race, and payer type in univariate analysis (p<0.001). Mortality rates by race were: white 40%, black 40%, Hispanic 33%, other 51%, and by payer type: Medicare 43%, Medicaid 35%, private 33%, Medicare plus private 46%, other 46%, uninsured 25%. In the logistic regression model significant independent predictors of mortality were increasing age, other race (non-black, non-white, non-Hispanic), and Medicaid or other insurance. Each additional year of age had a 2.9% increased odds of mortality (OR 1.03; 95% CI 1.03-1.03; p<0.001). Compared to white patients, odds of death were 1.6 times higher for other races (95% CI 1.32-2.01; p <0.001). Compared to those with private insurance, odds of death were higher for patients with Medicaid (OR 1.27; 95% CI 1.11-1.45; p<0.001) or other insurance (OR 1.55; 95% CI 1.28-1.87; p<0.001).

Conclusion: Septic shock mortality varies by age, race, and payer type. Patients who identified as other races had increased septic shock mortality compared to white patients. Patients with Medicaid had increased odds of death from septic shock compared to those with private insurance.

## 153 Sex Differences in Evaluation for Acute Pulmonary Embolism Among Emergency Department Patients Aged 18-49

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Background and Objectives: Acute pulmonary embolism (PE) occurs with approximately equal incidence in non-pregnant adult women and men. Although sex is not a risk factor in any validated clinical decision tool for predicting risk of PE, limited data suggest that women may be tested more frequently. We hypothesized that women are tested for PE in the ED at different rates than men.

Methods: We performed a retrospective chart review of patients between ages 18-49 who presented to a tertiary hospital ED during calendar years 2016-2018 and had a chief complaint or discharge diagnosis of pulmonary embolism, chest pain, dyspnea, hemoptysis, or syncope; patients with traumatic etiologies were excluded. This cohort was selected due to the greater potential harms of unnecessary testing. We extracted data elements from the electronic medical record including chief complaint, diagnosis, and testing in the ED. Multiple imputation by chained equations was used to account for missingness of key data elements. Descriptive statistics were performed for this cohort, by biological sex, age, and chief complaint. Chi square was used to compare rates of testing between women and men.

Results: We studied 5,789 encounters, 2808 men and 2981 women. The overall incidence of PE in this cohort was 1.4%, 1.6% for men and 1.2% for women. Women were more likely than men to undergo D-dimer testing (385/2981, 12.9% vs 193/2808, 6.9%, p<0.01). Women were also more likely than men to receive imaging studies, (181/2981, 6.1% vs 130/2808, 4.6%, p<0.02). Of the included chief complaints, patients presenting with hemoptysis were most likely to have imaging performed (5/30, 16.7% of women and 3/31, 9.7% of men).

Conclusion: Sex and gender based differences in the presentation, workup, and diagnosis of disease have been found to be clinically significant in a variety of disease processes. In this cohort of ED patients for whom PE was likely a diagnostic consideration, women were more likely to undergo testing despite equal disease incidence. This is potentially harmful given the risks associated with overtesting (eg ionizing radiation). Clinicians should consider these differences and evidence based guidelines when evaluating patients for possible PE.

## 154 Emergency Department Patient Self-Reported History of Venous Thromboembolism Varies Based on Terminology Used

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Background and Objectives: Pulmonary embolism risk stratification scoring systems, such as the Pulmonary Embolism Rule-out Criteria (PERC), utilize a patient's self-reported history of pulmonary embolism (PE) and deep vein thrombosis (DVT). We hypothesized that patients' understanding of medical terminology may affect their self-reported history of PE or DVT and that this may lead to incorrect PERC classification.

Methods: We enrolled a convenience sample of patients presenting to the University of Utah Emergency Department (ED) with chest pain and/or shortness of breath between July 2010 and June 2019. We administered a series of standard questions regarding patients' past medical history, asking "Have you been diagnosed with a pulmonary embolism or deep vein thrombosis?" and, later, "Have you ever had a blood clot in your lungs or legs?" We noted the number of patients who answered "no" to the first question and "yes" to the second question. We reviewed the medical record to determine how many of these individuals had a previously documented PE or DVT. We reviewed additional PERC components to determine how many of these patients may have been incorrectly classified as PERC-negative based on their response to the first question.

