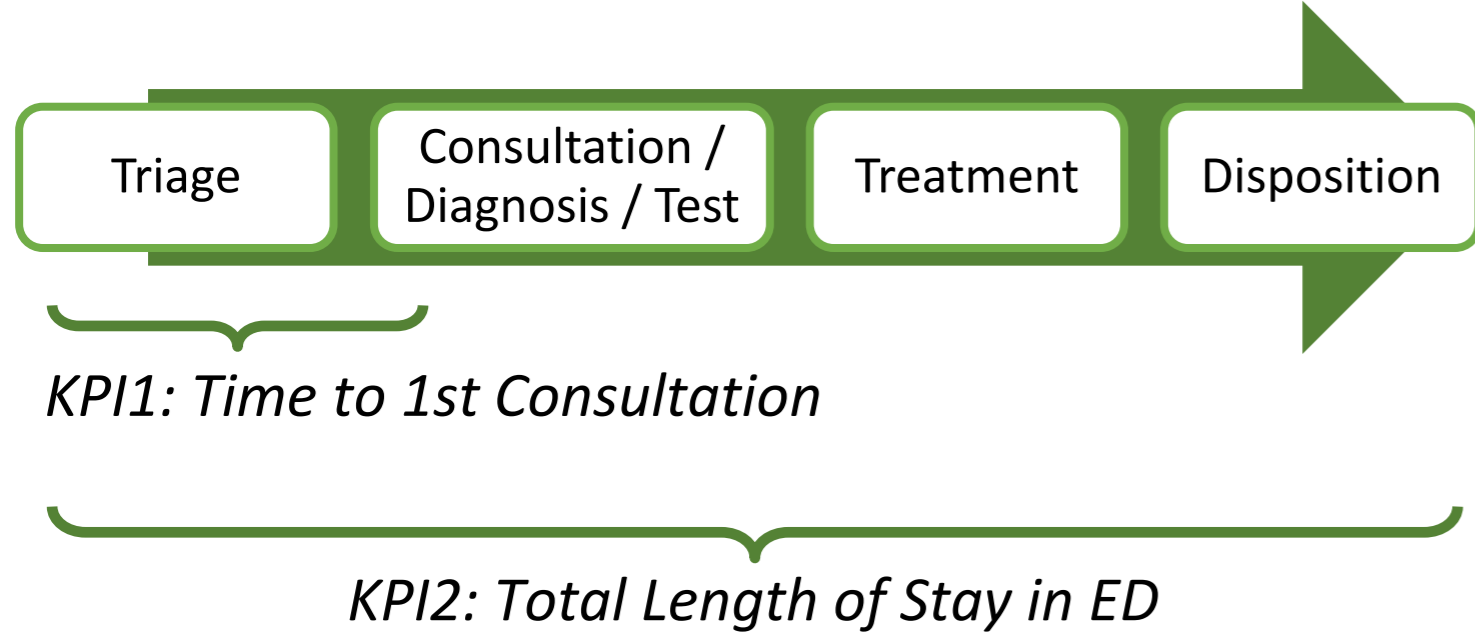


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## INTRODUCTION

### PROCESS FLOW AND KPIS IDENTIFICATION

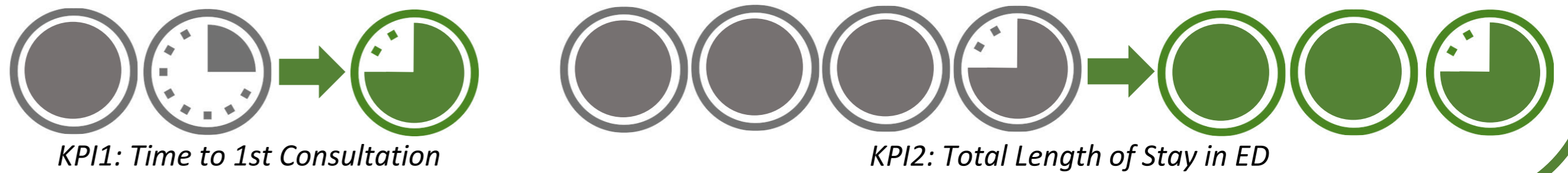


### PROBLEM STATEMENT

The Emergency Department is under-performing due to: increase in patient volume, and changing patient composition. System symptoms: Space congestion, lengthy stay, long wait time for doctors, etc.

