

Application of Lean Management for Improving Productivity of Housekeeping Staff in Health Care Industry: A Case Study

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Abstract: Staffing is by far the largest expenses which the Environmental Services (ES) department incurs, typically accounting for 75-80% of total department spending of the health care industry. It faces the challenge to reduce their internal processes (services) specially housekeeping costs significantly in the current scenario and in future to structure them more efficiently. The health care industry which showed continuous growth in recent years, now looks ahead to difficult time, economic turbulences and decline in sanitation condition. As a result of this, health care industry will have poor patient satisfaction in the future less than what it is now. The health care sector is recently implementing modern methods such as lean management and instruments to optimize productivity and efficiency to increase the quality of services even further. This research aims to show practical experiences of the application of lean management methods in the health care sector and to make a statement about their suitability and the possible potential for optimization. The study will emphasis in an industrial hospital where value stream mapping concept, work study and lean methodology has been implemented successfully.

Key words: Lean management, housekeeping, health care industry, working and standard force, emphasis, implementing

INTRODUCTION

Unlike to other industries, the working environment in healthcare industry is very complex. There are many pressures including competing against the industry in providing a good patient care and experience. It is very challenging to provide an excellent level of service to make the patient and their families feel like they are being cared for in a clean environment. The list of these challenges is long one and includes: staffing issues, technique variation, high turnover, availability of skilled manpower, supply chain delays, unexpected equipment outages, supply leakage, etc.

Over the last decade there has been a rapid increase in the implementation of lean in healthcare. The purpose of lean is to create maximum value for patients by reducing waste and waits. The origin of lean thinking is from the automobile sector and research on its application and sustainability in health care is still progressing (Zoe, 2010). It attacks organization thinking and value which results in transformation of organization behaviour and culture over time (Smith *et al.*, 2012). Recently, it has been demonstrated that the application of lean concepts in the health care industry has resulted in improvement in

patient satisfaction in many countries like the United States, United Kingdom, Australia (Fine *et al.*, 2009). Despite indications that lean is prevalent in health care, many authors regard its implementation to be pragmatic, patchy and fragmented (Burgess and Radnor, 2013). The lean management can also be holistically applied in health care such as the transformation of an overall business strategy (Smith *et al.*, 2012; Ulhassan *et al.*, 2013). The literature is replete of successful lean interventions whereas it lacks on failed attempts or barriers to its implementation in health care (Mazzocato *et al.*, 2012).

In a recent literature review, it has been observed that the use of process improvement methodologies in the public sector by using lean concept are 51% of publications sourced and 35% are specifically focused on lean in health services (Zoe, 2010). The majority of lean investigations published in the international literature refer to the Toyota management system as applied to health care (Mazzocato *et al.*, 2012; Hummer and Daccarett, 2009; Belter *et al.*, 2012; Casey *et al.*, 2009; Ford *et al.*, 2012; Naik *et al.*, 2012; Waldhausen *et al.*, 2010; McDermott *et al.*, 2013). The literature reports various activities to implement lean in health care such as 5S events to reorganize the workplace, Rapid Process

Improvement Workshops (RPIW) and Value Stream Mapping (VSM) to improve current and future care processes (Esain *et al.*, 2008).

The importance of a well-run housekeeping system cannot be overlooked. This function is essential to a good patient experience and can have an impact on other facets of the patient's exposure to the hospital. A hospital can't run without a housekeeping department. The principles of a lean management system can also be applied in this type of operation just as they would be applied anywhere else in the manufacturing industry. There are multiple opportunities to apply these methods and systematic approach to the management of a large or small housekeeping organization.

MATERIALS AND METHODS

The industrial hospital: The hospital in this case study is an industrial hospital (health care industry) which was established in 1908 in a tent with two beds and has now grown from the level of a dispensary to a 914 bedded industrial health care institution with a wide range of specialties and some super specialties spread over the outpatient and inpatient areas. The hospital cater to around 60,000 inpatients annually including around 21,000 surgeries in 14 operation theatres and take care of 14,50,000 outpatients. The hospital is well known throughout the region as a centre for critical care catering to seriously ill patients and is a healthcare facility of choice for the people.

