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A 6S Implementation and Impact Assessment in the Housekeeping and Linen Department of Tertiary Care Hospital

Keerthana S[1]*, Sheeba Minerva Salins[2]

[12]M. S. Ramaiah University of Applied Sciences, University House, Gnanagangothri Campus, NEW BEL Road, MSR Nagar, Bengaluru, 560054

ABSTRACT

In modern days, healthcare cost is increasing tenfold along with immense pressure on healthcare providers to reduce the cost, improve quality of service and safety, lessen waiting time and eliminate the errors in the system. 6S targets at optimizing the process by eliminating waste and uses visual aids to achieve efficiency at workplace. The study aims at assessing the changes that is attained with the implementation of 6S in housekeeping and linen department of a tertiary care hospital. A quantitative method of data collection was employed with the help of a questionnaire and checklist. Independent Paired t-test, descriptive statistics and Repeated Measures ANOVA (RM-ANOVA) was used to analyse the data obtained. The Paired t-test indicated all the five sections of the questionnaire was very statistically significant (<.001). The pre-implementation score for housekeeping department was 33.593% and post score was 91.406%. The score for linen department improved from 62.5% to 88.28. The p-value for sort, shine, standardize, sustain and safety was found to be statistically significant; whereas set in order did not have statistical significance for housekeeping department. The p-value for sort, set in order and shine did not have statistical significance between the means but standardize, sustain and safety have statistical significance between the means for linen department of the hospital.

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*Corresponding Author E-mail:
keerthana.sheshareddy@gmail.com

INTRODUCTION

Healthcare service quality which is rendered to the population and community will reflect in the healthcare outcomes significantly (Kanamori et al, 2016). In order to justify the definition of service quality, patient satisfaction is crucial. The service quality is a form of judgment made by the patients depending to their acuities and if the patient expectations are not met, service dissatisfaction is achieved. The patient perception and expectations play a determining role in the level of satisfaction they get from the healthcare services (Kanamori et al, 2016).

On the other hand, healthcare costs are increasing by tenfold and there is an immense pressure on the healthcare service providers to reduce the cost, improve service quality and safety, lessen waiting time and eliminate the errors in the system (Venkateswaran, n.d, 2011). Hence, here is a necessity for scientific and managerial approach to deal with this issue that are posing serious impact of the hospitals as a whole (Kanamori et al, 2016).

The lean framework principle is a process of continues improvement which was originated by the Toyota production system; concentrates on eliminating waste and streamlining the workflow combining principles, practices, tools and techniques (Ezzeddine et al, 2020). Lean production is a combination of models like continuous quality improvement which was introduced by W E Deming and total quality management (Paschka et al, 2018). Lean was adopted in healthcare after its grand success in the manufacturing sector (Ezzeddine et al, 2020).

Takashi Osada in 1980's recognized the importance and application of 5S in the business settings (Venkateswaran, n.d, 2011). 5S is a tool that aids in improving the quality and productivity. 5S was developed by Hiroyuki Hirano (Kanamori et al., 2016). 5S results in an organized workplace which helps employees to differentiate common and uncommon situations that aids in reducing the errors and cost in parallel to improving the safety. The overall aim is to cater what and at where is it needed and at which time is it needed. 5S is a basis for lean workplace (Venkateswaran, n.d, 2011).

The 5S was originated from Japanese which stands for seiri, seiton, seisou, seiketsu and shitsuke that in a broader scope refers to keeping up cleanliness. These words when translated to English implies for sort, set in order, shine, standardize and sustain that aims at maintaining an organized and productive workplace. The 5S technique laid foundation for the concept of lean healthcare that augment value addition levels by eliminating all non-value adding factors. (Kanamori et al, 2015)

The 5S technique originated in manufacturing sector of Japan and was adopted in the West during 1980s. currently it is being applied in the healthcare industry as a structured method in order to organize and standardize the workplace as part of lean healthcare. It is identified as relatively inexpensive approach that serves as a beginning of healthcare service improvement. (Kanamori et al, 2015)

5S results in an organized work environment that facilitates employees to easily differentiate between the normal and abnormal conditions thereby reduction in cost, defects and enhanced safety. The overall intention is to deliver the needed items at needed place and needed time. 5S is a tool which is coiled as lean philosophy/ thinking in Toyota management system. Many healthcare facilities adopted the 5S principle that enhanced efficiency of services (Young, 2014).

