

CHINESE PUBLIC HOSPITALS' PRACTICES AND STRATEGY OF TOTAL QUALITY MANAGEMENT IN THE COVID-19 PANDEMIC: A FIELD RESEARCH

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Abstract

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Implementing the 6S approach in healthcare can drive continual improvement in efficiency, safety, and productivity despite hurdles (Wang & Liu, 2023). This study analyzed three hospitals, two of which implemented 6S management during the 2019 coronavirus pandemic and one during a non-pandemic period. Surveys conducted before and after the implementation of 6S measured improvements in healthcare quality, economic variables, and hospital satisfaction. The data was analyzed using Statistical Package for the Social Sciences (SPSS) 21.0, and statistical significance was attributed to p-values below 0.05. The use of 6S management, which is a part of total quality management (TQM) methods, resulted in systematic improvements in efficiency, organization, cleanliness, and standardization, hence enhancing the quality of service in Chinese public hospitals. It had a substantial positive impact on healthcare quality, economic metrics, and satisfaction across different levels of hospitals. The use of 6S management in Chinese public hospitals has a beneficial impact and is capable of mitigating the negative consequences of an epidemic. Nevertheless, the implementation of this approach requires additional research and customized tactics specifically designed for hospital settings to improve quality, effectiveness, and patient contentment.

Keywords: TQM, Chinese Public Hospitals, New-Coronary-Pneumonia Pandemic, 6S Management

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1. INTRODUCTION

Public hospitals in the People's Republic of China are currently facing numerous intricate challenges (Chen et al., 2022). These factors encompass the uneven allocation of medical resources, heightened competition among healthcare facilities, disparities in the quality of healthcare services, and less-than-optimum patient experiences (Xu et al., 2020). These difficulties provide significant obstacles for patients seeking medical help and threaten the long-term sustainability and progress of the national healthcare system (Sun et al., 2021; Zhang et al., 2020).

Healthcare delivery involves numerous problems related to delivering appropriate patient care (Que et al., 2020). These problems encompass the efficient allocation of resources, the deployment of suitable equipment, and the cost-effective management of patients' health concerns (Que et al., 2020; Sun et al., 2021). Implementing total quality management (TQM) procedures can be highly beneficial for hospitals as they can help identify and reduce medical errors and failures, leading to improved productivity and performance (Bai et al., 2015; Chatzidimou & Ioakimidis, 2023). These practices, which include employee engagement, mutually advantageous supplier relationships, quality assurance, and customer-focused services, are essential for hospitals to provide effective healthcare services that meet the demands of patients. Therefore, when faced with a variety of individuals or groups with an interest in the matter, TQM becomes a prominent approach for healthcare companies to effectively handle the complexities of delivering healthcare services (Alsmairat et al., 2024; Van Nguyen et al., 2023; Shrivastav, 2023).

The performance of a service is directly connected to the quality of its implementation at all stages of conceptualization and delivery to meet the needs of customers (Bhat et al., 2023; Żegleń et al., 2022). The effectiveness of healthcare services depends on the precision of medical diagnosis, treatments, and how services are provided to patients (Bai et al., 2015). The epidemic has caused a rapid increase in the number of patients being admitted to hospitals and has led to a shortage of resources. This has made decision-making in healthcare more difficult because of the uncertainty surrounding healthcare operations (Sun et al., 2021). Healthcare services need to increase the capacity of beds, equipment, human resources, and facilities. Many hospitals have adopted TQM to minimize the interruptions caused by COVID-19, improve their ability to respond, and expand their capacity (Bai et al., 2015; El-Tohamy et al., 2015). Ensuring the continuity of TQM is essential for hospitals that want to maintain sufficient healthcare services in the aftermath of the pandemic, as the effects of COVID-19 will persist in the next years (Zakariah, 2019). Hence, the study of TQM and its impact on the quality of hospital services continues to be a relevant area of research. This analysis aims to determine if hospitals have implemented TQM practices in response to pandemic issues and to identify the specific TQM techniques that have a significant influence (Alsmairat et al., 2024).

The 5S and 6S approaches provide frameworks for organizing workspaces, ensuring cleanliness, and applying standardized procedures (Wang & Liu, 2023). The 6S methodology, which incorporates "Safety" as a major component, is ideal for high-risk industries and safety-first businesses. It is gaining popularity in hospitals because of its ability to improve efficiency, waste management, safety,

quality, and contamination control. The 6S technique simplifies investments and expenditures, and with a clear and safe workspace, healthcare providers can focus on patient care quality.

