

Research and Academics in KP California Emergency Medicine

Quarterly Report: 2020 Q1

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Hot Off the Press^a

TPMG (Northern CA)

Ballard D, Dimmig J. Medically Clear: Nonmydriatic ocular fundus photography and how it could avoid missed diagnoses. *Emerg Med News*. 2020;42(1):1,31.

Essay: https://journals.lww.com/em-news/fulltext/2020/01000/medically_clear_nonmydriatic_ocular_fundus.2.aspx

Chang AD, **Carter K**. Twisted teeth: ovarian torsion secondary to mature teratoma. *Cereus*. 2020;12(1):e6649.

Full-text: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7015113/>

Nishijima DK, Gaona SD, Faul M, Tancredi DJ, Waechter T, Maloney R, Bair T, Blitz A, **Elms AR**, Farrales RD, Howard C, Montoya J, Garzon H, Holmes JF; Sacramento County Prehospital Research Consortium. The association of trauma center transport and long-term functional outcomes in head-injured older adults transported by emergency medical services. *Acad Emerg Med*. 2020;27(3):207-216.

^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

Abstract: <https://www.ncbi.nlm.nih.gov/pubmed/31917495>

Garmel GM, Pettis HM, Lane DR, Darvish A, Winters M, Vallee P, Mattu A, Haydel MJ, Cheaito MA, Bond MC, Kazzi A. Clerkships in emergency medicine. *J Emerg Med*. 2020 Jan 3 [Epub ahead of print].

Full-text: [https://www.jem-journal.com/article/S0736-4679\(19\)31023-6/fulltext](https://www.jem-journal.com/article/S0736-4679(19)31023-6/fulltext)

Simon LE, **Kene MV**, Warton EM, Rauchwerger AS, **Vinson DR**, Reed ME, Chettipally UK, **Mark DG**, **Sax DR**, **McLachlan DI**, **Cotton DM**, **Lin JS**, Kharbanda AB, Kharbanda EO, **Ballard DW**. Diagnostic performance of emergency physician gestalt for predicting acute appendicitis in patients age 5-20 years. *Acad Emerg Med*. 2020 Apr 2 [Epub ahead of print].

Abstract: <http://dx.doi.org/10.1111/acem.13931>

DOR Spotlight: <https://spotlight.kaiserpermanente.org/emergency-physicians-can-use-clinical-experience-to-accurately-predict-whether-a-child-has-appendicitis/>

Rana JS, **Mark D**, Huang J, Rauchwerger AS, Reed ME, **Sax DR**. The 30-day adverse outcomes among patients treated in the ED for HF by LV systolic function status. *J Am Coll Cardiol*. 2020;75(11S1):880.

Abstract: http://www.onlinejacc.org/content/75/11_Supplement_1/880

Offerman S, Gosen J, Thomas SH, Padilla-Jones A, Ruha AM, Levine M. Bupropion associated seizures following acute overdose: who develops late seizures. *Clin Toxicol (Phila)*. 2020 Mar 26 [Epub ahead of print].

Abstract: <https://www.ncbi.nlm.nih.gov/pubmed/32212940>

Vinson DR, Aujesky D, Geersing GJ, Roy PM. Comprehensive outpatient management of low-risk pulmonary embolism: can primary care do this? A narrative review. *Perm J*. 2020;24:19.163.

Full-text: <https://bitly.com/PEinPrimaryCare>

Natsui S, Doctor JN, May LS, **Vinson DR**, Arora S, Yadav K, Zein D, Meeker D. Trends in measurement and improvement of emergency physician performance: an environmental scan. *eMed Res*. 2020;2:100006.

Full-text: <https://bit.ly/2UFEnsr>

Walker G. Calculated decisions: GRACE ACS risk and mortality calculator. *Emerg Med Pract*. 2020;22(1):CD6-CD7.

Full-text:

https://www.ebmedicine.net/topics.php?action=showTopic&topic_id=621&ad=calculators#GRACE

Walker G. Emergentology: The methidemic may be worse than heroin. *Emerg Med News*. 2020;42(1):1,6.

