

## Original Research Article

**Time-Motion Study to Improve Sample Collection Process**Dr. S. Naga Satish Kumar<sup>1</sup>, Dr. N. Lakshmi Bhaskar<sup>2</sup>, Dr. N. Satyanarayana<sup>3</sup><sup>1</sup>Senior Resident, <sup>2</sup>Assistant Professor (S.G.), <sup>3</sup>Professor & H.O.D., Department of Hospital Administration, Nizam's Institute of Medical Sciences, Punjagutta, Hyderabad, Telangana – 500082**\*Corresponding author**

Dr. S. Naga Satish Kumar

Email: satish.salveru@gmail.com

**Abstract:** The first step in any quality approach process is identifying and studying the process in detail as what, how, when and by whom the process is carried on. Time-Motion study helps in studying the process by observing the process in person and recording the events to identify unnecessary steps and eliminate or reduce these steps for improving the process. The study aims to improve sample collection process in Nizam's Institute of Medical Sciences using Time-Motion study approach. The present study is an observational cross sectional study done by trained volunteers who personally follow the patient from entry till exit in sample collection room in the month of July, 2016. Results showed that the whole process of sample collection involved 4 operations, 5 transports and 3 delays. Total distance travelled was 55m and total time spent for process was 38 minutes 5 seconds (operation – 10 minutes 10 seconds and delays – 28 minutes) by the patient during the process. Total time spent can be reduced to 15-20 minutes by implementing bar-coding, creation of toilet facilities nearby, planning of phlebotomists as per patient flow, etc.

**Keywords:** Time-Motion Study, Sample collection, quality improvement.

**INTRODUCTION:**

Quality in Healthcare industry is a continuous and never-ending process. Though hospitals are at different points on their quality path, all hospitals are committed to quality improvement. Hospitals employ different approaches and models of quality improvement such as Quality Circles, Lean, Six Sigma, etc. First step in quality improvement is defining the process in detail [1]. Time-Motion Study is one such approach, which helps in studying the process in detail [2].

A time and motion study (or time-motion study) is a business efficiency technique combining the time study work of Frederick Winslow Taylor (1881 A.D) with the motion study work of Frank B. Gilbreth and his wife Lillian Gilbreth (1885A.D). It is a major part of scientific management (Taylorism) [3, 4]. Time and motion study is a work measurement technique for recording the times of performing a certain specific job or its elements carried out under specified conditions.

It is estimated that around two thirds of important clinical decisions about admissions, discharge and medication are based on laboratory test results [5]. Almost every patient is sent for laboratory investigation

where sample collection is the foremost process, which not only affects the quality of results, but also satisfaction of patients. So, it was planned to study and improve Sample Collection process in Nizam's Institute of Medical Sciences, a tertiary care teaching hospital in Hyderabad, India. The present study aims to define the process and various elements of Sample Collection process in the institute using Time-Motion study method and recommend improvements, thus improving patient satisfaction.

**METHODOLOGY:**

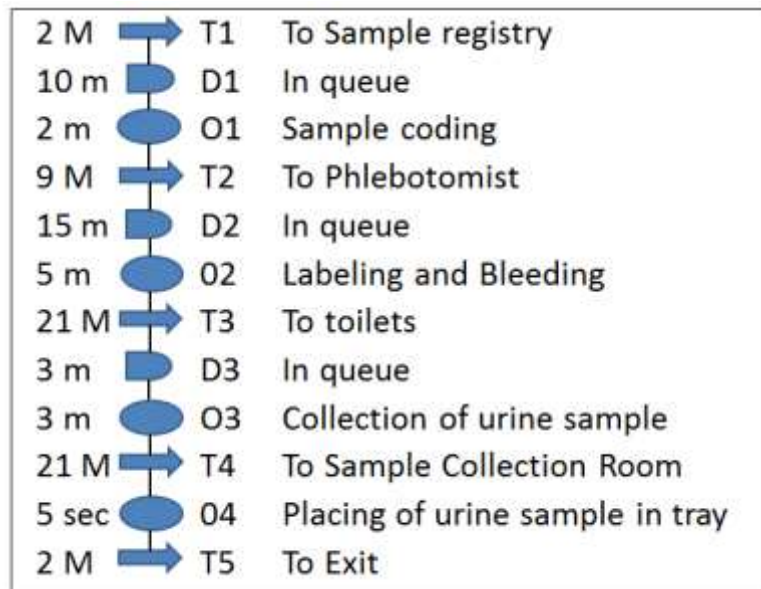
Study design adopted is an observational cross sectional study done in the month of July, 2016 using Time-Motion study approach. Volunteers, selected from the hospital management students, were trained to collect the data for the study. They were asked to follow the patient during sample collection process and note down each step in process and measure the process in time taken and distance travelled from beginning till end of the process. Descriptive statistics were used to summarize the data. The steps in sample collection are defined by various elements of Time-Motion study (i.e. Operations as O, Delay as D, Transport as T/→, Storage as S/∇ and Inspection as I/□).