5S is not one time activity, rather a continuous improvement technique that requires the policy makers to make strategic decisions throughout the survival of the organization (Thapa et al, 2018). 5S implementation in hospitals guarantees

a cleaner and more organized workplace by which a patient centric environment is reflected. 5S aids in achieving uncluttered workplace, main stream the processes and inventory and methods to achieve housekeeping morals (Pandya et al, 2015). Every step of 5S implementation influences on safety, starting from sort where unnecessary items including broken items and sharps are removed to sustain under which regular cleaning and audits will be conducted (Pandya et al, 2015).

6S is an alteration of 5S that adds "safety" into the process. 6S as a whole aim at creating a clean, organized and improves performance at workplace. 6S targets at optimizing the process by eliminating waste and uses visual aids to achieve efficiency at workplace. Cost reduction, improved quality and efficiency, error reduction, improved safety at workplace, reduces search time, stronger communication and higher job satisfaction are the key benefits of 6S implementation (Paschka et al, 2018).

LITERATURE REVIEW

Sort

Sort is the first step that aims at distinguishing between necessary and unnecessary items at the workplace (Thapa et al, 2018). The item that is unnecessary have to be documented clearly (Ezzeddine et al, 2020). A red coloured paper that is called as red tag is attached to unwanted items at the workplace. The red tagged item temporarily moved to holding area which is called as seiri or red tag area. The red tagging follows the following steps: identification of unnecessary items; red tag the item; shift the item to holding area; discard those items which are truly unnecessary (Dhounchak, 2017). In order to implement "Sort", the team must be aware of what are the materials in use, which materials are in storage, where the necessary materials are place and requirements of the user (Ezzeddine et al, 2020).

Set in Order

This step is achieved when the items are arranged according to the frequency of use which aids for easy retrieval of items and return them to respective places after use (Thapa et al, 2018). Set in order reduces the search time as every item will have a respective place for it within the department. Labelling the items, racks and cupboards is the most important part of this step that will help in easy identification of required item that in turn reduces the search time (Dhounchak, 2017). The employees must place the items in the designated area to improve the appearance and visual control. The pre and post photos must be taken as a documentation which tells about activity benefits that is most important in this step. The benefits of this step are clear visibility of items and easy identification of errors and rectification of the same and hence visual cues are used during this step (Ezzeddine et al, 2020).

Shine

Shine is to clean and simultaneously inspect for defects if any at the workplace to ensure dust free floor, equipment and machinery (Thapa et al, 2018). This is a phase of sanitization. The cleaning standards must be decided and documented by the team members. Along with cleaning, clutter removal and dusting, identifying the defects in equipment and infrastructure followed by fixing them is essential. The source of dirt, damage and waste needs to be identified and eliminated at this stage (Ezzeddine et al, 2020).

Standardize

To uphold good standards of organization at workplace by maintaining cleanliness and orderliness at any given point of time (Thapa et al, 2018). The management must make efforts to standardize the 1st 3Ss in the workplace (Dhounchak, 2017). Standardization permits for consistency is the implementation. Primary

standards of housekeeping are applicable within the facility. Every employee is expected to know what their responsibilities are. The standards must not just be confined to the operational processes like maintenance and storage rather, even in the administrative works like book keeping and human resource management (Ezzeddine et al, 2020).

Sustain

To educate employees on 6S practices consistently so as to make it a part of organizational culture (Thapa et al, 2018). The management must make a checklist to ensure everyone follows the process properly. The efficiency and safety should be continued day after day. Organizational and employee commitment is required at this stage. The staff are required to abide by the rules of sorting and cleaning. There is need to conduct regular audits and inspections on the set standards of 6S implemented within the facility. Radar graph is used to represent the audit score (Ezzeddine et al, 2020).

Safety

Safety is the last step of 6S that focuses at workplace safety to proactively lessen the probability of accidents at workplace (Dhounchak, 2017). This step aims at making the workplace safe for the employees by eliminating all possible hazards and mixing any issue that poses dangers in the future. Efficiency is also improved by reducing the errors within the facility (Paschka et al, 2018).

