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RESEARCH ARTICLE

APPLICABILITY OF THE "5S MANAGEMENT METHOD" FOR QUALITY IMPROVEMENT AT HEALTH CARE FACILITIES IN INDIA

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ABSTRACT

INTRODUCTION:

The 5S management method, originally developed in Japanese industries for quality improvement, has since been adopted in healthcare settings worldwide. Several developing countries have reported positive outcomes from its implementation in healthcare, including improved workspace organization, enhanced environments, better compliance with regulations, and increased patient satisfaction. This study aimed to assess the applicability of the 5S management method for quality improvement in tertiary-level healthcare facilities and to evaluate the changes brought about by 5S in the workplace, including both process and outcome measures of healthcare services.

METHODS:

This mixed-methods study was conducted in twelve departments across the two largest tertiary hospitals in Nadiad, Gujarat, from July 2023 to December 2023. Quantitative data served as the primary component, supplemented by qualitative data. A structured 5S audit checklist and semi-structured interviews were used for baseline assessment, external evaluation, and qualitative data collection, respectively.

RESULTS:

Following 5S implementation, the mean scores increased in all twelve departments, with statistically significant improvements in most cases. The mean 5S score in the private hospital increased by 30.99%, while that of the government hospital increased by 43.39%. Post-implementation, turnaround time decreased for case registration, pharmacy, and emergency room services while laboratory efficiency improved, accompanied by reductions in medical errors and hospital-acquired infections. Qualitative analysis identified key themes such as enhanced work environments and improved quality of services.

CONCLUSION:

The study shows that implementing the 5S management method effectively improves work environments, efficiency, quality, and staff satisfaction in both government and private tertiary healthcare facilities in India; sustaining these improvements is essential for long-term success.

KEYWORDS

5S management method, health management, quality improvement, health care, lean, tertiary hospital

INTRODUCTION

Health is the basic human fundamental right. The right to quality health care has been a priority since the WHO constitution (1946), continuing through the millennium development goals (MDGs) to the latest sustainable development goal (SDG) target 3.8.[1–3] It is clearly evident that globally, the focus is on providing quality healthcare services as efficiently as possible.

In India, the healthcare system differs on many levels, such as private versus government, or urban versus rural healthcare systems. The budget for healthcare expenditure is relatively low, which affects infrastructure, resources, quality, the number of patients accessing healthcare, and the training of healthcare staff. Despite these challenges, India has made significant progress in improving its healthcare delivery system over the past decade. The emphasis is gradually shifting from providing a greater quantity of healthcare services to ensuring higher quality. The quality of healthcare depends on various factors, including economics, resources, infrastructure, management, and location. The quality of care includes organizational factors such as appearance, better patient outcomes and safety, improved efficiency of public healthcare, reduced waiting times before being served, and reductions in medical errors, in addition to clinical practice. The Government of India has introduced various standards and accreditations such as the national quality assurance standards (NQAS), the Kayakalp award scheme, the LaQshya program, national accreditation board for hospitals and the healthcare providers (NABH), and the Indian public health standards (IPHS) to improve the quality of the healthcare system.[4–6]

Globally various methods have been deployed to provide quality healthcare efficiently. The 5S management method is one such approach. The 5S management method was originally implemented by manufacturing industries in Japan during the 1980s for quality improvement. 5S stands for five Japanese words: "Seiri, Seiton, Seisou, Seiketsu, and Shitsuke," which translate to "Sort, Set in order, Shine, Standardize, and Sustain" in English.[7,8] "Sort" refers to the separation and removal of unwanted and unnecessary items from the work area. "Set in order" means organizing items so that every staff member can find what is required with minimal effort. "Shine" refers to maintaining cleanliness in the workplace. "Standardize" means achieving a high level of standardization in all activities carried out in the first three Ss, using checklists and standard operating procedures (SOPs). "Sustain" refers to maintaining all these practices over the long term.

