Optimizing Resident Call Assignments
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2017 Healthcare Engineering and Patient Safety Symposium

Problem Statement

The general surgery residency program at St. Joseph Mercy Ann Arbor must staff daily call and rounding teams

PGY1 Intern
PGY2/PGY3 Mid AM
PGY3/PGY5 Mid PM
Chief

Rounding, Vacation, Weekends Off

[All PGY Levels]

Abiding the rules governing the schedule makes coordinating the monthly call and rounding assignments a complex challenge

Traditionally, a chief resident constructs the resident assignment schedule by hand

The construction process is resource-intensive yet often fails to satisfy the individual & collective needs of stakeholders

Importance of Schedule Quality

Schedule quality impacts

Clinical/administrative workflow
Patient access, quality, safety, satisfaction
Training quality and burnout

Research Objective

Develop a decision support system to enable fast construction of high-quality resident schedules while improving measures of quality

How is an optimization problem defined?

There are three components to an optimization problem: decisions, rules, and metrics. For this specific problem, examples of these components are:

Decisions
• Is resident \( r \) assigned to task \( t \)?

Rules
• Call and rounding teams require sufficient coverage
• Residents must have sufficient time between tasks

Metrics
• Post-call OR shifts, weekend equity, personal preferences, etc.

Coverage
\[
l_c \leq \sum_{r \in R} \sum_{t \in T} \sum_{d \in D} x_{rtd} \leq u_c \quad \forall (R_c, T_c, D_c) \in C
\]

Pre-assignment
\[
x_{rtda} = 1 \quad \forall (R_a, T_a, D_a) \in A
\]

Prohibition
\[
x_{rtda} = 0 \quad \forall (R_p, T_p, D_p) \in P
\]

Resident Requirement
\[
l_q \leq \sum_{r \in R} \sum_{d \in D} x_{rtd} \leq u_q \quad \forall (R_q, T_q, D_q) \in Q
\]

Spacing
\[
x_{rtd} + x_{rtd'} \leq 1 \quad \forall r \in R, d, d' \in D, (s_r, t_r, D_r) \in S
\]

Paired Tasks
\[
x_{rfjdj} - x_{rsjej} = 0 \quad \forall r \in R, (f_j, d_j, s_j, e_j) \in J
\]

Results

Preliminary results for the December 2017 scheduling horizon have been generated. Below are results snippets.

Sunday December 10, 2017 Mid AM Rounding
Monday December 11, 2017 Mid PM Rounding
Tuesday December 12, 2017 Mid PM
Wednesday December 13, 2017 Mid PM

We generate weekly views, like the one above, for each day of the scheduling horizon. This schedule of the horizon is generated for each task.

Walker’s Schedule:

Quality
Residents ±1 call assignment of cohort
All vacations granted

Time
Schedule generated in < 60 seconds

Future Goals

Quality
Implement metrics based on leadership feedback

Efficiency
Streamline administrative and schedule revision processes

Acknowledgements

We graciously thank these organizations for their support: