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Implementation of 5S management method for lean healthcare in clinical biochemistry laboratory of a government hospital in India

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***Abstract*---**Government healthcare organizations are facing big challenges as a result of increasing burden of diseases. Since the resources are limited, by restructuring the organizational infrastructure a better use of available resources is possible, which will improve the quality of services. The 5S approach is an effective tool of lean management principles which reduces waste through a better organized workplace, leading to improved quality service. The objectives of this study were to analyse the perceptions of healthcare workers about 5S methodology and examine the feasibility and effectiveness of implementing 5S in a clinical biochemistry laboratory. This interventional study was conducted in three phases. First phase was about advocacy and training of trainers. The second phase included a implementation of 5S and practicing it under supervision. The third phase had review meeting, and filling of the feedback questionnaire. The study revealed that the laboratory has become a more organised and safe place to work. It has helped in developing a

positive attitude in the staff towards their responsibilities and inspired others to follow 5S methodology. Implementation of 5S required commitment of top management and total involvement of staff at all levels. The organisational culture, communication, attitude of employees is some important factors that influence success or failure of 5S methodology for lean management.

Keywords---quality, government healthcare, clinical biochemistry laboratory, 5S.

Introduction

With the increasing burden of population and limited resources, one of the biggest challenges in the healthcare sector is to provide quality service in government health setups. The service quality gets compromised due to organizational deficits. Since the resources are limited, by restructuring the organizational infrastructure a better use of available resources is possible, which will improve the quality of service provided to the customers. The Toyota Automobile company in Japan developed the concept of lean management for effective and efficient functioning of the organization (1). The 5S approach is a simple and effective tool of management which reduces waste through organized workplace leading to improved quality of service. 5S is a Japanese technique which was introduced by Takashi Osada in early 1980s (2). It nourishes quality culture and motivation amongst the workers. It is a low cost program which can be effectively used to bring about visible changes in the quality of service provided, leading to increased satisfaction amongst the care givers and end users. The 5S tool has been widely used with other Japanese tools like Kaizen, Kanban, Error Proofing and Visual Management (3).

The 5S methodology has been used for quality improvement in government health care setups in several countries with resource constraints. Countries like Tanzania and Sri Lanka have adopted 5S as a national strategy for improvement in quality in healthcare service (4, 5). The 5S concept is derived from Japanese words Seiri, Seiton, Seiso, Seiketsu, Shitsuke (1). The 5S steps:

- Sort: Sorting is about going through the area, looking for items that are not required and that are taking up space. Sorting will help in the assessment of items which are required. It is important for the team members to get involved in this task and initiate the concept of “Reduce, Reuse, and Recycle”.
  - Identify the items not required at their current location
  - Dispose-off the items that are not required after approval from team members and management
  - Establish holding areas for items not in current use but may be required in future.
- Store: This step is about setting things in order. All necessary items are arranged in an order of use so that the items can be picked as and when required.
  - Every item has a clearly defined area

    - Equipment and consumables are placed based on their daily, weekly and monthly use
    - Colour codes are used to improve visual management
- Shine: After removing unneeded items and allocating specific storage area to the items, the next step is of cleanliness.
    - Thorough cleaning – Make it shine
    - Fix responsibility for maintaining cleanliness
- Standardize: It is about developing a consistently organized workplace. The team develops standard operating procedures which improve overall efficiency. It is important to analyze the work and define the way that best meets the needs of all stakeholders.
    - Develop standard operating procedures
    - Ensure documentation of processes
    - Assign tasks and develop audit schedule for monitoring
- Sustain: This is the most difficult and challenging stage. It is important to prevent 5S from becoming a onetime event. Indicators or measures of performance need to be defined so that regular monitoring can be done for ensuring sustainability. Feedback from workers should be taken at regular intervals for any modification in implementation of 5S.
    - Maintain consistency in the method of doing work
    - Involve all team members for consistency

The impact of 5S methodology has been studied in many countries like USA, India and Sri Lanka where this tool has been combined with other lean management tools. These interventional studies showed improved workplace, increased physical space, improved safety and better compliance of the regulations (6-10). The successful implementation of 5S requires a set of actions performed systematically and a high level of commitment from all the participants. Employee motivation is an essential element for successful implementation of 5S (11).

Objectives

- To analyze the perception of health care workers about 5S methodology implementation.
- To examine the feasibility of implementing 5S in clinical biochemistry laboratory in a government health care setup.

