MAN 256 - Hospital Capacity Expansion Options

Below discusses the Shouldice Hospital operations. It's an hospital that specializes in hernia operations. While many providers discharge patients after a short time, which can be a painful experience, Shouldice offers a wholistic service and takes pride in taking care of patients before and after the surgery.

There is also an HBS case covering their operations that I made available for purchase at a discounted rate ($4.25 - about 80 TRY) at the below link. This is an interesting case, but reading the case is not immediately required for this assignment, and you therefore can opt not to purchase the case.

https://hbsp.harvard.edu/import/1027824

As there is a lot of demand for Shouldice's particular offering, Shouldice administrators are interested in expanding their capacity to allow more patients inside, but are worried about quality problems. They want to maintain the same experience for the patients, a typical procedure described in the below chart.

	What Happens	When	Resources Used
Day 1	admit, exam, test, orientation, dinner	pm	bed, …
Day 2	surgery, anesthesia, recovery	all day	surgery, bed
Day 3	recovery, exercise, meals		bed
Day 4	recovery, exercise, meals		bed
Day 5	discharge	am	

They are considering two main approaches: improve physical plant capacity (beds, surgery resources) or expand work schedule (they currently operate from Sunday to Friday with the Saturday off).

This is a group assignment. Each group should consist of at most four students and at least two students. Please email our TAs Dilara (dilara.aksoy@ug.bilkent.edu.tr), Koray (koray.karadag@ug.bilkent.edu.tr) for assistance if you have trouble finding people to partner with, they can connect you with other students with the same problem.

Our goal for this assignment is to consider these options for expansion using an LP model. Specifically:

1. Formulate a linear program model to maximize the number of patients to be admitted each week, i.e. find the optimal admissions schedule. Shouldice currently operates with a capacity of 33 surgeries (operating capacity) per day, 89 beds, and works 6 days a week (Sun-Fri). You may consider

formulating a problem around setting a weekly admittance schedule and assume unlimited demand (Shouldice is popular but can't respond to the demand).

2. Identify different capacity options that are captured by your formulation based on bed capacity or work week. For example, what would be the effect of increasing operating capacity by 5, 10 or 15 surgeries per day? Or, how about increasing bed capacity to 100, or 150? How about expanding operations to Saturday? In addition to these options, you can explore different configurations on your own and make assumptions as you see fit.

3. For each option:

    - Calculate the optimal schedule
    - What is the annual throughput (# patients) that can be treated)?
    - What is the capacity utilization?
    - What is the annual cost?
    - What is the annual profit?

Each admitted patients brings in about $2,100 in revenues. Total annual cost of the hospital is currently around $12m ($8.5 for hospital operations and $3.5 for clinic operations). We know that a 50% expansion in bed capacity by adding a new plant is about $4m. Feel free to make assumptions about the costs of your proposed expansion options (and clearly annotate them and briefly argue for their validity).

4. Write a brief report of your findings (max of 2 pages, not counting tables or figures). This two page report, in addition to briefly presenting the results of your LP analysis, should include practical considerations. I want you to worry about side effects of your proposed expansion options. For example, even though your LP analysis may favor one option over another, you are free to recommend another good enough option because it may enable Shouldice to maintain its quality levels. Feel free to also discuss (or even better, analyze using your LP model) other capacity

expansion opportunities you may identify in addition to the ones I suggest above even if you cannot directly evaluate them in your LP models.

5. Submit the 2 page report along with your excel spreadsheet (clearly mark and annotate your work, including any sensitivity analysis) via email to our TAs Dilara (dilara.aksoy@ug.bilkent.edu.tr) and Koray (koray.karadag@ug.bilkent.edu.tr) by October 23, midnight Türkiye time. Please send one email for each group, and make sure all other group members are CC'd in that email and clearly marked in the submitted files.