Results: Over the nine-year study period, 4560 patients agreed to participate. Average patient age was 51.9 years (range: 18-100) and 54.7% of patients were female. When asked if they had a "blood clot in your lungs or legs," 601 patients (13.2%) answered "yes." Of these patients, only 380 patients (63.2%) answered "yes" when asked if they had a history of "pulmonary embolism or deep vein thrombosis." Of the 221 patients who answered "yes" to one question but "no" to the other, 126 (57%) had a documented history of PE or DVT. Twelve (5.4%) of the patients with a documented history of PE or DVT may have been incorrectly classified as PERC-negative based on their response.

Conclusion: A large number of ED patients provided discordant responses when asked about their history of PE or DVT utilizing more complex and simpler terminology. Most of these patients had a documented history of PE or DVT and some may have been incorrectly classified as PERC-negative. These findings have clinical and research implications when inquiring about patient medical history.

## 155 Accurately Identifying Pulmonary Embolism in Imaging Reports Using Natural Language Processing

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Background and Objectives: Diagnostic evaluation for suspected pulmonary embolism (PE) with computed tomography pulmonary angiography (CTPA) accounts for two million studies annually in the US and reducing overuse of CTPA is the target of national society guidelines. Yet commonly used diagnosis codes from claims data have limited reported sensitivity (84-87%), with reported CTPA yield (PE diagnoses/CTPA studies performed) of 3-16%. We evaluated the performance of a natural language processing (NLP) approach to identify PE in unstructured CTPA reports.

Methods: We developed and tested NLP algorithms to first identify CTPA studies for PE using imaging data in the electronic health record across 21 emergency departments (EDs) of an integrated health care delivery system. We then applied NLP to determine PE findings among eligible CTPA studies compared against a

standard of manual chart review. A random sample of 700 studies from 2013-2018 comprised the CTPA report cohort. We segmented the CTPA report into history, impression and findings, then searched text strings for indicator words and modifiers before and after the indicator. Manual review to categorize studies as positive, negative or indeterminate was tabulated against NLP classification. We then calculated final NLP performance, including sensitivity, specificity, misclassification rate, and positive and negative predictive value (PPV and NPV).

Results: NLP analysis of the imaging reports classified 587 of 700 studies protocoled for PE rather than for other indications (aortic dissection or aneurysm protocol) with 98.3% sensitivity, 99.7% specificity, and 0.6% misclassification rate. For identifying PE, NLP achieved sensitivity of 98.2% and specificity of 99.8% with a PPV of 98.2% and NPV of 99.8%. NLP identified 9.5% of studies as positive for PE, compared to 9.5% by manual chart review, with a misclassification rate of 0.3%.

Conclusion: In studies to evaluate PE diagnostic yield, NLP shows excellent performance in identifying PE studies and PE-related findings. Applying NLP to classify CTPA studies shows promise for reliable assessment of CTPA yield, an important outcome measure in clinical interventions to optimize CTPA ordering. This study supports the feasibility of developing an accurate physician feedback measure based on NLP ascertainment of CTPA yield.

## 156 Outcomes From a Multicenter Implementation Study of a Home Treatment Protocol for Venous Thromboembolism

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Background and Objectives: Data are lacking to accurately assess the short-term rate of adverse events related to home treatment of venous thromboembolism (VTE) including deep vein thrombosis, DVT) and pulmonary embolism (PE) in emergency department (ED) using direct acting anticoagulants (DOACs). This study reports 30-day outcomes from a two-state, multicenter implementation study.

Methods: With adherence to the Standards for Reporting Implementation Studies (StaRI) Statement, we implemented a protocol at three hospitals located in the Dallas TX metro area and four hospitals in the Indianapolis, IN metro area. Eligible ED patients had either DVT and PE (or both) and were deemed as low risk using either modified Hestia or sPESI plus clinician judgment. Patients were prescribed either apixaban or rivaroxaban, and discharge occurred within 24 hours of triage. Primary outcomes were rates of unscheduled medical visits, bleeding causing change in medication, recurrent VTE, discontinuation or switching of initial anticoagulant at 30 days.