A study of 6S implementation in pharmacy department was conducted in Northwestern Memorial Hospital which is an 894 bedded medical centre showed a significant improvement in the workplace. The study used questionnaire as an assessment tool which was given to the pharmacy staff. There was 75% rise in satisfaction levels for sort, 50% rise in level of satisfaction for set in order, 37.5% rise in satisfaction for shine, 12.5% rise in satisfaction for standardize, 87.5% rise in satisfaction for sustain and 37.5% rise in satisfaction for safety. The pre and post implementation scores were 46% and 92% respectively (Paschka et al, 2018).

According to a study conducted by Thapa R et al, biomedical department of a tertiary care teaching hospital underwent 5S implementation. The study used audit score as an assessment tool. The audit results improved significantly after the from 31.79% before implementation to 91.749% after implementation. The paired t test value was observed to be 8.5673 at p value < 0.0010 (Thapa et al, 2018).

This study was conducted with the aim to assess the 5S implementation campaign in Urban Health Centre of Gujarat. The study showed significant improvement in all 5 stages of 5S with a maximum improvement in sort from 3.21 to 3.80 out of 5 followed by set in order that is from 3.06 to 3.79. shine showed rise in the score from 3.41 to 3.60, standardize from 3.08 to 3.71 and sustain improved from 2.75 to 3.64 (Pandya et al, 2015).

Shahali Sh et al, conducted a study to understand the clients satisfaction post implementation of 5S. the authors used SERVQUAL as questionnaire and checklist to measure the satisfaction. The pre an post intervention score was 2.4 and 4.2 respectively. The study concluded by saying that though the expected score was higher when compared to clients perception, implementation of 5S aided in lowering the quality gap (Kanamori et al, 2016).

RESEARCH METHODOLOGY

Sampling Technique and Data Collection

The data collected was done through primary data collection methodology by using interviewer administered structured questionnaire. Census study was adopted with a population size of 86 and 100% response rate.

Measurement Development

The questionnaire contained 5 sections namely; workplace environment with 6 questions, equipment maintenance with 5 questions, efficiency with 5 questions, safety and perception of 6S with 5 questions each. To assess the workplace environment, equipment maintenance, efficiency and safety a five-point Likert scale was adopted with excellent rated at 5 and poor rated at 1. To assess the perception of 6S, strongly agree was rated at 5 and strongly disagree rated at 1 on a five-point Likert scale.

Validation and Reliability

The questionnaire was validated by experts prior to pilot study. The pilot study was conducted with a sample size of 25. The reliability of the questionnaire was confirmed by obtaining the Cronbach alpha value which was .841.

Checklist

The study also adopted a checklist in order to audit the department before and after the implementation. The checklist contained six parts namely; Sort with five checkpoints, Set in order with five checkpoints, Shine with six checkpoints, Standardize with seven checkpoints, Sustain with four checkpoints and safety with five checkpoints. The checklist was scored from 0 to 4 were 0 for three or more problems, 1 for three problems, 2 for two problems, 3 for one problem and 4 for no problem.

RESULTS AND DISCUSSION

Majority of the responders were females (65.5%) and remaining were males (33.3%). 34.5% of the responders were of the age group between 20 – 25, followed by 31 – 35 (21.8%), 36 – 40 (20,7%), 26 – 30 (16.1%) and 5.7% above 41 years. Majority of the participates had primary education (62.1%). Majority of the staff had 3 to 5 years of experience (47.1%).

Independent Paired t-test was used to check for the significant difference before and after the implementation of 6S tool. The results indicated that there was a statistically significant difference in before and after scores. The p-value for all five sections of the questionnaire was less than .001 which by the standard criteria considered as very statistically significant. The mean difference before and after the implementation for workplace environment was -2.14922, -2.04651 for equipment maintenance, -2.02326 for efficiency, -1.91395 for safety and -2.14186 for perception on 6S.

The housekeeping department was audited before and after the implementation with the help of a checklist. Under sort, the pre and post score was 3.9% and 14.8% respectively, for set in order 7.81% to 14.84%, for shine there was an increase from 7.03% to 17.87%, from 5.46% to 20.31% for standardize, from 3.12% to 10.93% for sustain and from 6.25% to 13.28% for safety.

