A Time Motion Study in the Immunization Clinic of a Tertiary Care Hospital of Kolkata, West Bengal

Amitabha Chattopadhyay, Ritu Ghosh, Sucharita Maji, Tapobroto Guha Ray, Saibendu Kumar Lahiri
Department of Community Medicine, RG Kar Medical College, Kolkata, India

ABSTRACT

Background: A time and motion study is used to determine the amount of time required for a specific activity, work function, or mechanical process. Few such studies have been reported in the outpatient department of institutions, and such studies based exclusively on immunization clinic of an institute is a rarity. Materials and Methods: This was an observational cross sectional study done in the immunization clinic of R.G. Kar Medical College, Kolkata, over a period of 1 month (September 2010). The study population included mother/caregivers attending the immunization clinics with their children. The total sample was 482. Pre-synchronized stopwatches were used to record service delivery time at the different activity points. Results: Median time was the same for both initial registration table and nutrition and health education table (120 seconds), but the vaccination and post vaccination advice table took the highest percentage of overall time (46.3%). Maximum time spent on the vaccination and post vaccination advice table was on Monday (538.1 s) and nutritional assessment and health assessment table took maximum time on Friday (217.1 s). Time taken in the first half of immunization session was more in most of the tables. Conclusion: The goal for achieving universal immunization against vaccine-preventable diseases requires multifaceted collated response from many stakeholders. Efficient functioning of immunization clinics is therefore required to achieve the prescribed goals. This study aims to initiate an effort to study the utilization of time at a certain health care unit with the invitation of much more in depth analysis in future.

Keywords: Immunization clinic, tertiary care hospital, time motion

Introduction

A time-motion study is a business efficiency technique combining the time study work of Frederick Winslow Taylor with the motion study work of Frank and Lillian Gilbreth. It is a major part of scientific management (Taylorism). A time and motion study is used to determine the amount of time required for a specific activity, work function, or mechanical process. During the last decade, the number of patients seeking Outpatient Department (OPD) services has increased many folds, but the facilities in the OPD have not increased at the same rate. The outpatient department thus requires a systematic study of its services for its efficient management and function. It is therefore imperative that a simple time and motion study of an OPD system and suitable inexpensive interventions can go a long way to improve the efficiency of a hospital.

Thus, as the name suggests “time motion study” is concerned primarily with increasing performance by measuring and then minimizing the time taken to perform various operations without compromising the quality of services. The fundamental philosophy of this discipline suggests that (a) although there are numerous ways to perform any task, one method will be superior to others, and (b) the superior method can be determined
by observing and analyzing the time taken to carry out parts of the activity.\(^{(2)}\)

Few such studies have been reported in the outpatient department of hospitals, and such studies based exclusively on immunization clinic of an institute is a rarity. Hence, this present study was carried out in the immunization clinic of a tertiary care hospital, with the objective of determining the activity time at the service points in the immunization clinic, as such clinics dealt with the most vulnerable and sensitive section of the population, for whom satisfactory preventive/promotive care was essential.

**Materials and Methods**

This was an observational cross sectional study done in the immunization clinic of R.G. Kar Medical College, Kolkata, over a period of 1 month (September 2010). The study population included mother/caregivers attending the immunization clinics with their children. The total sample was 482. Before starting the study, ethical clearance for conducting the study was taken from the ethical committee of R.G. Kar Medical College, Kolkata. The month of September was selected randomly to carry out the study. The registration records of last 3 years of the immunization clinic were reviewed and average daily registration including both old and new immunization cards was found to be 60 in number. Every third mother/caregiver registering in the clinic on the day of study was selected by systematic random sampling method; as the number working days in the month of September 2010 was 21, the minimum sample fixed to be achieved was 420. Final sample size achieved was 482. Informed consent was taken from every mother/caregiver selected for the study beforehand.

Predesigned and pretested schedules were used to record time and other information, and pre-synchronized stopwatches were used to record total activity time (which included waiting time + service time). As the immunization clinic was open from 10.00 am till 2.00 pm, data collection started at 10.00 am. Time was recorded at the following points:

a. At the entrance (entry time)
b. Immunization table 1 (after completion of initial registration by public health nurse)
c. Immunization table 2 (after completion of nutritional assessment of child and health education to mothers by interns)
d. Immunization table 1 (after completion of final registration by public health nurse)
e. Immunization table 3 (after completion of vaccination and post vaccination advice delivery by public health nurse)
f. Exit time

