

# S.T.A.T. ECGs: Supporting Technicians in Acquiring Timely ECGs

Andrew E. Levy, MD MS<sup>1,2</sup>; Mustafa Ozkaynak, PhD<sup>1,3</sup>; Juliana Barnard, MA<sup>1,2</sup>; Sharon Pincus, MA<sup>1,2</sup>; Michael Ho, MD, PhD<sup>1,2</sup>

1. Data Science to Patient Value Navigation Laboratory (D2V NavLab); 2. University of Colorado School of Medicine; 3. University of Colorado College of Nursing



## BACKGROUND

The Division of Cardiology reviewed a “near-miss” patient safety event related to delayed performance of a **STAT priority electrocardiogram (ECG)** in a floor unit patient with high-risk chest pain.

While the importance of prompt ECG completion (<10 mins) during pre-hospital and emergency room care is well-established, **no similar measures exist for hospitalized patients.**

Meanwhile, delays in ECG acquisition contribute to delayed diagnosis and treatment of in-hospital STEMI.<sup>1</sup>

There are few published attempts to improve ECG completion times among hospitalized patients.<sup>2</sup> We sought to understand drivers of delays at UCH.

## METHODS

An analysis of 21,495 time-stamped inpatient ECGs performed at UCH between 1/1/2018 and 10/30/2018 was completed.

- Descriptive statistics for ECG volume, ECG completion delays and total technician staffing levels were calculated
- Correlations between ECG characteristics and delays were examined.

From February to April 2019, a **qualitative researcher** completed interviews and observations with staff involved in ECG completion. Interviews focused on:

- Processes: components & prioritization of ECG acquisition
- Environment: technician morale, nurse perceptions

Based on these initial quantitative and qualitative analyses, a discrete event simulation model was developed to evaluate changes in:

- 1) technician shifts and staffing ratios
- 2) the proportion of STAT orders
- 3) nurse training to help perform ECGs

