



## APPLICATION OF LEAN PRACTICES IN A SUPER SPECIALITY HOSPITAL FOR IMPROVED SERVICE DELIVERANCE

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### ABSTRACT

The service quality is sacrosanct in healthcare. Other industries often boast that their service quality differentiates them from competitors and the trend is visible in Hospital segment too. While saying so, quality of service having a direct impact on the health and safety of those served. Under these scenarios the quality management is the prime factor of Hospitals to improve the service quality and patient care. Healthcare leaders worked to *improve patient care* through a myriad of quality programs and process improvement. Perhaps, many

of these quality improvement efforts have fallen short of expectations and the net result is having an impact on the delivery of care. Lean in health care is one of the Modern quality management programs that are rooted in pioneering research conducted a century ago by Americans Frederick Winslow Taylor and Walter Shewhart. Taylor focused on studying existing workflow processes, experimenting with alternative processes that removed unnecessary or inefficient activities and adopting those processes that resulted in consistent production quality and improved worker productivity. Shewhart was the first to implement statistical process control, a quality control method in which data are regularly analysed in order to identify anomalous production patterns.

The objective of this study is to study the application of lean system to streamline work processes in a super speciality hospital in order to decrease variations in the services provided to the patients so that cost is reduced while at the same time patient satisfaction is visibly increased. Out of various departments in the hospitals, Value streams in three departments has been developed through direct observation as well as discussions with the concerned staff. The steps were divided into Value Added, Non-Value Added and Non-Value Added but

necessary. There is a sincere attempt to develop a frame work for process flow that can address the Non Value-Added activities and a future Value Stream Map will be developed.

### **Relevance of application of Lean in hospitals**

Current think tank works on cost effectiveness and quality controls to deliver more with less (Fine, Golden, Hannam, & Morra, 2009). In order to meet this demand many health care organisations are looking in to the industrial improvement techniques like *Lean* to improve quality and Safety (Kaplan, Patterson, Ching, & Blackmore, 2014). “primary goal of the Lean philosophy is to be extraordinarily customer focused and responsive by ridding the entire system of waste, thereby delivering to a customer exactly what she or he wants, when she or he wants it, defect-free and on time” (Nelson-Peterson and Leppa, 2007, p. 288). But the application of Lean in Health care is still not an evidence based (Goodridge, Westhorp, Rotter, Dobson, & Bath, 2015; Lawal et al., 2014; Rotter et al., 2014; Walshe, 2009; Young & McClean, 2008). Since the Patients are the customers the value should be defined from their perspective. Though all Health care facilities proclaim to be patient centred, the activities are not consistent with this stand (Deloitte).

The Operational definition of Lean health care management has two defining features (Rotter et al, 2018): Lean philosophy and Lean activities. Lean philosophy is made up of Lean principles and Continuous improvement.

- ✓ Lean principle: This refers to a set of over arching set of principles to transform work culture aimed at eliminating waste, improving flow of patients, providers and suppliers and ensuring all processes are value adding to the customers. These activities need to be done by the employees since the people doing the work is better suited to find solutions
- ✓ Continuous improvement: This acknowledges that Lean is not a single process but rather is a continuous process of improvement.

Lean activities are of two types: assessment activities and improvement activities

The two pre- requisites for Lean in any organisation is Lean Leadership and Lean culture. Lean aligns how an organisation thinks and works (Flinchbaugh and Carlino 2006). Lean principles to become institutionalised, there needs to be a transformation in corporate culture, processes, practices and management (Womack, 2002).

It is well documented in literatures that the Lean practices should be linked to the organisation’s culture through systems, operations and procedures (Bhasin, 2013). This can

be obtained by the following steps (Bhasin, 2013)., Decisions are made at the lowest levels, Participative leadership, Team work with total involvement and committed personal, the work provides personal as well as professional satisfaction and Collaboration between highly skilled employees and management.

Lean Sustainability Iceberg Model was suggested by Hnes in 2010 which advocates that even though Lean tools and Process management are required for attaining Lean system, the more important role is played by Strategy and Alignment, Leadership and Behaviour and engagement. Management commitment, effective and open communication, team working, organisation culture change, and training employees are preconditions for Lean in Healthcare sector (Sparrow, Hird, and Cooper, 2014).

There are five actions that will enable an organisation to improve its functions through Lean management (Dr. Monica W. Tracey and Jamie W. Flinchbaugh, 2015)

1. Formation of Lean teams;
2. Calculation and communication of metrics;
3. Communication across borders;
4. Communication to employees regarding their roles;
5. Acknowledgement and celebration of success.

These five actions will help the staff to develop a Lean culture and that needs to be complimented by recruitment policies, and communication across organisational boundaries and create and work with measurements.