Due to a lack of resources, disorganized work environments, and poor management, healthcare workers often become frustrated, make unintentional mistakes, and lose interest in patient care. The 5S management method is a cost-effective, participatory approach that workers can implement to increase productivity by creating and maintaining a clean and tidy workplace.[8] Eventually, the 5S method was applied in non-production settings such as offices and healthcare facilities worldwide.[9] The impact of the 5S management method in the healthcare sector has been documented in many countries, including the United States [10,11], India [12–14], Jordan [15], Sri Lanka [16], and Senegal [17], although other lean tools and methods were often used alongside the 5S method. Observed changes as a result of these interventions included improved working processes, increased physical space, elimination of safety violations, improved regulatory compliance, improved clinical indicators of safety, increased time with patients, and improved patient satisfaction. [11,12,15,16]

Despite encouraging results from the 5S method in various low- and middle-income nations, only a handful of studies have explored its applicability in Indian healthcare facilities. No qualitative research has been conducted in India to examine staff members' perceptions and opinions regarding the 5S management method. To fill this evidence gap, the present study was carried out at resource-constrained government and private tertiary healthcare facilities, with the aim of studying how the implementation of 5S creates changes in the workplace, including processes and outcomes of healthcare services, and to conduct a comparative analysis between both types of facilities.

METHODS

STUDY DESIGN:

The present study used a mixed-methods design, with quantitative data as the primary component and qualitative data as the secondary component.

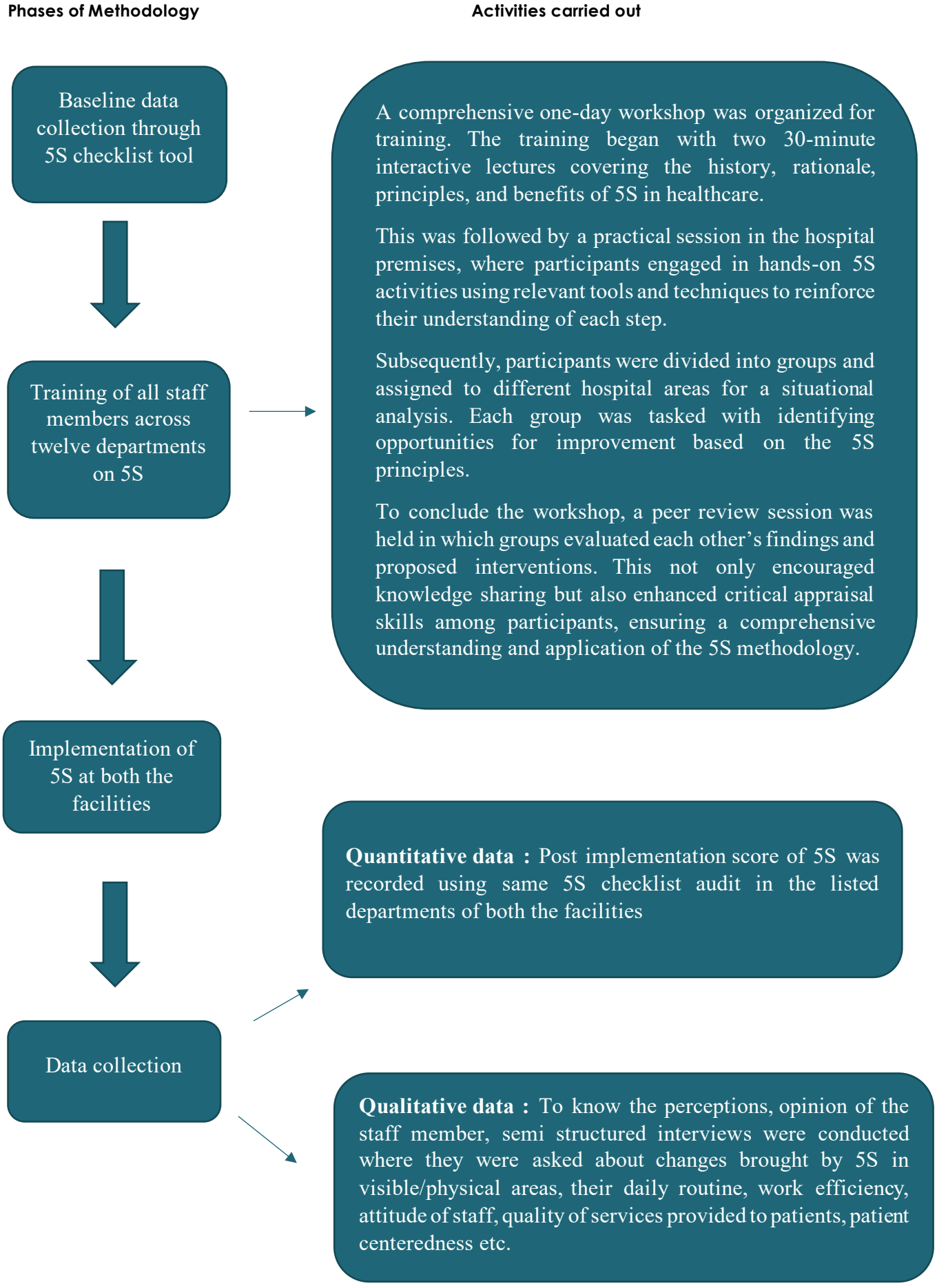
STUDY SETTING & PROCEDURE:

The study was conducted in the two largest tertiary hospitals in the city of Nadiad, Gujarat, between July 2023 and December 2023. One hospital was a government facility (Civil Hospital), and the other was a private facility. After obtaining permission from the institutional ethical committee (letter No. NDDFMSR/IEC/2023/03/05 dated 14/06/2023) and the superintendents of both hospitals, data were collected. The detailed methodology is shown in Figure 1.

A structured 5S audit checklist was used for baseline assessment and external evaluation. Twelve departments of both the facilities were included in the study such as pharmacy, emergency room, pathology laboratory, male medicine ward, labour room, operation theatre, blood bank, biowaste management, registration room, outpatient department (OPD), imaging centre, and central sterile supply department (CSSD). Each question was assessed through personal observation, and a score from 1 to 5 was given. Scoring was in descending order: 5 for excellent, 4 for good, 3 for average, 2 for poor, and 1 for very poor performance. Baseline data on average turnaround time, incidence of materials going out of stock, medical errors, and other parameters were also noted. Baseline data collection was followed by training for staff members (laboratory technicians, pharmacists, and nursing in-charges) regarding 5S implementation in their respective departments at both hospitals. After a two-month gap following the training, post-implementation data were collected using the same 5S checklist. The fifth S (sustain) was assessed at the end of six months. Collected data were compiled in Microsoft Office Excel 2010 format and analyzed using Epi Info software version 7. Appropriate tests, such as paired and unpaired t-tests, were applied. A p-value of <0.05 was considered statistically significant.

For qualitative data, verbal consent was obtained from staff members prior to interviews, which were recorded for later analysis. Semi-structured interviews were conducted with staff members from departments that had participated in the 5S program, based on their availability. Interview questions focused on the impact of the 5S program on parameters such as work environment, staff attitudes and behaviors, efficiency, workplace satisfaction, and quality of services. Contradictory views and negative opinions about the 5S program were also noted. For qualitative data analysis, interviews were transcribed verbatim, followed by a thematic approach, and the process tracing method. The principal investigator conducted the interviews, transcription, translation, and theme analysis independently, following the six stages described by Braun and Clarke.[18] The investigator was fluent in Hindi, English and Gujarati. Both investigators reviewed their preliminary analyses and agreed on theme definitions and a common thematic and sub thematic structure.

FIGURE 1: FLOW OF METHODOLOGY



RESULT

TABLE 1: DEPARTMENT-WISE MEAN 5S SCORING OF GOVERNMENT & PRIVATE HOSPITAL (OUT OF 5)