### PROJECT OBJECTIVES

- Conduct systemic investigation to understand the system dynamics
- Model the system through simulation analysis
- Propose improvement policies to improve KPI performance



## SYSTEM INVESTIGATION AND MODELING

### SYSTEM INVESTIGATION

- MANPOWER**
  - Insufficient doctors and nurses
  - Medical Officers (MOs) requiring decision oversight put burden on senior doctor manpower
  - High turnover results in frequent new nurse re-training, impacting efficiency & productivity
- PROCESS**
  - Long tests result in waiting time & insert pressure on bed resources
  - Long waiting time to consultation results in congestion
  - Decision priority: clearing up current patients vs. taking up new patients
- FACILITY & EQUIPMENT**
  - Only one (shared) ECG machine
  - Limited area for beds & lack of bed area arrangement result in congestion

### DATA ANALYSIS



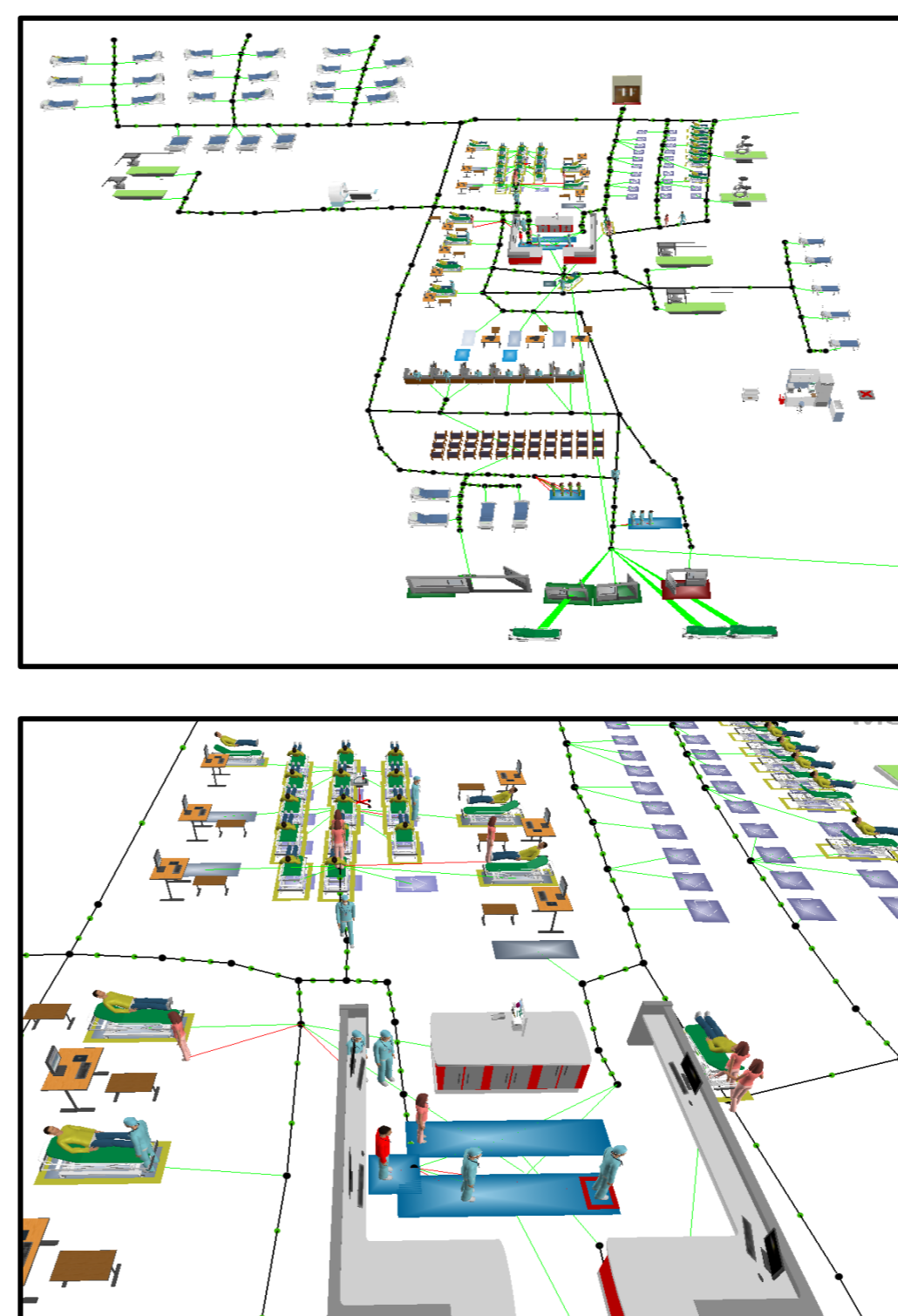
### PROJECT SCOPE

Long Term Aspects and Solutions:  
Manpower Increase & Facility Redesign

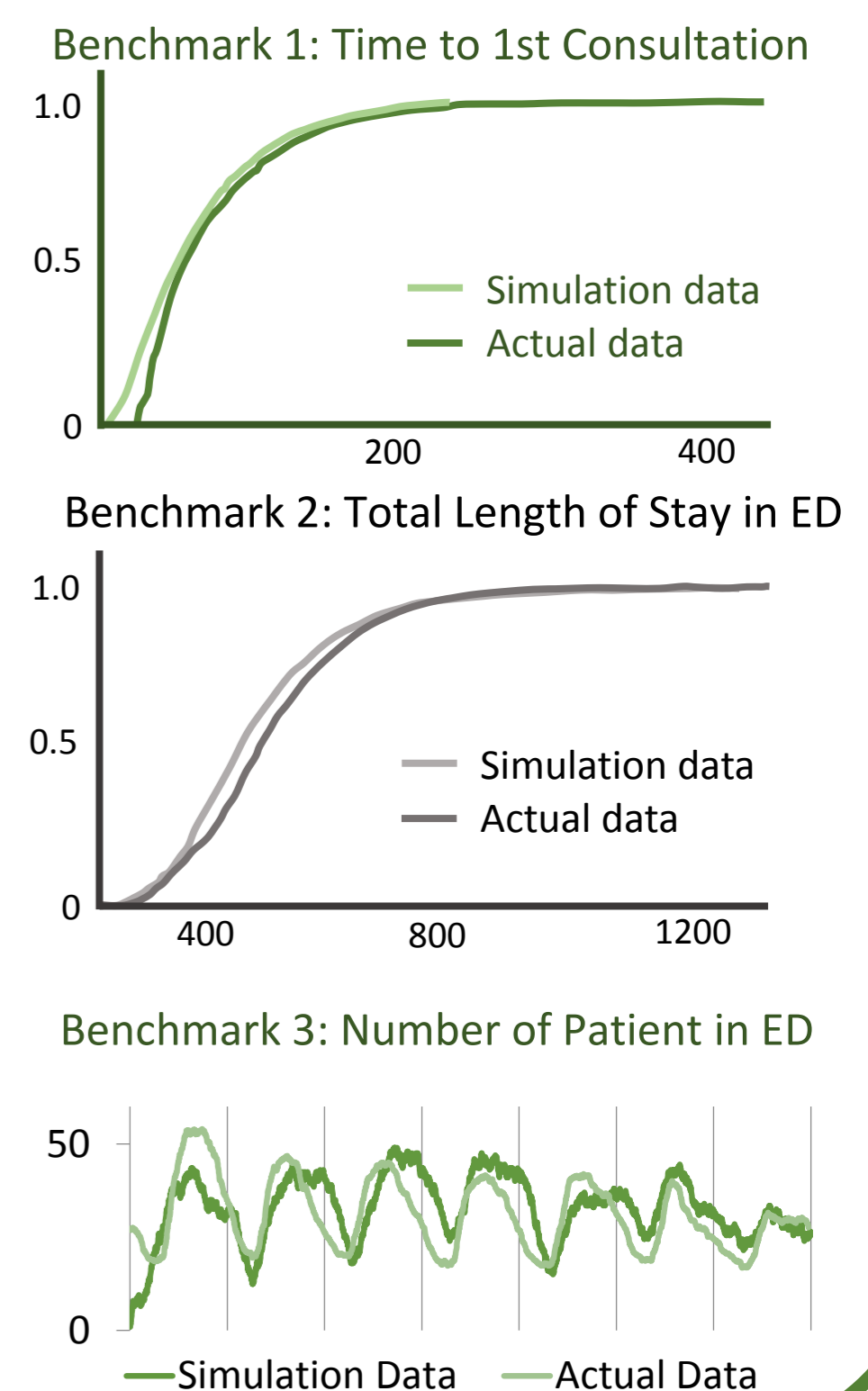
(High cost, Low Feasibility, Long Lead Time)