The above patients are admitted in various wards, cabins and specialty wards distributed in 12 wards (640 beds), 84 cabins and 9 specialty and super specialty units. The hospital has >350 doctors, around 650 nurses, 150 paramedics, technicians and pharmacists and around 1800 support services staff on contract which mainly includes housekeeping support, dietary services, laundry services, ambulance services, etc.

Understanding the workload: The whole hospital is divided into six parts based on the criticality of frequency of cleaning and is namely general ward area, semi critical area, critical area, outpatient area and public area, peripheral areas like Chajja, Drain, RMO's office, etc. The core understanding of environmental services is to recognize what constitutes the workload in these areas. Actual deployment of shift wise workforce is shown in Table 1. There are mainly four factors which need to be worked into the equation for each staffing position is.

Cleanable square footage: This is the measurable space, i.e., the gross square footage within the walls and under

Table 1: Classification of productivity standard

Space classification	Productivity standard (ft ² /h)
Surgical suites	425
Restrooms	480
Patient rooms	1000
Nurse's stations	1800
Offices	2500
Lobbies	2500
Conference rooms	3000
Corridors	15000
Ride-on-scrubbing or brushing	17860

the roof of any individual facility. Cleanable square footage only counts the actual space that the cleaning staff has to clean and excludes locations such as electrical or maintenance closets, inner space between walls, courtyards, roads and passages within the hospital premises (unless this area is cleaned by the ES department) and parking garages. The engineering services department has detailed information as well as to obtain building and floor plans.

Frequency of cleaning: This specifically relates to the number of times an identified location or square footage will be cleaned in a 24 h period such as a lavatories and wash room to be cleaned six times a day, general wards are cleaned three times a day, critical and semi-critical areas are cleaned twice daily, main lobby or public restroom that is cleaned multiple times based on condition throughout the day.

Lock-in areas: This refers to departments or locations to which a housekeeper is assigned for a shift or length of time regardless of square footage or frequency. These areas includes emergency/casualty, high dependency unit, etc. Where it's required to have housekeeping staff available for cleaning functions irrespective of the size of the department or volume of patients being seen.

Space classification: In the health industry, space is identified based on its use. For example, the classification and their associated productivity standards used in the industry are listed in Table 1. Each classification requires a different level of cleaning and time commitment. A terminal cleaning of a surgical suite will require more focused cleaning than an office area or general passage. Each classification will be assigned its own productivity standard as staffing assignments are developed.

Table 1 can be used as a general guide; all times will vary slightly according to fixtures and furnishings. These productivity standards are estimated averages and managers should validate any standard used according to the ability of their assigned staffs. The above four categories are not all a manager will need to know to build the department's schedules. However, they are the core

workload standards. The four categories will be incorporated into the process of building a workload time study and functioning schedules for departmental staff. Adjustments then are made to the core workload as required.

Standard work process: A housekeeping department's core activity lends itself well to the establishment of standardized work practice to drive the processes. The work product output day in and day out on multiple shift is mostly done on a daily frequency. The cleaning of patient rooms, tidying of public restrooms and emptying of trash receptacles around the facility are basic functions of the operation that must be completed multiple times a day.

The best place to start in the development of standard work is observation. We observe housekeepers doing their work and take detailed notes regarding the step-by-step process. There are going to be multiple key processes that may belong to the same individual depending on their area of responsibility.

