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Process Improvement using Value Stream Mapping – A Lean Thinking in Indian Health Care Sector

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Abstract
Incidents and quality problems are a prime reason why health care leaders are calling to redesign health care delivery. With rising pressure on Healthcare providers, to reduce costs and improve quality, an increasing number of organizations are looking to "Lean" tools and techniques as a breakthrough solution for performance improvement. In this paper, an overview of lean thinking and its implementation in a hospital located in the southern part of India is been presented. It describes about the process improvement in hospitals using lean principles which can have a positive impact on productivity, cost, quality and timely delivery of services.
Keywords: process improvement, quality service, value added and non value added activities.

Introduction:
The quality services in Indian Health Care Sector vary depending upon the location and income of the population. For a heavily populated country like India, private expenditure on health is significantly higher than the government expenditure on health. At the time of India's independence in 1947, only 8% of the health care delivery was private however, 80 – 85% of the licensed physicians, 93% of the hospitals and 80% of the outpatient clinics in India operate, in whole or in part, within the private sector (March 2013, World Health Statistics). Though the Indian Government attempts to increase the percentage of total expenditure on health by nearly 3% from 2010 to 2011 the increase still remains insufficient for the increasing population of the country. Also, within urban and rural India, the quality service and infrastructure resources vary significantly. The 68.84% of the total population of India (2011 Census of India) do not receive proper quality health care. Therefore a need for low cost – high quality health care exists for Indian population. Thus, the application of lean thinking is seen as one of the potential solutions for the Indian health care sector.

Objective of the study:
The present study, "Process Improvement using Value Stream Mapping – a Lean Thinking in Indian Health Care Sector" mainly deals with the following objectives,

1. To study and identify the bottlenecks faced by the hospital in terms of non value added activities.
2. To eliminate the bottlenecks and develop Future State value stream map which can increase the value added time and reduce non value added time.

Methodology:
The present study is both qualitative and quantitative. This research is based on the material collected by both primary and secondary data.

Collection of primary data: The first, we acquired data directly from the company. To do this we talked with administrator, HR, floor managers and Doctors of the Hospital. The methodology is a Qualitative Research, it is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind. Qualitative research is especially important in the behavioural sciences where the aim is to discover the underlying motives of human behaviour. Through such research we can analyze the various factors which motivate people to behave in a particular manner or which make people like or dislike a particular thing. The data collected is primary data using Observation method. The observation method is most commonly used method especially in studies related to Behavioural Science. The observation was systematically planned and recorded and is subjected to validity and reliability. The advantage of this method is firstly, subjective bias is eliminated. Secondly, the information obtained is related to what is currently happening. Thirdly, this method is independent of respondents.

Tools of analysis:
Value Stream Mapping

Scope of study: India is a land full of opportunities for players in the medical devices industry. The country has also become one of the leading destinations for high-end diagnostic services with tremendous capital investment for advanced diagnostic facilities, thus catering to a greater proportion of population. Besides, Indian medical service consumers have become more conscious towards their healthcare upkeep. The diagnostic lab services have been witnessing an increase in the number laboratory tests being outsourced to India. The coming years will see a rise in the share of the organised players in the diagnostic services market. The favourable demographic virtues offer an attractive market for healthcare providers and investors in India.

Period of study: The study has been undertaken during the period from December 2014 to May 2015. The primary data has been collected during the said period.

Limitations of study: The study was confined to one branch alone. The duration of the project was limited. No

proper information was provided because of data confidentiality. Some data related to the process can't be measured.

Review of Literature:

Lean management principles have been used effectively in manufacturing companies for decades, particularly in Japan. It is believed that lean principles can be indeed successful if applied to the delivery of health care. This is because; the services encounter high costs with slow processes because of non value added activities, which lead to poor quality and low customer satisfaction[18]. Many healthcare organizations adopt the Toyota Production Systems as the practices and performance improvement that often called the Lean Healthcare management system[17]. In order for lean principles to take root, leaders must first work to create an organizational culture that is receptive to lean thinking. The commitment to lean must start at the very top of the organization, and all staff should be involved in helping to redesign processes to improve flow and reduce waste. Although health care differs in many ways from manufacturing, there are also surprising similarities: Whether building a car or providing health care for a patient, workers must rely on multiple, complex processes to accomplish their tasks and provide value to the customer or patient.