### **Lean Operations**

Most Healthcare organisations view Lean as a set of tools for improving processes and not as an all encompassing business philosophy. This leads to patchy implementation of Lean system which acts as more of a detriment to organisation performance than an improvement (Poksinska, 2010, Burgess and Radnor's, 2013). Lean implementation requires learning by doing wherein Lean is implemented by those involved in the particular process. Processes may be value adding, non value adding, non value adding but necessary. In lean we remove the non value adding processes, stream line the necessary and value adding processes in a continuous manner. All changes are implemented, evaluated and modified on a continuous basis. The initiative needs to be implemented by staff who are trained by organisation leaders rather than technical experts. It requires leadership commitment to empower employees to make changes and to continuously pursue improvement.

The five Lean principles modified for services are as follows (E. Andrés-López<sup>a</sup>, I. González-Requena<sup>a,\*</sup>, A. Sanz-Lobera, 2015).

- *Specify what creates value; Identify the value stream; Flow; Pull; Strain for perfection*

Lean tools that are applicable to the services are mentioned below:

**5S method:** viz Sort, Straighten, Shine, Standardise and Sustain to be implemented.

**Value Stream Mapping:** Identify all steps in a process that delivers value to a customer. Evaluate each of these steps and streamline it in such a way that only value adding and necessary steps are remaining.

**Kaizen events:** Regular Kaizen events need to be conducted multiple times every year in which all employees need to participate in a rotatory basis. In these events, all employees participate and put in ideas pro actively and various processes are analysed and improvements are suggested and evaluated.

**Removal of waste or Muda:** Overproduction: due to poor planning, delay due to poor co-ordination, Unneeded transport or movement: outdated work habits, poor housekeeping, over quality, duplication: excessive bureaucracy, Excess variation: demand fluctuations, Failure to meet demand, lack of customer focus: lack of motivation, Underutilised resources: resistance to change, Manager's resistance to change: risk aversion

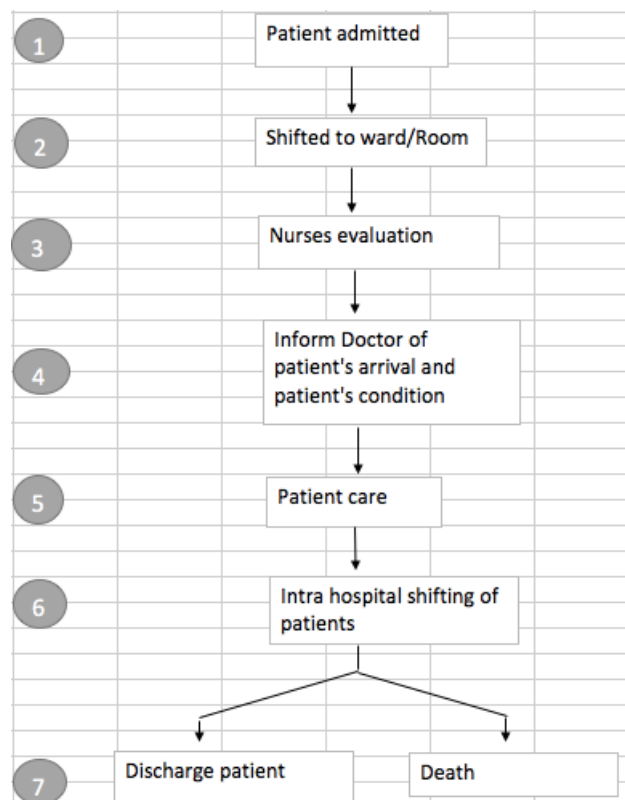
- **Bottle neck analysis:** try to limit the constraint, plan all the other processes around the constraint and then elevate the constraint
- **Key performance indicators:** metrics should be developed so as to track and quantify changes and improvements.
- **Root cause analysis:** instead of trying quick fixes, analysing the underlying cause by asking why five times and fixing that should become the norm
- **SMART goals:** goals that are specific, measurable, attainable, relevant and Time specific
- **Standardise work processes:** the only variation in any activity should arise from the patient
- **Takt time:** the process time for all processes should be less than Takt time.

Nursing Department, Emergency Room and Laboratory Medicine Departments were studied and value stream maps developed. Convenient sampling was done to estimate the time taken for each step. Any step in the flow that has any one of the Muda or waste is taken as Non-Value Added. In addition, steps that have high variations are also considered as Non-Value Added.

### Nursing Department

In the nursing department, the Value Stream is developed by following the Staff Nurse in IP department. The Value Stream starts when a patient gets admitted to a ward and ends when a patient is shifted out through discharge or death.

