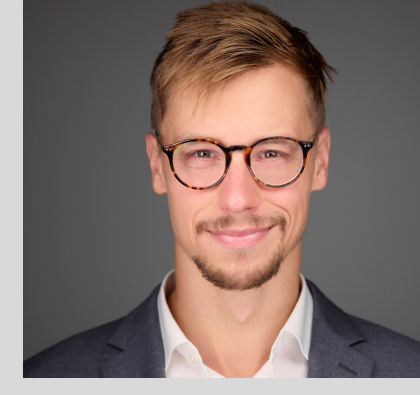




**Vincent Rogers**



**Anton Ipsen**

# We Need More Green Dots:

## Digital Decision Support for Post-Surgical Care

**BWH Statistics**

**27,000+** Yearly Surgeries

**2.6M+** Yearly Patient Encounters

\*Encounter: Individual hospital visit

Hospitals are a complex, dynamic ecosystem where **hundreds of decisions** are being made every second. Many of the most important patient decisions are made in the **perioperative department**, through which all surgical patients must go

Within this department, few people make more critical patient decisions than the **post-anesthesia care unit (PACU) Charge Nurse**

### PACU Charge Nurse Decision-Support Wish List

- ✓ All relevant information, all in one place
- ✓ Information sooner

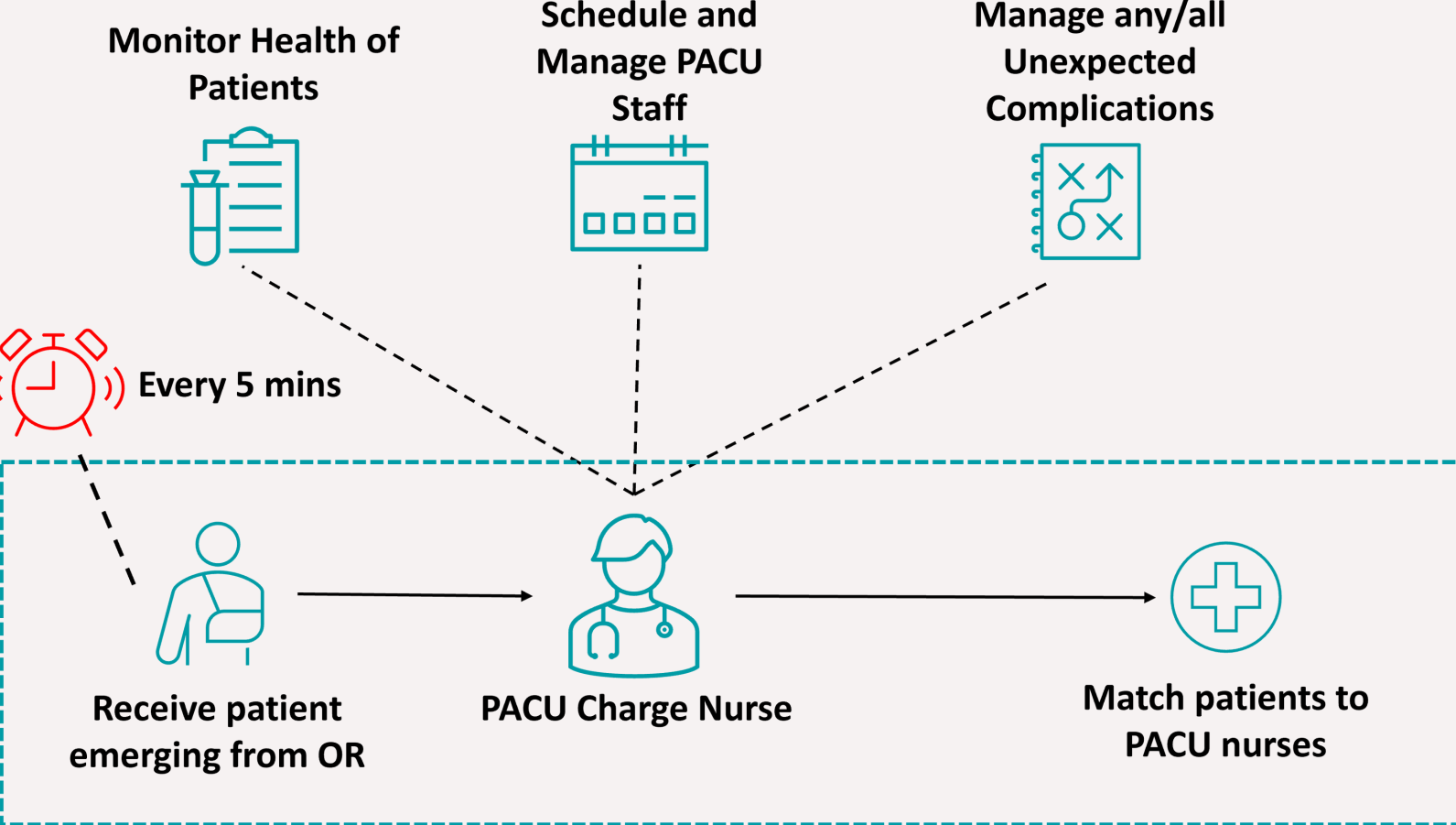
**The PACU Charge Nurse has many responsibilities:** Monitor the recovery of all patients, schedule and allocate staff, and manage all activities and complications

