

## Time motion study of registration and billing department of a tertiary care hospital in Raigad district of Maharashtra, India

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### Abstract

**Background:** Time motion studies are used for planning and performance evaluation of the system. Effective time management in the registration and billing department of the hospital will save patients time and improve patient satisfaction. This study was conducted in the registration and billing department of a tertiary care hospital in Navi Mumbai. **Objectives:** The study aimed to analyze the time required for patients/relatives in the registration and billing department and the experience of the patients/relatives regarding the front office and discharge process in a tertiary care hospital. **Materials and Methods:** A cross-sectional study was conducted using the convenience sampling method, with 300 participants from the billing and registration department. The study was conducted in a tertiary care hospital using a pretested structured questionnaire from August 2021 to January 2022. **Results:** Three-fourth (75%) and 19% of patients completed the Out-patient Department/In-patient Department registration within 5 minutes and 10 minutes, respectively, with reasonable patient satisfaction. Twenty-two percent and 45% of patients had to wait for 30 minutes and 45 minutes to complete the billing process of laboratory investigations, respectively, and patient satisfaction was reasonable. For the discharge process of Mahatma Jyotirao Phule Jan Arogya Yojana scheme patients, 60% and 37% had to wait for 3 to 5 hours and less than 3 hours, respectively. The root cause analysis for the delay in the billing and discharge process showed that the patient load was high for daily discharges, less staff, and slow hospital software functioning in the billing department. **Conclusion:** The study recommended workforce and space management to improve the quality of services and patient satisfaction.

**Keywords:** Time motion, billing department, waiting time, patient experience

### Introduction

A Time-motion Study (TMS) may be defined as a systematic examination of methods of carrying on activities to improve the effective use of human resources and equipment and raise the bar for performance in the tasks being done<sup>(1)</sup>.

Time-motion theory enhances resource planning and allocation. Knowing how much movement and time are needed for a specific task allows you to allocate the necessary resources. Time motion studies were introduced in industries at the beginning of the twentieth century. Later, this was applied in the healthcare industry after its success<sup>(2)</sup>. The cost savings increased with more excellent resource management and worker productivity. Motion study, also called a method study, is the systematic recording and critical examination of how to do things to make improvements. It involves the investigation of existing or alternate methods of work and improving them. TMS has been adopted by hospital managers and researchers, who initially applied these methods to study costs and inefficiencies in healthcare

delivery and then rapidly expanded the focus of their studies toward patient safety and quality.

There is nothing more on this planet greater than time. Time motion studies are thus used for planning and performance evaluation<sup>(3)</sup>. The registration department and hospital administration face significant challenges, from congestion and lengthy wait times. A patient's initial impression of the hospital is developed in the registration and billing department, which is regarded as the entrance to hospital services. Although the patient is satisfied with the treatment in the hospital, the hospital authorities must ensure that patients get hustle-free services in this department.

The billing, registration, and Mahatma Jyotirao Phule Jan Arogya Yojana (MJPJAY) department thus requires a systematic study of its services for efficient management and function. MJPJAY is a Maharashtra Government initiative for making healthcare access to a lower socio-economic section of society. Beneficiaries seek medical care in an empanelled tertiary hospital, and the government takes care

of the expenses. The MJPJAY scheme was started in this hospital in the year 2012. Therefore, a billing, registration, and MJPJAY department must function efficiently. Most of the patients are from urban, rural, and tribal areas of the Raigad and Thane districts. They avail of specialty and super-specialty services of the hospital under the MJPJAY scheme and hospital charity.

### Objectives

1. To assess the waiting time for registration of Out-patient Department (OPD)/In-patient Department (IPD) patients in the tertiary care hospital
2. To determine patients' waiting time to complete the billing process of laboratory investigations
3. To assess the waiting time for patient discharge from the ward to the completion of the billing process of MJPJAY scheme patients
4. To identify the factors that cause the delay in the registration and discharge of patients in a tertiary care hospital

### Materials and Methods

#### Study Design and Study Site

It was a cross-sectional study of TMS in the billing and registration department of a tertiary care hospital in Raigad district, Maharashtra, India.

#### Sampling Method

A convenient sampling technique was used, considering the daily OPD attendance and inpatient admission. A sample size of 300 was derived for the study using formula  $n = \frac{z^2 \times p(1-p)/e^2}{1 + \{z^2 \times p(1-p)/(e^2 \times N)\}}$ , out of which 120 patients/relatives were from the billing department and 150 patients/relatives were from the registration department, and 30 patients were from the MJPJAY scheme.