A sustainable green healthcare environment necessitates efficient medical waste management, education, and safety and risk management (Yu et al., 2020). However, obstacles such as a lack of time, competence, motivation, and the bureaucratic structure of healthcare systems can impede successful implementation. Despite these hurdles, the 6S technique encourages a culture of continuous improvement and operational excellence, revolutionizing workspace operations and setting new benchmarks for efficiency, safety, and productivity. At a Chinese medicine hospital, researchers used the "6S" management concept in clinical nursing and pharmacy management (Wei et al., 2020). The findings revealed higher nurse satisfaction and efficiency, with fewer handover items, less inventory time, better intensive care unit (ICU) rescues, and fewer adverse occurrences. However, the single-center study may have a selection bias. Researchers recommend more trials in larger hospitals and other settings, notably during the COVID-19 pandemic, to provide more robust data.

The literature highlights important issues in Chinese public hospitals, such as resource allocation, competition, and service quality discrepancies. However, research on the impact of TQM and the Six Sigma approach during crises such as COVID-19 is scarce. This study employs TQM to assess how 6S site management techniques impact healthcare service quality in Chinese hospitals. The study aims to improve hospital management and service delivery during pandemics, providing important insights into healthcare quality management. Using quantitative surveys, the study investigates TQM and 6S implementation. The expected results are expected show how these techniques improve efficiency, minimize errors, and improve resource management, demonstrating their practical value.

The research, therefore, aims to examine the effects of implementing 6S site management, supported by TQM theory, in Chinese hospitals during the COVID-19 pandemic. The research question is:

RQ: How does the implementation of TQM practices, specifically 6S site management, affect the service quality in Chinese public hospitals?

The article is structured as follows: Section 2 examines the relevant literature. Section 3 looks at the research technique employed in the study. Section 4 presents the empirical results. Section 5 goes over these findings in depth. Finally, Section 6 wraps up the article and makes some final observations.

2. LITERATURE REVIEW

2.1. The 6S concept of total quality management in hospital

The China hospital 6S management alliance was established in Beijing in May 2018 to adapt to these developments. The 5S/6S management system plays a crucial role in hospitals, ensuring a clean, safe working environment, improving medical safety, and reducing the rate of hospital-acquired infections (Sun et al., 2022; Wang & Liu, 2023). Effective hospital management is vital in infection prevention

and control. The 5S/6S management system standardizes healthcare workers, encourages good habits, and improves hand hygiene compliance, playing a significant role in departmental management (Bhat et al., 2023; Rouf et al., 2017). It enhances the quality of sterilization testing and surgical instruments, ensures the safe use of medical supplies, and improves the efficiency and satisfaction of medical equipment maintenance. The 6S site management organization, consisting of a leadership team and a working group, emphasizes cleanliness, organization, and efficiency in various hospital areas. Quality control officers and the departmental quality and safety management team oversee work to ensure smooth operations and quality improvement. 6S management, an evolution of Japan's 5S activities, enhances efficiency and output by incorporating safety. Applied globally in various sectors, it aims to improve quality, increase productivity, eliminate waste, promote sustainability, and guarantee safety in a clean, simple environment (Firdaus & Irfan, 2023; Siallagan, 2023).

TQM approaches, particularly 6S site management, have dramatically enhanced service quality in industries such as healthcare, including Chinese state hospitals (Chen, 2021; Patel & Patel, 2020). There are numerous study opportunities, such as examining the integration of TQM with Industry 4.0 capabilities for efficiency and quality improvements and the significance of Quality 4.0 in increasing customer happiness and competitiveness. Another intriguing field is researching the interaction of TQM's hard and soft parts and creating an integrated model that connects TQM practices to performance metrics (Jiménez et al., 2019). However, prior TQM studies had drawbacks, such as potential bias, a lack of a comprehensive literature review, and a limited study of TQM's dynamic elements, particularly in public hospitals. While these limits are significant, they also open up new avenues for research in this area.

2.2. The impacts of the COVID-19 epidemic on the quality of healthcare services

There has been substantial research into the influence of COVID-19. Techniques employed in studies include systematic reviews, meta-analyses, and observational analytics. Individual health facilities, multicenter networks, regional registries, and national health information systems can serve as data sources (Jiménez et al., 2019; Raman et al., 2021). One significant discovery is the efficacy of public health initiatives in lowering COVID-19 incidence. Handwashing, mask-wearing, and physical separation have all been linked to a drop in cases. However, the epidemic has revealed issues with healthcare quality measurement. Current techniques are labour-intensive, have considerable data delays, and lack standards to facilitate efficient data sharing. Another notable conclusion is that healthcare service consumption decreased significantly during the pandemic despite some reports of increases (Whaley et al., 2020).

This research considerably improves our understanding of COVID-19's impact on healthcare services and public health initiatives. They highlight the importance of resilient and responsive healthcare systems. However, there are still holes. While meeting unmet needs is a top concern, research into the health effects of service reductions could help decrease unneeded care after the pandemic. Furthermore, the pandemic has hampered

the sustainability and continuity of care, influencing the phenomenon of unfinished business.