### As-Is-Value Stream Map



Step 2:

Information is obtained to nursing station from admission desk	Action	Value Added/Non Value Added	Type of waste	Waste observed	Average time spend on NVA
Prepare room for patient	Information is obtained to nursing station from	Value Added			
Accompany patient to room	Prepare room for patient	Non Value Added	Human Potential	This activity does no require medical skills possessed by a staff nurse	4.6 mins per patient
Give orientation regarding room: telephone, various no:s, hospital policies, waste segregation	Accompany patient to room	Non Value Added	Human Potential	This activity does no require medical skills possessed by a staff nurse	2.4 mins per patient
	Give orientation regarding room: telephone, various no:s, hospital policies, waste	Non Value Added	Human Potential	This activity does no require medical skills possessed by a staff nurse	7.6 mins per patient

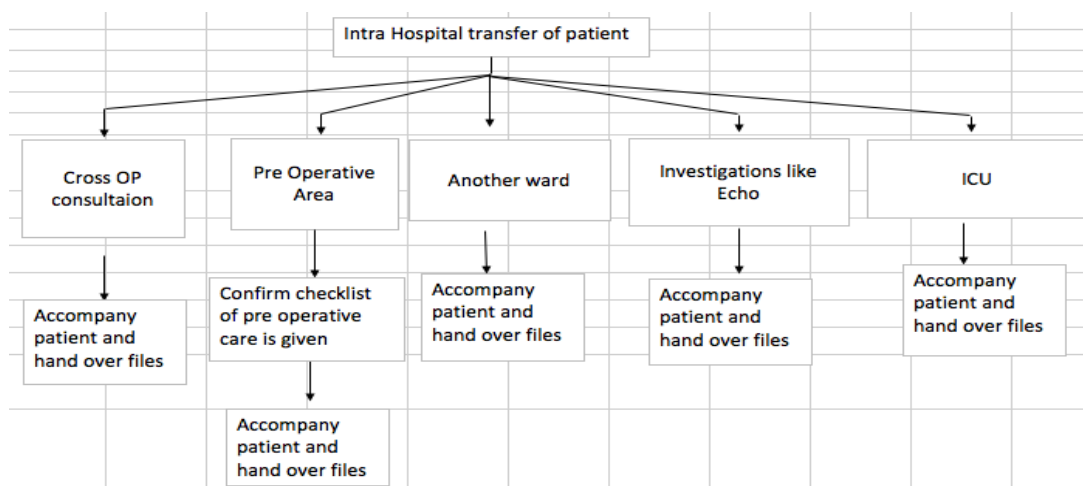
Step 3&4:

Take the vitals	Action	Value Added/Non Value Added	Type of waste	Waste observed	Average time spend on NVA
Head to toe assessment of patient	Take the vitals	Value Added			
Nurses diagnosis based on complaints and assessment	Head to toe assessment of patient	Value Added			
Formulation of Nurses Care Plan	Nurses diagnosis based on complaints and assessment	Value Added			
Documentation of all the above processes	Formulation of Nurses Care Plan	Value Added			
	Documentation of all the above processes	Non Value Added	Over processing	Takes more time since Nurses do documentation with pen and paper instead of EMR	25 mins per patient

Step 5:

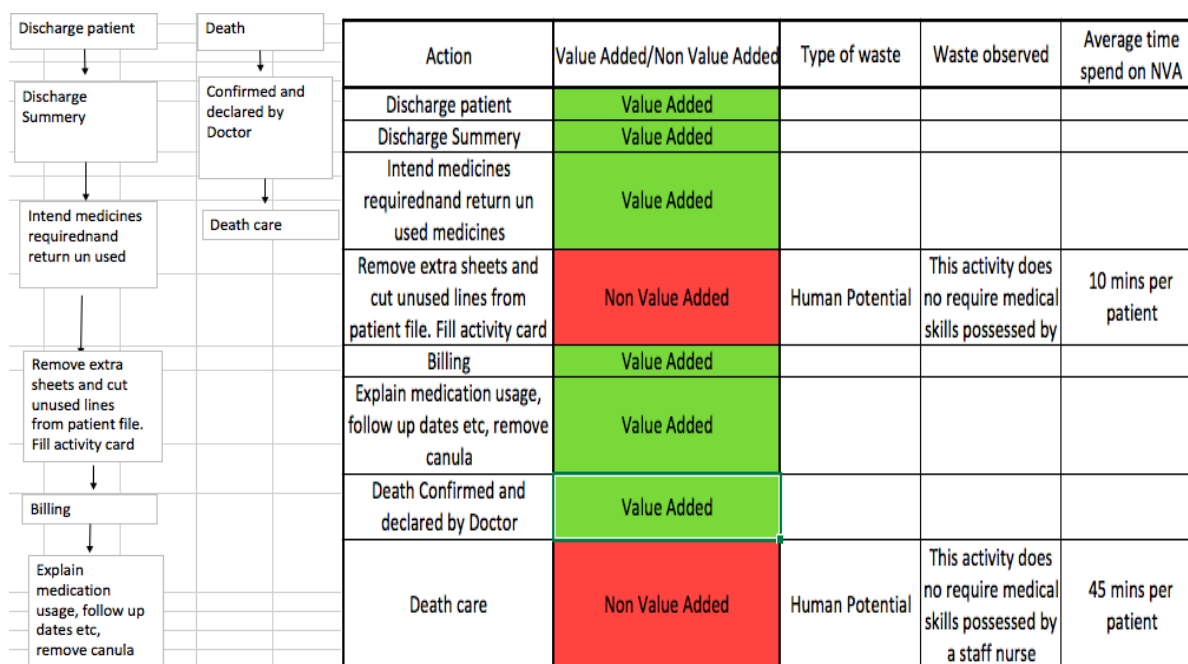
Personal care: Sponge bath, mouth, catheter, drain, back care	Action	Value Added/Non Value Added	Type of waste	Waste observed	Average time spend on NVA
Administer medications	Personal care: Sponge bath, mouth, catheter, drain, back care	Non Value Added	Human Potential	This activity does no require medical skills possessed by a staff nurse	37.9 mins per patient
Accompany Doctor during rounds	Administer medications	Value Added			
inform cross consultation to particular Doctor	Document medicines given	Value Added			
inform cross consultation to particular Doctor	Accompany Doctor during rounds	Value Added			
Collect sample for any new investigation and send	inform cross consultation to particular Doctor	Value Added			
Manage any incident	Collect sample for any new investigation and send	Value Added			
Document all the above	Manage any incident	Value Added			
	Document all the above	Non Value Added	Over processing	Takes more time since Nurses do documentation with pen and paper instead of EMR	25 mins per patient