Focus on Short Term & Cost Efficient  
System Aspects for P2 patients

### SIMULATION



### MODEL VERIFICATION

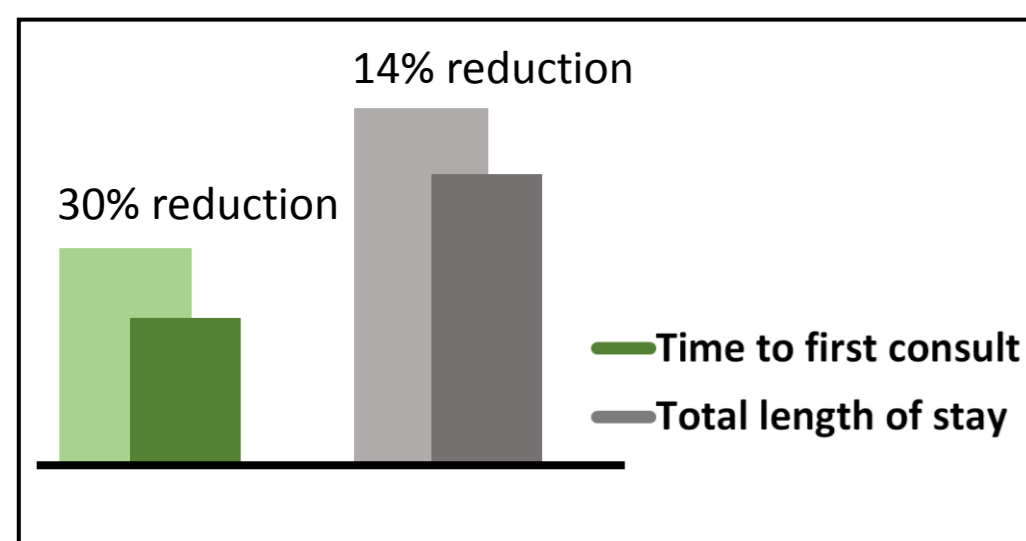


## SOLUTION TESTING

### NURSE RESCHEDULING

**PROBLEM SITUATION:** changing patient volume results in higher nurse utilization during peak hours

**TESTED SENARIOS:** rescheduling nurse level to fit demand change



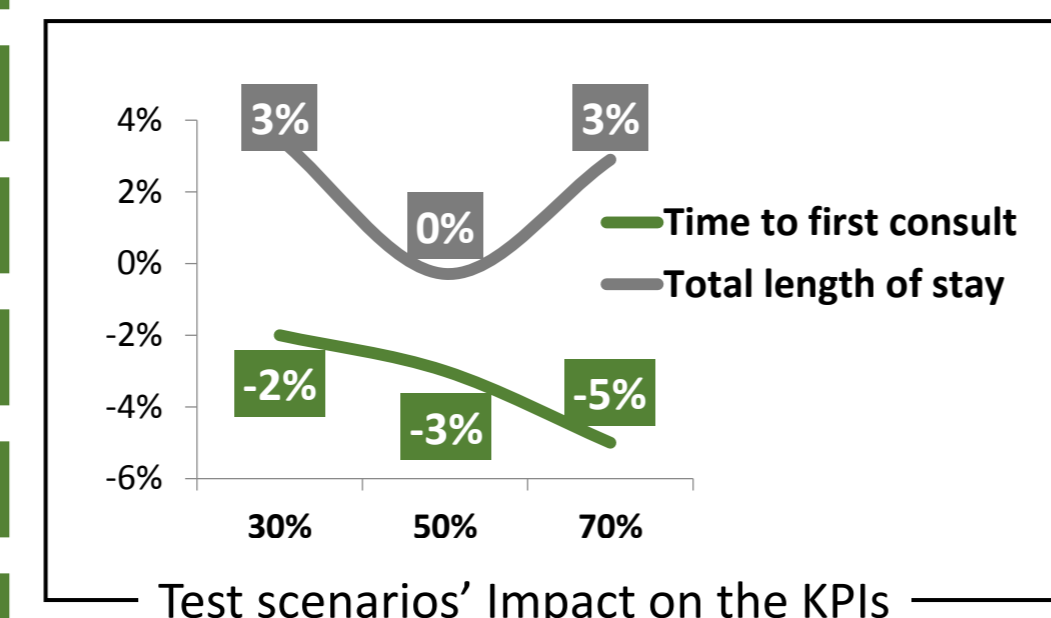
#### DISCUSSION

- Best improvement on KPIs
- Does not incur additional cost
- Nurse-patient ratio is maintained at all times
- Quick implementation
- Rescheduling needs nurses' adaptability

