

Introducing FRAM as a tool for surgical process modeling: A case study for understanding surgical scheduling complexity

Sidra Rashid, Rebecca Weber, Niklas Grabbe
Research Group MITI
TUM4HealthTech Project

11/07/26

FRAMily Abstract Presentation



About Me



- Klinikum rechts der Isar University Hospital Technical University of Munich
- Researcher at the Surgery department at MITI (Minimal Invasive Therapeutic Intervention)

The Surgical Ward: Essential, Central, and Expensive

1 minute = 30€

Admission
and
Examination



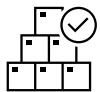
Pre-operative
Preparation



Post-operative
care



Patient
rehabilitation



Inventory
Management



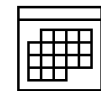
Planning and
Scheduling



Material
Preparation



Intra-logistics
and Tracking

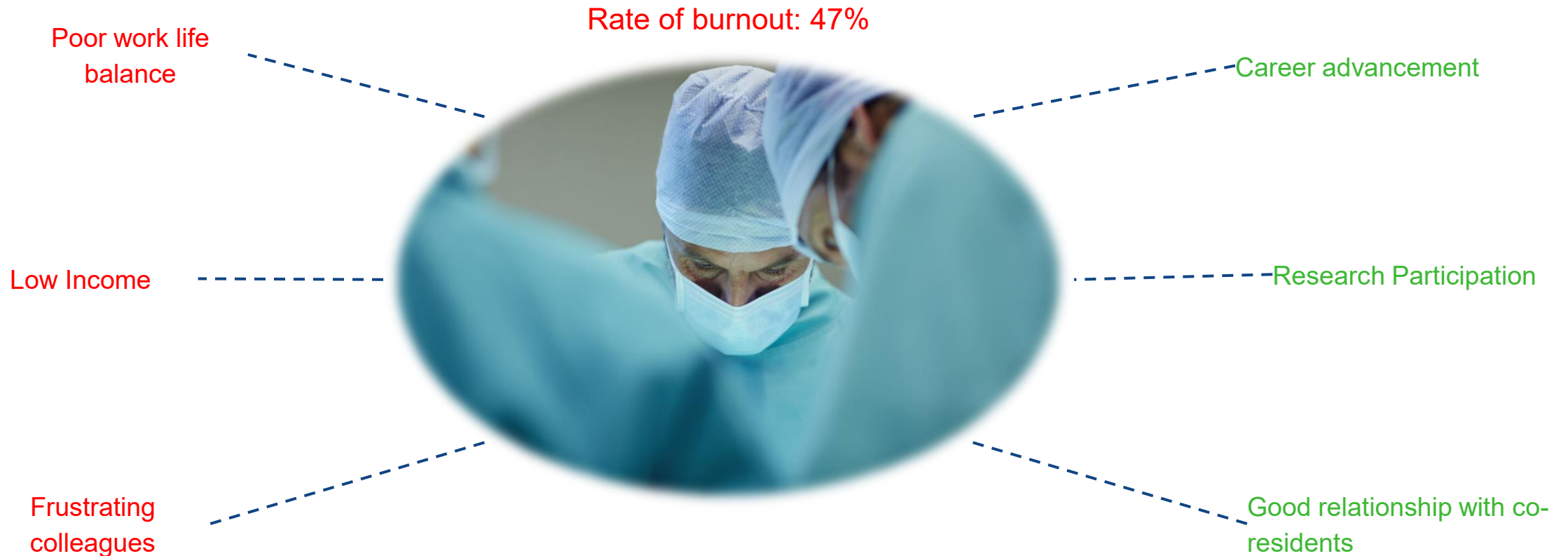


Prioritization
and
Preparation



Purchasing
and
Repair
Management

Burnout Among Surgeons and Surgical Trainees



But Why?