Method study and work measurement were done on the various group of housekeepers. The housekeepers responsibility for the main facility public restrooms, tidiness of the main lobby and several administrative offices in the vicinity and an outpatient clinic location with occupied by several physician groups were also observed and noted, i.e., as is condition of work process were recorded. Many areas had different scope and had multiple standard work documents available and there is scope for review and improvement. We find that the requirements of a hospital main lobby will differ from that of an outpatient clinic. In turn, the need of an outpatient clinic is going to differ from the needs of an administrative office. Therefore, one place to start looking for lean principles within the housekeeping operation of the organization is going to be standard work. A few different ways to spot a potential need for standardized work in a housekeeping operation are:

- Challenges related to consistency
- An unacceptable overtime trend
- Late arrival of staff in their area of responsibility
- Variation in look and feel of the work or work product across areas of responsibility

Some common areas to look for standardized work in housekeeping:

- Cart setup and organization
- Room turn setup and appearance
- Operating room cleaning processes (between cases and end of day)
- Floor care and maintenance

RESULTS AND DISCUSSION

Optimizing environmental services staff: A housekeeper will spend two or more hours each day on non-cleaning activities such as traveling to the supply or linen closet, running for the supervisor, performing computer or study work, setting up equipment, donning personal protective equipment and restocking his or her cart. Annualized, the non-cleaning time for a typical housekeeping staff can be in the hundreds of thousands of rupees lost productivity per year.

Understanding the process that the environmental services department follows in each area of the facility is critical to maximizing the performance and productivity of its staff. For instance, properly stocked custodial carts and runners to restock these carts can help to minimize travel time for the housekeeping staff. Operational efficiency and process management are key to controlling costly non-cleaning time.

Labor-efficient techniques: Labor cost is approximately 80% of an environmental services budget. Chemicals, consumables, staff training and equipment make up the remainder of the maintenance budget, so it's imperative to minimize the number of housekeeping staff and use the most labor-efficient techniques in the cleaning the hospital. Housekeeping activity is normally manpower intensive, using automation and shifting cleaning activity to equipment-based and using the right cleaning equipment will save labor costs.

Some of the equipment used in our case study is rider automatic scrubbers, backpack vacuums, touch-free restroom cleaning machines and microfiber equipment. These are considered to be the best practices due to the amount of labor savings they achieve compared with traditional cleaning. Beyond equipment, a good work loading program was also used to answer labor issues. This is the systematic calculation of a cleaning process to determine the amount of time and staff required to clean a facility. Every floor type and fixture for each room is recorded. Each room in the hospital is also recorded as part of an area type and each area type has a defined set of tasks that are required for thorough cleaning.

A standard task time and frequency is applied to each room to determine the total number of hours needed to clean the facility. The time standards from the program are then summarized by facility, area, room and zone to help determine if the facility has the correct number of staff to clean and if there is the proper balance of staff throughout the day. To access the manpower, we have to know exactly how many square feet of both direct patient care and non-direct patient care one is responsible for

cleaning because the cost to clean each is very different. Other factors that drive up labor costs in Environmental Services (ES) and need to be properly managed are the number of patient discharge cleanings. While each day's cleaning requirements can be different due to the number of surgeries, specialized patient rooms and patient discharges, the software needs to be flexible enough to calculate the daily Full-Time Equivalent (FTE) requirements. After the correct number of daily ES staff is determined, the next step is to determine if the staff members are properly allocated. This is called workload balancing. The premise is to close the gap between the available time to clean with the required time to clean the facility.

For example, after breaks and non-cleaning time are subtracted for one 8 h employee there are 400 min left to clean per day. This would be the available minutes to clean. The required minutes to clean are determined from the daily needs of the facility such as patient room discharges, routine patient room cleaning, emergency room cleaning, restroom cleaning and office cleaning. If it takes 45 min to clean a discharged patient room a 400 min employee couldn't be assigned to 10 discharge cleanings, plus side work and all the patient hallways in his or her area. There isn't enough time available to physically complete the work assignment. Many ES departments base staffing assignments on employee feedback, manager experience or other non-value-based data. With the help of work-loading software we tried to know if the assigned minutes to clean equal the housekeeper's available minutes to clean and the total No. of housekeeping staff are calculated termed as Working Force (WF). Considering personnel allowances and leave cover we arrived to standard force for the housekeeping staff, the complete picture of manpower deployment is depicted in Table 2. This report helps ES managers to allocate staff properly to achieve fair and balanced workloads for each shift. Supervisors also can boost employee morale by showing that everyone has the same amount of work and no one individual is receiving less work due to perceived favoritism.