Step 6:



Action	Value Added/Non Value Added	Type of waste	Waste observed	Average time spend on NVA
Intra Hospital transfer of patient	Value Added			
Cross OP consultaion	Value Added			
Pre Operative Area	Value Added			
Another ward	Value Added			
Investigations like Echo	Value Added			
ICU	Value Added			
Confirm checklist of pre operative care is given	Value Added			
Accompany patient and hand over files except to ICU	Non Value Added	Motion	Unnecessary movement by employees	11.8 mins per patient
Accompany patient and hand over files to ICU	Value Added			

Step 7:





### Value Chain Analysis

The average number of patients per ward is 25 and the average number of attenders per shift per ward is 1 and nurses per ward per shift is 3. The average nurses to patient ratio is 1:8. A staff nurse spends an average of **165.2 mins or 2.75 hours on the medical needs of a single patient during a shift.**

- **Human potential**

- Since one attender has to provide personal care, accompany for investigations, clean the rooms and arrange clean utility, assist minor dressings etc for 25 patients, very often the Nursing staff supplement their efforts. On an average the nursing staff will prepare rooms for incoming patients for 3 out of 5 patients, accompany patients to their rooms 3 out of 5 times, give orientations regarding rooms, telephone numbers, hospital policies etc to 2 out of 5 patients, provide personal care like sponge bath, catheter care, mouth care etc to 2 out of 5 patients. During a single shift on an average, there are 4 admissions, 6 personal care patients, 3 back care patients and 10 intra hospital shifts in a ward. Accordingly, nursing staff spends an **average of 123 mins or 2.05 hours in assisting attenders during a single shift.** In addition to this, Death care is given by staff nurse to 2 patients out of 5 deaths which takes an average of 45 mins per patient.

- **Motion**

- According to hospital policy, a staff nurse should accompany all patients during intra hospital transfer. During a single shift, there is an average of 10 intra hospital shifts from a ward exempting shift to ICUs amounting to **118.6 mins or 1.98 hours.**

- **Over processing**

- The documentation part of a Staff Nurse's job includes nurses note, medication notes, patient check list, incident report, nursing care plan, activity card, patient charts like vitals, pain chart, cannula assessment etc. This is not something that directly adds value to the patient. But since it is being done by pen and paper, it takes an average of **289 mins or 4.82 hours a shift per staff nurse.** When done by pen and paper, maintaining all the records required by NABH results in a number of duplication of efforts.

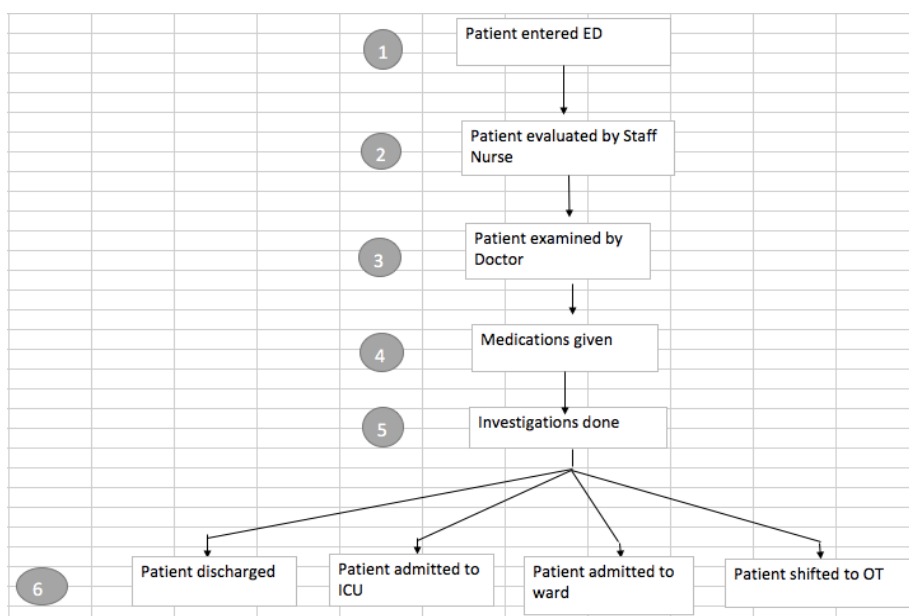
- During a shift, nursing staff spend **9.8%** supplementing the efforts of Attender staff, **9.4%** accompanying stable patients during intra hospital transfers and **68.8%** on documentation. A total of **88%** of nurse hours is spend on Non Value Added activities.