Factors for Surgical Delays and Cancellations

- Administrative and Scheduling Problems¹
 - Overscheduling
 - Underestimation of surgery durations
 - Unavailability of OR time
 - Lack of OR beds

61%



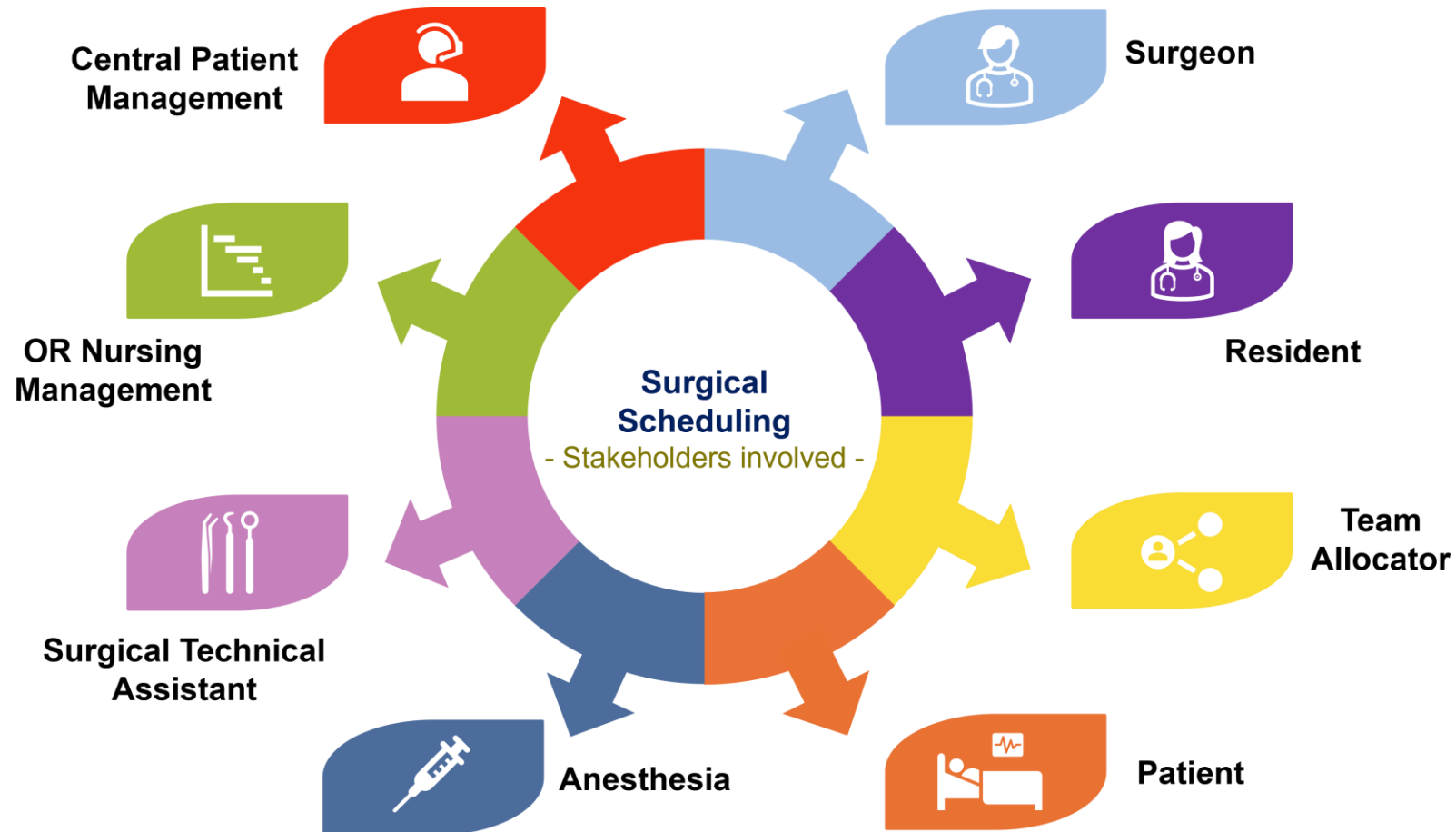
Patient-related



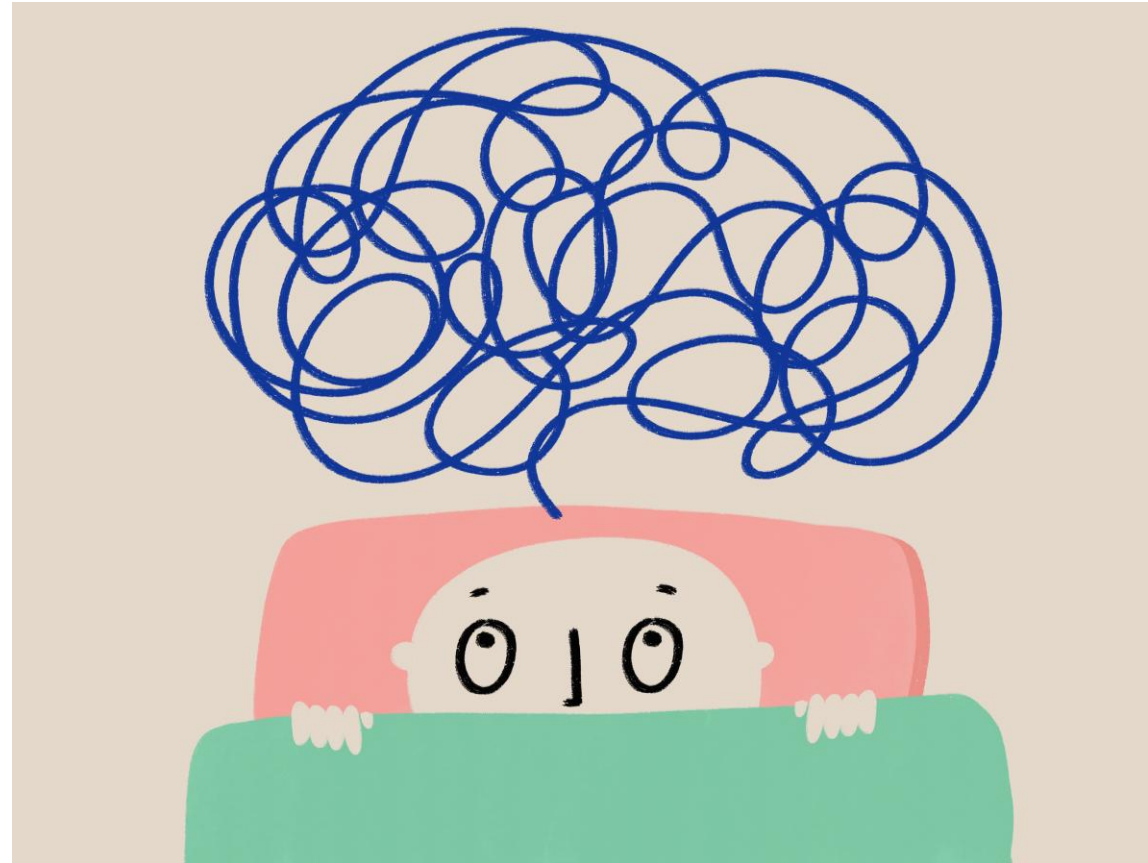
Change in treatment plan

¹Mona Koushan, Lincoln C Wood, Richard Greatbanks, Evaluating factors associated with the cancellation and delay of elective surgical procedures: a systematic review, *International Journal for Quality in Health Care*, Volume 33, Issue 2, April 2021, mzab092, <https://doi.org/10.1093/intqhc/mzab092>