## FIGURES

Figure 1: Inpatient ECGs (21,495) by priority and whether they were delayed

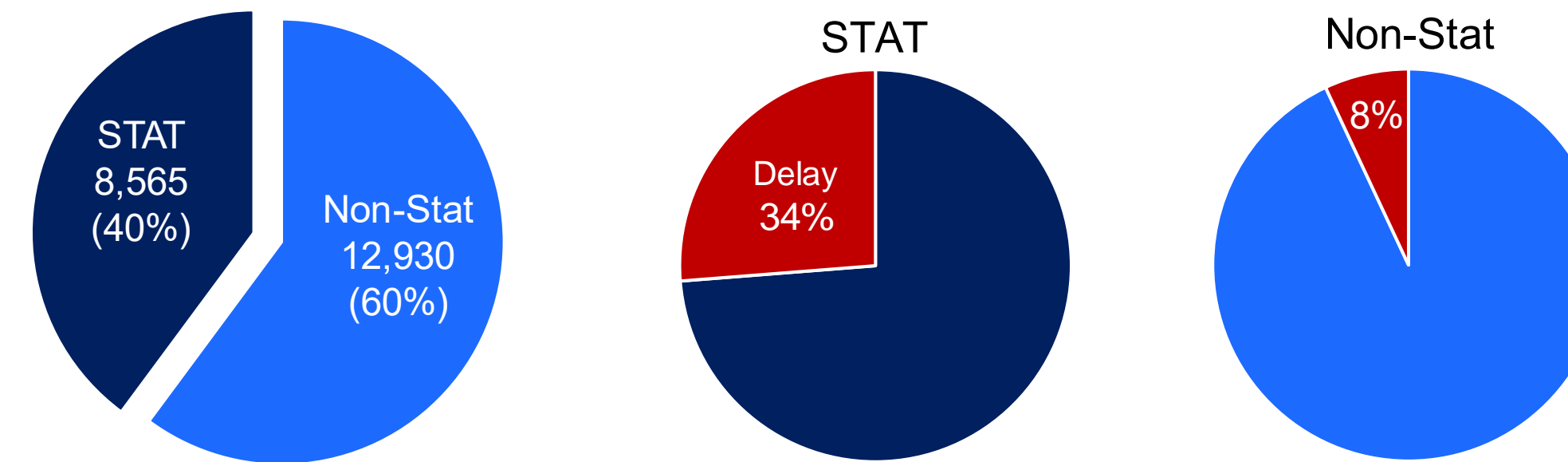


Figure 2: Hourly ECG Volume (Gray) vs. Hourly Technician Staffing

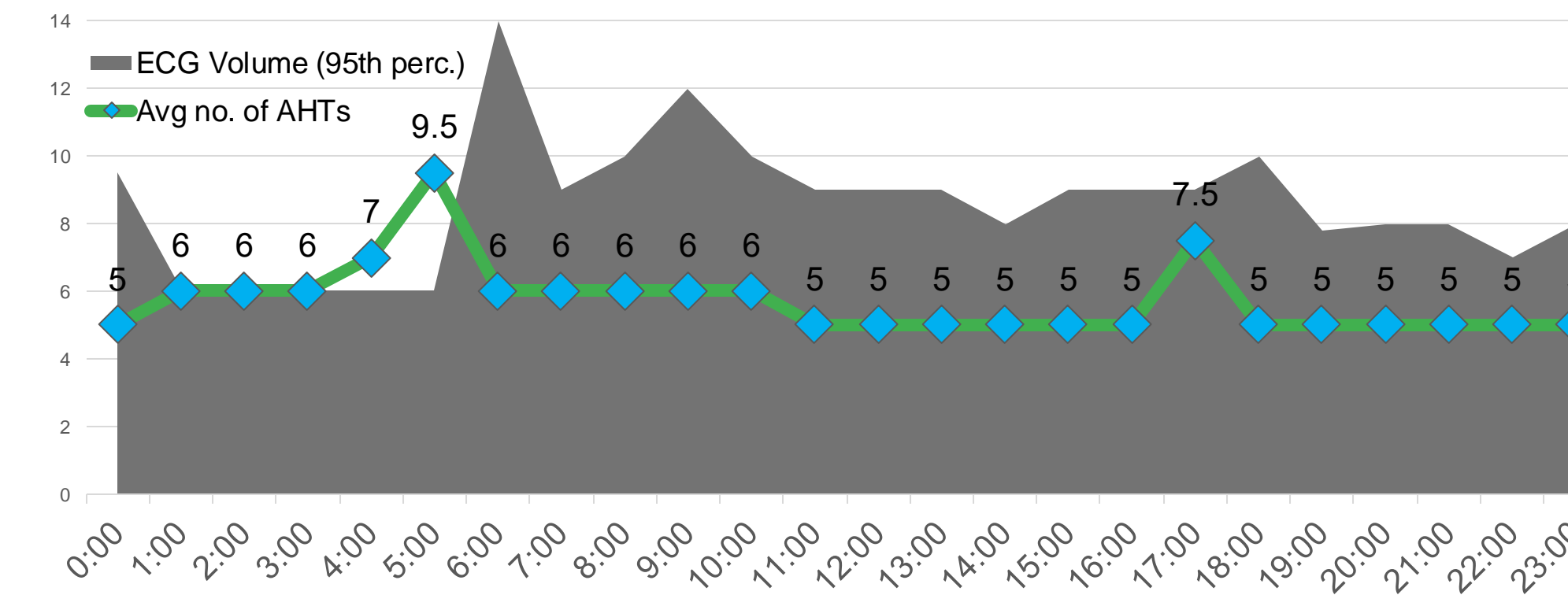
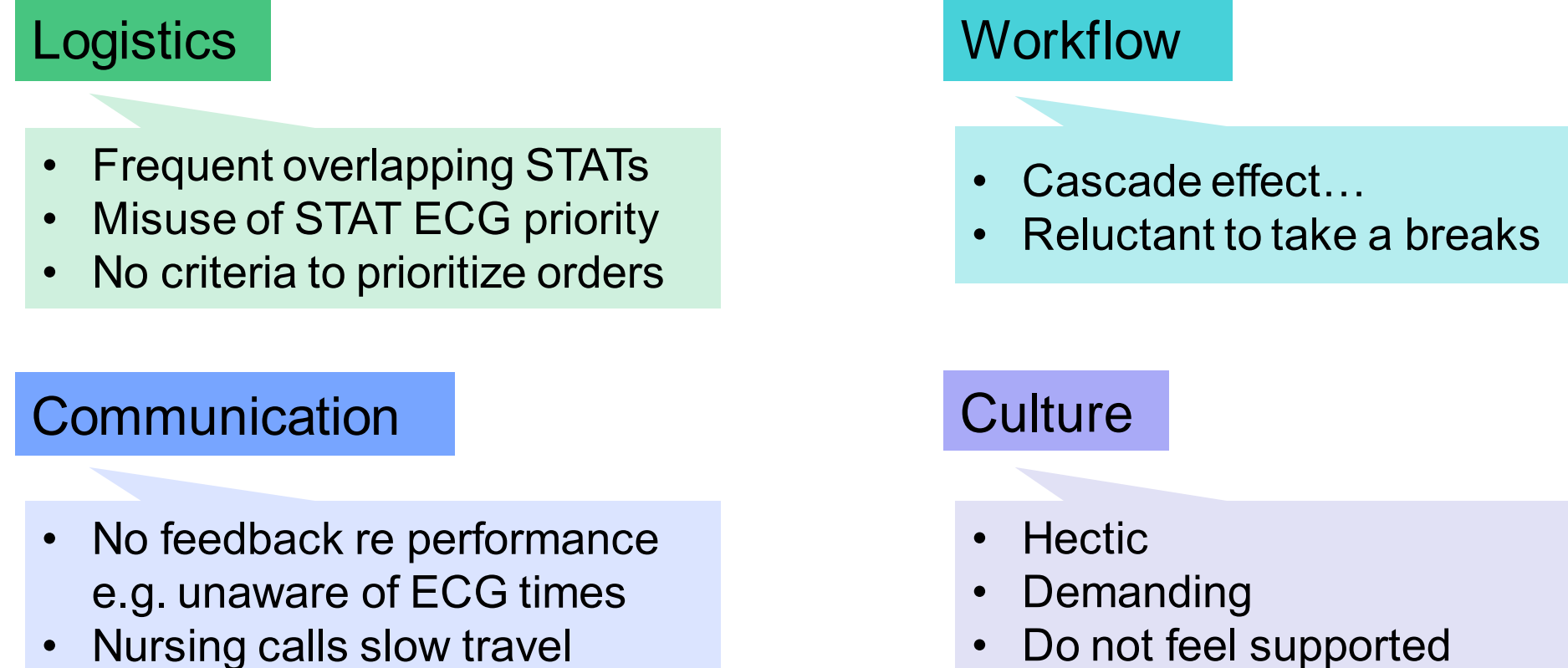