#### Inclusion Criteria

Patients and relatives aged 18 to 65 years, who were fit and willing to participate were enrolled in the study.

#### Exclusion Criteria

Differently-abled persons who have separate counters were excluded from the study.

#### Study Period

The study was conducted for a period of 6 months, from August 2021 to January 2022.

#### Data Collection

Data regarding the arrival time and completion of the registration/billing process at the registration and billing counters were recorded with the help of a digital stopwatch by the observer. Patients/relatives were interviewed using a pretested semistructured questionnaire including both closed and open ended questions; wherein name, demographic details, and their opinion regarding delay in the registration

and billing counters were captured with open ended questions. For MJPJAY patients, the doctor recorded time from the declaration of discharge for the patient until the billing was completed by using a digital stopwatch.

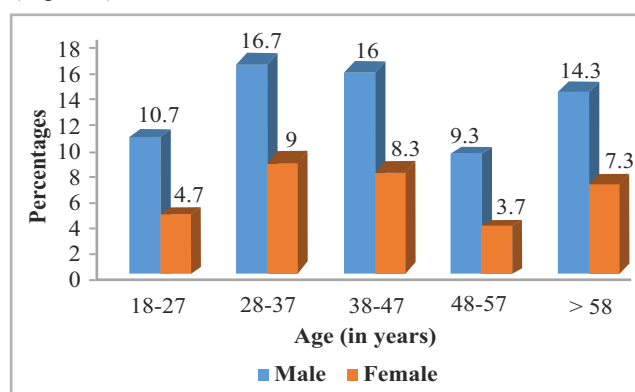
#### Data Analysis

Data entry and analysis were done using Microsoft Excel 2016. Percentages were calculated, and graphs were plotted for descriptive statistics. Qualitative data were analyzed using Ishikawa Diagram.

Ethical approval was obtained from the Institutional Ethical clearance Committee Vide letter No.:103/21 dated July 26, 2021. Prior written consent was taken from each patient/relative before starting the study.

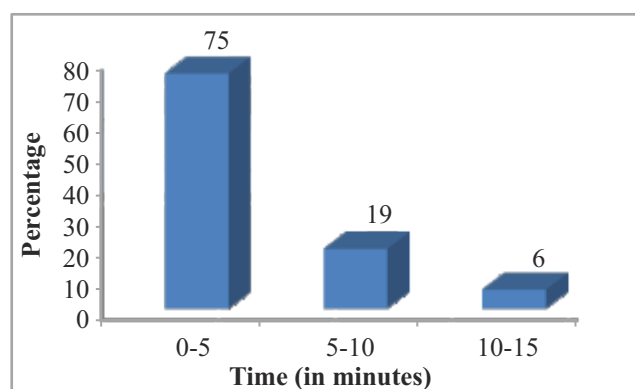
### Results

The study was carried out among 300 participants; 67% of participants were males, and 33% were females. Study participants' age and gender-wise distribution showed that 15%, 26%, 24%, 13%, and 22% were in the age group of 18-27, 28-37, 38-47, 48-57, and above 58 years, respectively (Figure 1).



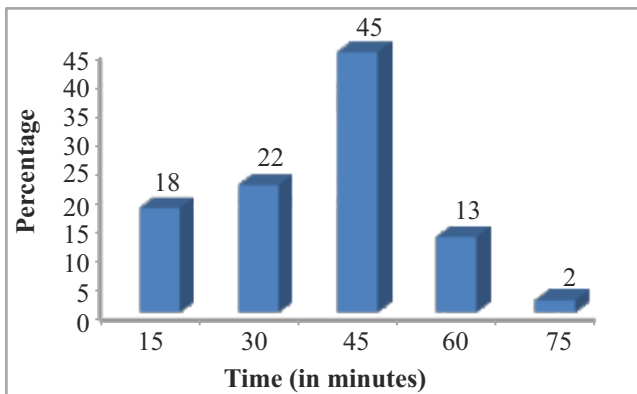
**Figure 1: Age and Gender distribution of study participants**

At the registration counter, 75%, 19%, and 6% of patients required less than 5 minutes, 5 to 10 minutes, and 10 to 15 minutes for the registration process of OPD and IPD papers, respectively, in the tertiary care hospital (Figure 2).