Methodology

This was an interventional study done in the clinical biochemistry laboratory of Government Institute of Medical Sciences, Uttar Pradesh, India, catering to urban as well as rural population. It was a pilot study where 5S methodology was implemented in a specific setting. It was used for the first time in the government health care set up of this institute.

Step 1: Advocacy with hospital managers

The first step in implementation of 5S was advocacy with the hospital authority and the key persons. The objective of the advocacy meeting was to orient the hospital managers to

- Basic principles and of process of implementation of 5S
- Expected out comes

Step 2: Facility assessment

The targeted areas were assessed before implementation of 5S activities to understand the ground situation. The team felt the need of 5S implementation after a detailed on site appraisal.

Step 3: Training of the trainers

The trainers included the faculty members of the department of biochemistry. They were the first to be trained as they were the ones under whose supervision of the staff in the clinical biochemistry lab was supposed to be working for 5S implementation. The second phase included the implementation of 5S tool.

Step 4: Preparation of lesson plan for orientation session

The aim was to orient the staff to adopt 5S principles which ultimately lead to improved quality of service and patient care.

Step 5: Orientation of staff

The participants of the study were informed in advance about the venue, date and timing of the orientation session. An informed consent was taken from all those who were willing to be a part of the study. The participants included the technicians, data entry operators, store keeper of the laboratory.

Step 6: Implementing of 5S

Once the orientation session was completed successfully, The base line information and action plan were shared with the staff. The staff gave their own insights and inputs which helped in further refining the action plan. This phase took five days to complete. The various activities undertaken during this step are detailed below.

1S: Sort

Sort means separation and removing or discarding unwanted and unnecessary items from the workplace. The concept of "*Reduce, Reuse, Recycle*" was explained to the laboratory staff. During this sorting stage, lots of unwanted items like spare parts of equipment not in use, old requisition forms, unclaimed patient reports, repeat printouts of patient reports, broken bins etc. were identified. The items which could be reused in future were segregated. A few items were found to be of not much use in the biochemistry laboratory. These were handed over to other

relevant departments where they could be used more effectively. This activity lead to generation of a lot of empty space which could be used effectively. All the files and documents were sorted and arranged in their specified areas. Some items which were not in current use were identified for storage in a properly designated location.

2S: Store

This step is mainly a process to put orderliness in every workplace for better work efficiency. The aim was to achieve a function oriented arrangement for all the necessary items. The workstations were organised properly. Use of visual information aids like placement of posters was done. Floor markings were used wherever required. Labelling of equipment including fixation of their location was done. Tags were prepared and used for home locations for items and equipment. The work stations for specific tasks were demarcated using coloured tapes.

3S: Shine

After removing unneeded items and determining the best storage locations for those that remained, our focus turned towards “Shine” or cleanliness. All staff and faculty members of the biochemistry laboratory participated in this cleanliness drive.

4S Standardise

Standardised work is the method for developing best practice and methods in the work place. Standardisation can be adopted at any level. Supervisors constantly kept emphasising on the usefulness of adopting standardised work practices. Several SOPs were prepared for various analytical tests. The staff and faculty members were counselled to ensure that all equipment and items were always kept in their defined locations. All cabinets were clearly labelled. Inexpensive tapes were used for marking and shadowing the location of items.

5S: Sustain

To prevent 5S from becoming a onetime event, a plan has been made for sustaining and continually improving the workplace organisation. A detailed check list has been developed for 5S implementation. The lab personnel were asked to use the checklist while practicing 5S under supervision. This was done so that 5S can be adopted and internalised as a regular process in day to day work activities of the laboratory. Further, it has been planned to hold regular inspections on a fortnightly basis to review the 5S implementation status.

Step 7: Practising 5S under supervision

This phase continued for twenty days where staff and faculty worked together for successful implementation of 5S. The target and priority places for application of 5S were identified and worked upon. Every day the supervisors emphasised on the importance of the 5^{th}S that is the importance of sustainability of other 4S.

Step 8: Review meeting and Questionnaire based feedback taken

After completing the implementation and practice phases, a review meeting was conducted. This meeting included the staff and the faculty of the biochemistry laboratory. A review of the progress of 5S methodology was done. All participants agreed that successful implementation required regular monitoring of the day to day work practices. This should include periodic inspections and mentoring of the team members.A written feedback was obtained from the participating staff and faculty in the form of a questionnaire The 5-point Likert scale was used for obtaining feedback. The identity of the responders was kept anonymous. The feedback questionnaire was adapted from a validated questionnaire (12). The percentages of participants responding to each item were noted. The median and satisfaction index of each item was calculated (13). The questionnaire also included a few open ended questions so as to elicit general perception comments from the participants.

