

No Time To Wait: Real-Time Quality Monitoring for Early Interventions at TGH



Company Advisors: Nicole Nehls, Kunal Patel, Kam Ho, Dr. Lien Le,
Dr. Peggy Duggan, Dr. Laura Haubner
Faculty Advisor: Dr. Georgia Perakis
PhD Advisor: Angela Lin



Project Overview

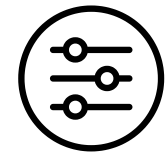
Project Goal

Develop and deploy a **real-time predictive model** for monthly **mortality** and **quality of care** at TGH to enable timely **operations-level interventions**

Pain Points



Manual & Delayed Data Retrieval and Compilation



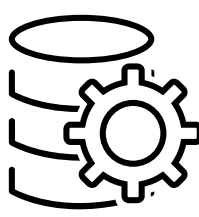
Static Model with **Low** Accuracy and **Hard-to-Update** Logic



Excel-Based Reporting with **Limited Diagnostic Insight**

Full-Stack Palantir Foundry Application

Data Pipeline Automation



14 Variables from 8 Departments over 45 Months
Qlik + Vizient + EPIC + Excel Sources

Mortality Domain			
Number of discharges to hospice (higher is better)	Number of hospice admissions (lower is better)	Number of inpatient deaths (lower is better)	Number of transfers from another hospital (lower is better)
Number of patients readmitted prior to hospice admission (post-combat) (lower is better)	Number of PSQ-04 (consentment failure to stay)	Sepsis Bundle Compliance (EP: red < 70%, yellow 70-80, green > 80; IP: red < 60, yellow 60-65, green > 65)	Volume of transfers to ICU
Code bills outside the ICU	Nursing patient ratios	Volume of Rapid Response Events	Appropriate documentation to include high scored variables
Higher number of	Completion of	Number of HAs	Number of Repeat

Figure 1. Mortality Domain Variables Overview

Raw Data to **Actionable Metrics**
14 Data Pipelines => **1 Consolidated Calculation Pipeline**