### Table 1: Service delivery time at the different activity points (n=483)

| Activity points                | Mean ± S.D (in seconds) | % of total activity time | Median (in seconds) | Interquartile range (Q3-Q1) |
|-------------------------------|-------------------------|--------------------------|---------------------|-----------------------------|
| Initial registration (Table 1)| 165.9 ± 167.7           | 16.5                     | 120                 | 120                         |
| Nutritional assessment and health education (Table 2) | 179.5 ± 176.8 | 17.85 | 120 | 120 |
| Final registration (Table 1) | 120.12 ± 143.06 | 11.95 | 60 | 60 |
| Vaccination and post vaccination advice (Table 3) | 465.25 ± 453.75 | 46.3 | 300 | 420 |
| Exit time                     | 74.34 ± 77.51           | 7.4                      | 55                  | 25                          |

### Table 2: Service delivery time (trimmed mean in seconds) in relation to old/new registrations, day of visit, hour of visit

| Variables                        | Initial registration (Table 1) | Nutritional assessment and health education (Table 2) | Final registration (Table 1) | Vaccination and post vaccination advice (Table 3) |
|----------------------------------|--------------------------------|------------------------------------------------------|-------------------------------|--------------------------------------------------|
| Old registration (n=133)         | 169.6                          | 180.9                                                | 198.3                         | 401.2                                            |
| New registration (n=349)         | 129.7                          | 143.2                                                | 69.6                          | 421.1                                            |
| Day of visit in a week           |                                |                                                      |                               |                                                  |
| Monday (n=136)                   | 219.2                          | 143.2                                                | 105.1                         | 538.1                                            |
| Tuesday (n=51)                   | 109.8                          | 181.3                                                | 125.1                         | 374.04                                           |
| Wednesday (n=118)                | 126.1                          | 141.1                                                | 103.8                         | 393.9                                            |
| Thursday (n=93)                  | 114.9                          | 141.9                                                | 78.7                          | 326.8                                            |
| Friday (n=84)                    | 138.9                          | 217.1                                                | 111.9                         | 412.9                                            |
| Time of visit in a day           |                                |                                                      |                               |                                                  |
| 10.00 to 12.00 noon (n=321)      | 147.2                          | 162.5                                                | 96.4                          | 419.2                                            |
| 12.01 pm to 2.00 pm (n=161)      | 127.03                         | 136.9                                                | 107.8                         | 403.9                                            |

The following activities were carried out in the respective immunization tables.

In immunization table 1, initial and final registrations of new and old registration cards were done. In the case of initial registration of new cards, a day-specific
serial number was given and in final registration, a new registration number was allotted to the card; it was also checked whether nutritional assessment was done in immunization table 2 and vaccines scheduled for that day were prescribed. In the case of initial registration of old cards, a day-specific serial number was also given and in final registration process it was checked whether nutritional assessment was done in immunization table 2 and vaccines scheduled for that day were prescribed. In addition, in case of old cards, information related to previous vaccination and the already allotted registration number were verified and matched with the records maintained in the clinic during initial and final registration process.

In immunization table 2, nutritional assessment of the child was done by clinical and anthropometric methods along with plotting of growth chart and health education was given to mother/caregiver. Also, a comparison with previous records was done in the case of old cards.

In immunization table 3, vaccination was given and appropriate post vaccination advices were given to the mothers/caregivers along with information regarding next visit.

The layout of the immunization clinic is detailed in Figure 1. (The sequence of movement of mother/caregiver was as follows: After entry the participants went to immunization table 1 for initial registration, after which they approached immunization table 2 for nutritional assessment of the child and health education; thereafter the participant returned to immunization table 1 for final registration and was subsequently sent to immunization table 3 for vaccination and post vaccination advices followed by exit from the clinic. The reason for following a two-step registration process, as stated by the clinic health staffs was to ascertain that the mothers/caregivers attend immunization table 2 for nutritional assessment of the child and health education as they had the tendency of bypassing this Table to attend immunization table 3 directly for vaccination and post vaccination advices.)

Motion of every mother/caregiver selected for the study was followed from the entry till exit from the immunization clinic in the above sequence, and time spend in the above-mentioned activity points was recorded. Statistical analysis was done by using Microsoft Excel 8.0. Time has been expressed as mean, median, trimmed mean (all in seconds), and interquartile range (IQR). Trimmed mean (5% of the extreme values on either side was trimmed) was calculated as data was very much skewed leading to large standard deviations.

Results
Table 1 presents the service delivery time at the different activity points. In the initial registration table the mean time taken was 165.9 ± 167.7 s, while the median value was 120 s (IQR=120). The mean time taken at nutrition and health assessment table was 179.5 ± 176.8 s and median time was 120 s (IQR=120). Final registration had a median value of 60 s (IQR=60). Vaccination and post vaccination advice table took 46.30% of total activity time, while the mean and median time was 465.25 ± 453.75 and 300 s, respectively.