Observations and Results

The study was intended to evaluate the effectiveness of implementing 5S methodology in a clinical biochemistry laboratory. There were 15 participants in this study, which included faculty members, technicians, data entry operators and a store keeper.

Feedback Questionnaire and its Analysis

After completion of the study, the participants were asked to provide feedback through a detailed questionnaire which included twenty questions graded on a 5-point Likert scale. There were also some open ended questions about changes they would recommend in implementation of 5S. The twenty closed ended questions in the feedback questionnaire were grouped under six subgroups or domains. Details are given in the Table 1 below.

Table 1
Domain and items of questionnaire

Domain	Question
Cost efficiency (more productive to organization)	Unneeded items at the workplace are eliminated and the items required are organized, required floor space is reduced
	Cost savings are achieved by reducing inventory
Neat and tidy healthy environment workplace	Work place is cleaner and more organized that makes workers comfortable
	Improved labeling and marking for home locations
	Work environment simplified which boosts morale of workers
	Improved orderliness of items
Improved safety in workplace	Improved hygiene and cleanliness
	Standardization steps eliminate unsafe practices
	Proper location, organized workplace eliminate waste of motion

Workplace is more structured and standardized	Implements standardization thereby achieving output consistency
	Less time spent on searching items
	Documents and files well identified and easy to locate
Change in attitude and behavior	Increased awareness of 5S practices
	Improved collaboration among staff members
	Increased reuse of items
	5S practice extended outside work
	Voluntary participation in maintaining cleanliness of the facility
Feasibility and sustainability	Feasible to practice 5S regularly
	Sensitization session on 5S was able to clearly communicate the process and benefits of 5S
	Periodic reviews will help in sustaining the practice of 5S

Feedback was taken using a 5 point Likert scale as shown in Table 2. The median was 5 (Strongly agree) for most of the items, 4 (Agree) for a few items and 3 (Neither agree nor disagree) for one item. The Satisfaction Index (SI) of each item was calculated using the following formula [13]:

$$\frac{[(n1*1) + (n2*2) + (n4*4) + (n5*5)]*20}{(n1 + n2 + n4 + n5)}$$

Here n is the total number of participants giving the score mentioned in the subscript for that particular item. The scores were rated on a 1-100 satisfaction index scale. Response to feedback on work place is cleaner and more organised that makes workers comfortable and increased awareness of 5S practices had the highest satisfaction index of 100. The lowest satisfaction index 68.57 was reported for the response if 5S practice extended outside work.

Table 2
Response to Feedback Questionnaire on 5S Implementation

S. No	Question	Response to Likert Scale						
		5	4	3	2	1	M	SI
1.	Unneeded items at the workplace are eliminated and the items required are organised, required floor space is reduced	10 (66.66)	5 (33.33)				5	93.33
2.	Cost savings are achieved by reducing inventory	3 (20)	12 (80)				4	84
3.	Work place is cleaner and more organised that makes workers comfortable	15 (100)					5	100

S. No	Question	Response to Likert Scale						
		5	4	3	2	1	M	SI
4.	Improved labelling and marking for home locations	11 (73.33)	4 (26.67)				5	94.67
5.	Work environment simplified which boosts morale of workers	12 (80)	3 (20)				5	80
6.	Improved orderliness of items	9 (60)	6 (40)				5	92
7.	Improved hygiene and cleanliness	4 (26.66)	11 (73.33)				4	85.33
8.	Standardization steps eliminate unsafe practices		8 (53.33)	7 (46.67)			4	80
9.	Proper location , organised workplace eliminate waste of motion	10 (66.66)	5 (33.33)				5	93.33
10.	Implements standardization thereby achieving output consistency	1 (6.66)	12 (80)	2 (13.33)			4	81.54
11.	Less time spent on searching items	12 (80)	3 (20)				5	96
12.	Documents and files well identified and easy to locate	13 (86.66)	2 (13.33)				5	97.33
13.	Increased awareness of 5S practices	15 (100)					5	100
14.	Improved collaboration among staff members	7 (46.66)	4 (26.66)	4 (26.66)			4	85
15.	Increased reuse of items		12 (80)	3 (20)			4	80
16.	5S practice extended outside work		5 (33.33)	8 (53.33)	2 (13.33)		3	68.57
17.	Voluntary participation in maintaining cleanliness of the facility	2 (13.33)	8 (53.33)	5 (33.33)			4	84
18.	Feasible to practice 5S regularly	4 (26.66)	7 (46.66)	4 (26.66)			4	87.27
19.	Sensitisation session on 5S was able to clearly communicate the process and benefits of 5S	13 (86.66)	2 (13.33)				5	97.33
20.	Periodic reviews will help in sustaining the practice of 5S	13 (86.66)	2 (13.33)				5	97.33