Name of the department	Hospital Type	S1		S2		S3		S4		P value
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Pharmacy	Private	3.67	4.33	1.75	3.00	3.00	4.33	3.67	4.00	< 0.05
	Civil	4.00	4.67	2.50	3.75	2.33	3.67	4.00	4.00	< 0.05
Pathological lab	Private	3.00	4.25	3.00	3.80	4.00	4.50	3.00	4.33	< 0.05
	Civil	2.75	4.25	2.20	3.20	2.00	3.00	2.75	4.00	< 0.01
Emergency	Private	2.50	4.25	3.40	4.40	3.40	4.20	2.50	3.00	< 0.05
	Civil	3.25	4.50	3.00	3.80	3.00	4.20	3.25	4.00	< 0.05
Labour room	Private	2.50	4.00	3.00	4.00	3.00	4.00	2.50	4.00	< 0.05
	Civil	2.75	4.25	2.83	4.17	3.40	4.40	2.75	4.00	< 0.05
Male medicine ward	Private	2.25	4.00	2.83	4.00	3.00	4.20	2.25	4.00	< 0.01
	Civil	3.75	4.50	3.00	4.17	3.20	4.40	3.75	4.00	> 0.05
Operation theatre	Private	2.50	4.25	3.40	4.20	4.60	5.00	2.50	4.00	> 0.05
	Civil	2.75	4.00	3.40	4.20	4.60	5.00	2.75	4.00	< 0.05
Blood bank	Private	4.00	4.75	1.40	3.20	3.75	4.50	4.00	4.67	< 0.05
	Civil	2.50	4.00	2.00	3.40	2.00	3.50	2.50	4.00	< 0.001
Biowaste management	Private	4.33	4.67	2.33	3.00	4.25	4.50	4.33	4.00	> 0.05
	Civil	3.00	3.67	2.67	3.00	1.75	3.00	3.00	4.00	< 0.05
Registration room	Private	2.67	4.33	2.00	3.00	3.25	4.50	2.67	3.50	< 0.05
	Civil	2.67	3.67	3.50	4.50	1.25	2.50	2.67	3.00	< 0.05
OPD	Private	3.00	4.00	2.60	4.20	3.40	4.40	3.00	4.00	< 0.05
	Civil	2.75	3.50	2.40	3.40	1.60	3.00	2.75	3.00	< 0.05
Imaging centre	Private	2.75	3.75	3.00	4.20	3.40	4.40	2.75	4.00	< 0.05
	Civil	2.75	3.50	2.20	3.40	2.40	3.20	2.75	3.00	< 0.05
CSSD	Private	4.33	4.67	3.00	3.67	4.50	4.75	4.33	4.00	< 0.05
	Civil	3.00	4.33	1.33	3.33	2.25	4.25	3.00	4.00	< 0.05

Table 1 shows the department-wise mean 5S scores for government and private hospitals before and after 5S implementation. In almost all departments, the mean 5S score increased after implementation. The difference between pre- and post-5S implementation was statistically significant in the majority of departments in both government and private hospitals (p-value <0.05).

FIGURE 2: COMPARATIVE ANALYSIS OF THE IMPACT OF 5S IN GOVERNMENT AND PRIVATE HOSPITALS (SCORE OUT OF 5)