Figure 3: Findings from qualitative interviews with technicians



## RESULTS

- ECGs were ordered with a **STAT priority in 40%** of cases
  - Use of STAT **varied from 7% to 95%** among individual clinicians.
- Delays were found in >35% of STAT ECGs vs. <10% of non-stat ECGs.
- Delays in STAT ECGs were strongly correlated with STAT ECG volume.
  - Technicians called this observation a “**cascade of delays**”
- Technicians described spike in ECG orders when staffing levels were low.
  - Figure 2 quantitatively confirms this qualitative observation.
- Simulated changes in staffing & policies suggest:
  - technician hours **outperforms**  in proportion of STAT ECGs
    - **Short shifts** (4–6 hours) may help  technician staffing hours
  - If **Cardiology nurses** perform ECGs on their unit →  delays
  - The negative effect of **not replacing a technician** who calls in sick is more powerful than the positive effect of any intervention.
  - Technicians described a **hectic** and **unforgiving** work environment
    - Addressing technician burnout may help avoid attrition.

## CONCLUSIONS

- In light of the above findings, UCH operations leadership trained charge nurses on Cardiology units to perform STAT ECGs.
- Next steps will include:
  - Reform of ECG technician staffing models
  - Creation of a dashboard for leadership to review the timeliness of ECGs and performance of ECG technicians

## KEY REFERENCES

1. Levine GN, Dai X, Henry TD, et al. In-Hospital ST-Segment Elevation Myocardial Infarction: Improving Diagnosis, Triage, and Treatment. *JAMA Cardiology*. 2018;3(6):527-531.
2. Dai X, Meredith D, Sawey E, Kaul P, Smith SC, Stouffer GA. A Quality Improvement Program for Recognition and Treatment of Inpatient ST-Segment Elevation Myocardial Infarctions. *JAMA Cardiology*. 2016;1(9):1077-1079.



Data Science to Patient Value (D2V)

UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS



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