Essay: [https://journals.lww.com/em-](https://journals.lww.com/em-news/Fulltext/2020/01000/Emergentology_The_Methidemic_May_Be_Worse_than.3.aspx)

[news/Fulltext/2020/01000/Emergentology_The_Methidemic_May_Be_Worse_than.3.aspx](https://journals.lww.com/em-news/Fulltext/2020/01000/Emergentology_The_Methidemic_May_Be_Worse_than.3.aspx)

Walker G. Emergentology: The EMR dilemma hidden in plain sight. *Emerg Med News*. 2020;42(2):13.

Essay: https://journals.lww.com/em-news/Fulltext/2020/02000/Emergentology_The_EMR_Dilemma_Hidden_in_Plain.6.aspx

Walker G. Emergentology: What can EM learn from Disney? *Emerg Med News*. 2020;42(3):19.

Essay: https://journals.lww.com/em-news/Fulltext/2020/03000/Emergentology_What_Can_EM_Learn_from_Disney_18.aspx

SCPMG (Southern CA)

Rogers AJ, Hamity C, **Sharp AL**, Jackson AH, Schickedanz AB. Patients' attitudes and perceptions regarding social needs screening and navigation: Multi-site survey in a large integrated health system. *J Gen Intern Med*. 2020 Jan 2 [Epub ahead of print].

Full-text: <https://link.springer.com/article/10.1007/s11606-019-05510-9>

Rogers A, Hu YR, Schickedanz A, Gottlieb L, **Sharp A**. Understanding high-utilizing patients based on social risk profiles: a latent class analysis within an integrated health system. *J Gen Intern Med*. 2020 Jan 9 [Epub ahead of print].

Link: <https://link.springer.com/article/10.1007%2Fs11606-019-05510-9>

Zheng C, Sun BC, Wu YL, Lee MS, Shen E, Redberg RF, Ferencik M, Natsui S, Kawatkar AA, Musigdilok VV, **Sharp AL**. Automated identification and extraction of exercise treadmill test results. *Am Heart Assoc*. 2020;9(5):e014940.

Full-text: <https://www.ahajournals.org/doi/full/10.1161/JAHA.119.014940>

Altman D, Sun B, Lin B, Baecker A, Samuels-Kalow M, Park S, Shen E, Wu YL, **Sharp A**. Impact of physician-patient language concordance on patient outcomes and adherence to clinical chest pain recommendations. *Acad Emerg Med*. 2020 Feb 13 [Epub ahead of print].

Abstract: <https://www.ncbi.nlm.nih.gov/pubmed/32056327>

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In Preparation^b

1. Characteristics of COVID-19 Patients Evaluated in the Emergency Department

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

Co-Investigators: 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.

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

Vinson (Sacramento/Roseville), with the CREST Network; Tara Greenhow (San Francisco; Regional Lead, Pediatric Infectious Disease), Gabriel J. Escobar (DOR; Regional Director, Hospital Operations Research) and Vinnie X. Liu (DOR; Regional Director, Hospital Advanced Analytics)

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 KPNC who tested positive for SARS-CoV-2. The results of this study may contribute to a better understanding of this patient population at a critical juncture of their care.

2. 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/KP Santa Clara)

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 over the past decade, that if not promptly diagnosed and treated, leads 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 made. 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 caused by delays. This retrospective cohort study will identify incidence of and factors associated with potential delay in diagnosis of SEA among KPNC patients.

3. 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** (Sacramento/Roseville)

Funding: University of Perugia, Italy

KP Study Sites: Multiple medical centers around the world, including 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.

Just Launched

1. Understanding the impact of implementing an age-adjusted d-dimer on patient outcomes and use of diagnostic imaging in suspected pulmonary imaging

Principle Investigator: **Adam L. Sharp** (Department of Research and Evaluation [DRE]/Los Angeles)

Co-Investigators: Ali Ghobadi (Orange County), Darryl Palmer-Toy (SCPMG Regional Lab), David R. Vinson (Sacramento/Roseville), Bryan Lin (DRE), Michael Gould (DRE)

Funding: SCPMG Care Improvement Research Team Project

Study Sites: All KPSC EDs

Summary: In 2015 KPSC converted d-dimer lab thresholds for suspected pulmonary embolus to an age-adjusted limit ($\text{age} \times 10$) for patients over 50. The results of this change on patient outcomes (30-day PE and mortality) and utilization of advanced imaging is not known. Our study uses an adjusted interrupted time series approach to understand the impact of this change on patient outcomes and clinical care.

