-day major adverse cardiac event rates in ED CP patients with non-low modified HEART risk scores (*Am J Emerg Med*), and The performance of a retrospective method to determine risk score classification for ED patients with possible ACS (*Acad Emerg Med*). The validation manuscript was just published in the *J Am Heart Assoc*. The impact paper was recently submitted.

24. The management of stable monomorphic ventricular tachycardia in the community ED setting

Principal Investigator: **Ian D. McLachlan** (San Francisco)

Co-Investigators: James S. Lin and Taylor Liu (Santa Clara), Sean C. Bouvet (Walnut Creek/Antioch), David R. Vinson (Roseville/Sacramento), Mary E. Reed (DOR), and the KP CREST Network

Funding: KP Northern California Community Benefit Program

Study Sites: KP Northern California

Summary: Monomorphic ventricular tachycardia (VT) is most often a precursor to life-threatening ventricular fibrillation and cardiac arrest. A small minority of patients with VT, however, present to the ED alert and oriented, with normal blood pressures. "Stable VT" may be amendable to pharmacological treatment, but because it's uncommon, few studies have compared treatments. This retrospective cohort study will include ED patients who were treated for stable monomorphic VT in KP Northern California. We will describe patient selection, treatment variation, VT termination rates, and major side effects.

Status: We presented an abstract of an interim analysis at the Society of Academic Emergency Medicine annual meeting, May 2019, and presented the complete dataset at the American College of Emergency Physicians in October 2019. The manuscript is under construction.

25. 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.

26. ED transvaginal ultrasound for accuracy and effects on management

Principal Investigator: **Peter Sacchi** (San Diego)

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

Study Site: San Diego

Summary: Pelvic pain in non-OB (GYN population) is a common ED presentation. Transvaginal ultrasound is a common imaging modality utilized in the ED. But formal compressive transvaginal US studies are time and resource consuming. This study is to evaluate whether bedside point-of-care ultrasound performed by ultrasound trained ED providers is non-inferior when evaluating for significant GYN pathology compared to standard imaging modalities - namely formal comprehensive ultrasound performed in the department of radiology and computed tomography of the abdomen and pelvis. Follow up at 30 days for significant events would be the primary endpoint.

Status: The data are collected. Analysis is underway.

27. RISTRIDGE: 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 Board

KP Study Sites: KPNC

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: Data collection continues.

28. Understanding variation in reporting for pediatric abdominal ultrasound studies, rates of "equivocal" studies, and association between ultrasound findings and the pARC score

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

Co-Investigators: Maura Olcese and Andrew Saxon (Oakland pediatric residents), Dustin W Ballard (San Rafael), Edward J. Durant (San Leandro/Modesto), and the KP CREST Network

Funding: Community Benefit Program, KP Oakland Pediatric Residency Program, and NIH (via the CREST Pediatric Abdominal Pain study)

KP Study Sites: CREST medical centers

Summary: There is significant variation in reporting for pediatric abdominal ultrasound studies despite studies suggesting the need for standardization. In addition, between 30-60% of ultrasound reads are considered "equivocal," which often leads to further downstream testing, in particular CT scans. In this sub-study of a larger NIH-funded study of pediatric abdominal pain evaluation in the ED, we will describe rates of equivocal ultrasound (US) reports in KPNC, describe variation in reporting (including terminology and documentation of secondary signs of possible infection), and association between equivocal reports and risk of appendicitis as measured by the pARC score.

Status: Data collection is complete. We presented an abstract at the 2020 meeting of the Pediatric Academic Societies: "Prevalence of equivocal pediatric abdominal US reports for suspected appendicitis in 11 EDs in an integrated delivery system" and another at the 2020 meeting of the Society for Academic Emergency Medicine: "Indeterminate ultrasound in pediatric appendicitis is prevalent, poorly documented, and predicts additional imaging". Manuscripts are being written.

