Coordination of Surgical Blocks and Ambulatory Clinics at a Large Teaching Hospital

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11-10-2014

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Outline

• Motivation and Background
• Goals
• Inputs
• Decisions, Constraints, and Objective
• Initial Results
• Challenges
• Conclusions/Future Work
Motivation
Background

• Colorado Health System
  – Numerous locations and specialties
  – Piloting project for Orthopedics

• Providers
  – Require both Operating Room (OR) and Clinic Room time
  – Must satisfy numerous individualized requirements
  – Limited work locations

• Current Schedule
  – Pieced together over time
  – Minimal “wiggle-room”
  – Providers want more time
Goals

• Develop a **mathematically-based decision support tool** that **efficiently schedules** health care providers into **operating and clinical rooms** over a monthly horizon

• **Enable what-if analyses** for incorporating new providers, adding new rooms, addressing bottlenecks, and improving existing schedules
Inputs

• Types of rooms
• Room locations
• Room availabilities
• Provider availabilities
• Allowable daily schedules
• Provider room requirements (work packages)
• Scheduling considerations
  – Continuity across weeks
  – Specialty Coverages
Decisions

• **Sequence:** a combination of room types and how many rooms of each type that make up a single, feasible day of work
  – (e.g. 2 Denver ORs in the AM and 4 Denver Clinic rooms in the PM)

• **Decision Variables:** Does provider $p$ work sequence $s$ on day $d$ of week $w$?
Constraints

• Must work a sequence every day
• Allowable sequences
• Provider room requirements
• Limited provider availability
• Weekly continuity
• Strict room capacities
• Specialty coverage requirements
Objective

• Minimize the total number of *virtual rooms* that are used
  – *Virtual Room*: A room that doesn’t physically exist, but is used to represent a planned overbooking

• *Other metrics*: continuity, required travel, number of rooms
Initial Results

• Monthly schedule with reduced room overutilization is quickly generated

• Report is generated on room utilization which enables identification of room over/underutilization

• Capable of what-if analyses:
  – Hiring a new providers
  – Adding new rooms
  – Modifying current work packages
Challenges

• Learning each other’s languages
  – Identifying scheduling rules / constraints
  – Ease vs. complexity of implementation

• Identifying where scheduling flexibility exists
  – How flexible is the system?
  – How much flexibility to include in the model?
Future Work

• Identify and implement additional scheduling requirements

• Incorporate schedule quality metrics into objective

• Standardize process for gathering inputs and generating new schedules

• Expand scope of scheduling
Thank You!

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We thank Dr. Jose Melendez, Suzanne Sullivan, Emily Porritt and the many others at UCH for their continued time and insights!
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