Status: Data collection is underway.

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

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

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.

3. How is outpatient management of pulmonary embolism defined in the primary English-language literature? A narrative review

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

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

Funding: The PI is supported by the TPMG 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: Data collection is underway. We hope to submit an abstract for presentation at the 2020 meeting of the American College of Chest Physicians.

4. Redressing the underrecognition of “Cold Drink Heart”: Patients teaching physicians about atrial fibrillation triggered by cold drink and food

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

Funding: The author is supported by the TPMG Physician Researcher Program

Summary: A few years ago, one of my undergraduate research interns and I published a report on “Cold Drink Heart” in an open access journal: Lugovskaya N, Vinson DR. Paroxysmal atrial fibrillation and brain freeze: a case of recurrent co-incident precipitation from a frozen beverage. *Am J Case Rep*. 2016;17:23-26. After publication, numerous patients with this condition from around the world sent us emails to express their gratitude for validating the causal connection they had made between ingesting frozen drinks and their episodes of paroxysmal atrial fibrillation, a validation all the more important since many of their physicians had dismissed it. In this essay, I summarize these patients’ correspondence and provide a brief review of the literature on this underrecognized condition.

Status: The essay has completed peer-review and will be published later this year.

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 compressions. We hypothesize that participants will generally be poor assessors of high-quality

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

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 and **Adam L. Sharp** (DRE^d and Los Angeles)

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 (e.g., Yale Observation Score) and offer CDS links to Peds HBS/Peds ID-approved guideline documents/flowcharts. CDS content and evaluation will emphasize utilization outcomes.

Status: We have begun data collection.

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

4. A systematic review of clinical practice guidelines for pediatric head injury in emergency medicine

Principal Investigator: PREDICT Network (Australia/New Zealand)

Co-Investigators: **Dustin W. Ballard** (San Rafael)

Funding: Fulbright Scholarship/Centres for Research Excellence (NHMRC)

KP Study Sites: N/A

Summary: To inform guideline development, the study team, with the assistance of the KP Library team, performed a literature search and appraisal from 2013 to 2019 and assessed existing guidelines addressing the acute management of children with mild to moderate head injury, including concussion. Six high quality guidelines were identified and are being drawn from to inform evidence updates and recommendations during the guideline development process.

Status: The systematic review work is in the manuscript draft stage.

5. 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 (Sacramento/Roseville), 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 is underway. We had an abstract accepted for presentation at the 2020 Pediatric Academic Societies meeting.

6. The Scene to Needle (STN) feasibility study of pre-hospital telestroke for patients with suspected acute stroke

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

Co-Investigators: Jonathan Vlahos and Zita Konik (San Rafael), Jeff Klingman (Walnut Creek), Alexander Flint (Redwood City), Mary E. Reed (DOR), Mai N. Nguyen-Huynh (DOR), and the KP CREST Network

Funding: KP Northern California Community Benefit Programs

Study Sites: KP Northern CA

Summary: We intended to do a pilot feasibility study of a pre-hospital intervention in adult patients with suspected acute stroke. In eligible patients, a pragmatic cluster of Marin County Emergency Medical Services (EMS) providers would activate the Scene to Needle (STN) telemedicine protocol after initial assessment determines a patient meets acute stroke criteria. The STN protocol will utilize a video consultation in the ambulance between the patient, paramedics and regional Kaiser Stroke FORCE Doc (stroke neurologist) under the supervision of the Marin County EMS Agency (PI is the Medical Director). The FORCE Doc will confirm the diagnosis of stroke and, if the patient meets criteria, initiate the tPA treatment algorithm prior to ED arrival. We hypothesized that the STN intervention will prove feasible and minimally impact EMS on-scene and transport times. In preparation for the feasibility study, we undertook a survey of prehospital personnel on their opinions of telehealth care in the EMS setting.

Status: We presented the results of our survey at a national EM meeting in May 2019 and have that manuscript under peer-review. Work and field testing with KP IT are currently on indefinite hold pending regional work to identify teleconsultation priorities and best practices.