Lean in healthcare

Healthcare organizations are under sturdy force to progress. Society is aging, the demand for Healthcare services is increasing, but financial conditions for Healthcare systems are not improving or even worsening. In recent times, Healthcare systems are challenged to be affordable, accessible, safe, thorough, efficient and cost effective as possible. There is a need to look for new and more efficient ways of providing care. Not soon after WWI TPS, introduced lean manufacturing concepts into the manufacturing industry. The first descriptions of TPS appeared in the late 1970's[1] but the book *The Machine That Changed the World* by Womack and Jones[2] first popularized the approach under the name "Lean production". Womack and Jones were among the first authors to propose how Lean techniques could be applied to services and specifically to Healthcare.[3] They said that, implementing Lean thinking in Healthcare is to put the patient in the foreground and include time and comfort as key performance measures of the system.

Lean thinking in Healthcare lies in eliminating waiting times, repeat visits, errors and inappropriate procedures. Spears[4] emphasize empowerment of employees by providing them with the necessary tools to improve processes in their area of work. This means that all Healthcare staff becomes focused not only on taking care of the patient, but also on finding better ways to care of patients. Lean enhances process steps that are valuable and essential for patient care, while eliminating those that fail to add value. As a result staff members feel empowered to improve care processes and are more satisfied with their jobs.[4]

There is little evidence of the complete Lean philosophy being applied in the Healthcare system.[5,6] Lean Healthcare is about simplifying processes by understanding what adds value and eliminating waste.[7-13] It is often emphasized that current Healthcare systems consist of fragmented process which require a shift in how the flow of patient care delivery is perceived and organized[14] .The care processes in large Healthcare organizations simply evolve over time and are seldom a result of conscious planning and action [7, 14]. The Healthcare processes are organized with a focus on the doctors, nurses and other clinical staff and are often not optimized for patients [13, 15]. The care is organized in departmental silos and often the only person who sees the whole of the patient journey is the patient himself or herself [7, 15]. In such systems, a patient can typically spend hours in hospitals for only some ten minutes of value-added time. Applying Lean thinking, specifically value stream and continuous flow, has the potential to help break down the silo mentality, enabling changes to occur across functional boundaries [15]. Much of the work which is performed within the Healthcare setting does not directly add value from the patient's point of view[7]. It is rarely clearly specified how processes should ideally work in Healthcare operations. The consequence is inconsistency in care, unreliable access to resources and processes, and constant interruptions, which in turn implies inefficiencies, long waiting times, increased potential for errors, and worker frustration[8]. As stated before, Lean Healthcare is mostly about how to manage and improve processes, but what does it actually mean in practice.

First, the Healthcare units recognized the patient as the primary customer and as a critical factor to be taken into consideration when designing processes and delivering care. The second step is learning to see the processes as they are performed with all problems and shortcomings. It is necessary to categorize the huge variety of patients with different conditions into groups with similar needs and value streams and see the different patient flows through the Healthcare system[16]. One of the frequently discussed and used principles in Lean Healthcare is patient pathway/journey/flow. The patient flows through a series of different processes in the patient pathway/journey. The point is to follow the route through which a patient needs to travel from the demand for care to the completion of treatment as the patient experiences it. All the steps in a patient's pathway can be visualized with help of VSM. With VSM staff can quickly come to understanding that all work is a process and all processes can be improved[7]. Third, process improvement in Healthcare implies specifying how work is expected to be conducted and removing waste in the form of waiting time, rework due to poor

procedures, workarounds, interruptions, etc[12]. In this respect the most commonly mentioned Lean principles and methods are standardized work, waste reduction and continuous flow. Creating continuous flow is the goal of process improvement. The idea is that the patient should flow between Healthcare units and staff groups without interruptions. Ideally patients should move from one step in their care to the next without delay.