Tools for training: Standardized training clearly identifies the expectation of what needs to be cleaned and simplifies the cleaning process. Each room should have a defined list of tasks, frequencies and products to be used during cleaning and all employees should be trained the same way using the same materials and guidelines. When the training is standardized across all shifts, the cleaning results are more dependable and predictable.

Job cards, process flow charts and product wall charts are common tools used with a standardized training program. These programs help ES departments find and retain skilled talent. It also raises the level of professionalism within the department and raises employee morale by creating a clean, healthy and safe facility.

Our aim is to measure the cleaning program and to monitor and take corrective action in delivering clean, healthy and safe buildings at the lowest total cost. This we have done by implementing Quality Control (QC) program which is simple, intuitive and flexible to use. It should be easy to implement and should sustain an ongoing cleaning program that continuously improves outcomes and cleaning results. It should also be able to record the deficient rooms and measure the historical performance by area, room and employee. A QC trending report is essential to communicate and implement corrective action in any substandard areas. The goal is to manage performance, increase accountability and improve results.

Lean housekeeping: The principles of a lean management system work in healthcare industry operation just as they would anywhere else. There are multiple opportunities to apply these methods and systematic approach to the management of a large industrial health care housekeeping organization. Some low-hanging fruit to look for:

- Management rounding
- Task frequencies
- Staff level-loading
- Daily management for continuous improvement

Management rounding

Gemba: The leadership of the hospital was ensured of getting out of the office and to do the Gemba (continuous improvement) to see how work is being done in real-time. The direct connection of management in the form of rounding becomes easy for the operators to deviate need base from an acceptable standard. Couple the need to set behavioral expectations of staff through regular monitoring with consistent turnover of staff that is regular to the industry and have a need to institute this type of regular management communication.

Focused group review meeting: Researcher method employed was the accommodation of regular hospital administrator's in-house meetings with the supervisors of environmental services department. This allowed an

Table 2: Showing deployment of housekeeping staff before study and post implementation lean concept