7. EHR-based decision support for pediatric acute abdominal pain in emergency care

Principal Investigator: Elyse O. Kharbanda, Health Partners, Minneapolis, MN

Co-investigators: **Dustin W. Ballard** (San Rafael), Mamata V. Kene (San Leandro/Fremont), Uli K. Chettipally (South SF, retired), David R. Vinson (Sacramento/Roseville), Dale M. Cotton (South Sacramento), and the KP CREST Network

Funding: National Institute of Child Health and Human Development (NICHD at the NIH)

Study Sites: 11 CREST EDs in KP Northern California

Summary: With a cluster randomized trial we are studying the impact of patient-specific electronic clinical decision support on the use of diagnostic imaging, clinical outcomes and costs of care among children with abdominal pain at risk for appendicitis.

Clinical Trial: <https://clinicaltrials.gov/ct2/show/NCT02633735>

Status: We have published four papers so far: (1) Our derivation and validation study of the pediatric Appendicitis Risk Calculator (pARC) in *Pediatrics*; (2) Our KP pARC validation study in *Ann Emerg Med*; (3) Our study of the development of our CDS tool in *EGEMS (Wash DC)*; and (4) Our study of the impact of text message alerts to emergency physicians on clinical trial enrollment in *J*

Am Med Inform Assoc. The pARC has been posted on MDCalc: <https://www.mdcalc.com/pediatric-appendicitis-risk-calculator-parc>. We are currently writing our impact paper.

8. 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.

9. 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 (South Sacramento), **Steven R. Offerman** (South Sacramento), **David R. Vinson** (Sacramento/Roseville), Scott D. Casey (UC Davis), Mary E. Reed (DOR), 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 beginning to collect data.

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 is underway.

11. 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 being written

12. 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 underway

13. Impact of Opioid Safety Initiative Education on Emergency Department Opioid Prescribing

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

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

Funding: KP 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 has begun.

14. 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 (Sacramento/Roseville), 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 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 have developed a natural language processing (NLP) algorithm to identify positive CTPAs and will use it to evaluation study yield. We had an abstract of our NLP work accepted for presentation at the 2020 Society for Academic Emergency Medicine.

15. Evaluating the incidence of contrast associated acute kidney injury in ED patients

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

Co-Investigators: Vignesh Arasu (Vallejo), Ajit Mahapatra (Santa Clara), Mary E. Reed (DOR), and the KP CREST Network

Funding: KP Northern California Community Benefit Program

Study Sites: KP Northern California

Summary: Recent studies of acute kidney injury (AKI) after IV contrast-enhanced computed tomography (CT) suggest that prior observational studies overestimate the incidence of contrast-associated AKI and cast doubt on whether IV contrast is even associated with AKI. In this retrospective observational study, we will evaluate AKI incidence among all adult ED patients with chronic kidney disease grades 3-5 undergoing CT with or without IV contrast. To account for differences in distributions of AKI risk factors between contrast and no contrast arms, we will apply propensity score matching before performing logistic regression analysis to evaluate whether contrast administration is associated with AKI.

Status: Data collection and analysis are complete. The manuscript is underway.

16. Factors contributing to false cardiac catheterization laboratory activations for patients with suspected ST-segment Elevation Myocardial Infarction (STEMI): Our three-year experience with a Heart Alert Protocol

Principle Investigator: **Joel T. Levis** (Santa Clara)

Co-investigators: Philip C. Lee and Eleanor Levin (Santa Clara), Cesar Avila (Stanford)

Study Site: Santa Clara

Summary: This retrospective chart review of all Heart Alert (Code STEMI) activations at a single medical center over a three-year period (2009-2011) will elucidate those factors which contribute to false Heart Alert Activations (e.g., presenting ECG, patient demographics, time of day/day of week of activation, symptom presentation, involvement of a cardiologist in decision to activate).

Status: The manuscript is under construction.

17. 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.