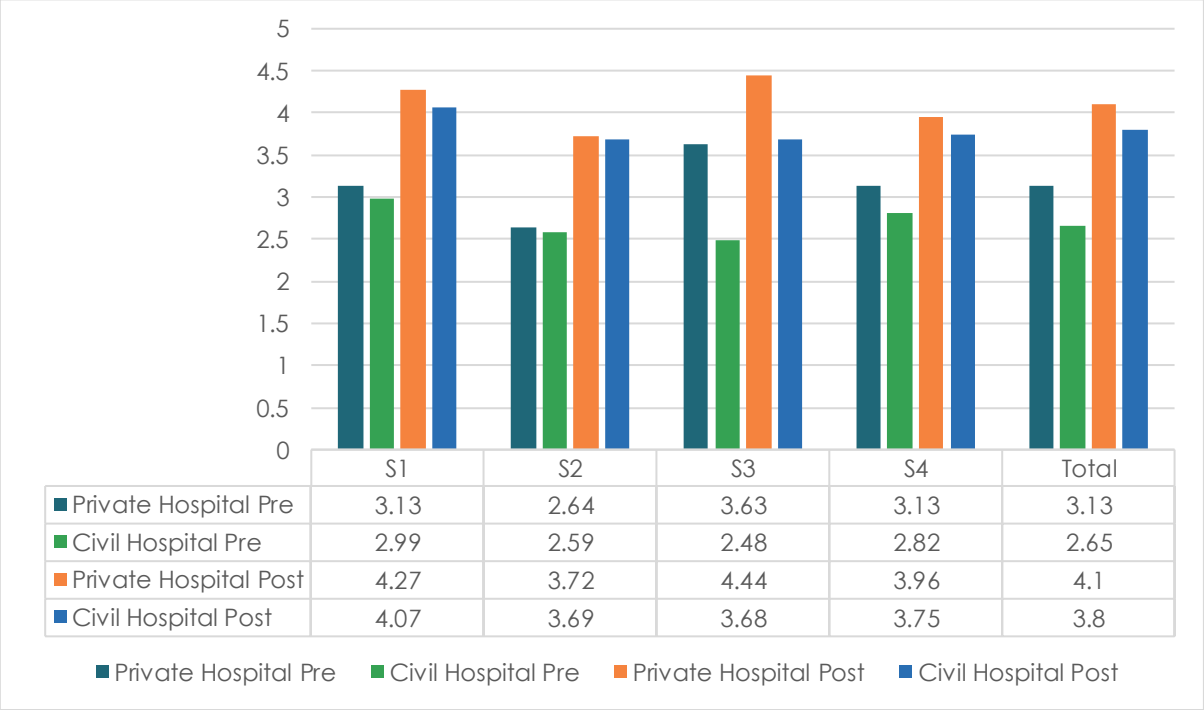


Figure 2 shows a comparative analysis of the impact of 5S in government and private hospitals. The mean 5S score in the private hospital increased by 30.99%, while that of the government hospital increased by 43.39%. Despite the 43.39% increase in the government hospital's 5S score, its mean score still lagged the private hospital mean score. However, the difference between the government and private hospital mean scores was not statistically significant ($p>0.05$). The mean score for the fifth S (sustain) was 3.8 in the private hospital and 3.5 in the government hospital.

TABLE 2: OUTCOME OF 5S IMPLEMENTATION AT TERTIARY LEVEL HEALTHCARE CENTRE

Department	Process changed as per 5S Implementation	Outcome
Pharmacy	Visual control methods adopted by displaying look alike, sound alike drug list	Prevented mix-up of drugs while dispensing and avoided potential medical errors in government hospital
Pharmacy	Drug storage done systematically by arranging it alphabetically from earlier department wise storage	Average turnaround time (TAT) to find and dispense medication reduced drastically by 35% in private hospital
Blood bank	Colour coding system adopted for timely alert to replenish reagents	Incidence of reagents went for out of stock reduced significantly
Emergency Room	Tagging system developed to differentiate working/empty oxygen cylinder	Average turnaround time (TAT) to find working cylinder reduced by 52% and 46% respectively in private & government hospital
Laboratory	Reagent stored according to the frequency of use and colour coding system adopted for timely alert to replenish reagents	Able to manage same number of samples in 24% time than previously. Incidence of reagents went for out of stock reduced
Case Registration	Removed obsolete and unwanted items from the desk	Average turnaround time (TAT) for a patient in a waiting queue reduced by 12% and 19% respectively in private and government hospital
Medicine Ward	Implemented sort, set in order, shine and standardization	Hospital acquired infection rate has come down by 32 per cent and 41per cent

	respectively in private and government hospital

Table 2 shows the outcomes of 5S implementation in various departments. After 5S implementation, turnaround time was significantly reduced in the pharmacy, emergency room, and case registration window. The incidence of reagents going out of stock was significantly reduced. Medical errors and hospital-acquired infection rates were also significantly reduced, while laboratory staff were able to manage samples more efficiently.

QUALITATIVE DATA ANALYSIS

TABLE 3: THEMATIC STRUCTURE OF QUALITATIVE ANALYSIS FOR 5S IMPLEMENTATION

Theme	Subtheme
1) Work environment	a) Visual appearance b) Safety of staff
2) Quality of service	a) Efficiency b) Patient centredness

Table 3 shows theme and subtheme structure of 5S implementation.

WORK ENVIRONMENT

One of the themes in the qualitative analysis was a change in the work environment after 5S implementation, with subthemes of visual appearance and staff safety.

a) Visual Appearance

One nurse reported, "Earlier, my workplace used to be completely messy – so many forms, files and what not. Even I used to dislike such an unpleasant work environment. Now, after implementing 5S, I have found more place to work, as everything is stored in an organized way. Not only that, but this visual change has also brought a positive work environment."

b) Safety of Staff

Another nurse said, "Sometimes, there is an accidental spillage on the floor by patients, relatives, or staff members, which endangers safety. But due to 5S management, there is a spillage box and a proper cleaning product checklist, which help us to clean everything at the right time."