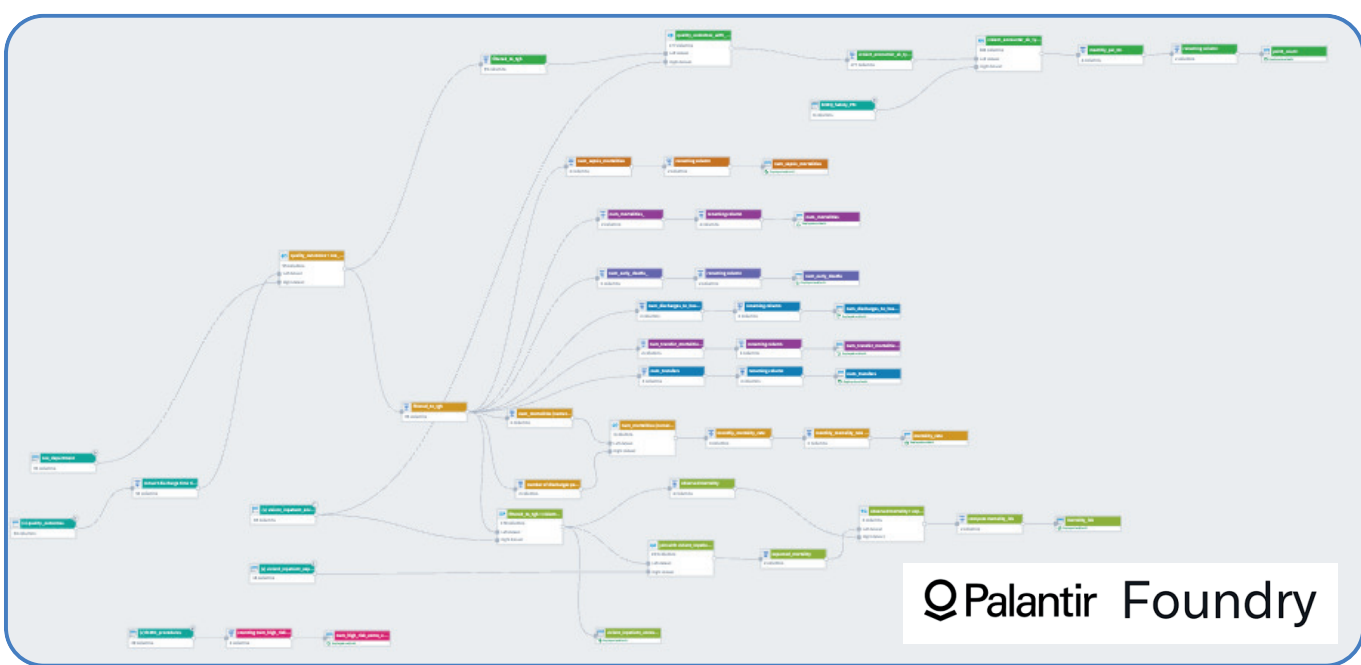


Figure 2. Consolidated Data Pipeline

Monthly **Mortality Score** calculation

Each variable is categorized into **three levels** per month:

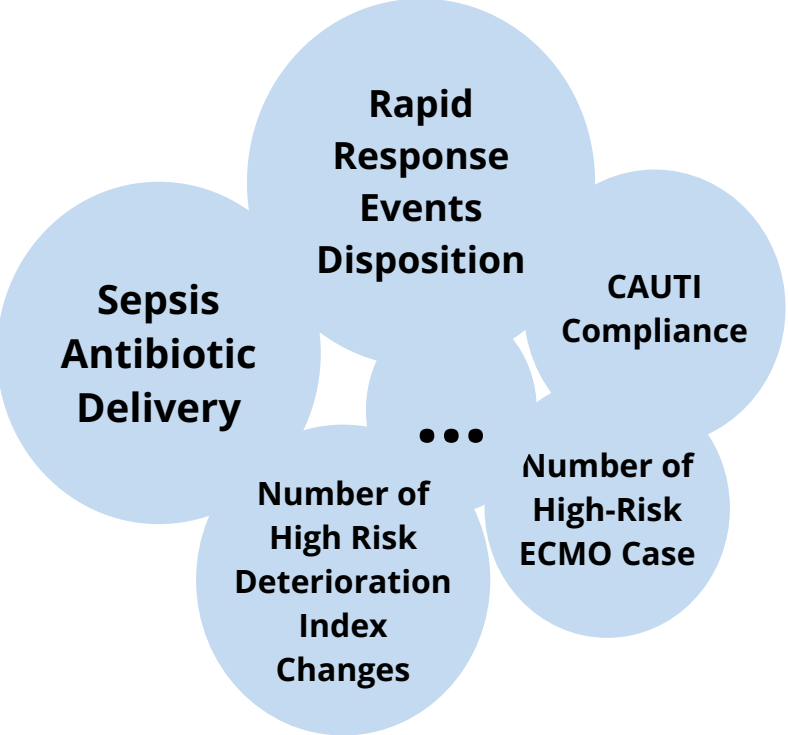
Strong, Moderate, Poor

Monthly Performance Score = $1 \times (\text{count of strong-performing variables}) + 2 \times (\text{count of moderate-performing or N/A variables}) + 3 \times (\text{count of poor-performing variables})$

Additional Variables



12 Additional Variables from 6 Doctor Shadowing Sessions



Scoring System Enhancement

Elastic Net Model Trained on 196 Weeks of Historical Data
(Index RMSE: **0.1119**)
→ **Feature Impact** and **Direction**