18. Do carbon monoxide levels rise in firefighters during overhaul operations following a structure fire?

Principle Investigator: Todd Filgrun (Sacramento Fire Department)

Co-investigator: **Kevin E. Mackey** (South Sacramento), David Shatz (UC Davis), and others

Study Region: Sacramento County

Summary: Firefighters are exposed to toxic gasses including carbon monoxide (CO) during fire suppression activities. This prospective observational study measured pre- and post-exposure CO levels and found that the majority of exposures were associated with no changes in CO from baseline after fire suppression or overhaul.

Status: An abstract was presented at the National Association of EMS Physicians meeting in Tucson, AZ, January 2012. The manuscript is being written.

19. Prevalence, treatment and outcomes of ESBL urinary tract infections in the ED

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

Co-Investigators: Zena Salim (KP Oakland IM Resident)

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

KP Study Sites: KPNC

Summary: Extended spectrum beta-lactamase (ESBL)-producing organisms pose unique challenges to clinicians in light of their resistance to some common antibiotics. In this retrospective cohort study, we will examine the treatment and outcomes of patients hospitalized with febrile urinary tract infections caused by ESBL-producing organisms.

Status: Data collection continues.

20. 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 (Sacramento/Roseville), 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.

21. 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's Delivery Science 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.

Status: Our first manuscript was published in the *J Amer Coll Cardiol*: "Performance of coronary risk scores in patients with CP in the ED." Our second manuscript is undergoing peer-review: "Patients with moderate or high modified HEART scores are not at moderate or high risk of adverse cardiac events." The period of implementation of our electronic clinical decision support tool across 13 CREST EDs completed at the end of 2019. Analysis will begin soon.

22. 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 (Sacramento/Roseville), 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 amenable 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.

23. Recognition of outpatient pulmonary embolism (the ROPE study)

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

Co-Investigators: David R. Vinson (Sacramento/Roseville), Dustin W. Ballard (San Rafael), Mary E. Reed (DOR), Corby Makin (former UC Davis resident), Matt Stevenson (Stanford resident), and the KP CREST Network

Funding: KP Northern California Community Benefit Programs

Study Sites: KP Northern California

Summary: It is unknown what proportion of ED patients who receive an objectively-confirmed diagnosis of acute pulmonary embolism (PE) had seen an outpatient provider for explicit PE-related symptoms in the preceding weeks. This retrospective cohort study will answer the following questions: What patient characteristics facilitate early recognition of PE? Might delayed recognition occur because these patients have fewer risk factors to start with or more normal vital signs, making their PE harder to recognize? Does timing of recognition correlate with clinical outcomes?

Status: The manuscript is in the works. We presented an abstract at the American College of Emergency Physicians in October 2018.

24. Early-phase resuscitation fluids in critically ill adults: Lactated ringers vs normal saline

Principal Investigator: **Nicholas Montano** (San Diego)

Co-Investigator: Jeff Lapoint (San Diego)

Funding: Regional Research Committee Grant

KP Study Sites: KP Southern California

Summary: Fluid resuscitation is a cornerstone of critical care medicine and, more often than not, critically ill patients receive normal saline (0.9% sodium chloride) during their initial phase of resuscitation. Normal saline, however, is not without its harm; hyperchloremic metabolic acidosis secondary to fluid resuscitation with normal saline is associated with all-cause hospital mortality, acute kidney injury, and inflammation. Lactated ringers, on the other hand, is not associated with hyperchloremic metabolic acidosis and, thus, may provide a morbidity and mortality benefit in critically ill patients requiring fluid resuscitation. In this retrospective study of a 7-year cohort of critically-ill ED patients, we aim to evaluate the morbidity and mortality benefit of lactated ringers versus normal saline and, if statistically significant, propose a transition from normal saline to lactated ringers as the fluid of choice in the resuscitation of this population.

Status: Data collection is underway.

25. Prevention and treatment of amatoxin-induced hepatic failure with IV milk thistle (Silibinin [Legalon® SIL]): an open multicenter clinical trial

Principal Investigator: Todd Mitchell (Dominican Santa Cruz Hospital)

KP Northern California Regional PI: **Steve R. Offerman** (South Sacramento)

Funding: Madaus Inc

Study Sites: Northern California and beyond

Summary: The industry-sponsored study includes patients two years and older with a history of eating foraged mushrooms and GI symptoms and LFTs abnormalities suggestive of amatoxin poisoning. Eligible patients receive intravenous Legalon SIL (Silibinin), 20 mg/kg/day. The primary outcome is prevention of liver transplantation and death. See <https://clinicaltrials.gov/ct2/show/NCT00915681>

Status: Enrollment ended in December 2018.