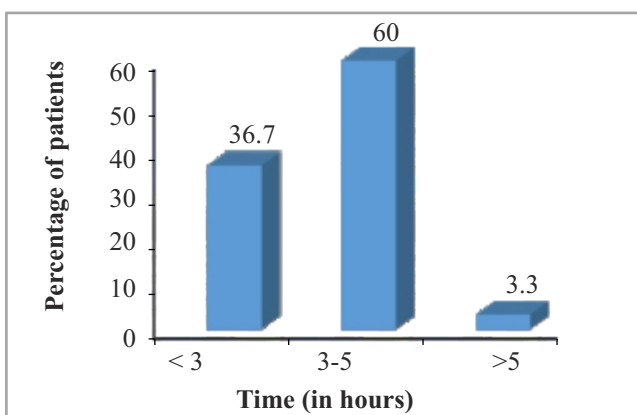
**Figure 2: Waiting Time in Registration Department (OPD/IPD)**

The waiting time calculated for patients at the billing counter for laboratory investigations showed that 18%, 22%, 45%, 13%, and 2% required 15, 30, 45, 60, and 75 minutes respectively to complete the billing process (Figure 3).



**Figure 3: Waiting time in billing department for laboratory investigations**

For the patients registered under the MJPJAY scheme, the time required for the discharge from the ward to the completion of the billing process was recorded. It showed that 36.7%, 60%, and 3.3% of MJPJAY patients took less than 3 hours, 3 to 5 hours, and more than 5 hours, respectively (Figure 4).

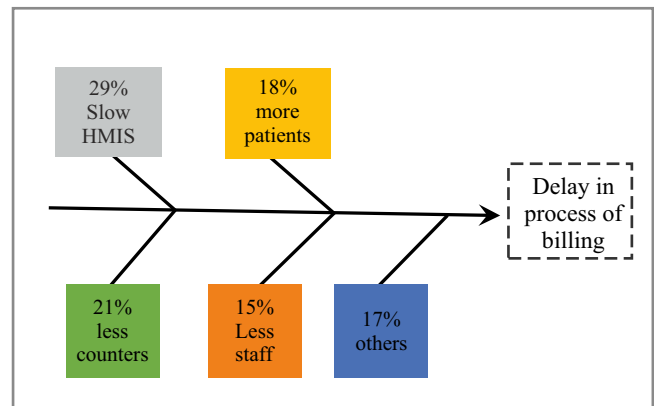


**Figure 4: Time taken for discharge process of MJPJAY patients**

Out of the 120 patients interviewed for their experience at the billing counters, the results showed that 6%, 61%, 23%, and 10% of patients/relatives had excellent, good, poor, and inferior experience, respectively, in the billing department.

The root cause analysis for the delay at the billing counter was shown by the Ishikawa diagram. It showed that 29%, 18%, 21%, 15%, and 17% of people gave the opinion of slow HMIS, more patients, fewer counters, less staff, and other reasons, respectively (Figure 5). The root cause analysis for reasons for the delay at the registration counter depicted by the Ishikawa diagram showed 10%, 53%, 23%, 9%, and 4% people gave the opinion as a slow Health management

Information System (HMIS), more patients, few counters, few staff and others respectively. The results for the delay of the MJPJAY scheme patients' discharge process were analyzed using the Ishikawa diagram; this showed that 43%, 7%, 10%, 17%, and 23% of participants gave the opinion that the server was slow, more patients, fewer counters, less staff and other reasons respectively.



**Figure 5: Root cause analysis for the delay of patient's billing process according to study participants**

### Discussion

A time and motion study determines the time required for a specific activity, work function, or mechanical process<sup>(1)</sup>. TMS allows you to improve processes and performance optimization. Improved working practices increase productivity and reduce worker exhaustion. Effectiveness is not just about how hard you work but how smart you are<sup>(1)</sup>. This study concluded that the number of male participants were higher than that of female participants. The waiting time for OPD/IPD registration for 75% and 19% of patients was 5 minutes and 5 to 10 minutes, respectively. The time required for billing laboratory investigations was 45 minutes and 30 minutes for 65% and 22% of patients, respectively. Majority of the studies conducted in India were based on waiting time for registration, OPD consultation, laboratory services, and discharge process.