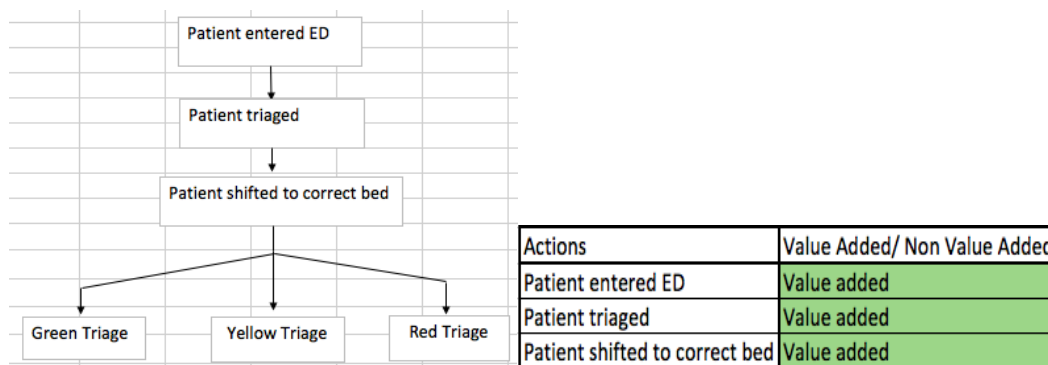
**Emergency Department (ER)**

In a super speciality hospital set up the ER (Emergency Room) is an important area that requires superior attention of the management. The Process need to be put in place in accordance to the international ER practices and the system process integration is one of the key aspects of the administration, in terms of analysing the situation for each and every case received and put them in to the correct clinical protocols in line with the escalation matrix designed by the hospital administration. In Emergency Department, the Value stream map was developed by following the patient. The Value Stream starts as the patient enters the ED and ends as the patient is shifted out either through discharge or admission.

