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Surgery Center Planning & Efficiency Study in an Architectural Practice

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May 14th 2019



01 HDR & Data-Driven Design

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HDR

- Architecture & Engineering (& Consulting)
- Over 10,000 employees
- More than 225 offices internationally

HDR Consulting

- Industrial Engineers
- Data Scientists
- Data Engineers
- Computational Designers

- Strategic Planners
- Researchers
- Healthcare Clinicians



02 Background

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Background & Key Questions From Clients

- Context: New or existing surgical suite
- How can we be more efficient in a surgery environment?
- How to plan the space efficiently?
- "We want to be LEAN!"
- Help us determine the right way of operating to maximize our patient experience



High-level Baseline Process



High-level Baseline Process – Additional Details



High-level Space Type



Why SIMIO?

- DES offers the ability to test various scenarios before live piloting
- Simio offers
 - Advanced DES capabilities
 - Minimized modeling effort with pre-set functions
 - Ability to import architectural drawings
 - 3D view to achieve quicker client buy-in
 - Outputs are easy to visualize both in/outside of Simio



03 OR Scheduling & Modeling

OR Scheduling

Surgery Scheduling / Future State



Past Patient Population

Growth by Specialty	IP	OP
1. Ortho	1%	3%
2. Neuro	-2%	2%
3. Ophthalm.	0%	3%
4. ENT	0%	4%
5. Vascular	-1%	1%
6. Urology	-5%	5%
Total	-1%	3%



Future Patient Population

How Does Surgery Scheduling Work For Future Patient Population?





QUEUE STORAGE

Scheduling the Operating Rooms

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OR Modeling Approach & Outcomes



Modeling Functionality (Model Properties)

Pre/Post-op & PACU Interchangeable

Patients maintain "ownership" and return to same pre-op space after surgery

Data-Driven (Scheduled) Duration



Model Outputs / Performance Indicators

1. Total Patient Waiting Time for each phase (Pre-op, OR, etc.)



→ Indicates lack of available capacity and operational inefficiency; correlated with patient experience 2. OR Room Utilization

 \rightarrow Target 75%

average over time

Time (Overtime)



3. Last Case Start/End

4. Prep/Recovery Room Utilization



→ Indicates overloaded system, delays and variability → Typically less utilized on average due to uneven scheduling patterns



Limitations and Areas for Improvement







5 ON STE

APPTA

"Watch" Resources For Utilization Metrics

- Allows resource utilization metrics to be computed based on scheduled operating hours
- Fixed-capacity room resources allow service to continue until all surgeries are complete
- "Watch" resources go on/off-shift based on schedule and allow Room resource has fixed capacity



Data Tables To Incorporate Scale

- Many times, models we build are at first conceptual in nature
- Data tables are set up in Simio to incorporate travel distances once the physical space and scale is determined
- Scripting in the design software allows us to export distances between points of interest (using shortest path or other algorithms) and "paste" into Simio model





05 OR Scheduling Support



5 ON STE



Real-Life Application: Surgeon Estimates

Concept: Surgeon estimates "scheduled surgery duration"



Real-Life Application: Data-Driven Duration Algorithm

<u>Concept</u>: Determine median (actual duration) of specific historical data samples to determine "scheduled surgery duration"



Real-Life Application: Data-Driven Duration Algorithm

<u>Concept</u>: Determine median (actual duration) of specific historical data samples to determine "scheduled surgery duration"

Sample 1 - Median:Data-Driven Scheduled Duration = 1.5 hoursOption 1: Under-estimationActual Surgery Duration = 3 hoursOption 2: Over-estimationActual Surgery Duration = 1 hourOption 3: On-timeActual Surgery Duration = 1.5 hour



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Conclusion



Data-Driven & Informed Planning Exercise