in an **emergency**, why wait?

Martin Jung // Marcelo Queiroz

Yatin Mujmudar // Keith LoMurray

Zuckerberg San Francisco General Hospital

What is SFGH?

- Only level 1 trauma center in San Francisco
- Largest trauma center in city

Stakeholders

- Hospital and trauma center administrators

The wait time problem

Harming patients while driving down revenue

Worst wait time in city

- Admissions:
  - SFGH: 452 m
  - City Average: 306 m
- Discharge:
  - SFGH: 255 m
  - City Average: 156 m

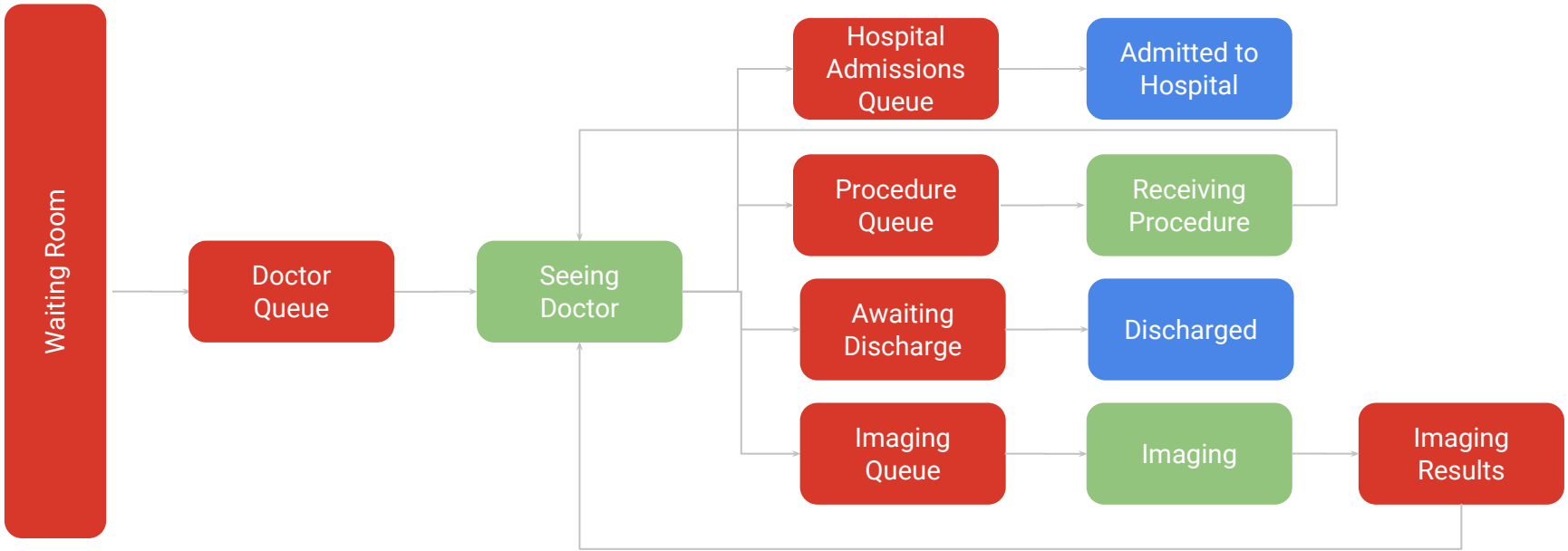
Poor quality

- Quality of care / misdiagnosis
- Patient harm

Poor patient experience

- Yelp reviews and NPS
- Impacts on financial performance

The emergency department



Research Question:

How do the different stages in the ED and the patient severity affect wait time?

Why is question important?