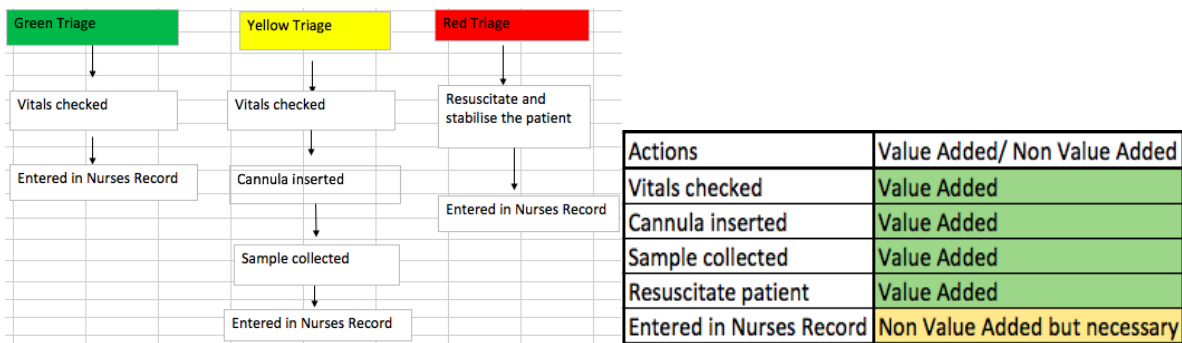
**As-Is-Value Stream Map**



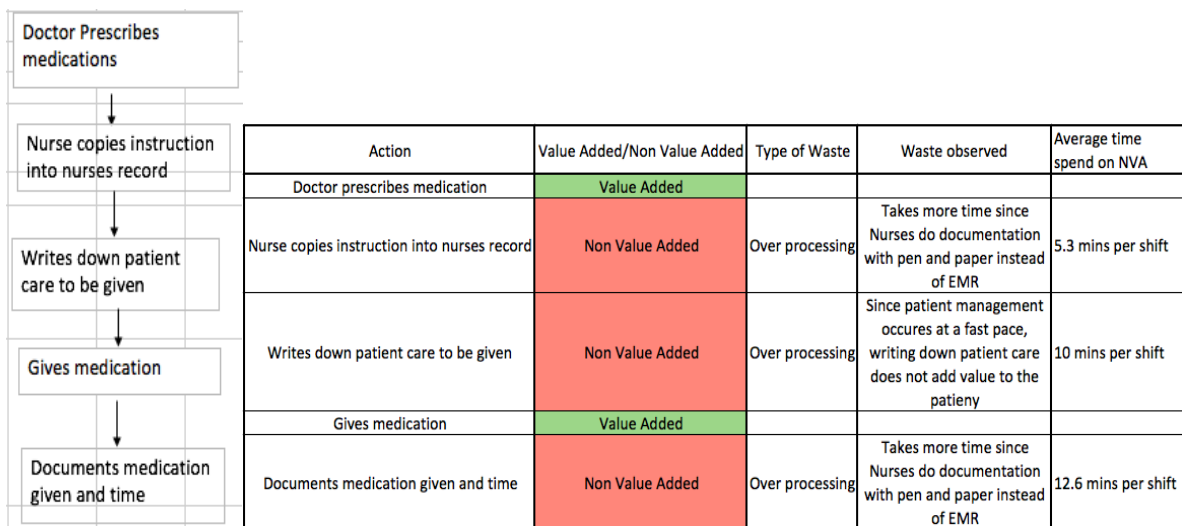
**Step 1:**



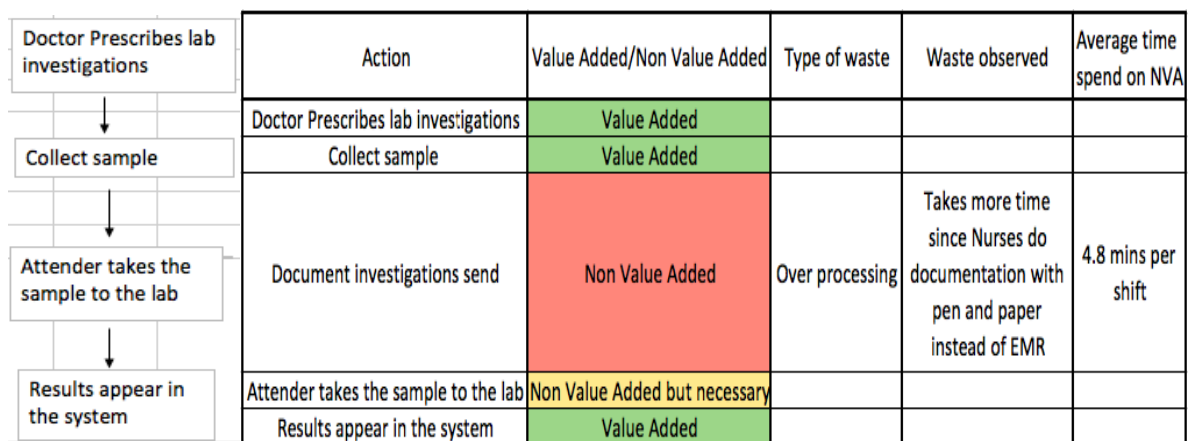
Step 2 &3:



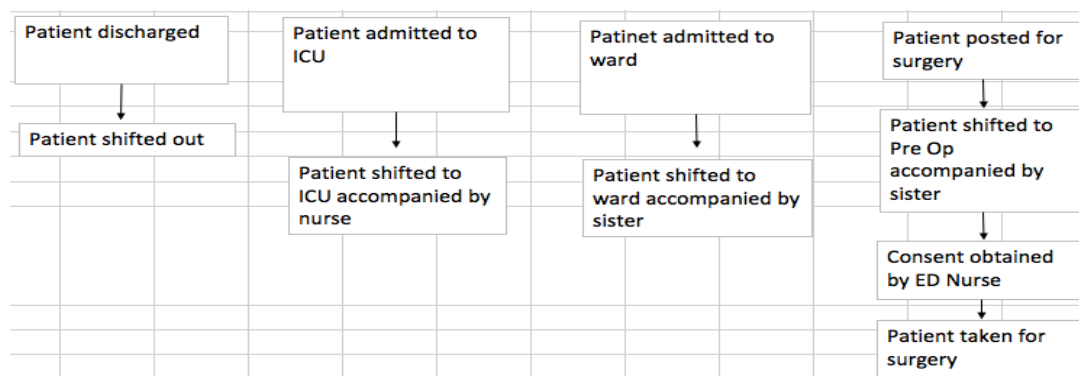
Step 4:



Step 5:



Step 6:



Action	Value Added/Non Value Added	Type of waste	Waste observed	Average time spend on NVA
Patient discharged	Value Added			
Patient shifted out	Value Added			
Patient admitted to ICU	Value Added			
Patient shifted to ICU accompanied by nurse	Value Added			
Patinet admitted to ward	Value Added			
Patient shifted to ward accompanied by sister	Non Value Added	Motion	Stable patient being accompanied by staff nurse doesnot add value to the patient	47 mins per shift
Patient posted for surgery	Value Added			
Patient shifted to Pre Op accompanied by sister	Value Added			
Consent obtained by ED Nurse	Non Value Added	Waiting	ED Nurse waiting along with Pre Op Nurse to obtain consent for procedures does not add value to the patient	55.6 mins per shift
Patient taken for surgery	Value Added			

**Value Chain Analysis**

The average number of patients per shift is 20 and nursing staff per shift is 4

- **Over processing**

- Although doctor’s prescription is documented only through EMR, Nurses make a pen and paper record of medications to be given and investigations to be send. Once the investigations are send, it is documented once again as services rendered. Similarly, nurses care plan is prepared and documented. This is value adding for an IP patient where in the patient remains in the department for a long duration. But in ER where the patient is shifted out immediately after emergency care is given, this step is not adding any value to the patient. In addition, the staff also maintain several registers which is duplication of efforts and can be easily removed through EMR. During a shift a single staff nurse spends on an average **38.9 mins on these documentation** activities.

- **Motion**

- Since Hospital policy requires a patient to be accompanied by staff nurse during admission from ER, a staff nurse on an average spends **47mins per shift** accompanying

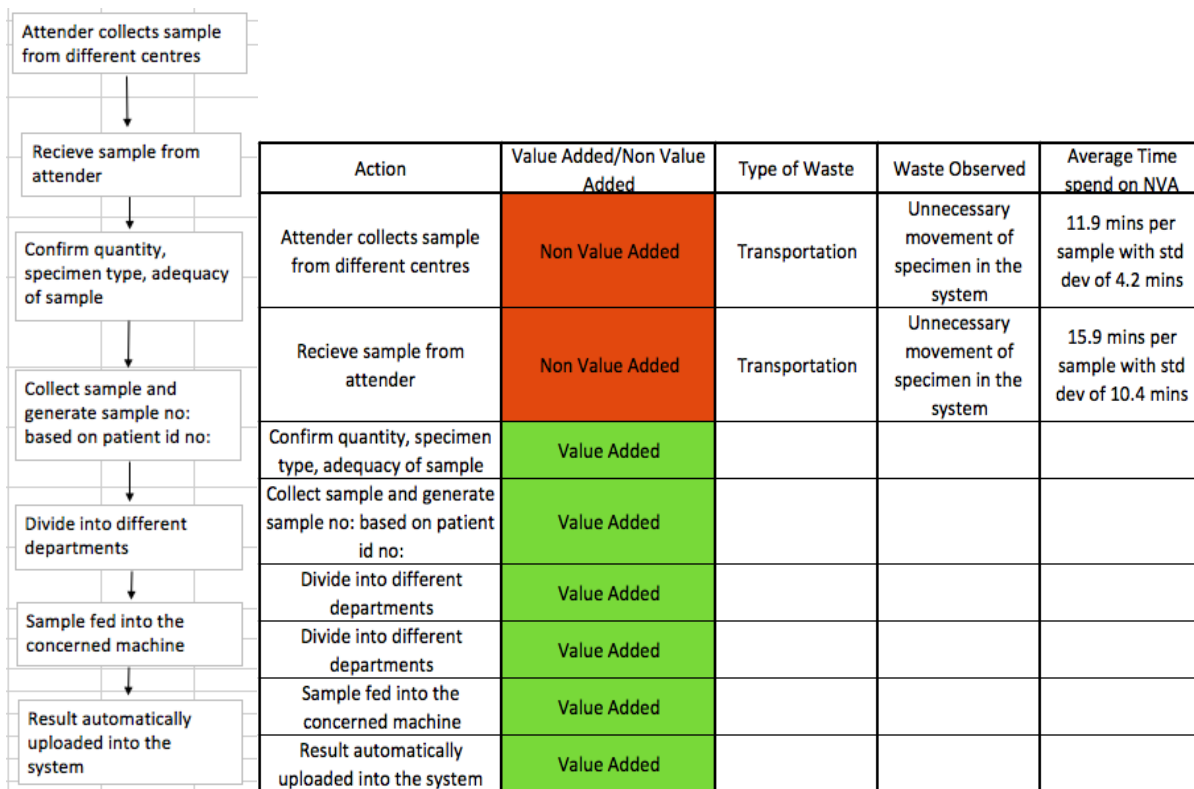
patients. In case of stable patients this is not value adding. On the other hand, it causes staff shortage in the ER especially during peak hours, mass casualty and when there are sick patients who require close care in the ER.