QUALITY OF SERVICE

Another theme identified was quality of service, with subthemes of efficiency and patient satisfaction.

a) Efficiency

One pharmacist reported, "Earlier, there used to be complete chaos and a long queue outside the pharmacy counter to collect medicines. Now, after 5S implementation, we are dispensing medicines much faster, resulting in shorter queues."

b) Patient-centeredness

One head nurse reported, "New nursing staff always had confusion about similar pronounced drugs (e.g., diclofenac and dicyclomine) or similar-looking vial boxes. There was always a threat in our minds that, by mistake, they might infuse the wrong drug into a patient. But now, with the help of 'look-alike and sound-alike drug list,' they are managing patients confidently without any errors."

DISCUSSION

The present mixed-methods study was conducted in the two largest tertiary hospitals in the city of Nadiad, Gujarat. One was a government hospital (Civil Hospital), and the other was a private facility. In the present study, baseline data were collected at both facilities, followed by 5S training. Post-implementation data were collected to study how 5S implementation creates changes in the workplace, including processes and outcomes of healthcare services. Twelve departments from both facilities were included in the study.

Table 1 shows the department-wise mean 5S scores for government and private hospitals before and after 5S implementation. It is evident from the results that, after 5S implementation, the mean score increased in almost all departments. The difference between pre- and post-5S implementation was statistically significant in the majority of departments (p-value <0.05). Our study findings are consistent with those of Pandya et al. and Patwa et al.[13,14] Although both studies were conducted at different urban health centres rather than in different hospital departments, both reported a significant increase in mean scores after 5S implementation.

Figure 2 compares 5S impact in government and private hospitals. The mean 5S score rose by 30.99% in the private hospital and by 43.39% in the government hospital, likely because the government hospital's lower baseline score allowed more room for improvement. However, the difference in mean 5S scores between government and private hospitals was not statistically significant (p>0.05), and no previous studies comparing 5S scores in these settings were found.
Table 2 shows the outcomes of 5S implementation in various departments. In our study, the average turnaround time (TAT) to find and dispense medication was reduced by 35 per cent in the private hospital after 5S implementation. Similar findings were reported by Al-Araidah et al. in an inpatient pharmacy in Jordan, which reported a saving of more than 45 per cent in the drug dispensing cycle time.[15] Laboratory staff were able to save 24% of their time while running the same number of samples after 5S implementation. Similar findings were reported by Rutledge et al. at a tertiary care hospital laboratory in the USA, which reported improved turnaround time with a 20% increase in laboratory testing volume.[10] In the present study, hospital-acquired infection rates decreased by 32% and 41% in the private and government hospitals, respectively. Similar findings were reported by Withanachchi et al. at a women's hospital in Colombo, Sri Lanka, which reported a 52% and 33% reduction in post-caesarean section infection rates and in stillbirth rates, respectively.[16] In the present study, the average turnaround time to find a working cylinder was reduced by 52% and 46% in the private and government hospitals, respectively. Similar findings were reported by Ikuma and Nahmens in the USA, which reported that goals related to regulatory compliance, ergonomics, or safety were achieved in all departments.[11]

Table 3 shows the thematic structure of qualitative analysis for 5S implementation. In the present study, work environment and quality of services were the main themes, with visual appearance, safety of staff, efficiency, and patient-centeredness as subthemes. Similar findings were reported by Kanamori et al. in Senegal, which identified work environment, staff attitude and behavior, quality of services, efficiency, patient-centeredness, and safety as key domains.[9] From the above findings, it can be concluded that, irrespective of geographic location, type of hospital, or department, our study findings are consistent with previous findings, suggesting positive outcomes following 5S implementation.

LIMITATION OF STUDY:

The current study was conducted only in twelve departments of two large tertiary hospitals in a single city. Although the results are positive, before generalizing them, large-scale studies in hospitals across multiple cities and departments over a longer period need to be conducted in the future to bring about much-needed changes in the management system.

CONCLUSION

The present mixed-methods study demonstrates that the 5S management method is applicable and effective for quality improvement in both government and private tertiary healthcare facilities in India. Implementation of the 5S method leads to improved work environments, increased efficiency, better patient outcomes, and enhanced staff satisfaction Sustainability of such a method is the key to achieve long term desired outcomes.

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DECLARATION OF CONFLICTING INTEREST

The authors declare that there is no conflict of interest.

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