Table 2 shows the service delivery time (trimmed mean in seconds) in relation to old/new registrations, day of visit, time of visit. In the case of new registrations, time taken at vaccination and post vaccination advice table was more, while in all other tables participants with old registration cards took more time. Regarding the day of visit it was found that the maximum time for initial registration was taken on monday (219.2 s), while tuesday (181.3 s) took the maximum time for final registration. Maximum time was also spent on the vaccination and post vaccination advice table on Monday (538.1 s) while nutrition and health assessment table took maximum time on friday (217.1 s). Time taken in the first half of immunization session was more for all the tables except for final registration.

Discussion
Historically, time motion studies were used in the manufacturing industry to evolve pay scales with the thought that money was the only motivation for work. Today, time motion studies can be effective for performance evaluations, for planning purposes in order to predict the level of output that may be achieved and can be used to unmask problems and create solutions and also can be used for time cost analysis.

The outpatient department is the point of contact between the health care facility and the community. The problems of OPDs of developing countries are long waiting time, long queues, inefficient staffs, absence of staffs, etc. The problem is more grave when the OPD
deals with pediatric patients like in the immunization clinics. No comparable time motion studies carried out in any other immunization clinic have been found, but other time motion studies have been carried out in relation to surgical interventions, nursing activity monitoring. Few salient features of this study were that the overall time taken at the vaccination and post vaccination table was substantially more than other tables (46.3%). Old registrations cards took more time in immunization Tables 1 and 2 probably due to the fact that verifications and comparisons were made with previous records in the clinic in the case of these cards. Similarly, time taken at the different tables during the first half of the clinic (10.00 a.m–12.00 noon) was generally more probably due to more number of mother/caregivers attending the clinic in the first half. On Mondays, more time was taken in initial registration table (immunization table 1 in the Figure 1) and in vaccination and post vaccination Table (immunization table 3 in Figure 1) which may have been due to more number of participants coming to the immunization clinic on the first day of week (n=136). Such bottlenecks identified may have relations to number of staff present on the particular day of study, unequal efficiency of the members of the staffs, pattern of arrangement of activity Tables in the immunization clinic, availability of vaccines uniformly, varying number of participants in relation to different days/hour of visit, etc. However, these variations need to be studied in depth. Again, factors affecting waiting time and service time in different Tables may be studied separately for further future discussions. A time motion study of operation theater time use during laparoscopic cholecystectomy by surgical specialist residents commented regarding the need of change of the current layout of the operating room for time saving. Similarly, a time motion study at New Delhi and North India showed that cataract surgical output can be increased in the country if operation theatre time is utilized optimally.

The quality and efficiency of the immunization services can be improved if the constraints and bottlenecks in the system are identified, analyzed, and attempts are made to overcome them. Perhaps this study will help in the initiation of further in-depth analysis of the bottlenecks related to this particular system of health care delivery.

**Conclusion**

The goal for achieving universal immunization against vaccine preventable diseases requires multifaceted collated response from many stakeholders. Efficient functioning of immunization clinics is therefore required to achieve the prescribed goals. Time management at all levels of health care system is the need of the hour which has to be recognized and necessary steps must be taken. This study had the limitation of being observational and would have been more effective if more related variables like number of staff present at each table on different days could also have been included and interventions could have been done leading to comparisons between different time utilizations in different layout settings of the clinic or by changing other contributory factors. At the end, it may be stated that this study aims to initiate an effort to study the utilization of time at a certain health care unit with the invitation of much more in-depth analysis of the method of functioning and subsequent remedial steps for optimal functioning of the system.

**References**

1. Anand TR, Gupta YP. Rationalization of working of OPD in a hospital: A case study. Health Population, Perspective and Issues 1983;6:77-94.
2. Chatterji M. A time motion study of a paediatric OPD of a Teaching Hospital in Kolkata; Thesis, 1992, Calcutta University.
3. Koehler, Kenneth G. Time Cost Analysis, CMA, Hamilton. May 1992; Vol. 66.
4. Geryane MH, Hanna GB, Cuschieri A. Time-motion analysis of operation theater time use during laparoscopic cholecystectomy by surgical specialist residents. Surg Endosc 2004;18:1597-600.
5. John N, Murthy GV, Vashist P, Gupta SK. Work capacity and surgical output for cataract in the national capital region of Delhi and neighbouring districts of North India. Indian J Public Health 2008;52:177-84.

**How cite this article:** Chattopadhyay A, Ghosh R, Maji S, Ray TG, Lahiri SK. A time motion study in the immunization clinic of a tertiary care hospital of Kolkata, West Bengal. Indian J Community Med 2012;37:30-3.

**Source of Support:** Personal, **Conflict of Interest:** None declared.