26. Analysis of the effect of fascia iliaca block on decreasing opiate use for patients with hip fractures using a multidisciplinary management pathway

Principal Investigator: **Kenneth Perry** (San Diego)

Funding: Regional Research Committee Grant Fund

KP Study Sites: San Diego

Summary: Hip fractures lead to millions of ED visits each year and are associated with significant morbidity and mortality. When sustaining a hip fracture, patients are often given opioid medications to control pain, which may lead to complications including altered mental status,

respiratory depression and hypotension leading to prolonged inpatient stays and increased morbidity and mortality. The fascia iliaca block using ultrasound guidance is an alternative to opioid pain medications by providing regional anesthesia to the areas of pain. It has been incorporated into a multidisciplinary pathway for pain management of hip fracture patients that present to the ED at Kaiser San Diego. The literature suggests that use of the fascia iliaca block may decrease the requirement for opioid medications and decrease length of stay.

Status: We presented an abstract at the Society for Academic Emergency Medicine, Las Vegas, May 2019. Manuscript is underway.

27. RISTRIAGE: Standardizing Emergency Department 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 (Sacramento/Roseville), 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: We are beginning data collection.

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), Ed 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 had an abstract accepted for presentation 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"

29. Young children presenting to the ED with food allergy reactions: triggers, treatment, healthcare utilization, and outcomes

Principal Investigator: Jimmy Ko (Allergy, Oakland)

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

Funding: KP Northern California Community Benefit Program

KP Study Sites: KP Northern California

Summary: In this retrospective cohort study, we will describe rates of ED visits and hospital admissions for food allergy (FA) in children <5 years of age from 2016-2018 and assess for differences by patient demographics. We will also identify predictors of more severe FA reactions, defined as hospital admission, anaphylaxis, or pre-hospital or ED epinephrine use, using multiple logistic regression. We hypothesize that ED FA visit rates increased over the study period, and that infants are less likely to have severe reactions compared to older children. This study will increase understanding of the morbidity and healthcare utilization of young children with FA and provide useful information to parents and physicians.

Status: Data collection is underway.

30. Derivation and testing of a search tool that combines ICD codes and unstructured clinical data to improve accurate case identification of ED patients with acute heart failure (AHF)

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

Co-Investigators: Dustin G. Mark (Oakland/Richmond), Jamal Rana (Oakland), Mary E. Reed (DOR), and the KP CREST Network

Funding: KP Northern California Community Benefit Program

Study Sites: KP Northern California

Summary: HF affects 6 million Americans. Research on outcomes, resource utilization, risk stratification and management of AHF patients in the ED is limited both in volume and quality. In particular, accurate case identification has been challenging. We plan to develop a search tool to retrospectively identify patients with AHF in the ED based on structured (ICD codes, chief complaint, and laboratory tests) and unstructured (clinical detail within ED provider notes) data. We will develop (derivation cohort) and then test (validation cohort) the tool on a random sample of 400 KPNC ED patients during 2013-2014.

Status: Data collection is complete. We have a manuscript undergoing peer-review: Use of machine learning to develop a risk stratification tool for emergency department patients with acute heart failure

31. 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 (Sacramento/Roseville), Dustin W. Ballard (San Rafael), and the KP CREST Network

Funding: TPMG Delivery Science 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: Data collection is underway. We had an abstract accepted for presentation at the 2020 American College of Cardiology meeting: The 30-day adverse outcomes among patients treated in the ED for HF by LV systolic function status. *J Am Coll Cardiol.* 2020;75(11S1):880 [abstract]. We have a manuscript in peer-review: "30-day outcomes of patients with AHF treated in the ED."

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 has begun.

33. 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.

35. 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.

35. 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.

36. 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.