• **Waiting**

- Hospital policy requires that ER staff should accompany patients posted for surgery, talk with the doctor and obtain consent from family members. Once pre Op check list is done, the patient can be handed over to Pre Op staff who can then take consent. On an average a staff spends **55.6 mins per shift** to obtain consent. This creates staff pressure at times of peak hours, mass casualty and when there are patients in ER.
- A staff nurse in ER spends **9.2%** of his/her shift hours on documentation and a staff is posted for the sole purpose of doing pre Op services, accompanying patients to Pre Op and getting consent. A total of **34%** of nursing staff hours are spend on Non Value Added activities

**Laboratory Medicine-** In Laboratory, the value stream was developed following the sample. The Value stream started once the sample enters the lab and ends when the result is released.

**As-Is-Value Map**



### Value Chain Analysis

The average number of samples the lab examines in 24 hours is 400. The only substantial variation that occurs in the process is before the sample reaches the lab. Once it is collected in the lab, the sample is fed into respective machines and the remaining variations depends on the different times required for completion of different tests

- **Transportation**

- There occurs lot of variation in the time between collection of sample and receiving the sample in lab. This is because the route taken by the attenders is not constant. They go to whichever collection centre calls them leading to unnecessary movement of sample as well as motion of the attenders.

### Observations, Recommendations and conclusion

#### Development of Lean Culture

- There should be fundamental conviction from the management team towards adopting to the lean management principles and to embrace the changes in process management that can lead to improved patient care and service deliverance.
- The management should invest time and money for the improvement of deep study through continuous training, learning sessions and skill development process by setting up a professional training calendar with a process monitoring and application matrix.
- **Form a Lean team** with Head of Operations leading the team and a member from all departments should be involved as members. In the present analysis it was found that the most common non-value-added steps as well as variations occur due to improper utilisation or wastage of human potential, over processing and motion. To overcome these flaws, we have suggested some of the points as mentioned below. Similarly, the team should continuously analyse the processes in different departments in order to identify and rectify such issues so that only the remaining variations come from patient.
- **Conduct Kaizen (continuous improvement) events at least once every 3 months** that should allow all employees to participate on a rotation basis. This event should be spearheaded by the Head of Operations for greater benefits. The employees themselves should be allowed to discuss and identify steps that can be improved and come out with suggestions as how to be implemented the various points.
- The decisions taken in the Kaizen events should be circulated the staff of various departments as well as the roles that is expected of each level of employees and the steps

taken should be reviewed in subsequent meetings. Successes should be celebrated and failures analysed and viewed as points for improvement rather than correction.

### Removal of various kinds of wastes

- **Human potential waste:** Provide **optimum number of nursing assistants** so that skilled working hours are not spent on unskilled labour. Since in almost 50% of cases nursing staff is supplementing their efforts, the number of nursing assistants need to be doubled in the wards. This will decrease the wastage of specific skills as well as remove the time crunch present on the nursing staff thereby improving the quality of care provided
- **Motion waste:** Revisit **hospital policy of all intra hospital transfer** being accompanied by a staff nurse. Unstable patients shifted to ICU, investigations and Operation Theatre need to be accompanied by a staff nurse. But staff nurse is not necessary in case of transfer of stable patients there by freeing up skilled labour hours.
- **Over processing waste:** Documentation should be made completely by **EMR**. The present software has provisions for all the required documentation as well as options that will automatically generate the required records. But the software is slow to the extend that filling up the details of one re visit patient will take the staff nurse an average of 30 mins. The **software needs to updated** so that it allows faster entry of details and is error free.
- **A decisive and persistent push towards digitalisation** should be given by nursing department head. The staff needs to be given proper training on each and every options that are available in the present software. The nurses should also be made aware that presently, in an 8 hours shift, they are spending around **68.8%** of their working time on documentation in case of Ward Nursing staff and **9.2%** in case of ER staff. Going for EMR will drastically reduce this time spend which will decrease the number of duties per person as well as work load during each duty.
- **Waiting waste:** Revisit Hospital policy requiring ER staff nurse to accompany all patients admitted from ER as well ER staff obtaining consent for procedures from Operation Theatre. Stable patient can be shifted by attenders alone. Surgery patients can be handed over to Pre Op Nursing staff who can then talk to the doctor and obtain consent for procedures. Any further clarifications can be done through phone.
- **Excessive variation: Pneumatic Tube System** should be introduced in the hospital which will remove the requirement of attenders to deliver the samples. It will drastically

reduce the time and variation between sample collection and reception. It will also help in stream lining delivery of drugs from pharmacy to various localities.

#### To strive for

- **Improved patient outcomes** — Lean initiatives can increase value for patients by providing better healthcare services that more effectively treat medical conditions and reduce rates of recurrence. Such results can prevent unnecessary readmissions and the associated added costs or reduced reimbursement rates.
- **Increased patient satisfaction** — Patients are becoming more knowledgeable consumers of healthcare services. Satisfied patients are more likely to remain with healthcare provider.

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