29. 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

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. A clinical decision support tool to help predict AHF disease severity, employing accurate KPNC-specific risk estimates, would allow for more informed recommendations around venues and intensity of care customized to the KPNC setting. We propose a retrospective cohort study of adult patients presenting to a KPNC ED between 2015-2017 with AHF to validate clinical decision tools and determine KPNC-specific risk estimates for 30-day serious adverse events. We will also assess the feasibility of an EHR-linked clinical decision support system to extract heart failure-relevant data and efficiently present these to ED providers.

Status: We presented an abstract at the 2020 American College of Cardiology meeting. We have a manuscript in press with *ESC Heart Fail*: "Outcomes among acute heart failure ED patients by preserved versus reduced EF."

30. 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>

31. 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*. 2020 Oct 28 [Epub ahead of print]. <https://www.nejm.org/doi/full/10.1056/NEJMoa2029849>

32. 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: KPNC Community Benefit 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 underway.

33. DIZZiness Treatment through Implementation & Clinical strategy Tactics (DIZZTINCT-2)

Principal Investigators: **Adam L. Sharp** (Los Angeles, DRE), Kevin Kerber and Will Meurer (University of Michigan)

Co-Investigators: Navdeep Sangha and Prasanth Manthena (Los Angeles), Molly Jancis (Panorama City), Laura Damschroeder (University of Michigan)

Funding: National Institute on Deafness and Other Communication Disorders (NIDCD) 2R01DC012760-06A1

Summary: This study aims to determine the impact of an enhanced implementation strategy to assist physicians to accurately diagnose and treat benign paroxysmal positional vertigo and vestibular neuritis across all KPSC emergency departments. This includes evaluating the impact of CT use, length of stay, adverse events, hospitalization and misdiagnosis. We will also measure the effectiveness of a patient targeted intervention on patient reported outcomes and utilization as well as the lasting impact upon practice.

Status: Data collection is underway.

34. Prognosis in patients with confirmed or suspected COVID-19

Principal Investigators: **Adam L. Sharp** (Los Angeles/DRE), George Yuen (Orange County; Pulm/CC), Michael K. Gould, Claudia Nau, JaeJin An, and Kristi Reynolds (DRE)

Co-Investigators: Brian Z. Huang, (DRE), Benjamin Broder (Baldwin Park; Hospitalist), Matthew Smith (Los Angeles), Ali Ghobadi (Orange County), Matthew Silver (San Diego), Harminder Brar (Los Angeles), Christopher Subject (Los Angeles; Hospitalist), Kenneth Robinson (Panorama City), Natalie Mourra (Los Angeles; Family Medicine), Beth Creekmur (DRE), Sara Tartof (DRE), Steven Steinberg (Panorama City; Family Medicine), Michael K. Gould (DRE)

Funding: Regional Research Committee of Kaiser Permanente Southern California. Grant No.: KP-RRC-20200401

KP Study Sites: KPSC

Summary: The portfolio includes 4 projects that address stakeholder-driven questions regarding prognosis among: (1) ED patients with symptoms suggestive of possible COVID-19; (2) hospitalized patients with confirmed or suspected COVID-19; (3) critically ill patients with confirmed or suspected COVID-19; and (4) patients with hypertension and confirmed or suspected COVID-19.

Status: The ED study is completed. Other studies are collecting and analyzing data.

35. Understanding risk factors of firearm-related injuries and death in adult and pediatric populations: risk prediction and opportunities for prevention

Principal Investigator: Rulin Hechter (Pasadena)

Co-Investigators: **Adam L. Sharp** (DRE and Los Angeles), Sonya Negrif (DRE), Margo Sidell (DRE), Corinna Koebnick (DRE), Claudia Nau (DRE), Rebecca Cunningham (U of Michigan)

Funding: KP Task Force on Firearm Injury Prevention

KP Study Sites: KP Southern California

Summary: This study will develop a risk prediction model for both intentional and unintentional firearm-related injuries using data from KP Southern California. We will integrate individual, family, and community-level risk factors to develop a risk score that could be used to identify high-risk patients for targeted screening in the general medical setting. The study will also generate a heatmap to identify high-risk communities to inform strategies for firearm injury prevention interventions at the medical center and clinic level. The investigators will lay the foundation for implementing the risk score in care delivery to support real-time clinical decision making through collaboration with clinical stakeholders and operational leaders.