37. Outcomes of patients with supraventricular tachycardia and elevated biomarkers

Principal Investigator: **Clifford J. Swap** (San Diego)

Co-investigators: Andrew Williamson (San Diego)

Study Sites: KP Southern California

Summary: Many patients presenting to the ED with supraventricular tachycardia (SVT) and elevated troponin levels (after cardioversion) are admitted to the hospital. Our hypothesis is that these patients do not require admission and can be safely discharged with cardiology referral. We will undertake a retrospective chart review to investigate the outcomes of all ED patients with admit or discharge diagnosis of SVT and elevated troponin levels, to determine if these patients can be safely discharged.

Status: We presented an abstract at the Society of Academic Emergency Medicine annual meeting, Indianapolis, IN, May 2018. The manuscript is being written.

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

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

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.

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

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

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.

40. Clinical decision support for atrial fibrillation and flutter

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

Co-Investigators: E. Margaret Warton (DOR), Dustin W. Ballard (San Rafael), Dustin G. Mark (Oakland), Uli K. Chettipally (South San Francisco, retired), Bory Kea (OHSU), Dale M. Cotton (South Sacramento), Jodi Loyles (KP Regional), Alan Go (DOR), and the KP CREST Network

Funding: TPMG's Deliver Science Program (via the Physician Researcher Program)

Study Sites: KP Northern California

Summary: Our preliminary descriptive and analytic work will evaluate drug selection for stroke prevention with the recent availability of direct oral anticoagulants like dabigatran. We also will design, build, and pilot a web-based computerized clinical decision support tool to aid in the comprehensive management of ED patients and inpatients with atrial fibrillation and flutter.

Status: We presented an abstract at the American College of Emergency Physicians in October in San Diego that described how the introduction of dabigatran to the formulary increased overall initiation of oral anticoagulants at the time of ED discharge for stroke-prone patients with atrial fibrillation and flutter. Data analysis continues for the manuscript. We have also begun design of our clinical decision support tool and will test it in a pilot feasibility study at the three Capitol Service Area EDs in 2020.

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

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

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: Data collection is underway. 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.

42. Management of Acute PuLmonary Embolism (the MAPLE study)

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

Co-investigators: The KP CREST Network, Matt Silver, Cliff Swap, and Billy Krauss (San Diego), David H. Wang (Scripps, San Diego), Tamara Pleshakov (Los Angeles), Cyrus Yamin (Oakland/Richmond), Victoria Clague (San Rafael)

Funding: Garfield Memorial National Research Fund, KP Northern California Community Benefit Program, and the TPMG Delivery Science and Physician Researcher Programs.

Study Sites: KP Northern California

Summary: This retrospective cohort study describes the population of patients with acute PE across several regions from Jan 2013 through April 2015. We will analyze physician practice patterns and patient outcomes.

Status: We have published five papers to date: (1) post-ED follow-up, (2) the performance of the PE Severity Index, (3) the safety of home management, (4) breakthrough PE despite adequate anticoagulation, (5) pt satisfaction with home care. A ms on the predictive value of presyncope in this population has been accepted for publication. An abstract on the population of pts with pre-arrival imaging was presented at the regional meeting of the American College of Physicians in

early October and was accepted for presentation at the American Thoracic Society meeting. The manuscript is undergoing peer-review.

43. Comprehensive primary care clinic-based pulmonary embolism management

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

Co-Investigators: Erik R. Hofmann (South Sacramento), Suresh Rangarajan (Adult Primary Care, Oakland), Dayna J. Isaacs and Elizabeth J. Johnson (UC Davis) 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 9-year study period (2011-2019).

Status: We are building our structured data collection tool. We are submitting a small case series for peer-review.

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

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

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 2020.

45. Ischemic stroke after traumatic injury in children and young adults

Principal Investigator: Christine Fox (UCSF)

Co-investigators: Heather Fullerton (UCSF), Steve Sidney (DOR), **David R. Vinson** (Sacramento/Roseville), and others

Funding: NIH and the American Heart Association

Study Sites: Northern California

Summary: We identified KPNC trauma patients (<50 years old), 1997-2011. Within this cohort, we identified and confirmed cases of arterial ischemic stroke within four weeks of trauma and three controls per case. We calculated the 4-week stroke incidence, abstracted clinical data and estimated stroke odds ratios [OR] using logistic regression.