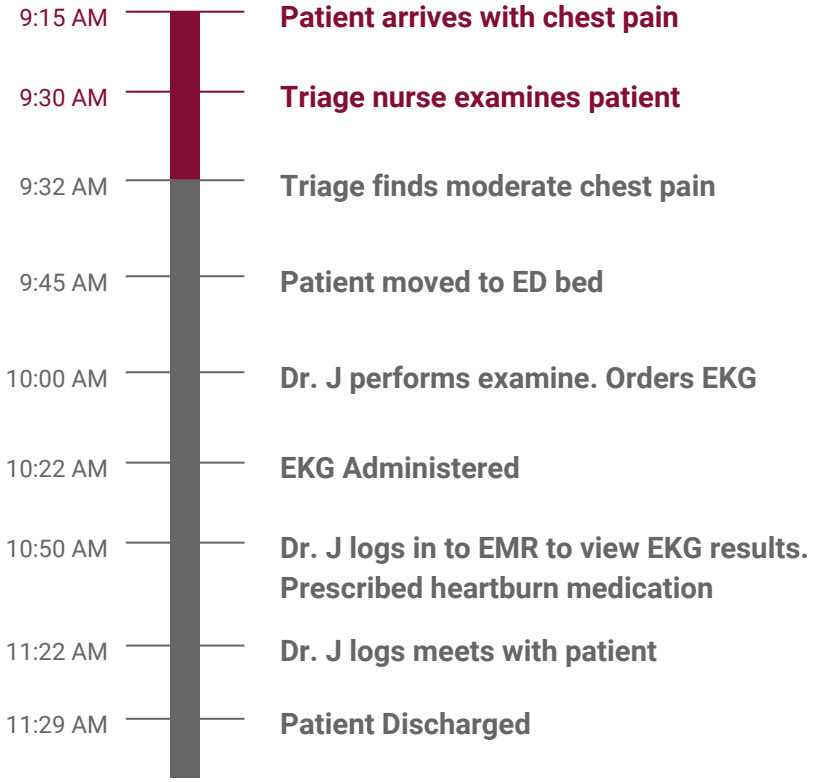
- Allows for concurrent null hypothesis testing

Why is it better than other questions

- Doesn’t presume to have determined the cause

Electronic Medical Records

- EMR data contains:
  - clinical information
  - all interactions



Data labeling / feature engineering

- Severity scored via risk model
- Labeling the stages of care

Example Patient One:

- Severity / Risk Score:
  - Based on presenting symptom receives a severity score of 3
- Stages of Care:
  - 0m - 15m: Waiting Room
  - 15m -30m AM: Doctor queue
  - 30m - 33m: Seeing doctor
  - 33m - 51m: Imaging queue
  - 51m - 57m: Imaging
  - 57m - 78m: Doctor queue
  - 78m - 78m: Seeing doctor
  - 78m - 98m: Doctor queue
  - 98m - 99m: Seeing doctor
  - 99m: Patient discharged

Train the model

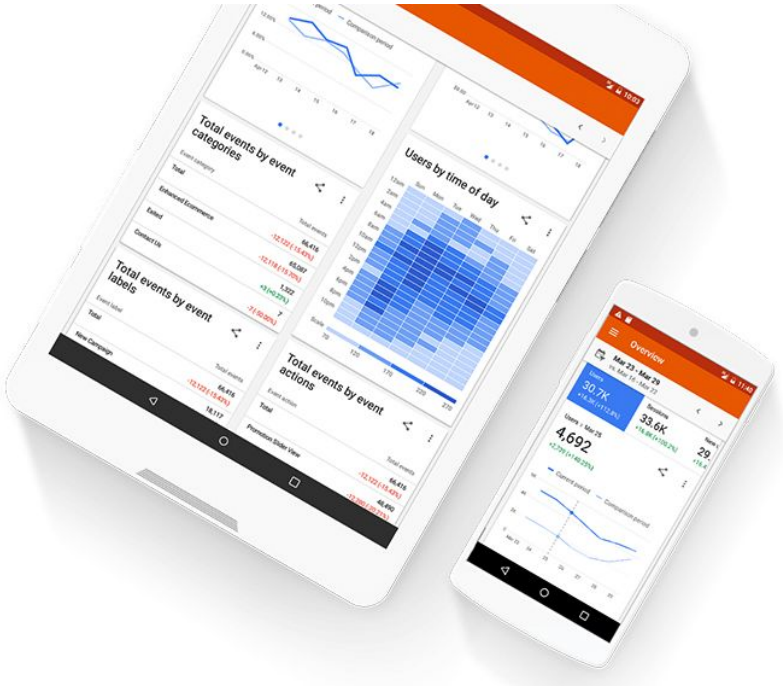
Wait Time ~ (Resources + FE inputs)

