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

Brian Lemay

University of Michigan

11-10-2014

Co-authors: Prof Amy Cohn, Dr. Jose Melendez, Elizabeth Olin, Emily Porritt, Billy Pozehl, Suzanne Sullivan, Yicong Zhang

CENTER FOR HEALTHCARE ENGINEERING & PATIENT SAFETY
UNIVERSITY OF MICHIGAN

UNIVERSITY of COLORADO HEALTH

Outline

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

Motivation

CENTER FOR
HEALTHCARE ENGINEERING & PATIENT SAFETY
UNIVERSITY OF MICHIGAN

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

CENTER FOR HEALTHCARE ENGINEERING & PATIENT SAFETY
UNIVERSITY OF MICHIGAN

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

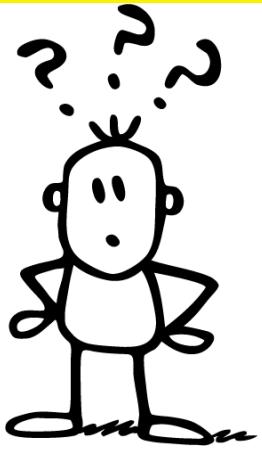
- **Other metrics:** continuity, required travel, number of rooms

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!

Contact info:

blemay@umich.edu

amycohn@umich.edu

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

CENTER FOR
HEALTHCARE ENGINEERING & PATIENT SAFETY
UNIVERSITY OF MICHIGAN

UNIVERSITY
of COLORADO HEALTH

CHEPS and the HEPS Master's Program

- **CHEPS:** The Center for Healthcare Engineering and Patient Safety
- **HEPS:** Industrial and Operations Engineering (IOE) Master's Concentration in Healthcare Engineering and Patient Safety offered by CHEPS
- CHEPS and HEPS offer unique multidisciplinary teams from engineering, medicine, public health, nursing, and more collaborating with healthcare professionals to better provide and care for patients
- For more information, contact Amy Cohn at amycohn@umich.edu or visit the CHEPS website at: https://www.cheps.engin.umich.edu

CENTER FOR
HEALTHCARE ENGINEERING & PATIENT SAFETY
UNIVERSITY OF MICHIGAN