**Nurse-Patient Allocation:** Assess **real-time acuity** of a patient, emerging from operating rooms (OR) and optimally allocating nurse resources to them

**Patient Acuity**

1 nurse ~ 3 patients (Green smiley)

2 nurses ~ 1 patient (Red sad smiley)



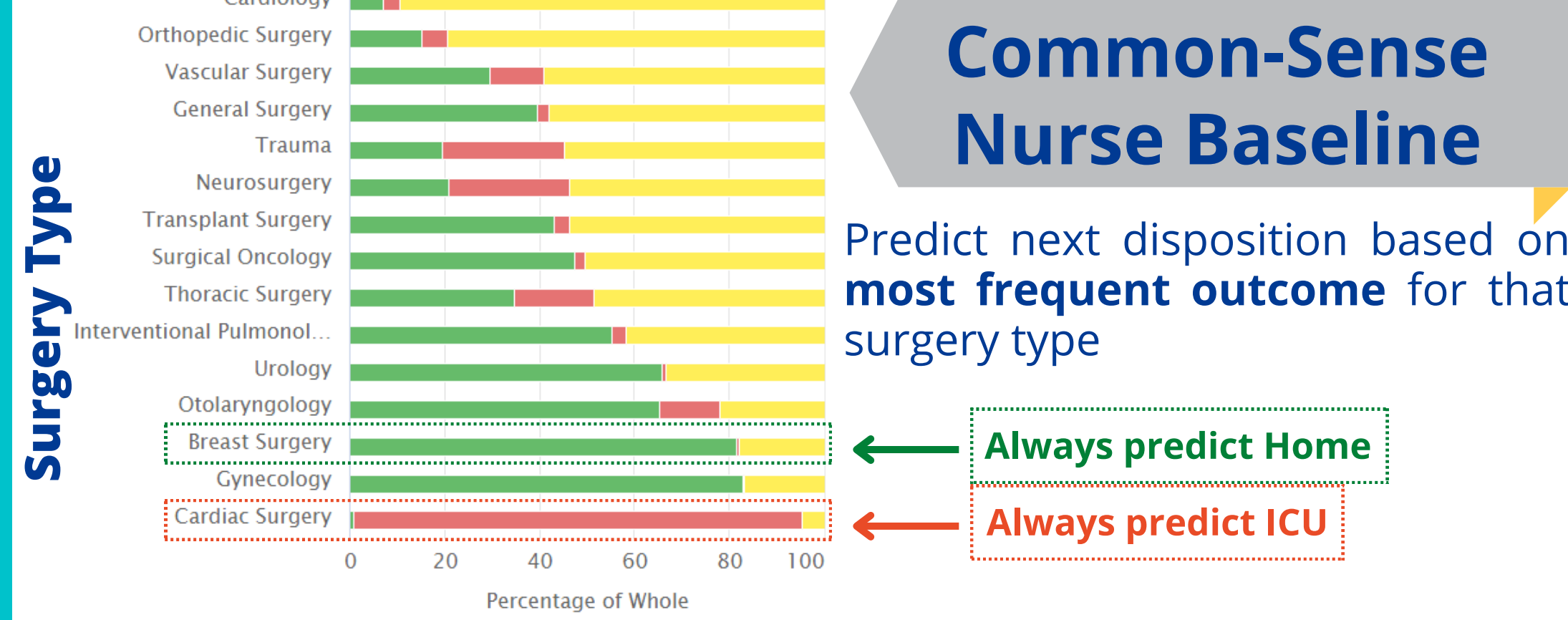
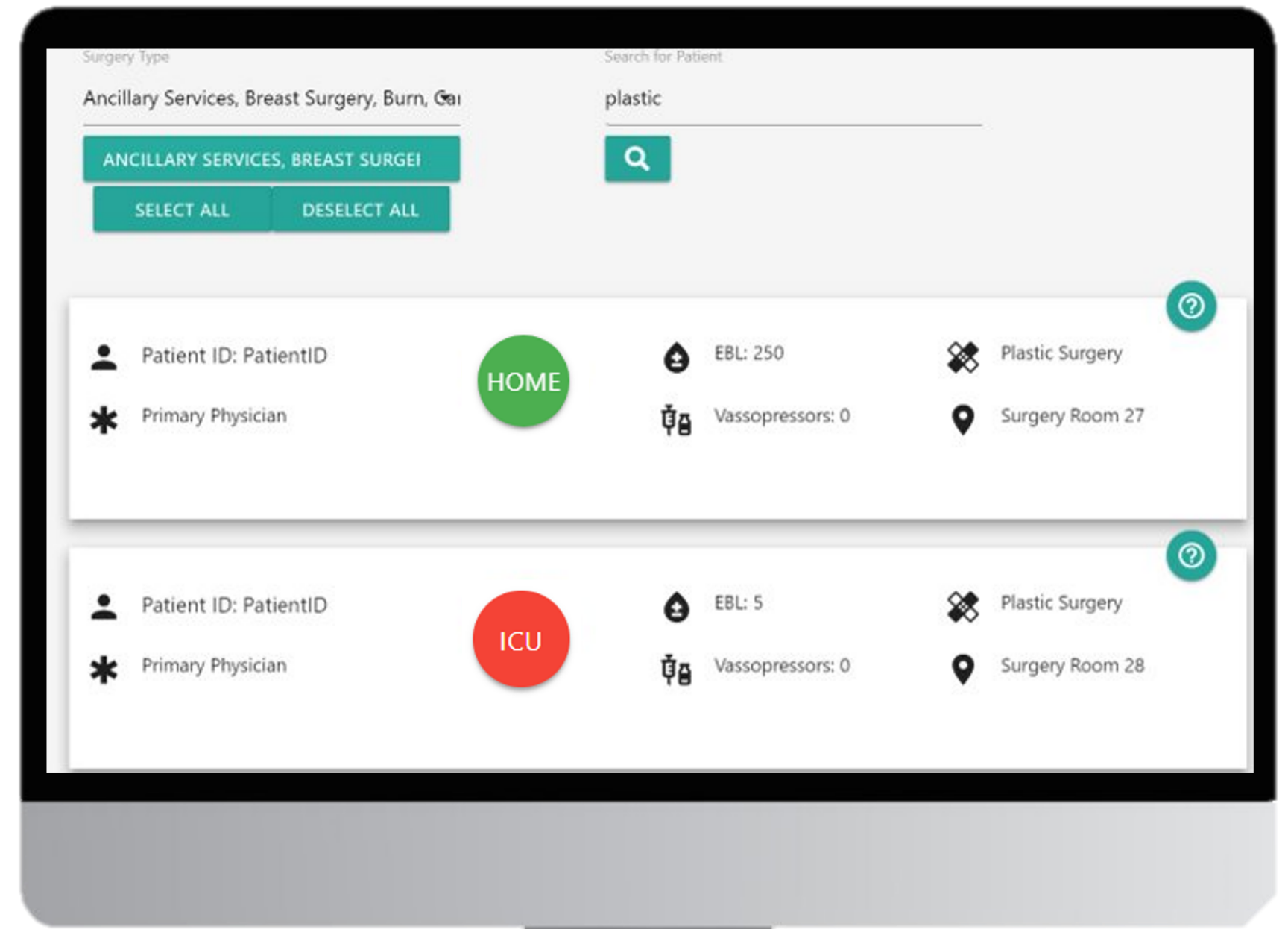
## The outcome of this project is a centralized, digital interface that delivers curated decision-support to stakeholders in real time