Areas	Existing deployment						Proposed agreed deployment						Changes w.r.t existing deployment
	"E"	"A"	"B"	"C"	WF	SF	"E"	"A"	"B"	"C"	WF	SF	
High dependency unit-male	-	4	3	3	10	13	-	4	3	2	9	11	-2
High dependency unit-female	-	2	1	1	4	5	-	2	1	1	4	5	0
Surgical ward-1A male	-	4	3	2	9	11	-	4	3	2	9	11	0
Surgical ward-1B female	-	4	3	2	9	11	-	4	3	2	9	11	0
Surgical ward-2A male	-	4	3	2	9	11	-	4	3	2	9	11	0
Surgical ward-2B female	-	3	3	2	8	10	-	3	3	2	8	10	0
Medical ward-3A male	-	4	3	2	9	11	-	4	3	2	9	11	0
Medical ward-3B female	-	5	4	3	12	15	-	5	4	3	12	15	0
Cabin-5 General	-	6	5	4	15	19	-	5	5	3	13	16	-3
Medical ward-6A male	-	4	3	3	10	13	-	4	3	2	9	11	-2
Medical ward-6B female	-	4	3	3	10	13	-	4	3	2	9	11	-2
Medical ward-7A male	-	4	4	3	11	14	-	4	4	2	10	13	-1
Medical ward-7B female	-	4	4	3	11	14	-	4	4	2	10	13	-1
Padeiatrics ward-8A	-	3	3	2	8	10	-	3	3	1	7	9	-1
Obs and gyane-8B	-	4	4	3	11	14	-	4	4	2	10	13	-1
Obs and gyane-9B	-	4	3	3	10	13	-	4	3	2	9	11	-2
Front cabin	-	3	3	3	9	11	-	3	3	2	8	10	-1
New cabin	-	3	3	3	9	11	-	3	3	2	8	10	-1
Casualty	-	5	5	5	15	19	-	5	4	4	13	16	-3
Observation ward (M)	-	1	1	1	3	4	-	1	1	1	3	4	0
Observation ward (F)	-	1	1	1	3	4	-	1	1	1	3	4	0
RMO office	-	2	2	1	5	6	5	0	0	0	5	6	0
Allied support services	-	4	4	2	10	13	8	0	0	0	8	9	-4
Chajja	-	2	-	0	2	3	2	0	-	0	2	2	-1
Drain	-	2	0	0	2	3	2	0	0	0	2	2	-1
Cats and dog	-	2	0	0	2	3	1	0	0	0	1	1	-2
BCU/CCU/ICU	-	1	0	0	1	1	1	0	0	0	1	1	0
Garage area	-	1	0	0	1	1	1	0	0	0	1	1	0
OPD	-	15	0	0	15	19	8	0	0	0	8	9	-10
Main gate and road	-	2	0	0	2	3	1	0	0	0	1	1	-2
X-Ray area	-	1	0	0	1	1	-	1	0	0	1	1	0
Administration	-	3	0	0	3	4	-	3	0	0	3	4	0
Spaciality block	-	1	0	0	1	1	1	0	0	0	1	1	0
Corridor and ward	-	15	10	0	25	31	10	5	5	0	20	24	-7
Medical stores	-	2	0	0	2	3	-	1	0	0	1	1	-2
Pathology	-	5	0	0	5	6	5	0	0	0	5	6	0
MOT	1	2	1	0	4	5	1	2	1	0	4	5	0
Dead body	-	1	1	1	3	4	-	1	1	1	3	4	0
Dispensary	4	0	0	0	4	4	4	0	0	0	4	4	0
Trauma centre	-	1	1	1	3	4	-	1	1	1	3	4	0
Dispensaries	-	7	0	0	7	9	5	0	0	0	5	6	-3
Supervisor	-	12	7	3	22	28	5	6	6	3	20	24	-4
Total	5	157	91	62	315	394	60	95	78	47	280	342	-52

opportunity to discuss ongoing operational challenges, annual goals, performance and new expectations of the team. It also allowed for real-time, unfiltered feedback from the frontline which proved to be valuable.

Regular connection with management was ensured which made it easier for the operational standards to take a backseat to behavioral challenges. In addition, the need for standards also arose of a consistent turnover of staff, therefore management rounding on seasoned and new employees alike would increase the team’s overall awareness of expectations related to behavior, adherence to the standards and ongoing performance.

It is also important to send the message across multiple locations; the management team developed a rounding process to monitor the state of the facility as they were observed during these events. The data was

collected using a mobile device and monitored on regular frequencies with multiple levels of the organization at the focused group review meeting. This allowed for targeted conversation with staff on areas that were improving and areas that presented opportunity leading to a more efficient and effective application of the management rounding as a resource. Some indicators that a manager rounding process is needed include:

- Variation in performance on key survey metrics
- Anecdotal evidence of less than optimal performance that persists and becomes a pattern
- Supply costs or overtime that trend up over a period of time
- Observed deficiencies that are clearly accounted for in standard work as unacceptable

Task frequencies: Work done by the housekeeping staff was collected and recorded, it was observed that the large majority of tasks completed by personnel are consistent across the housekeeping operation. Because of this commonality we developed a manual that lists how long a task should take to complete. It also account for how long the task should take given the kind of equipment used to do the work. This allows accessing the number of personnel required to perform the task and also designing the housekeeping operation. This helps in housekeeping operations to plan the assessment of every task that needs to be completed. A housekeeper's area of responsibility then become multiple locations that are separated geographically as the hospital is spread horizontally and the task frequencies dictate how many minutes of capacity are available.

This also helps in deciding or planning the demand is to have a good handle on how long it is going to take a staff member to complete a task or cover an area. By standardizing the frequencies that areas and items are cleaned, the department is able to plan staffing more efficiently and effectively.