**RESULTS AND DISCUSSION:**

Sample collection process was observed by the following the patient in sample collection room by the volunteers as flowchart with time and distance. The chart begins with patient entering sample collection room and ends with patient leaving sample collection room.

After billing of the concerned laboratory investigation, patient will be directed to sample collection room for collection of sample. The chart (Figure – 1) begins with patient entering the sample collection room, where the patient walks 2m to sample registry counter for registry and coding (T1). The patient has to wait for around 10 minutes in queue at the counter (D1). Service time for coding and registry (O1) is around 2 minutes which is done manually by the clerk. Then the patient is directed to phlebotomist and

patient needs to walk for 9m to reach phlebotomist (T2). The waiting time here in queue (D2) is 15 min on an average. After the waiting time, the phlebotomist receives the patient. The phlebotomist labels the sample collecting tubes, collects required amount of blood into sample collection tubes and then hands over a bottle to collect urine sample to the patient. The service time for this operation (O2) is around 5 minutes. The patient is directed towards toilets for collection of urine sample. The patient had to walk for 21m to toilets (T3) where the delay in queue on an average is 3 minutes (D3). After collecting urine sample which takes around 3 minutes (O3), the patient walks back 21m to sample collection room (T4) to submit the bottle. Patient would require 5 seconds to place the bottle in urine sample collection tray (O4) and walks back to exit for 2m (T5), where the chart ends.



**Fig-1: Chart of Sample collection process – Time-Motion study**

The whole process of sample collection involves 4 operations, 5 transports and 3 delays. Total distance travelled was 55m and total time spent for

process was 38 minutes 5 seconds (operation – 10 minutes 10 seconds and delays – 28 minutes) (Table – 1).

**Table-1: Elements of Sample collection process**

Element	Symbol	Quantum	Time	Distance
Operations	O	4	10 min 5 sec	–
Delay	D	5	–	55 m
Transport	T / →	3	28 mins	–

It can be inferred from the study that the patient had to spend more time in queues (28 minutes) than the actual service time rendered (10 minutes 10 seconds). The patient had to walk very long to toilets (42m to and fro) to collect urine sample which is not only unjust but also causing inconvenience to the patients.

The following recommendation were sorted out to reduce the total time spent and distance travelled by the patient for the process.

1. It can be noted that the coding process is manual, which can be replaced by any automation system like Bar-coding at time of

billing which can be labelled to sample collection tubes. This would help in eliminating initial steps in the process i.e., T1, D1 and O1. Time consumed in O2 will be reduced too, as automation avoids manual labelling of sample collection tubes. This system also helps in reducing mismatch of samples and thus reducing mismatch errors in pre-analytical phase of laboratory investigations.

2. Planning the number of service counters of phlebotomists as per flow of patients based on queuing theory will reduce waiting time before sample collection (reduces D2).
3. Provision of toilets in proximity to sample collection room would also avoid unnecessary travelling long distances (reduces T3, T4).
4. It can be estimated that implementing these recommendations can reduce the total time spent by the patient for sample collection process to 15-20 minutes and reduce distance travelled to 13m. Proper signage with detailed instructions of various steps in sample collection process facilitates patients and avoids confusion, improving patient satisfaction.

#### CONCLUSION:

Time-Motion study is a helpful tool to identify various processes in hospital which can help in identifying and reducing unnecessary steps in these

processes. Time-Motion study in conjunction with other quality approaches like Lean principle helps in reducing wastes and adds value to each step in the process[6]. Effective utilization of such quality approaches helps the hospitals in heading towards quality improvement and results in better patient satisfaction.

#### REFERENCES:

1. Jimmerson C, Weber D, Sobek D.K; Reducing Waste and Errors: Piloting Lean Principles at Intermountain Healthcare. Joint Commission Journal on Quality and Patient Safety, 2005; 31(5):249-257.
2. Chattopadhyay A, Ghosh R, Maji S, Ray TG, Lahiri SK; Atime motion study in the immunization clinic of a tertiary care hospital of Kolkata, West Bengal. Indian J Community Med 2012; 37(1):30-3.
3. Taylor FW; The principles of scientific management. Harper & Brothers Publishers, Ney York and London, 1914.
4. Baumgart A, Neuhauser D; Frank and Lillian Gilbreth: scientific management in the operating room. Quality and Safety in Health Care, 2009; 18(5): 413-415.
5. Plebani M; Errors in clinical laboratories or errors in laboratory medicine? Clin Chem Lab Med 2006; 44:750-9.
6. Mann D; Creating a lean culture: tools to sustain lean conversions. CRC Press; 2014.