Stakeholders in Surgical Scheduling

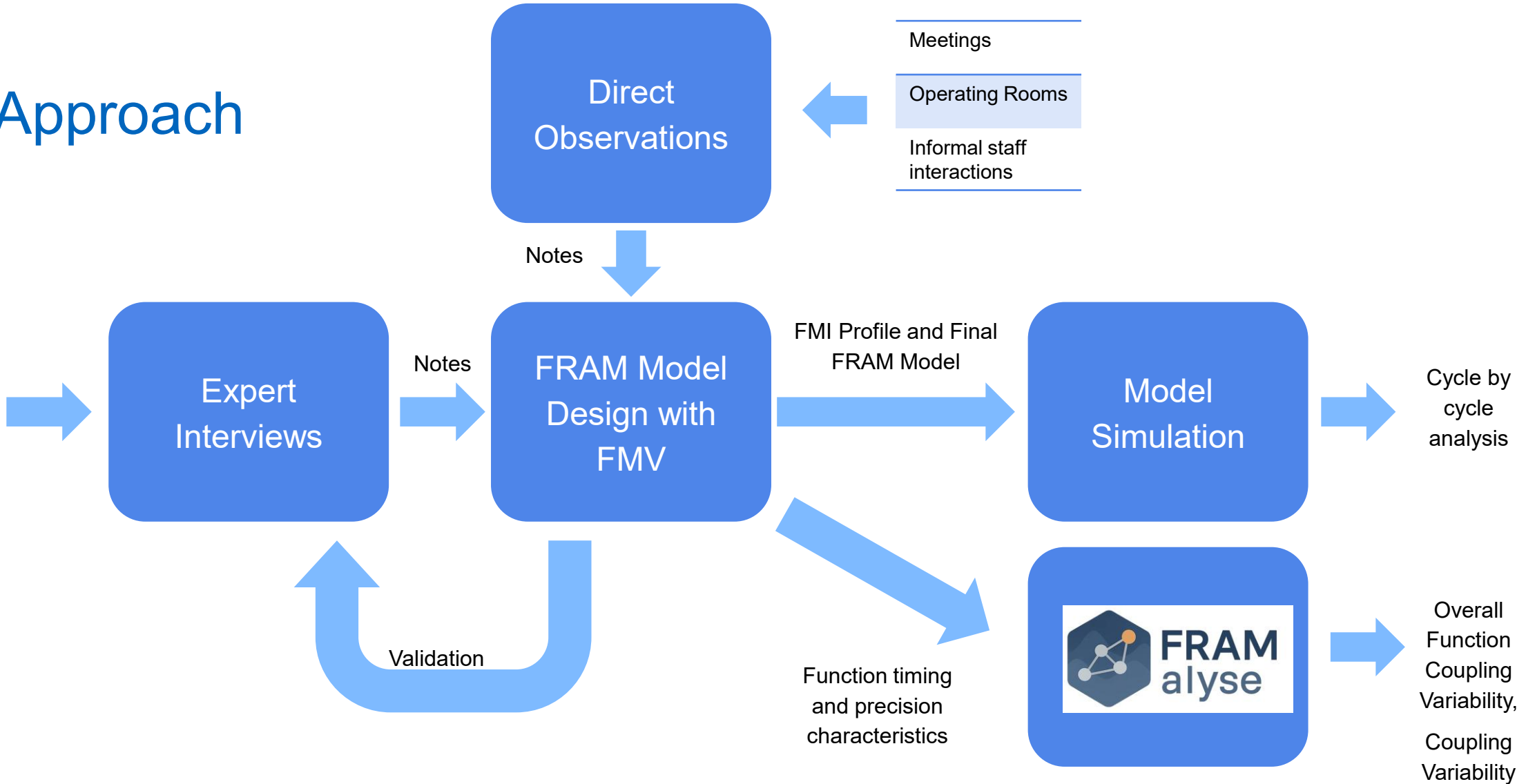


Understanding the Surgical Scheduling Process

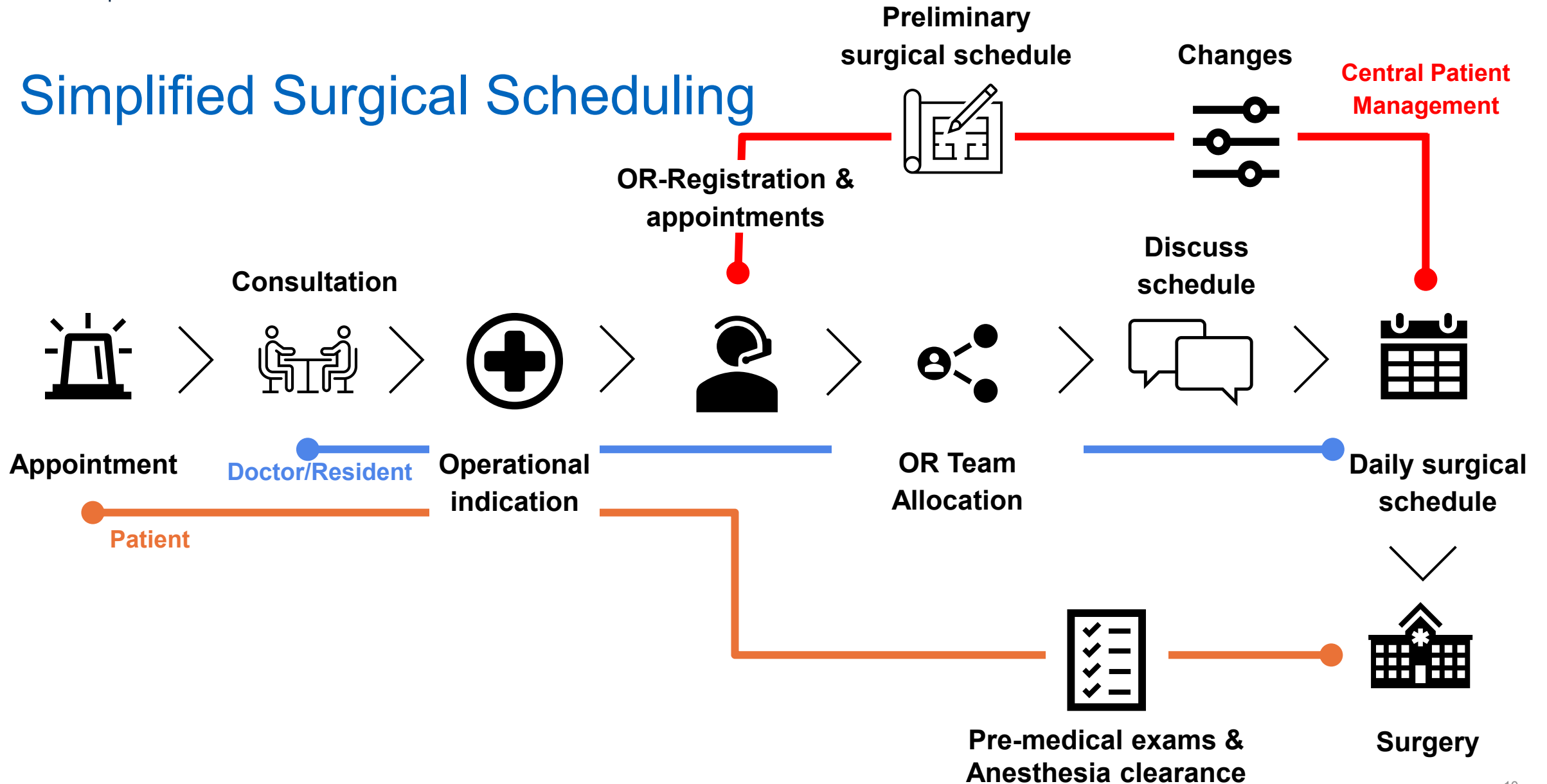