The application helps the PACU Charge Nurse make nurse-patient allocation decisions by approximating patient acuity through **predicting the next disposition** of patient

- Disposition Prediction**
- Influencing Features and Key Callouts**

- HOME** Least Sick: Goes home after recovery
- FLOOR** More Sick: Floor after recovery
- ICU** Most Sick: ICU after surgery

All the information to make the allocation decision in one place, **saving clicks** through Epic and calls to the OR



**Adding Pre-OP and Intra-Op Features**

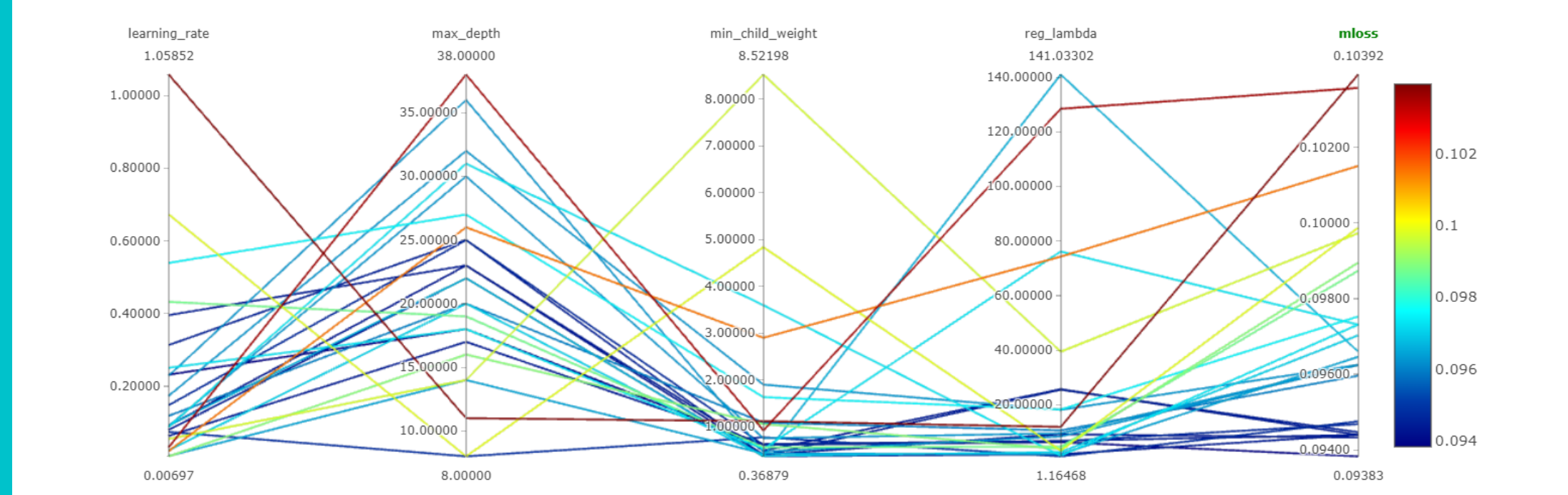
Working with **anesthesiologists and other medical experts**, we collected the features that are most predictive of patient acuity

**17,000+ Patients**

**6 Million+ Data Points**

Feature Type	Features	Preprocessing
Surgical Characteristics	ASA, surgery type, patient class, previous disposition, gender	One Hot Encoding
Categorical Comorbidity Conditions	Comorbidity factors, Charlson Comorbidity Index	One Hot Encoding
Continuous Intraoperative Vital Signs	Systolic blood pressure, heart rate, pulse oximeter	Feature Extraction with TSFresh Python package, Normalization
Continuous Intraoperative Medications and Fluids	Vasopressors, Blood Administered, Estimated Blood Loss	Normalization

Used **Bayesian Optimization** to tune hyperparameters and **Databricks MLFlow** to track and record experiments



## Final Results

**90%** Accuracy In Predicting Disposition Post-Surgery

**+37%** Over Baseline

“ When deciding if a patient needs **one nurse, or two nurses**, having this information definitely **makes that decision easier** ”

**-PACU Charge Nurse**

“ We LOVE the green dots, we need more of the green dots ”

- Improved Patient Outcomes
- Informed Decision Making
- Scalable Framework