Discussion

Though 5S has its origin in automobile manufacturing industry, it has been widely used in healthcare sector. Offering a quality service remains a challenge with constraints of cost and inequity in health services across developed or under developed nations. In this study we assessed the effectiveness of the 5S methodology and perception of faculty members and staff regarding 5S approach in clinical biochemistry laboratory of a government hospital. In our study all the participants have reflected their satisfactory experience with 5S methodology which can be considered as a success. The findings are in line with the Kanamori et al who concluded that the staff was satisfied and had a positive mind set in health care facility where resource constraints and other demotivating factors were prevailing (14).

Cost efficiency is an important quality element in the framework of quality assurance. This study shows that respondents agree to the fact that 5S implementation leads to cost efficiency by inventory reduction and increase in space requirement. This is consistent with the findings of the study conducted by Jumadi et al (12). In our study all participants strongly agreed that the workplace was more organised and simplified. By adopting standardised procedures the element of safety has also improved. The findings corroborates with the results of studies conducted by Patel et al and Sangode P (15, 16). Both the studies have been conducted in manufacturing sector in India. In one of the responses of open ended question the staff pointed out that "*it is easy to orient to new activity if we have a SOPs."* They agreed that the workplace was clutter free and less time was spent on looking for items. One of the faculty member responded that "*SOPs for equipment and analyte estimation has improved the internal as well as external quality checks."* Many studies in the past have pointed out the benefits of organised and safe workplace after implementing 5S (17-19).

A study by Juhari N et al quotes the importance of communication in motivating employees (20). One of the staff in our study mentioned "*I feel motivated seeing my supervisors working with enthusiasm with us, who keep inspiring us*". In our study the participants noticed a change in their attitude and behaviour after training on 5S. They felt collaboration amongst the staff and faculty has increased. They feel motivated and voluntarily participate in the maintenance of cleanliness of the laboratory. In one of the comments in the open ended question a participant responded saying "*I feel good when my colleagues from other department come to see and appreciate the visible change in our laboratory after 5S implementation.*" Some of the participants agreed that they feel motivated to follow 5S even outside work.

Parand et al emphasized on the importance of feedback and sharing the information with top management (21). Our study has improved the understanding of the program within the hospital. The results of feedback have been duly communicated to top management of the institute. It One common response of participants was that it is challenging to continue the practice of 5S on a regular basis. The most challenging part of 5S initiative is the last "S - Sustain" of the 5S. As mentioned in the study of Kanabar et al, maintenance of first 4 S of 5S is the most difficult part (22). As the novelty of initial 5S event fades

away, it will be the high level of commitment from the employees which will help sustain the 5S methodology. Once 5th S of sustainability is achieved it is a good indicator that campaign is moving in right direction of institutionalisation. As seen in this study implementing 5S methodology is feasible and acceptable amongst the participants. It has helped them to organise their workplace and make it safer.

Limitations

All the participants in the study have experienced the use of 5S methodology for the first time. The results may be the influence of adopting a new methodology which is breaking the monotony of old working style and not necessarily because of specific benefits of 5S as a lean management tool. The study period is a concern. A longer study period would help observe if the last "S – Sustain" of 5S is holding good or not. This pilot study was limited to clinical biochemistry laboratory at one institution. It can be conducted on a larger scale.

Conclusion

The study examined the effectiveness and feasibility of implementing 5S methodology in a government hospital. The study reveals the perception of study participants. The training was effectively conducted to provide knowledge and skills of 5S tools. The training improved the understanding of the key concepts of 5S.5S implementation will give a safer workplace.The participants agreed that feedback and follow up activities like a refresher session needs to be conducted for sustained use of methodology. Implementation of 5S required commitment of top management and total involvement of staff at all levels. The successful implementation of 5S can be showcased and demonstrated among other departments of the institution for widespread dissemination and replication.

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