The task frequency sheet for a hospital would look like a list of areas and or tasks that need to be completed categorized into major areas of work: general cleaning, floor care, terminal (or end of day) cleaning, trash removal, windows, stainless steel, etc. Each task would then have an identified frequency to follow when planning work. For example, patient room cleaning would occur daily and as needed. The frequency then for that task would be counted as daily and the department supervisor would need to ensure that there is staff to cover this work daily. On the other hand, floor care might have a frequency for burnishing (polishing) the floor of twice a week but a daily need to sweep and mop. Some key frequencies to ensure are available:

Floor care: Sweeping, mopping, scrubbing, burnishing and full refinishing.

Waste removal: Trash, bio-waste, sharps, linens removal for individual areas and also for complete removal and processing at the facility level.

Patient room cleaning: Daily cleans, trash and waste check-ins.

Procedural areas: Verify make-up of clean versus a daily terminal clean.

Staff level loading: It has been observed that in multiple facilities, the influx of admissions will rarely

matches with the out flux of discharges. Admissions will start ramping up around mid-morning and peak around the evening time while discharges don't begin to pick up until mid-afternoon and peak in the evening time.

This creates a demand issue for many housekeeping operators because as the admissions increase there will come a time in the day that a surge of discharges are processed requiring those wards and rooms to be cleaned. This may mean a housekeeper with an area to cover will have 50-60 discharges in a day which approximately comes to 6 discharges placed in the work queue within a span of 1 h. These discharge responsibilities are on top of her daily tasks assigned through area assignments and the frequencies discussed.

In order to counter this issue and make an attempt at balancing workloads, a review of normal shift patterns and staff available to complete the tasks at hand is employed by housekeeping managers. An advanced analysis was performed gathering 6 months of admission, discharge and transfer data. With the data, we created a graphical representation of how many in each category came through the emergency/casualty or orders by hour of the day. We were then able to take and compare that data to a graph of bed clean requests by hour of the day. This graphical analysis and the interpretation led to the team determining that a small group of striking staff would be deemed a "discharge team" and would handle only room turns. Their capacity was determined by using task frequencies, industry guidelines on how long the room turn should take and comparing it against the average amount of requests coming through the system by hour of the day.

This technique can also be used when analyzing the workload of staff assigned to floor care. In this case study, we have observed a tendency among contractors to want to have floor care personnel visible during the day shift. This results in a patient and their families walking down a hallway beside a floor scrubber or buffer. This can be disruptive to visitor flow, a noise disturbance and it introduces a risk of fall with slick floors. The facility is primarily void of visitors in the nighttime hours allowing for large areas of space to be cordoned for the purposes of floor care in a more efficient use of resources. If a department can find the right staffing complement to perform this maintenance on the night shift, it is recommended. Areas to look for level-loading opportunity:

- Discharge cleans
- Floor care processes
- Support area cleaning
- Supply restocking

Daily management for continuous improvement: It was found that housekeeping departments had a staff huddle during shift change. A process was developed which allows the handoff of the responsibility for staff in a common area, handoff of shared equipment and management communication. It's a good practice and most of the section had successfully employed this practice. We ensured a standard the conversation process across shifts and between members of the management team by the use of adaily management system. A few elements of a huddle to look for:

- Standard agenda
- Performance metric review
- Key process review
- Active engagement of staff

CONCLUSION

In this study, we discussed the lean management approach that focuses on operational aspects and productivity improvement of housekeeping activity in health care industry. The results of this study with reference to the applicability of lean management methods in housekeeping activity of the health care industry are very positive and encouraging. All the method improvement approaches were not suitable for the health care industry; some found suitable includes work study, value stream mapping, automation, daily management, etc. Through the time and motion study and its analysis through computer based programming, a lean housekeeping environmental services group was established. With the help of above lean approach, the standard working force has come down from existing No. of 394 staff to proposed agreed level of 342. This results in net reduction of 52 manpower deployment and improvement in labour productivity by 13% and cost saving of 10 million/year in the environmental services department. Through Continuous Improvement Project (CIP) workshops and daily management, department could able to sustain the productivity level and cost-saving as well as increase of patient and family member satisfaction.

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