### ADVANCED DECISION AT TRIAGE

**PROBLEM SITUATION:** long turnaround time and late ordering for blood test result in long ED stay

**TESTED SCENARIOS:** advancing blood test ordering, by 30%/50%/70% of patients during peak hours. (Increase in blood test demand due to incorrect decision to order by 5%, 10%)



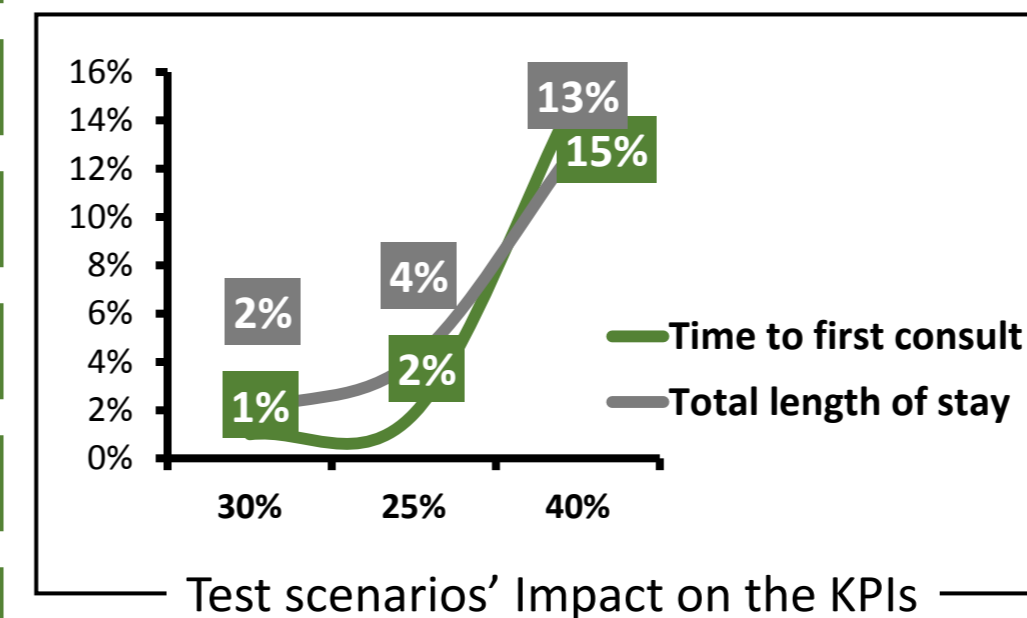
#### DISCUSSION

- Easy implementation
- Moderately long implementation time due to nurse training
- Error in test orders will incur extra costs.
- As triage nurses become more experienced over time, over ordering cases will decrease