Status: We published our first study in *Neurology* and presented an abstract at the International Stroke Conference in February 2019. A second ms is undergoing peer-review: Early seizures and age modify the development of pediatric post-traumatic epilepsy in a population-based cohort.

Recent Publications (since Oct 2019)^e

TPMG (Northern CA)

Ballard D, Vinson D. Medically clear: A glimpse into the future with DecisionBot2020. *Emerg Med News*. 2019;41(10):34.

Essay: https://journals.lww.com/em-news/Fulltext/2019/10000/Medically_Clear_A_Glimpse_into_the_Future_with.21.aspx

Kea B, Warton EM, Sun BC, Olshansky B, Lip GY, Raitt M, Reed ME, **Ballard DW, Vinson DR**, on behalf of the KP CREST Network. Stroke prophylaxis action after US ED diagnosis and discharge of atrial fibrillation and flutter patients. *Circ*. 2019;140:A12578.

Abstract: https://www.ahajournals.org/doi/10.1161/circ.140.suppl_1.12578

Durant EJ, De Cicco FL. Pectoralis Major Tear. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 Jan-. 2019 Oct 31.

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

Full-text: <https://www.ncbi.nlm.nih.gov/books/NBK549875/>

May T, **Garmel GM**. Rotator Cuff Injury. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2019 Jan-. 2019 Nov 16.

Abstract: <https://www.ncbi.nlm.nih.gov/pubmed/31613444>

Kindermann (Sax) D, Coates WC, Deiorio N, Collins RW, Mattu A, Cheaito MA, Lotfipour S, Kazzi A. Couples match in emergency medicine. *J Emerg Med*. 2019 Oct 5 [Epub ahead of print].

Abstract: <https://www.ncbi.nlm.nih.gov/pubmed/31594742>

Mozayan C, **Levis JT**. ECG Diagnosis: Dextrocardia. *Perm J*. 2019;23:18-244.

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Arangan J, **Lin JS**, **Bouvet SC**, Warton EM, Reed ME, Liu TI, **Vinson DR**, **McLachlan I** for the KP CREST Network. Treatment variation of stable ventricular tachycardia in the ED. *Ann Emerg Med*. 2019;74(4S):S27 [abstract 69].

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Full-text: [https://www.annemergmed.com/article/S0196-0644\(19\)31118-7/fulltext](https://www.annemergmed.com/article/S0196-0644(19)31118-7/fulltext)

Offerman S, Levine M, Gosen J, Thomas SH. Pediatric bupropion ingestions in adolescents vs. younger children—a tale of two populations. *J Med Toxicol*. 2020;16(1):6-11.

Abstract: <https://www.ncbi.nlm.nih.gov/pubmed/31713175>

From our KPNC Medical Toxicology Service: <http://www.kpnc toxicology.com/about-the-kpnc-toxicology-service.html>

Vinson DR, Arasu VA, Trujillo-Santos J. Detecting right ventricular dysfunction in patients diagnosed with low-risk pulmonary embolism: is routine computed tomographic pulmonary angiography sufficient? *Eur Heart J*. 2019;40(40):3356.

Link: <https://www.ncbi.nlm.nih.gov/pubmed/31544929>

Vinson DR, Lugovskaya N, Warton EM, Reed ME, Solomon MD, Nagam MR, Dutczak O, **Ballard DW**, on behalf of the KP CREST Network. Procainamide vs ibutilide in the cardioversion of recent-onset atrial fibrillation and flutter: a retrospective cohort study. *Ann Emerg Med*. 2019;74(4S):S7-8 [abstract 16].

Abstract: [https://www.annemergmed.com/article/S0196-0644\(19\)30692-4/fulltext](https://www.annemergmed.com/article/S0196-0644(19)30692-4/fulltext)

Vinson DR, Arasu VA, Trujillo-Santos J. Detecting right ventricular dysfunction in patients diagnosed with low-risk pulmonary embolism: is routine computed tomographic pulmonary angiography sufficient? *Eur Heart J*. 2019 Oct 21;40(40):3356.

Link: https://docs.wixstatic.com/ugd/0e64cd_3097155f92c346c28a47c5a1db2ef90e.pdf

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