Results: We enrolled 565 patients between 2017-2018, and had complete data on 540, including 422 with DVT and 127 with PE, (11 had both DVT and PE). Mean (SD) age was 59 (16) years and 350 (65%) had a Charlson comorbidity score of zero; 391 (72%) were prescribed rivaroxaban, and 149 (28%) apixaban. Within 30 days, 131 (24%) had an unscheduled medical care visit (all to ED), leading to 34 hospitalizations (6%), including 13 (2.4%) for probable recurrent VTE (6 DVT + 7 PE), and 6 (1.1%) for bleeding. Within 30 days, 56 (10.4%, 95% CI: 7.8-13.0%) discontinued (n=30) or switched the initial anticoagulant. Reasons for discontinuing drug at 30 days were bleeding (9), financial (9), other side effects (8) or recurrent VTE (4).

Conclusion: These real-world, 30-day outcomes data from an implementation study using a monotherapy home treatment protocol for low-risk VTE patients suggest a high rate (24%) of subsequent unscheduled medical care, and a 10.4% rate of anticoagulant discontinuation, mostly from bleeding and cost of drug. The data imply need to better plan for transitions in care, assess bleeding risk and barriers to drug access.

## 157 Bova Score to Predict Patients With Acute Pulmonary Embolism Unlikely for 48-Hour Adverse Events

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Background and Objectives: The Bova score was derived to identify normotensive patients at risk of 30-day mortality or pulmonary embolus (PE) related complication. Unfortunately, this tool may not predict who is at risk for sudden decompensation and necessitate ICU level care after initial diagnosis within the ED, but its simplicity and objective nature (RV strain, blood pressure, troponin, pulse) has appeal. We aimed to assess the Bova score for 48-hour adverse outcomes with the hypothesis that the Bova score could accurately identify a cohort of patients not in need of ICU care.

Methods: A retrospective study was performed at an academic ED evaluating patients presenting from 1/2014 –8/2019 who presented to the ED and were admitted with a chart diagnosis of PE with CT or VQ imaging confirmation within three days of arrival. A Bova score was retrospectively calculated from EHR data consisting of troponin, blood pressure, heart rate, and echo/CTA chest results obtained <12 hours from arrival. Bova score's discriminatory capacity was evaluated against two outcomes: 1) a composite outcome of adverse events at 48 hours consisting of death, thrombolysis, positive pressure ventilation, or vasopressor administration and 2) all cause in-hospital mortality during the index visit. The Bova score was evaluated by sensitivity, negative predictive value, and overall AUC for both outcomes.

Results: 786 patients were included in the study after excluding 57 due to sBP below threshold for a Bova calculation. Mean age was 59 years with 53% female. Overall incidence of composite outcome was 5.6% and in-hospital mortality was 3.8%. The median Bova score was 1 (IQR 0 – 2, max 7). When evaluating Bova for the 48-hour composite outcome, a score <=1 to define low risk offered a NPV of 97% (95%CI 95 – 98%) and sensitivity of 64% (95%CI 48 – 76%) with AUC of 0.71 (CI 95% 0.63 – 0.79). For inpatient mortality, Bova score <=1 yields a NPV of 98% (95%CI 96 – 99%), sensitivity of 67% (95%CI 47 – 83%), and overall AUC of 0.72 (95%CI 0.61 – 0.82).

Conclusion: Applying the Bova score to predict poor outcomes during the index visit identified a cohort of patients unlikely to have an adverse event at 48 hours or death during that encounter. This provides a simple, effective decision-making tool for emergency providers when attempting to determine disposition and immediate care for patients diagnosed with a pulmonary embolism during their ED visit.

## 158 Diagnostic Performance of Prehospital Acute Coronary Syndrome and Pulmonary Embolism Risk Scores: The RESCUE Study

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Background and Objectives: EMS assesses millions of patients each year with chest pain. However, validated acute coronary syndrome (ACS) and pulmonary embolism (PE) risk stratification tools, such as the History ECG Age Risk factor (HEAR) score and Pulmonary Embolism Rule-out Criteria (PERC), have yet to