Table 1. Independent Paired t-test to find the statistical significance between pre and post implementation assessment

		Mean	SD	SE Mean	Df	t	P-value
Workplace environment	Before	2.0407	.44276	.04774	85	42.979	<.001
	After	4.1899	.24275	0.2618			
Equipment maintenance	Before	2.0442	.49696	.05359	85	29.638	<.001
	After	4.0907	.30779	.03319			
Efficiency	Before	2.1512	.41380	.04462	85	37.261	<.001
	After	4.1744	.29393	.03170			
Safety	Before	2.2419	.38332	.04133	85	33.208	<.001
	After	4.1558	.32525	.03507			
Perception on 6S	Before	2.0651	.37503	.04044	85	39.782	<.001
	After	4.2070	.33247	.03585			

Hence, there was an increase from 33.593% to 91.406% in the housekeeping department.

The audit score for linen department before and after implementation under sort was 10.93% and 14.06% respectively, for set in order 12.5% to 14.06%, for shine there was an increase from 15.62% to 16.4%, from 14.84% to 17.18% for standardize, from 2.34% to 10.93% for sustain and from 6.25% to 12.5% for safety. Hence, there was an increase from 62.5% to 85.156% in the linen department.

Table 4. Repeated measures ANOVA for Housekeeping

	Sphericity	F	p-value
Sort	.03	12.429	.016
Set in order	.00	5.718	.064
Shine	.535	14.091	<.001
Standardize	.719	50.143	<.001
Sustain	.543	9.00	.005
Safety	.198	8.667	.002

Repeated Measures ANOVA or RM-ANOVA was conducted to check the level of statistically significant difference between levels of within subject variables. The post implementation audit using the checklist was conducted three times with same time interval between each audit. A p-value that is less than 0.05 is considered to be statistically significant. The p-value for sort was .016 which is statistically significant, the p-value for Set in order was .064 which is greater than 0.05 that implies there is no statistical significance followed by shine standardize, sustain and safety with p-value of <.001, <.001, .005 and .002 respectively which are statistically significant.

Table 5. Repeated Measures ANOVA for Linen Department

	Sphericity	F	p-value
Sort	.03	12.429	.016
Set in order	.00	5.718	.064
Shine	.535	14.091	<.001
Standardize	.719	50.143	<.001
Sustain	.543	9.00	.005
Safety	.198	8.667	.002

The p-value for sort, set in order and shine was found to be .251, .368, .156 respectively which tells that there is no statistically significant difference between the means. The p-value for standardize was .004, .022 for sustain and .002 for safety which is statistically significant.

Table 2. Pre and post implementation audit for Housekeeping Department

		Sort	Set in order	Shine	Standardize	Sustain	Safety	Total	Percentage (%)
Before	No. of checkpoints	5	5	6	7	4	5	27	33.593%
	Total score	20	20	24	28	16	20	128	
	Obtained score	5	10	9	7	4	8	43	
After	No. of checkpoints	5	5	6	7	4	5	27	91.406%
	Total score	20	20	24	28	16	20	128	
	Obtained score	19	19	22	26	14	17	117	

Table 3. Pre and post implementation audit for Linen department

		Sort	Set in order	Shine	Standardize	Sustain	Safety	Total	Percentage (%)
Before	No. of checkpoints	5	5	6	7	4	5	27	62.5%
	Total score	20	20	24	28	16	20	128	
	Obtained score	14	16	20	19	3	8		
After	No. of checkpoints	5	5	6	7	4	5	27	88.28%
	Total score	20	20	24	28	16	20	128	
	Obtained score	18	18	22	25	14	16	109	

CONCLUSION

The findings of this study proved that there is a significant difference between the pre and post implementation of 6S that is backed up by previous literatures. The results indicated that there is a very statistically significant difference between the means of workplace environment, equipment maintenance, efficiency, safety and perception on 6S for the pre and post data obtained. All the five sections assessed have improvements post implementation. The post implementation audit showed that there was a huge difference that was achieved within the departments in respect to all six components of 6S namely; Sort, Set in Order, Shine, Standardize, Sustain and Safety. The visual management, workflow and safety within the departments were improved. The highest improvement was observed for standardize in housekeeping department and safety in linen department that was proved by the audit score performed within the respective departments. The repeated post implementation audits showed that there was no statistical significance for sort, set in order and shine; on the other hand, standardize, sustain and safety had a statistically significant difference observed within the means. However, the audits can be done at a wider time intervals which was not achieved by the study. Since this study focused on 6S implementation in two departments, further researchers can concentrate on implementing 6S in various clinical and non-clinical departments on the hospital.

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