Status: Data collection is underway.

36. NBA-KP Lower Extremity Injury Prevention (LEIP) research program

Principal Investigator: **Adam L. Sharp** (DRE and Los Angeles), Anna Davis (CESR, Los Angeles)

Co-Investigators: Bob Sallis (Riverside), Corrine Munoz-Plaza (DRE, Los Angeles)

Funding: National Basketball Association and KP National Advertising & Sports Marketing

KP Study Sites: N/A

Summary: The ultimate goal of this proposal is to decrease rates of lower extremity injury (LEI) among youth athletes, with a special focus on high school basketball players, through consistent use of an evidence-based warm-up program. The study aims to accomplish the following: (1) Characterize the current state of LEI prevention (LEIP) warm-up programs among high-school aged youth basketball teams; (2) Develop an evidence-based warm-up program designed specifically for basketball LEIP, informed by input from HS players and coaches (Aim 1) to be feasibly implemented into routine use; (3) Understand approaches that result in the greatest adoption of and adherence to the LEIP program, by comparing alternative methods for delivering/disseminating and implementing the LEIP program.

Status: Qualitative data collection and systematic review are underway.

37. Comparative effectiveness of early diagnostic and disposition strategies for suspected acute coronary syndrome

Principal Investigators: **Adam L. Sharp** (DRE and Los Angeles) and Ben Sun (Penn)

Co-Investigators: Rita Redberg (UCSF), Michael Gould (DRE), Ernest Shen (DRE), Chengyi Zheng (DRE), Aniket Kawatkar (DRE)

Funding: NHLBI

Study Sites: KP Southern California

Summary: This is a comparative effectiveness study of five early diagnostic (stress ECG, stress echo, stress MP, CCTA or NO testing) and three disposition (inpatient, observation status, discharge) strategies for the ED evaluation of suspected acute coronary syndrome (ACS). We will study a prospective observational cohort of ~170,000 patients accrued over 5 years at EDs within the KPSC health system. The ultimate goal of this proposal is to improve outcomes after an ED evaluation for suspected ACS.

Status: We're in year 2 of a 4-year grant.

38. National diagnostic performance dashboard to measure and track diagnostic error using big data

Principal Investigators: **Adam L. Sharp** (DRE and Los Angeles), David Newman-Toker (Johns-Hopkins), Ketan Mane (KPMA)

Co-Investigators: Najilla Nassery (Johns-Hopkins), Ejaz Shamim (KPMA), Michael Gould (DRE) and Ernest Shen (DRE)

Funding: Moore Foundation

Sites: KP Southern California, Johns Hopkins, and KP Mid-Atlantic

Summary: Diagnostic errors may be the leading cause of preventable harm in U.S. healthcare, with estimates suggesting 12 million people a year are affected. New approaches to diagnostic performance measurement are vital to improve care moving forward. Evidence showing stroke misdiagnosed as benign dizziness in the ED is a target for improvement and this effort aims to operationalize a diagnostic performance dashboard for this condition. KPSC and KPMA will use similar methods to understand if myocardial infarction, pulmonary embolism, and sepsis offer similar opportunities to improve diagnostic performance.

Status: We're in year 2 of 2-year grant. An abstract was presented at ACEP, Oct 2019. Manuscript preparation underway.

39. *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: Study completed. Manuscript in progress.

40. 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: Data collection is underway.