Our Approach

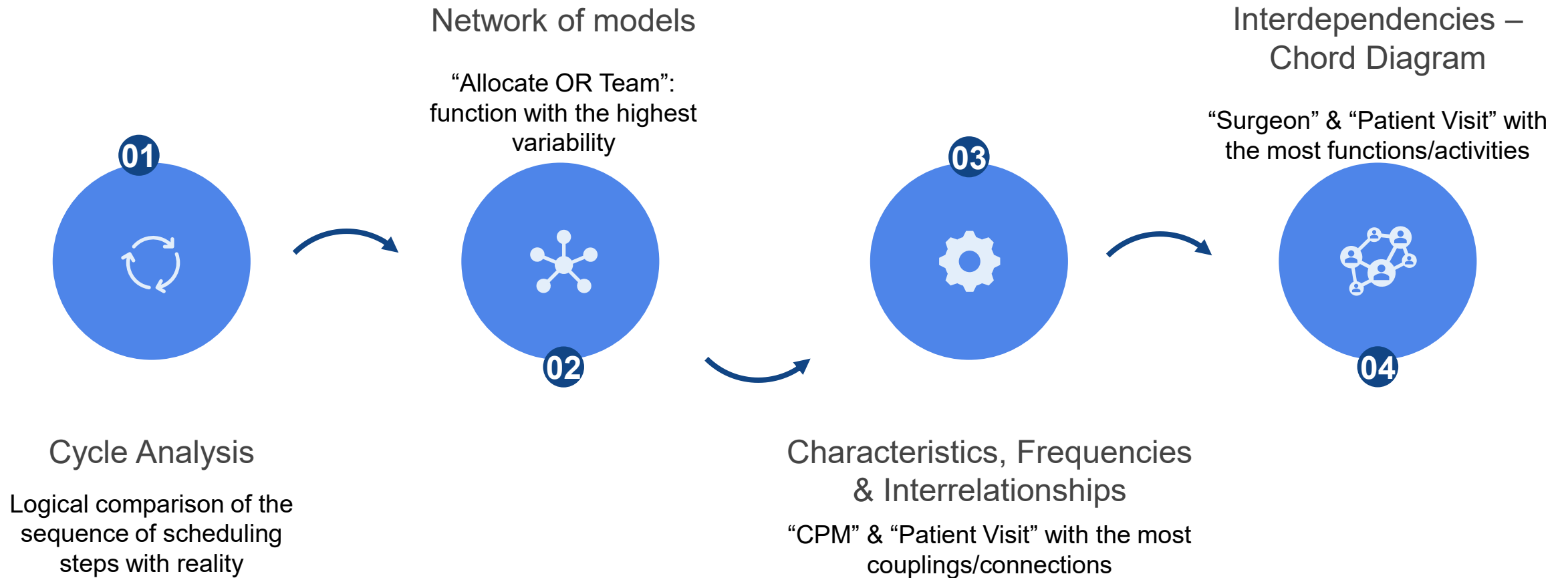
- CPM
- Surgeons
- Residents
- Technical Assistants
- Anesthetists
- Nursing Management



