Optimisation Project

ENGSCI 355

Problem Description

At Trump Hospital (in Las Vegas) patients enter the three general medicine wards via the Emergency Department. Each ward has a surgical team (Navy, Yellow, and Lime) and the team to which the admitting registrar belongs determines the ward to which the patient is assigned. Thus the registrar roster has a direct impact on the ward numbers. Trump Hospital is interested in balancing the ward numbers as much as possible, as this results in the best care for the patients (which would be “tremendous”). Therefore, they would like a roster designed with this in mind.

For the purposes of balancing admissions, the registrar shifts can be summarised as:

- **A** Admission shift. The registrar is on call and all new patients will be admitted to their ward;
- **P** Post-acute shift. This is always performed the day after the A shift, to follow up on patients;
- **N** Night shift. The registrar who is on call at night, admissions still go to the ward of the registrar who was working the A shift during the day;
- **Z** Sleep shift. After working night shifts registrars are given time to catch up on sleep;
- **X** No shift. Registrars are given some days off;
- **O** Other. All other shifts are grouped together as they do not affect admissions.

Each day one registrar must work the night shift. This is accomplished by having a night ‘tour’, which means one registrar works 7 days of consecutive night shifts, then gets three days off. During the night tour the registrar's other shifts are covered by a relief registrar. This means that during the (one complete week of the) night tour the registrar can be assigned two shifts; the night shift that they perform and one during the day that the relief registrar performs.

The rosters must also follow these rules:

1. One **A** shift must be performed each day;
2. The **A** shift on Saturday is followed by the **A** shift on Sunday, otherwise the **A** shift is followed by the **P** shift;
3. A night ‘tour’ consists of 7 days of **N** shifts starting on Friday and then 3 **Z** shifts;
4. Registrars can only be assigned **A**, **P**, **N**, **Z**, **X** or **O** shifts;
5. Registrars must be assigned one shift each day, or two during relief week;
6. Registrars must have every other weekend off.

There are 2 registrars in each ward team, and the registrar rosters are cyclic. This means there is a single 6 week roster, and each registrar works a different week of the roster simultaneously. At the end of a registrar’s week they move to

the next line of the roster, unless they are working week 6, in which case they switch to week 1 at the end of the week.

An example of a roster that has been used previously by the hospital is given in figure 1.

Week	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	O	A	P	O	N	N	N
2	N, O	N, O	N, A	N, P	Z, O	Z, X	Z, X
3	O	O	O	O	O	A	A
4	P	O	O	O	O	X	X
5	A	P	O	O	A	P	X
6	O	O	O	A	P	X	X

Figure 1: A General Medicine registrar roster for Trump Hospital

Data

Historical counts of admissions and discharges for 15 weeks is available in the excel worksheet *Trump_Data.xlsx*. These counts are broken down by period of the day. Note that the admissions can be used directly in your model, but you will need to make some sensible assumption about discharges, as you cannot determine for a particular discharge with which ward it is associated, and once you change the roster it is unlikely the same patients would even go to the same wards.

Deliverable

A group report of at most 3 A4 sides, detailing your model and solution, is due by the Thursday lab of week 8. Be sure to include background, any relevant data steps, model description and your best roster. An “editor” version of the report is due in the Lecture of week 7 (for aegrotat purposes, not marked, but used for evaluation purposes in the case that the editor does not sit the final exam). The editor for this report is the first group member listed below.

Groups

Group 1	**Group 2**	**Group 3**	**Group 4**	**Group 5**	**Group 6**	**Group 7**
Alice	Jeffrey	Benjamin	Logan	Vida	Olivia	Michael
Tina	Max	Olivier	Andrew	Sherwyn	Connor	Thomas
James	Alex	Lucy	Seung	Rory	Atchariya	Levon
Group 8	**Group 9**	**Group 10**	**Group 11**	**Group 12**	**Group 13**	
Kate	Riley	Nathan	Nicholas	Emma	Jaskirat	
Run	Alan	Matthew	Liam	Rayner	Kelvin	
Adam	Stephen	King	Leif	Oliver	Wen	