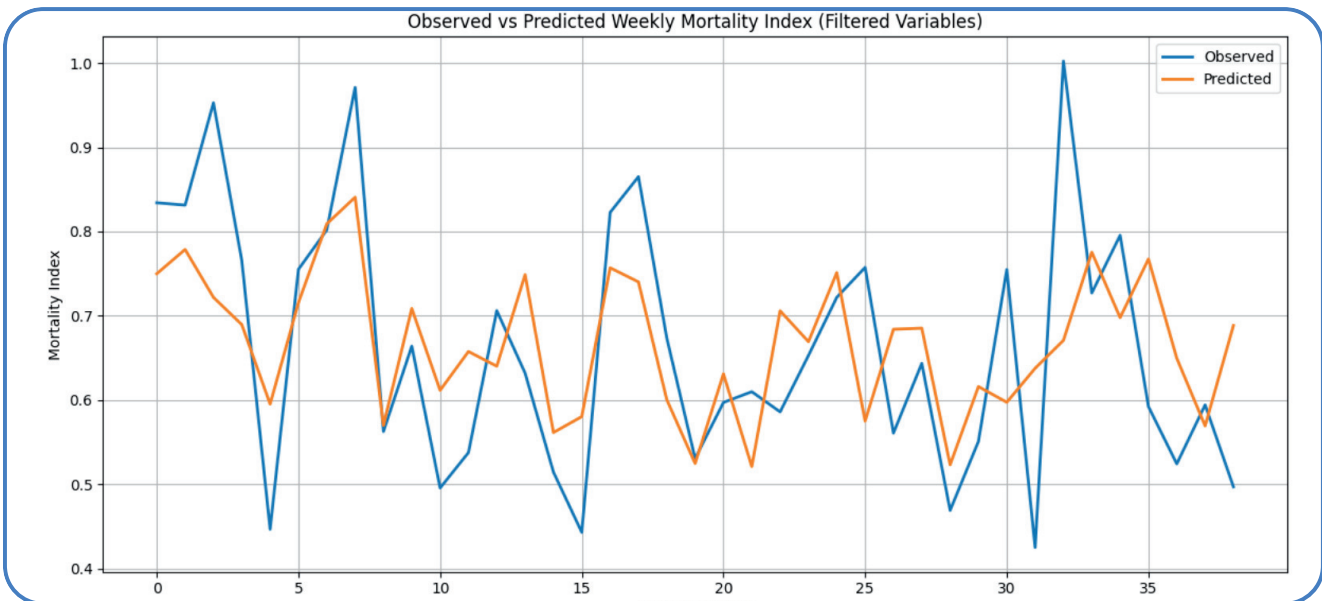
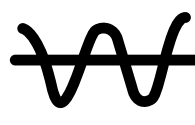
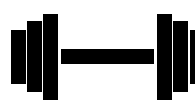