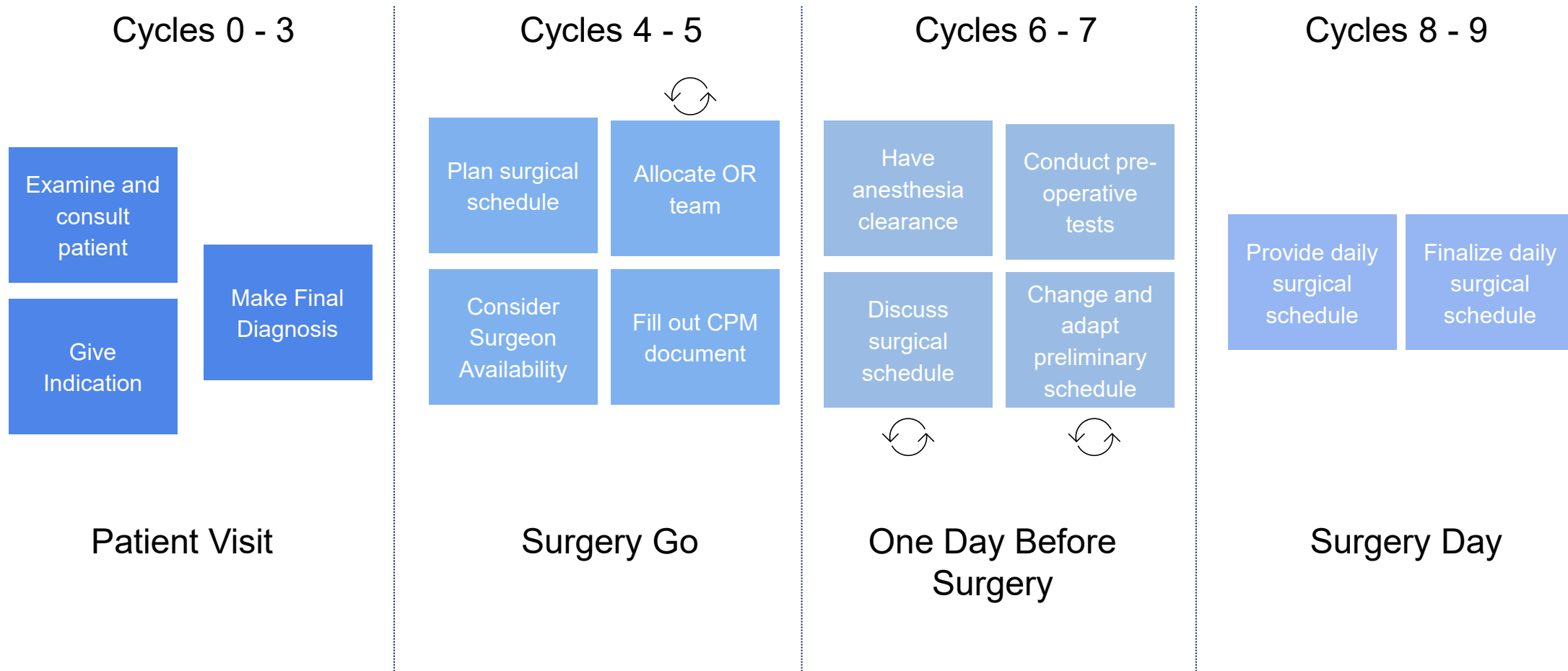
Simplified Surgical Scheduling



FRAM Model Analysis



FRAM Model Interpretation (FMI) Simulation Cycles

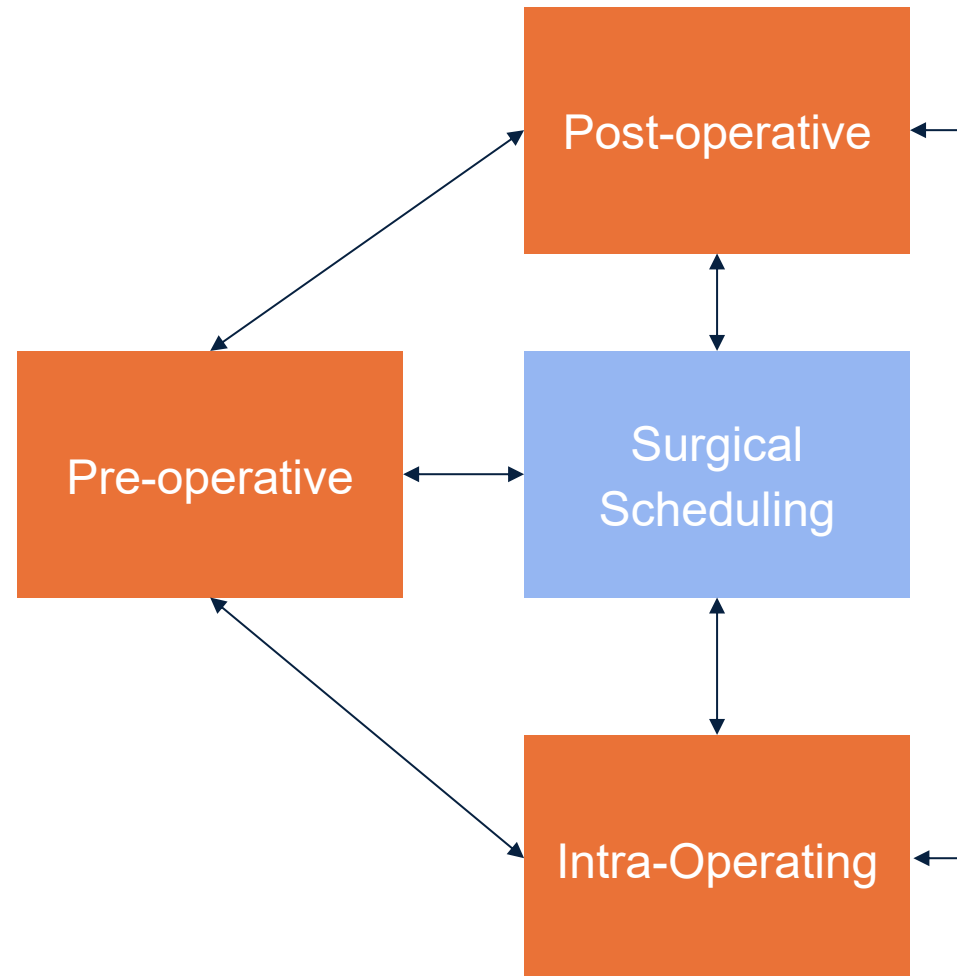


¹Note: This simulation represents only one possible instantiation of system behavior, given the specified interpretation profiles of the functions

Limitations

- Focus on a single department in one hospital
- Only one FRAM instantiation represented by the interpretation profiles and the variability distributions
- Results need further validation with historical data to confirm bottlenecks

Future Work



"A system is not the sum of the behaviour of its parts — it is a product of their interactions." – Russell Ackoff

Thank you!