Managing the Outpatient Department Waiting Time at Rajas Eye Hospital

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The case pertains to a situation of process based service in the context of an eye care hospital. For patients, one of the most common and annoying phenomenon is waiting time. This waiting time is quite universal in nature. For example, we can observe physical queues such as those in front of cash counters in supermarkets, check-in at airports, tickets windows in movie theaters etc. It is worthwhile to mention that waiting may be physical in nature as above or virtual such as the calls waiting in a call-center to be serviced (when a caller hears music!).

The reason of "waiting" lies in the mismatch between supply and demand and in the manner in which this mismatch occurs. This can be explained with the help of following two simple examples:

- Queue starts getting formed at the boarding gate just after the flight is announced: In this situation, expected demand rate becomes greater than the expected supply rate for a limited period of time as a result of which queue gets formed. More specifically, in such cases capacity (supply) is constant but demand exhibits sudden increase leading to implied utilization touching 100 percent over that limited time period.
- Waiting in virtual queue in a call-center: In this situation, even though capacity (i.e., supply) is greater than demand (incoming calls) on an average (implied utilization is well below 100 percent), the queue can still be formed because of the presence of variability in incoming calls.

Although, the difference between the two types of waiting is immaterial to customers (patients in our case). However, for the operations managers it is of significant importance. The root cause of first type of waiting time is a capacity problem and regular operations tools can be used to address the problem (like opening up more counters/servers) during a short period of time.

The root cause of the second type of waiting time is variability which is the underlying reality of the current problem context. Sometimes, a patient (demand) may wait for the service (supply) or sometimes it is other way around. This results in unpredictable waiting time from the perspectives of both patients and system.

In order to understand the root cause of variability in this problem setting, let us analyze the given situation from the following framework from manufacturing setting:

- **Input to the system**
  - Patient mix: There are patients of different categories arriving at OPD - patients with appointments, patients without appointments, follow-up patients.
  - Random arrivals of patients: Based on figures 2, 3, 4 and table 4 of the given case, it is clearly evident that patients from different mix arrive in random intervals of time.
- **Inherent variation in processing times**

  There are different activities for a new patient in OPD such as registration, preliminary - testing by Optometrists, Dilation, Consultation by Ophthalmologist and final consultation by Director. Depending on type of disease and patient, all these steps, carry inherent variation in processing times. According to figure 5 of the case, it takes between 2 to 5 minutes for registration, between 5 - 15 minutes for preliminary - testing by optometrists, between 30 - 40

minutes for dilation, between 4 - 7 minutes for consultation by ophthalmologist and between 1 to 3 minutes for final consultation by Director.

- **Routing**
  - Variable routing: It is clear that all the patients do not follow the same patient flow. For example, follow - up patients just meet the ophthalmologist and Director.
  - Dedicated resource: Somehow, Director has become a dedicated resource as every patient wants to visit him which adds to the queuing problem.

After identifying the reasons for variability in the system, it is important for managers to look for the ways to reduce variability.

Appointment system: For matching supply with demand, a somewhat obvious way is appointment. The Eye - Hospital do have a system of appointment. However, this may not completely eliminate variability in patient's arrival. Patients do not arrive perfectly at the scheduled time slots (15 minutes time slots as given in the case) and some might not turn up at all. The data from table 5 of the case suggests that there is an average deviation of more than 30 minutes from the appointment time by the patients. Some kind of penalty by putting the late arriving patients (deviated from the appointment time - slot) at the last may serve the purpose. However, patients may perceive this unfair. There may be a question "if a Doctor can be late, why not patient". Being in providing eye - care service to the patients, it is highly likely that Ophthalmologists may not keep up with the schedule.

There is another type of problem associated with appointment system. One is not sure, how much of system capacity (in terms of time - availability of Ophthalmologists and Director) should be booked in advance by appointment.

The focus should now be improving upon the inventory of patients (i.e., minimizing it) who wait for an appointment in the waiting area to see either Optometrist or Ophthalmologist or Director.

Analytical Modeling: This situation can be modeled on the pattern of staffing plan or capacity decision problem in terms of number of servers (for e.g., number of Optometrists or Ophthalmologists) given an inter-arrival time distribution, service-time distribution and constraint such as that only 1 percent of patients will have to wait for more than a specific time(say 30 minutes!). The objective is to find the solution with minimum cost where cost can be estimated in terms of wage rate of resource (Optometrists or Ophthalmologists). However, this may require simulation or more complicated queuing models.

Options to Reduce Waiting Time

1) Matching OPD timings with resource appointment times: If we consider the maximum processing time at all the stages assuming a new patient case, it takes near about 70 minutes. However, turnaround time turns out to be more than 140 minutes (nearly 2.5 hours). So what a patient does for 70 minutes, which is non-value added is an important question.

   Based on case information and table 6 of the case, it is obvious that there is a mismatch between the patients' appointment time-slots and Optometrist's, Ophthalmologist's and Director's availability in OPD. Currently OPD starts from 10:00 AM in the morning but resources (Optometrists, Ophthalmologists and Directors) are available only after surgeries (probably in afternoon) in OPD. This is a situation of demand (patient) leading the supply (resource) availability resulting in waiting.

   Probably, schedule of OPD appointment for patients can be made and delayed according to the resource availability.

2) Based on the date given in Table 6 of the case, simple analysis shows that Director has become the bottle-neck. (Table-1)

This implies that the Director is the bottleneck. Director can start early by an hour or so.

3) Opening OPD for 5 days instead of 4 days: Currently, the OPD is open for 4 days in a week. It is worthwhile to consider opening it for 5 days to accommodate the

Table-1

	Number	Processing Time/Patient (Min)	Timings	Available Time (Min)	Available Man-Minutes	Capacity (Number of Patients)
Director	1	2.22	13:00 - 17:00	240	240	108
Ophthalmologists	3	6.3	12:00 - 17:00	300	900	142
Optometrist	3	8.6	11:00 -17:00	360	1080	125

patients demand on the system. Below are some the comments on the possible ways to reduce the waiting problem mentioned in the case.

Possible ways to reduce the waiting problem

The case outlines several options in the consideration set to address waiting problem:

- Shifting operations to the first floor:

  This may help in reducing the number of patients waiting on a given floor. However, reduction in waiting time is still questionable.
- Waiting area enhancement:This may help in adding more seating capacity on the floor but requires investment. Again reduction in waiting time is questionable.
- Increasing the resources: This is a justifiable option.
- ERP implementation: May be looked at.
- Starting OPD earlier: Only add to the current problem. May increase the waiting time for the patients who arrive early.

Usage of Case

Besides introducing the service operations context, this case can also be used to teachthe following:

1) To understand the basic principle of Little's Law, which says:

   Average Patient in the OPD = Average TAT X Average Flow Rate of Patients from the System

2) As a context to teach simulation modeling.

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