Value stream mapping

Womack et al (1990), Taiichi Ohno (1988), Daniel T Jones (2006), Womack and Jones (1998, 2005), Peter Hines and Nick Rich (1997), Rother and Shook (1999) have studied the implementation of VSM effectively. VSM is a visualization tool oriented to the Toyota version of Lean Manufacturing (TPS). It helps to understand and streamline work processes using tools and techniques of Lean manufacturing. The goal of VSM is to identify, value added activities and decrease waste in the process waste, being any activity that does not add value to the final product. VSM can thus serve as a starting point to help management, engineers, production associates, schedulers, suppliers and customers to recognize waste and identify its causes. As a result, VSM is primarily a communication tool, which is also used as a strategic planning tool and a change management tool.

Analysis and Interpretation:

VSMs are used to map work processes, material flow, and information flow. They have a multitude of uses and are generally easy to create and understand. For this project we used Microsoft Visio to create current state and future state VSMs. Our first objective was to create a current state VSM for the CIS factory. To do this we initially created multiple current state VSMs. These current state VSMs included a high level VSM and various factory's individual VSMs for the specific members and assembly lines. For the future state VSM, we created multiple scenarios, which were used to make a final decision. For our maps we used the "value stream map" template within the Visio 2007 program. We then listed all the processes included for the corresponding production line. As shown and described in the figure below, we used the different symbols to create our VSMs.

Mapping the current state (VSM)

Rother and Shook (1999) has discussed that, mapping helps to see the sources of waste in the value stream. The reward of VSM is the elimination of large amounts of wastes in the organization. The extended value stream mapping includes suppliers and customers in their decisions to suggest Future state value map. Collecting and analyzing data from the information and material flow will aid you in improving the value proposition you offer the customer. A current state map starts by drawing the material flow and then by drawing the information flow. A current state map is drawn using a set of icons on a single sheet of A3 paper, and can be done initially as a 'brown paper' exercise for larger value streams.

Further many research scholars speak out that it is possible to identify and eliminate waste. In this connection, it was felt that the Patient work flow process was having some non value added elements which can be avoided. Hence as per the model suggests the study was carried out. VSM is a visual tool that integrates material and information flow into critical path chart to understand the relationship and the importance of all value added and non value added actions. This methodology enables the production office to prioritize the process for systematic lean techniques.

Analysis for the future state (VSM)

The bottlenecks were identified at the preliminary test and dilatation process as maximum number of patients wait for long time in this process. The reason behind the bottleneck was identified to be the transfer of medical records; it took time for the medical records to move from one table to another as it was maintained manually. This can be reduced by adopting new technology in the process system.

The plans of action for improving the Future state value stream mapping (FVSM) are:

1. To develop a new layout where the continuous flow of materials is possible. This will lead to better way to reduce cycle time of the patient.
2. To review the process flow in order to reduce the idle time.
3. To identify value added and non value added elements and minimize/ eliminate the non value added elements.

Proposals for future state (VSM)

It was proposed to suggest the following steps to be taken to implement a FVSM, in this merger it was decided to provide suggestions based on understanding and observation of current state mapping. It was observed from the literature survey that the non value added activity is performed by workers that do not add value to the service. These activities are considered to be wastes. Lean manufacturing tools will strive in eliminating these activities and in turn eliminate the waste in the process flow.

FVSM for the patient work flow process is drawn, however a sample proposal is shown in Fig. Since these steps have to be taken up in phased manner, the proposed FVSM indicates the process that can be avoided and improve the value added activities by reducing non value added activities.

Conclusion:

Lean thinking has become increasingly significant in the field of healthcare and this study proves that implementing the same makes a vast difference in value added time. From the study it is proved that we can

increase the value added time and reduce non value added time. Thus, the healthcare industry must implement lean thinking if they need to satisfy their customers.