Figure 3. Model Prediction versus Observed Mortality Index



Dynamic 24-Week Threshold for Each Weekly/Monthly Variable



Feature Weights Added to Scoring Formula



Predict Monthly Quality in **Real Time**

Real-Time Interactive Dashboard for Weekly/Monthly Reporting & Analyses

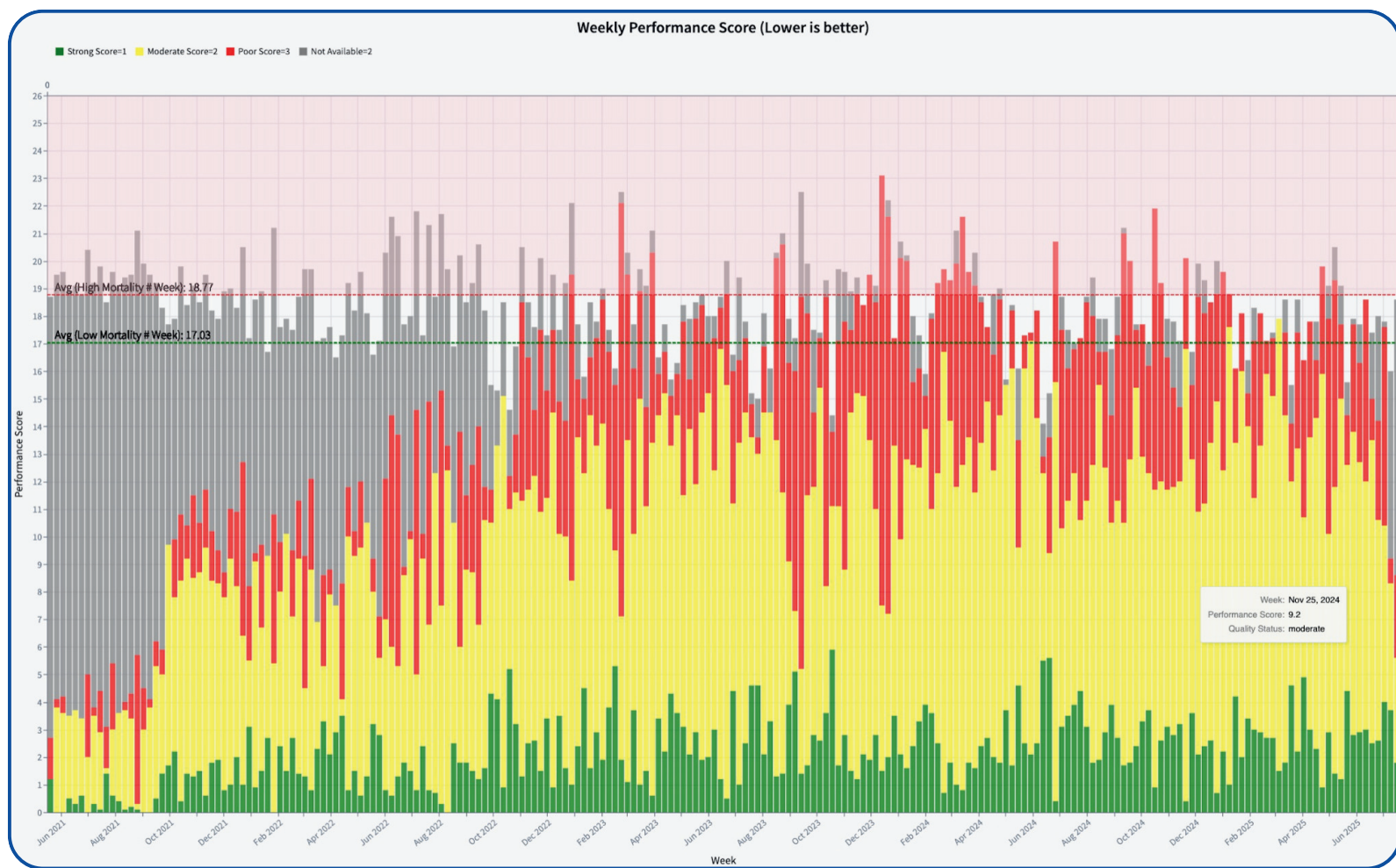


Figure 4. Colored Bar Chart for Weekly Quality Breakdown

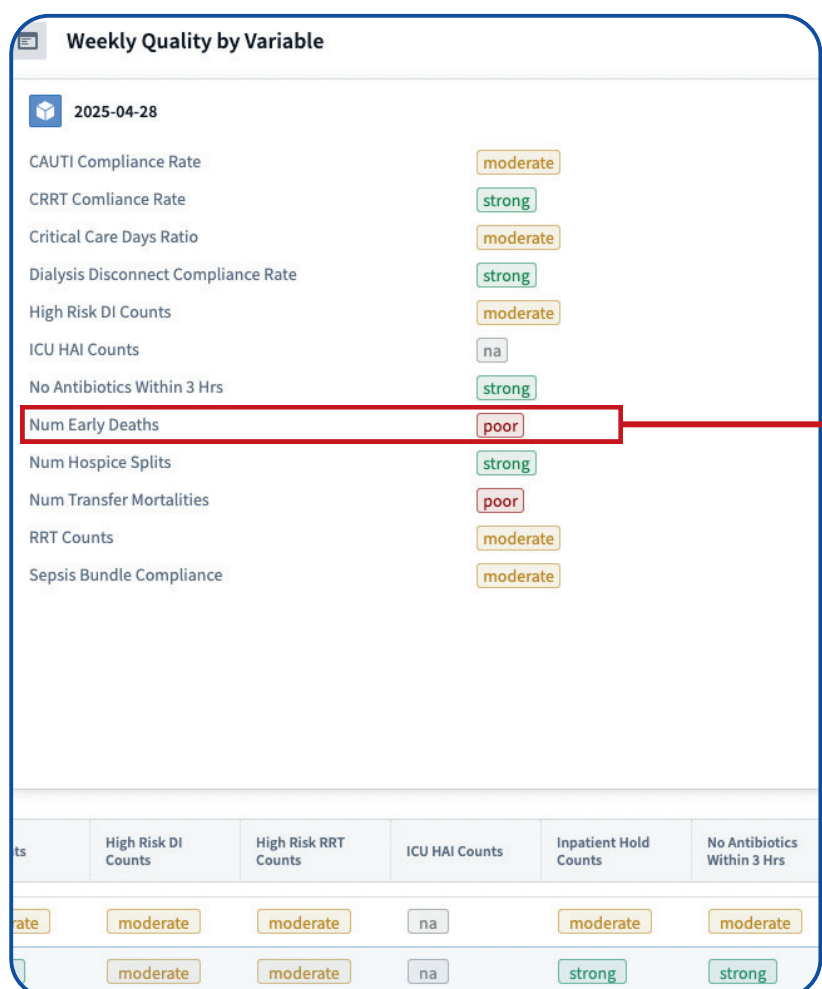
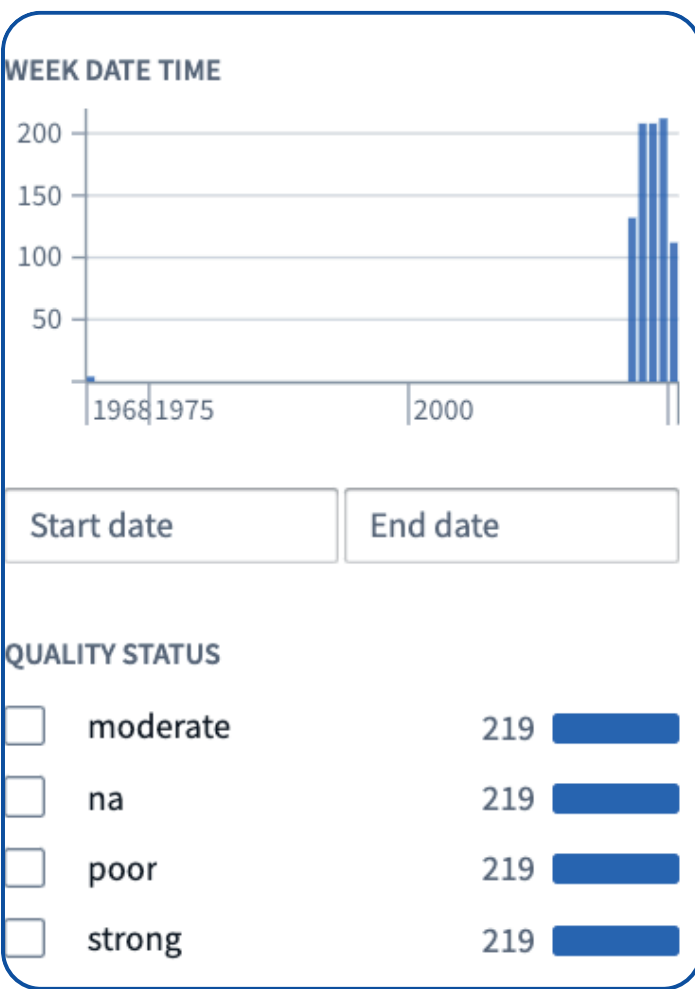


Figure 5. Weekly Variable Status View

Variable-Specific Drill Down as an Automated Intervention Guide

Ex) **Number of Early Deaths** is a **Poor-Performance Variable...**

Upon Click, Dashboard Shows Breakdown of

- **Discharge Departments**
- **Service Lines**
- **Diagnosis Related Groups (DRGs)**

User Knows **Who** is Responsible



Business Impact and Future Direction

Time-to-Action



-4 Weeks

- **Real-Time** Performance Tracking
- **Weekly and Variable-Level** Analyses

Prediction Accuracy

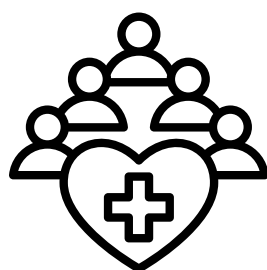


- Improved **Variable Selection** and **Weighting** Based on ML
- Previously 86%

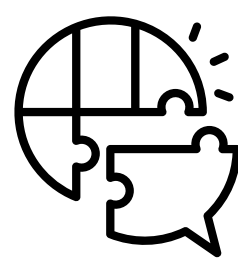
Workflow Efficiency



- **Automated** Data Pipeline
- **Automated Intervention Guidance**



Incorporate **Regional Epidemiology Trends** and **Seasonal Public Health Data**



Expansion to Additional Use Cases of **Readmission Risk Prediction** and **Patient Experience Modelling**