41. The management of atrial fibrillation and flutter in emergency medicine (the TAFFY Study)

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

Co-investigators: The KP CREST Network, Jie Huang (DOR), Patricia Ramos (KP Portland), David Glaser (KP Denver), Bory Kea (OHSU)

Funding: Garfield Memorial National Research Fund

Study Sites: KP Northern California (7 EDs)

Summary: This prospective cohort study is profiling the characteristics of ED patients with non-valvular AF in community settings, describing the variation in management across EDs, and correlating patient and management variables with utilization, procedures, and complications.

Status: A manuscript on quality of life outcomes was published in *Ann Emerg Med*. A manuscript on the anticoagulation of ED patients with AF at high risk was published in *West J Emerg Med*. Our

third manuscript is undergoing peer-review, this on facility-level variation in hospitalization. The next study will describe the management of recent-onset AF.

42. Ibutilide, amiodarone and procainamide for the cardioversion of atrial fibrillation/flutter: the Pharm CAFÉ Study

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

Co-investigator: Dustin W. Ballard (San Rafael), Aaron M. Rome (South Sacramento), Garrett Thiel, Oliver Dutczak and Nelya Lugovskaya (UC Davis, current or recent), Matt D. Stevenson (Stanford), Margaret Warton (DOR), Manvi R. Nagam (UN Reno) and the KP CREST Network

Funding: KP Northern California Community Benefit Program

Study Sites: KP Northern California

Summary: We are comparing effectiveness and adverse event rates of these three drugs at four hours. This comparative effectiveness study will yield important information to help guide emergency providers in the selection of pharmacological agents for the cardioversion of AF/F.

Status: We have presented four abstracts. The ibutilide study has been published. We presented an abstract at ACEP in Denver, Oct. 2019. A manuscript comparing the agents is under construction.

43. 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 an abstract at the Society for Academic Emergency Medicine annual meeting, May 2019, and presented another at the American Heart Association meeting in November 2019. The manuscript is being written.

44. 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), and the KP CREST Network

Funding: KPNC Community Benefit 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 completed manual chart review and have begun analysis. We have published two cases reports: *European Heart Journal Case Reports* and *Medicine (Baltimore)*. We presented an abstract of interim data at the American College of Physicians regional meeting (Oct 2020) and will present at their national meeting (2021). We also have several abstracts we will present at the American Thoracic Society in May.

45. What does it mean to manage acute pulmonary embolism as an “outpatient”? A brief report.

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

Co-Investigators: Judy Shan (KP CREST Network, DOR), Dayna Isaacs, Liz Johnson, and Harjot Bath (UC Davis), and Dani Julien (Sacramento State University)

Funding: The PI is supported by the TPMG DARE’s Physician Researcher Program

Summary: The evidence for the effectiveness and safety of outpatient management of select ambulatory low-risk patients with acute pulmonary embolism continues to mount. But what is meant by outpatient management? Lack of definitional clarity may hinder understanding of this emerging management strategy and lack of uniformity may impede its translation into clinical practice. We seek to describe the range of definitions provided in the literature.

Status: We presented an abstract at the 2020 meeting of the American College of Chest Physicians in October. The manuscript is in press at *Perm J*.

46. Identifying ED patients with mild traumatic intracranial hemorrhage at low risk for acute critical care intervention

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

Co-investigators: Kanwal Gill and Manny Garrido (Roseville/Sacramento), James S. Lin (Santa Clara), Dustin G. Mark (Oakland), Alex Buss (Walnut Creek/Antioch), Travis Anderson (UC Davis), Brock Daniels (New York Presbyterian), Vignesh Arasu (Vallejo), Cody McHargue (UCSF), E. Margaret Warton (DOR), and the KP CREST Network

Funding: KP Northern California Community Benefit Programs

Study Sites: KP Northern California

Summary: This multicenter retrospective cohort study seeks to answer two questions: what is the classification performance of the UC Davis clinical prediction instrument in identifying Kaiser patients with mild traumatic intracranial hemorrhage who do not require critical care interventions within 48h? What patient-level and facility-level characteristics are associated with non-ICU care?