Javed et al. showed that the mean registration time for patients was 10 minutes 36 seconds  $\pm$  6 minutes 44 seconds. Experience in the registration area was very good by 39%, good by 35%, poor by 16%, and 10% told it was unsatisfactory using point scale method<sup>(4)</sup>. Chopade et al. showed the mean time taken for registration was 683.88 $\pm$ 25.7113 seconds<sup>(5)</sup>. Medical check-ups took 29.37% of the total time, while the mean was 1002.12 $\pm$ 33.2281 seconds. According to 26.67% of study participants, the total time was too long. About 26% of study participants were not satisfied with the total time taken in the OPD, while 50.34% of study participants were satisfied with the total time<sup>(6)</sup>.

Sengupta et al. found that the mean registration time was calculated as 10 minutes 45 seconds  $\pm$  6 minutes 10 seconds.

Experience in the registration area was very good by 40%, good by 35%, poor by 15%, and 10% said it was satisfactory. It was normal according to 40% of people, slow for 30% of patients, and very slow for 15%<sup>(6)</sup>. The time required for OPD/IPD registration was 5 minutes for most of the patients, which is less as compared to other studies.

Afrane et al. observed that the average modal time taken to see a doctor on arrival for care at the hospital was between 2 to 3 hours. In the patient satisfaction survey, 67.6% were satisfied with the services, 26.06% were undecided, and 6.34% were unsatisfied. The majority of 93% of respondents blamed insufficient staff as the main cause of the delays<sup>(7)</sup>.

Naaz et al. found the mean waiting time at OPD, from arrival to entry in OPD for consultation, to be 1 hour 10 minutes 38 seconds; on average, a patient spent about 16 minutes 43 seconds in the pathology lab and 23 minutes 37 seconds in the radiology department. On average, a patient spent 2 hours 17 minutes 29 seconds from their arrival in the hospital to exit from the OPD. When the patients were asked about their experience at the registration counter, 13% replied "poor," whereas when asked to give feedback on time consumed in the queue at the registration counter, a maximum number (47%) of patients responded "normal," 8% patients said it was unbearable to stand in the queue<sup>(8)</sup>.

Aswar et al. observed that 4.1%, 46.2%, 41.9%, and 4.1% of respondents spent more than 30 minutes, less than 10 minutes, 10-20 minutes, 20-30 minutes in a queue to get the OPD card, respectively. The satisfaction survey showed that 65.3% of respondents were satisfied with the registration services, while 34.7% were unsatisfied. They were unsatisfied with the waiting area near the registration counter and the way of communication and information provided by the registration counter clerk. Majority (91%) were satisfied with laboratory services<sup>(9)</sup>.

However, in this study, for the majority of the patients, the registration time for OPD/IPD was less or the same as compared to other studies. Regarding the experience of patients/relatives at the billing counters, the results showed that 6%, 61%, 23%, and 10% of patients/relatives had excellent, good, poor, and inferior experience, respectively. When compared with other studies, the results were similar to other hospitals.

In this study, the Ishikawa diagram shows the root cause analysis for the delay at the billing counter (Figure 5). It showed that 29%, 18%, 21%, 15%, and 17% of people gave the opinion of slow HMIS, more patients, fewer counters, few staff, and other reasons, respectively.

The waiting time for the discharge process for 60% and 37% of MJPJAY patients was 3 to 5 hours and less than 3 hours, respectively (Figure 4). This time was recorded from the

discharge given by the treating doctor to the completion of the total billing process. The most common reasons for the delay in the discharge process were staff shortage and slow HMIS. Gujar et al. showed a delay in the discharge process of MJPJAY patients<sup>(10)</sup>. One of the studies also documented that the doctors in public hospitals complained about the lengthy documentation and complicated procedure under this scheme. Access barriers were identified at various levels of the scheme delaying the entire process from registration to seeking treatment<sup>(11)</sup>. This study depicts the results for the delay of the MJPJAY scheme patients' discharge process using the Ishikawa diagram; this showed that 43%, 7%, 10%, 17%, and 23% of participants gave the opinion that the HMIS server was slow, more patients at the counter, fewer counters, less staff and other reasons respectively. Many times the MJPJAY scheme website is also slow.