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Tables:

Table 1: Analysis of value added and non value added time

SL.NO	ACTIVITIES	VALUE ADDED TIME	NON VALUE ADDED TIME
1.	RECEPTION	1 min	2 min
2.	REGISTRATION	7 min	10 min
3.	CASH COUNTER	2 min	1 min
4.	PRELIMINARY TEST	15 min	35 min
5.	DIALATATION	30 min	20 min
6.	DOCTOR'S EXAMINATION	10 min	15 min
7.	NESCESSARY TEST	15 min	25 min
8.	DOCTOR'S CONSULT	5 min	20 min
9.	PHARMACY	3 min	10 min
10.	COUNSELLING	10 min	15 min
Total time		1 hr 38 mins	2 hrs 33 mins

Table 2: Proposal of Future Value Stream Mapping

SL.NO	ACTIVITIES	VALUE ADDED TIME	NON VALUE ADDED TIME
1.	RECEPTION	1 min	2 min
2.	REGISTRATION	7 min	10 min
3.	CASH COUNTER	2 min	1 min
4.	PRELIMINARY TEST	15 min	20 min
5.	DIALATATION	30 min	10 min
6.	DOCTOR'S EXAMINATION	10 min	5 min
7.	NESCESSARY TEST	15 min	15 min
8.	DOCTOR'S CONSULT	5 min	15 min
9.	PHARMACY	3 min	5 min
10.	COUNSELLING	10 min	10 min
Total time		1 hr 38 mins	1 hr 33 mins

Description for the above tables

Fig 1: CURRENT STATE MAP

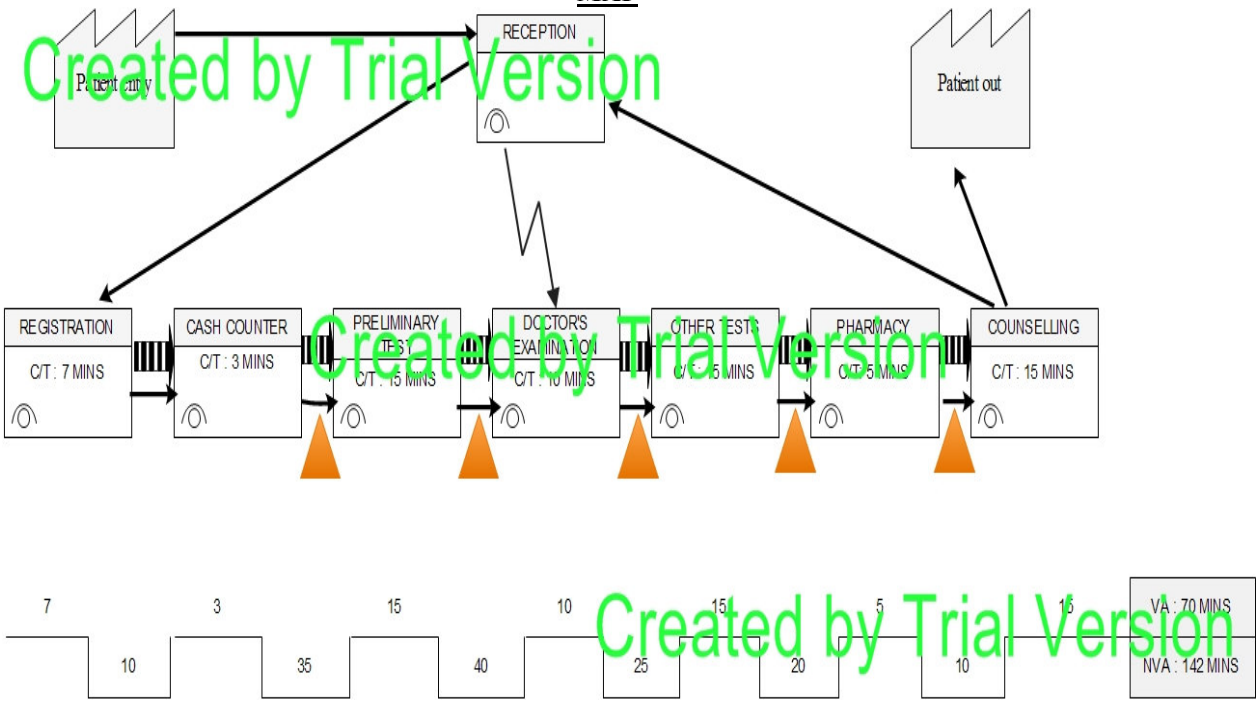

FIG 2: FUTURE STATE MAP