### IN-PATIENT BED ARRANGEMENT

**PROBLEM SITUATION:** admitted patients need to spend long bed waiting time, causing congestion

**TESTED SENARIOS:** Percentage reduction in time is predicted if bottle neck is reduced by 10%/25%/40%.



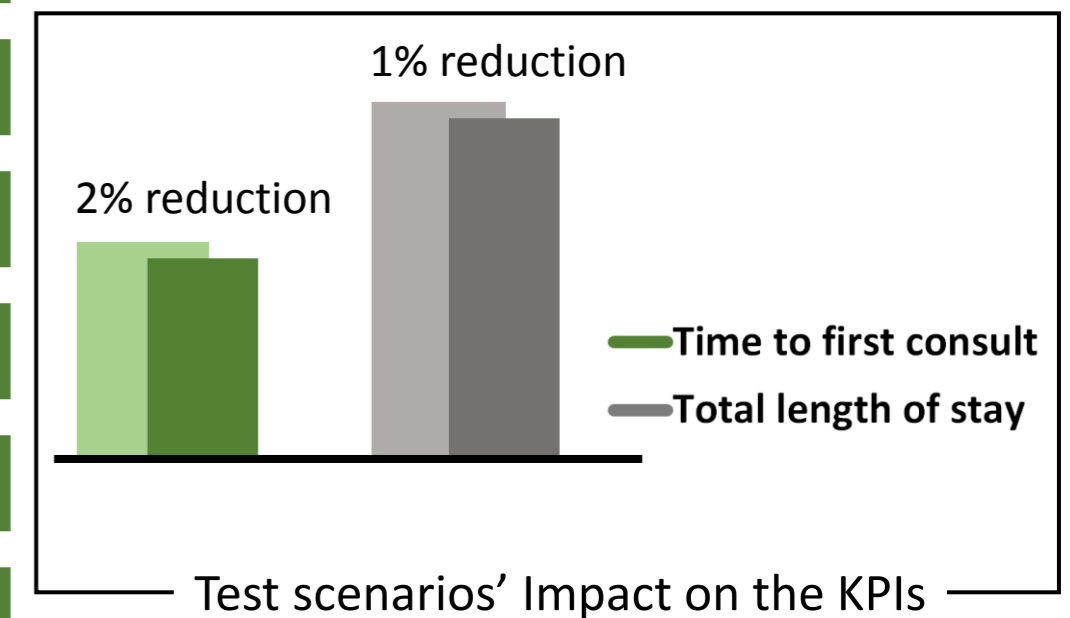
#### DISCUSSION

- Directly ease congestion
- Improvements on KPIs
- Cost for additional beds and EOW renovation is acceptable
- Long implementation time
- Relatively hard to implement

### ECG MACHINE ADDITION

**PROBLEM SITUATION:** more than 65% of P2 patients sharing only one ECG machine

**TESTED SCENARIOS:** add 1, 2, or 3 machines



#### DISCUSSION

- It is most optimal to add 1 ECG machine.
- Acceptable cost
- Very short implementation time
- Immediate but low impact on KPIs.

## CONCLUSION

### RECOMMENDATIONS

The improvement policies are recommended in the following ranking

- Rescheduling nurse level to fit demand change
- Advancing blood test ordering, by 30% of patients during peak hours
- Improve bed arrangement to reduce bed waiting time by 40%
- Adding one more ECG machine to system



### FUTURE DIRECTIONS OF STUDY

- Study and plan for long-term and large-scale improvement policies such as increase in manpower, facility revamp, etc.
- Use design of experiment techniques to test out the main interaction effects between the four short term improvement policies