Status: Data collection is complete. We presented an abstract on the validation of the UC Davis rules at the 2017 meeting of the Society of Academic Emergency Medicine presented another on the derivation of a community-specific rule at ACEP, October 2017. The first manuscript will be submitted in 2021.

47. 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: KPNC

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 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 in early data collection.

48. 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.

Status: Analysis is underway.

49. Population-based estimate of potential accuracy of field-based identification of endovascular treatment candidates

Principal Investigators: Jeffrey G. Klingman and Mai N. Nguyen-Huynh (Walnut Creek)

Co-investigators: Janet G. Alexander (DOR), **David R. Vinson** (Roseville/Sacramento), Lauren E. Klingman (Stanford University)

Study Sites: KP Northern California

Summary: This multicenter retrospective cohort study seeks to estimate the accuracy of field-based identification of patients with stroke-like symptoms who might be candidates for endovascular stroke therapy.

Status: The manuscript is in press with *J Am Coll Emerg Physicians Open* for later this year.

50. An Individual patient-level meta-analysis of the marginal contribution of right ventricle assessment to the prediction of 30-day all-cause mortality in patients with low-risk pulmonary embolism

Principal Investigators: Giorgio Maraziti and Cecilia Becattini (University of Perugia, Italy)

Co-Investigators: David Jiménez (Universidad de Alcalá, Madrid, España), **David R. Vinson** (Roseville/Sacramento), and many others

Funding: University of Perugia, Italy

KP Study Sites: KPNC

Summary: The need to evaluate for right ventricular function in patients with low-risk pulmonary embolism is unclear. We are undertaking a meta-analysis using individual patient-level data to evaluate the marginal effect of adding right ventricular assessment to the PE Severity Index and its simplified counterpart.

Status: The manuscript is undergoing revision for a peer-reviewed European journal.

Recent Publications (since Oct 2020)^e

TPMG (Northern CA)

Ballard D, Vinson D. Medically Clear: Trust your gut when you think it's not appendicitis. *Emerg Med News.* 2020;42(11):15.

Full-text: <https://bit.ly/38cwa6a>

Ballard D, Vinson D. Medically Clear: The less-is-more approach to acute diverticulitis. *Emerg Med News.* 2020;42(12):18.

Full-text: <https://bit.ly/33T5Gn9>

Shan J, **Ballard D, Vinson DR.** Publication non grata: The challenge of publishing non-COVID-19 research in the COVID era. *Cureus.* 2020;12(11):e11403.

Full-text: <https://doi.org/10.7759/cureus.11403>

Wilson CL, Tavender EJ, Phillips NT, Hearps SJ, Foster K, O'Brien SL, Borland ML, Watkins GO, McLeod L, Putland M, Priestley S, Brabyn C, **Ballard DW,** Craig S, Dalziel SR, Oakley E, Babl FE; Paediatric Research in Emergency Department's International Collaborative. Variation in CT use for paediatric head injuries across different types of emergency departments in Australia and New Zealand. *Emerg Med J.* 2020;37(11):686-689.

Abstract: <https://emj.bmj.com/content/37/11/686.long>

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

Reed ME, Huang J, Brand R, Graetz I, Jaffe MG, **Ballard DW**, Neugebauer R, Fireman B, Hsu J. Inpatient-outpatient shared electronic health records: Telemedicine and laboratory follow-up after hospital discharge. *Am J Manag Care*. 2020 Oct 16 [Epub ahead of print].

Full-text <https://www.ajmc.com/view/inpatient-outpatient-shared-electronic-health-records-telemedicine-and-laboratory-follow-up>

Garmel GM, Barker TD. Jaundice. In Harwood-Nuss' *Clinical Practice of Emergency Medicine*, 7th ed. Wolfson AB (ed). LWW: Philadelphia, PA; 2020, pp. 575-579.