- Inputs:
  - Feature engineered elements
  - ED staffing levels
- Machine learning model to predict wait times
- Model will seek to predict ED wait time based on model parameters
- Outputs
  - Predicted ED wait time
  - Weighs of model parameters & contributions to the wait time

Creating the app

Google Analytics for Emergency Departments

- Will tap into real time feed of ED's EMR data
- Report on historical wait times
- Predict & alert on upcoming wait time issues, with continuous monitoring of events.

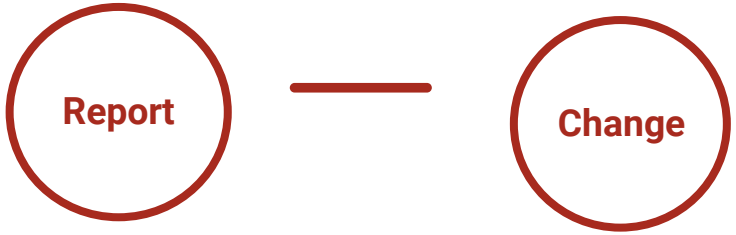


Communication and Final Products

Deliver Report

Communicate the report to stakeholders

Communication and Final Products



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Communicate the report to stakeholders

Implement Changes

Responsible teams make changes based on recommendations

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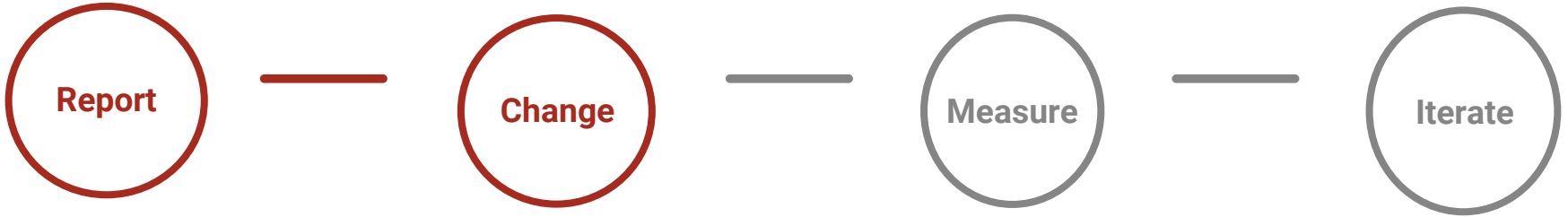
Measure Impact of Changes

Impact of changes are measured via the app

Communication and Final Products



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Measure Impact of Changes

Impact of changes are measured via the app

Iterate and continuously improve

Large and smaller tweaks can be identified and the results monitored via the app

Ethics and Managing Risks

PHI

Data from EMR is PHI under HIPAA

PHI data is sensitive data. PHI data has restrictions and penalties for disclosures.

- PHI not required
- Anonymized to avoid working with PHI data

Culture

Doctors, nurses, and administrators need to drive change

If staff resist change the recommendations will likely fail.

- Leadership driven change
- Data driven management
- Get staff buy-in

Follow up question

Do specific types of events contribute to ED wait times?

Project Summary

- RQ: How do the different stages in the ED and the patient severity affect wait time?

- Final Product:
  - App to monitor and predict wait times
  - Report on existing issues & other areas of improvement

- Follow up question:
  Do specific type of events contribute to ED wait times?

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Redirect

Ethics of redirecting low severity patients

Possible patient frustration. Potential for mistaken assessment & ED is required.

- Design an onsite experience.
- Create app to recommend alternatives.

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