The findings were similar to those of Ajami et al. in Kashani Hospital in Esfahan, Iran, where the queuing model was used to study the reasons for delays in discharges. The average waiting time for all the wards was found to be 5 hours. As per hospital personnel's opinion, the main reasons identified were delay in the discharge summary completion, lack of proper guidelines for the staff involved in the discharge process, and absence of hospital Information networking systems<sup>(12)</sup>. A study conducted in an immunization clinic in India showed a delay in registration due to inadequate staff<sup>(13)</sup>.

Green et al. studied queuing approach where some clinics offered medical assistance to patients attending walk-in clinics. These clinics must keep track of patients' turn in line, which notifies them when their consultation approaches. Patients can use their free time to utilize other services in the hospital<sup>(14)</sup>. Shobitha et al. showed that 50.9% of the patient's discharges took more than 180 minutes. Most of the patients also agreed that billing was a step that took the longest time in the discharge process, followed by discharge summary completion, so there should be adequate staffing depending on the patient load, especially in the billing department<sup>(15)</sup>. Prakash et al. showed that the delay in the discharge process could be avoided with adequate staff and patient counseling<sup>(16)</sup>.

Mageshwari et al. observed that patients need to undergo several check-ups, blood tests, and treatment according to the diagnosis of the disease. They have proposed patient scheduling techniques as an efficient technique to minimize the waiting time of patients and resource utilization<sup>(17)</sup>. Verma showed the application of the six sigma technique in crowd management in an OPD, this technique was helpful, and patient satisfaction also improved<sup>(18)</sup>. Thomas et al. showed that the total time taken for insurance, self-payment, and Discharge Against Medical Advice (DAMA) patients was 3, 4, and 5 hours, respectively. As per the satisfaction survey,

69.80% of the patients felt the discharge process was lengthy<sup>(19)</sup>.

Mundodan et al. found that the mean time for the discharge process from when the patient is advised discharge till the patient physically leaves the hospital ward was 5.68 hours. The time was 5.47 hours for the cash patients and 6.15 hours for those availing cashless/insurance services. Only 8.8% were discharged within the National Accreditation Board for Hospitals (NABH)-prescribed time limit of 180 minutes. The maximum delay occurred due to discharge summary completion, an average of more than four hours, followed by the time taken for bill clearance<sup>(20)</sup>.

In the present study, patients' registration and billing process times were relatively less or similar compared to other studies. But there is still scope for improvement in these departments. Time taken for the billing and discharge process is crucial because even if the patients are satisfied with the treatment in the hospital, they should be happy with the front office services as they are likely to remember their experience in the future.

### Conclusion

Registration for OPD services is free in the hospital, and therefore the patient waiting time is also less. There was overcrowding at the billing counter, as in a tertiary care hospital, patients are admitted for emergencies, chronic diseases, and major and minor surgeries; these patients require basic and advanced investigations to be done for treatment. Therefore, it takes time for the billing process. The hospital authorities should ensure that the patients spend less time in billing queues so they can reach the consulting doctor on time. For MJPJAY patients, the majority of the time, there is a delay in the process as the file moves through the different departments from ward to pharmacy and MJPJAY department, for the completion of all scheme-related procedures. Then finally, it goes to the billing counter. There could be delay in the preparation of discharge summaries by treating doctors. On a few occasions treating doctors declare discharge in the morning and fill the discharge cards in the evening due to their busy schedule as they are attending OPD or they are in the operation theatre; this needs to be avoided, and discharge cards should be completed on time.

### Recommendations

- Appoint adequate staff at the billing/registration counter to minimize overcrowding and reduce the waiting time for OPD/IPD registration, laboratory investigations, and billing.
- Increase the number of counters to minimize overcrowding during rush hour.
- Upgradation and maintenance of HMIS software to cater to the hospital's patient load.

- Outpatient and Inpatient registration counters should be separate.
- Regular training of the staff about the operation of HMIS software
- Supervised by the billing manager to identify issues faced at the registration counter by the patients and staff and provide solutions.
- The billing manager should conduct regular meetings and train the staff about improving the services.
- There is a requirement for a bigger space to accommodate long queues.
- Doctors should counsel the patients and nurses about their discharge date and billing prerequisites before the day of the discharge. Doctors must also fill out the discharge summary cards on time so that the nursing staff can initiate the billing process.

**Conflict of Interest:** Nil

**Source of Support:** Nil

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