Book at amazon: <https://www.amazon.com/dp/1975111591/>

Isaacs DJ, Johnson EJ, **Hofmann ER**, Rangarajan S, **Vinson DR**. Primary care physicians comprehensively manage acute pulmonary embolism without higher-level-of-care transfer. A report of two cases. *Medicine (Baltimore)*. 2020;99:45(e23031).

Full-text: <https://doi.org/10.1097/MD.00000000000023031>

Lee MO, Altamirano J, Garcia LC, Gisondi MA, Wang NE, **Lippert S**, Maldonado Y, Gharahbaghian L, Ribeira R, Fassiotto M. Patient age, race and emergency department treatment area associated with "Topbox" Press Ganey scores. *West J Emerg Med*. 2020 Oct 19;21(6):117-124.

Full-text: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7673899/>

Sax DR, **Mark DG**, Huang J, Sofrygin OX, Rana JS, Collins SP, Storrow AB, Liu D, Reed ME. Use of machine learning to develop a risk stratification tool for emergency department patients with acute heart failure. *Ann Emerg Med*. 2020 Dec 19 [Epub ahead of print].

Abstract: <https://doi.org/10.1016/j.annemergmed.2020.09.436>

Shan J, Warton EM, Reed M, **Vinson D**, Kuppermann N, Dayan P, Dalziel S, Rauchwerger A, **Ballard D**. Effect of clinical decision support on head computed tomography for children with minor head trauma. *Ann Emerg Med*. 2020;76(4S):S44-S45 [abstract 114].

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Shan J, Isaacs D, Bath H, Julien D, **Vinson D**. How is "outpatient management" of acute pulmonary embolism defined in the primary literature? A narrative review. *Chest*. 2020;158(4S):A2228.

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Abstract: [https://www.annemergmed.com/article/S0196-0644\(20\)31094-5/fulltext](https://www.annemergmed.com/article/S0196-0644(20)31094-5/fulltext)

Walker G. Emergentology: We need to take race out of algorithms. *Emerg Med News*. 2020;42(10):14.

Full-text: https://journals.lww.com/em-news/Fulltext/2020/10000/Emergentology_We_Need_to_Take_Race_Out_of.10.aspx

Walker G. Emergentology: The COVID-19 silver lining. *Emerg Med News*. 2020;42(11):20.

Full-text: https://journals.lww.com/em-news/Fulltext/2020/11000/Emergentology_The_COVID_19_Silver_Lining.10.aspx

Walker G. Emergentology: Waiting in the ED Is par for the course. *Emerg Med News*. 2020;42(12):23.

Full-text: https://journals.lww.com/em-news/Fulltext/2020/12000/Emergentology_Waiting_in_the_ED_Is_Par_for_the.11.aspx

SCPMG (Southern CA)

Ghobadi A, Lin B, Musigdilok VV, Park SJ, Palmer-Toy DE, Gould MK, **Vinson DR**, Hutchison DM, **Sharp AL**. Effect of using an age-adjusted d-dimer to assess for pulmonary embolism in community emergency departments. *Acad Emerg Med*. 2020 Nov 17 [Epub ahead of print].

Abstract: <https://pubmed.ncbi.nlm.nih.gov/33206443/>

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Full-text: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7642742/>

Kawatkar AA, **Sharp AL**, Baecker AS, Natsui S, Redberg RF, Lee MS, Ferencik M, Wu YL, Shen E, Zheng C, Musigdilok VV, Gould MK, Goodacre S, Thokala P, Sun BC. Early noninvasive cardiac testing after emergency department evaluation for suspected acute coronary syndrome. *JAMA Intern Med*. 2020 Oct 5. Online ahead of print.

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Preciado SM, **Sharp AL**, Sun BC, Baecker A, Wu YL, Lee MS, Shen E, Ferencik M, Natsui S, Kawatkar AA, Park SJ, Redberg RF. Evaluating gender disparities in the emergency department management of patients with suspected acute coronary syndrome. *Ann Emerg Med*. 2020 Dec 23. Online ahead of print.

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