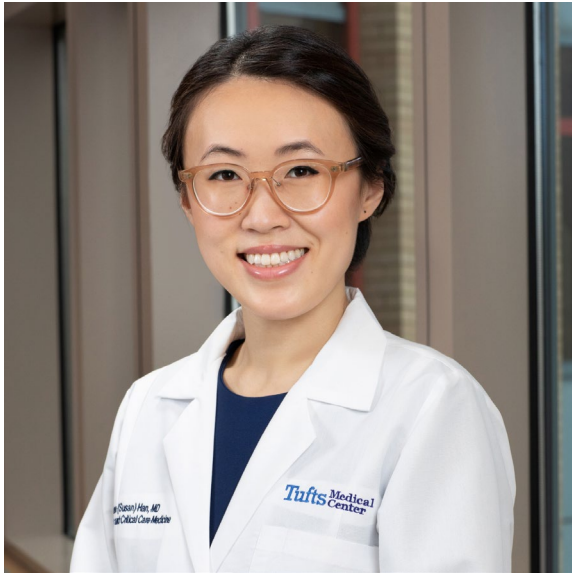# ATS Highlights 2024:
Critical Care Assembly Early Career Professionals

Xuan (Susan) Han, MD, MScBMI

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Tell us about yourself.

I am a pulmonary critical care physician interested in working at the intersection of clinical informatics, data science, and quality improvement to better understand and improve critical care practices and long-term patient outcomes after critical illness. After completing my medical training at the University of Chicago, I moved to Boston to join Tufts.

Tell us about your research.

My prior clinical research has focused on leveraging large EHR cohorts to analyze sepsis care practices and identify patients at particular risk for harm from delayed therapy. Currently, I am studying risk factors for poor outcomes in survivors of critical illness and ECMO support.

Where do you see yourself in 5 years?

I hope lead a multidisciplinary critical illness recovery program that provides structured evaluation and support for patients from the ICU into the outpatient setting, and to be driving forward the development of critical care informatics at my institution.

How has the Critical Care Assembly contributed to your career?

The Assembly has exposed me to incredible work that is being done by members across the field and provided great opportunities for collaboration and education.

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Identifying High-Risk Subphenotypes and Associated Harms From Delayed Antibiotic Orders and Delivery

OBJECTIVES: Early antibiotic administration is a central component of sepsis guidelines, and delays may increase mortality. The objective of this study was to characterize and compare patients who experienced order or delivery delays, investigate the association of each delay type with mortality, and identify novel patient subphenotypes with elevated risk of harm from delays.

DESIGN: This was a retrospective study of all patients admitted through the emergency department who met clinical criteria for infection at two tertiary care medical centers (2008–2018, 2006–2017) and four community-based hospitals (2008–2017). Adjusted logistic regression models were used to examine the relationship between each delay and in-hospital mortality. Causal forests, a machine learning method, was used to identify a high-risk subgroup.

RESULTS: A total of 60,817 admissions were included, and delays occurred in 58% of patients. Each additional hour of order delay (**odds ratio, 1.04**; 95% CI, 1.03–1.05) and delivery delay (**odds ratio, 1.05**; 95% CI, 1.02–1.08) was associated with increased mortality. A patient subgroup (Cluster 2) identified by causal forests with higher comorbidity burden, greater organ dysfunction, and abnormal initial lactate measurements had a higher risk of death associated with delays (odds ratio, 1.07; 95% CI, 1.06–1.09 vs odds ratio, 1.02; 95% CI, 1.01–1.03).

CONCLUSIONS: Delays in antibiotic ordering and drug delivery are both associated with a similar increase in mortality. A distinct subgroup of high-risk patients exist who could be targeted for more timely therapy.
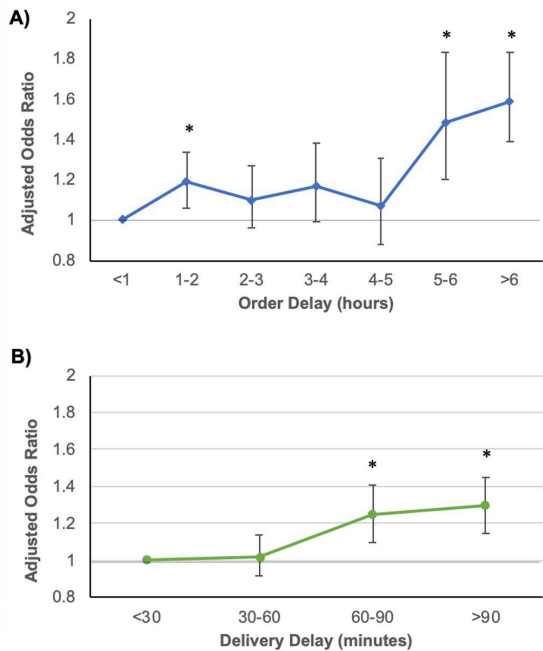
Figure 1. Association between different delay types and in-hospital mortality.

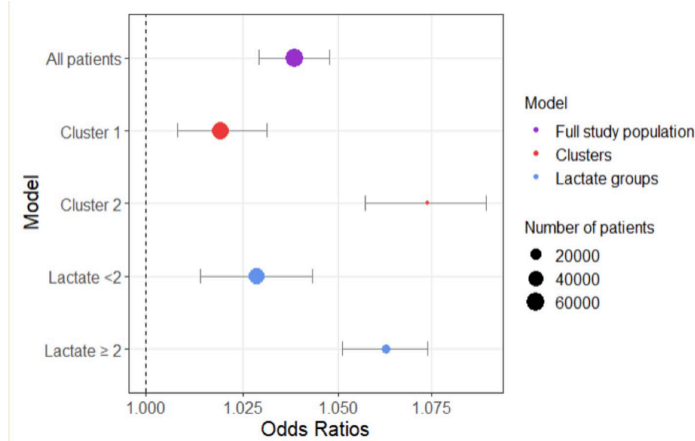*Figure 2. Association between cumulative delay and in-hospital mortality for patient subgroups and by lactate stratification.*