Our hypothesis is centred around the impact of TQM practices, specifically 6S site management, on the service quality in Chinese public hospitals.

H1: The implementation of these TQM practices has a significant effect on enhancing service quality.

3. METHODOLOGY

This scholarly investigation thoroughly analyzes the impact of 6S management and the COVID-19 epidemic on quality management metrics in public hospitals in the People's Republic of China. It utilizes a comprehensive survey technique (Walkowska et al., 2023). The paper offers a comprehensive examination of how 6S management contributes to improving medical quality, optimizing economic operations, and reducing the negative effects of the pandemic on hospital services. This study performs a comparative analysis of these indicators, both before and after the installation of 6S management, as well as during the pandemic, to evaluate the efficacy of 6S in reducing the negative impacts of the pandemic. The research focuses on medical quality indicators, economic operation indicators, and hospital contentment indicators. These indicators cover treatment outcomes, safety protocols, financial performance, resource usage, and patient contentment. The paper provides a thorough examination of how 6S management enhances medical quality, improves economic operations, and reduces the impact of the pandemic on hospital services.

3.1. Population and sample

This academic inquiry focuses on public hospitals in the People's Republic of China, which are classified into three levels. According to the "Statistical Bulletin on the Development of Medical Insurance in 2021" (Government of China, 2021), there are a total of 11,804 public hospitals in China, out of which 1,651 are grade 3A general hospitals. The study chose one hospital that represented each grade for a thorough review. Hospital A adopted 6S site management between December 2016 and January 2017 and then experienced the effects of the COVID-19 pandemic in January 2020. In March 2021, hospital B implemented the same management strategy and experienced comparable impacts from the epidemic. Hospital C adopted 6S site management between December 2021 and January 2022. The study examines the effects of TQM on important measures in each hospital both before and after the introduction of 6S site management. The technique of stratified random sampling is utilized for selection. Although the sample size is small, the study intends to produce significant findings about the efficacy of 6S management in both pandemic and non-pandemic situations. The study employed meticulous data analysis and rigorous statistical processing. Despite the limited sample size, the findings of the study provide a basis for further research. The study showcases the efficacy and practicability of initial findings, establishing a foundation for future investigations on a larger scale.

Although the sample size of three hospitals appears small, it is justified by the study's methodological rigor and stratified random sampling, which included one hospital from each

grade level to provide a representative review. The chronology for implementing 6S site management in each hospital was painstakingly documented, allowing a unique chance to evaluate the effects of TQM techniques before and during the COVID-19 pandemic. Despite the small sample size, extensive data analysis and rigorous statistical procedures improve the credibility of the findings, providing the framework for future, larger-scale studies.

3.2. Data collection and instrument

This inquiry utilizes survey approaches to gather data on TQM from hospital bulletins and computer systems. The obtained data is minimally affected by external factors, ensuring its reliability and validity. The study employs the Statistical Package for the Social Sciences (SPSS) to analyze data, perform different statistical tests, and facilitate both quantitative and qualitative data analysis. The research also utilizes self-designed questionnaires to measure Satisfaction among different hospital stakeholders, with the validity and reliability of these questionnaires confirmed by factor analysis and Cronbach's alpha coefficient approach. The research highlights the need for precise data entry, analysis, and control, which includes the processes of data cleaning and validation, to guarantee the dependability of SPSS and the questionnaires.

3.3. Data analysis

This study utilizes SPSS 21.0 software to quantitatively examine patient grouping data, where measurement data is expressed as the mean value plus or minus the standard deviation. The study

utilizes descriptive statistical techniques, including absolute frequency, per cent frequency, mean, and standard deviation. Statistical techniques such as the independent samples t-test and one-way analysis of variance (ANOVA) are used to compare and analyze the relationships between variables. Hypothesis testing is performed, and the p-value is used to determine if there is a statistically significant difference.

The study looks at medical quality, economic operations, and hospital contentment indicators, which include treatment outcomes, safety protocols, financial performance, resource utilization, and patient contentment. Alternative methodologies, such as case studies or mixed-methods studies that combine qualitative interviews and quantitative surveys, could provide a more in-depth and comprehensive knowledge of the impacts of Six Sigma management.

4. RESULTS

The hypothesis suggests that when TQM practices are implemented, particularly the 6S site management, it positively influences the quality of services in Chinese public hospitals. To test the effectiveness of 6S site management, we look at three key indicators: the quality of medical care, the economic performance, and the level of patient satisfaction.

4.1. Results of medical quality indicators

The study utilized the paired samples t-test to examine the medical quality indicator before and following the implementation of 6S site management in hospitals A, B, and C (see Table 1).

Table 1. The paired samples t-test of medical quality indicator before and after applying the 6S site management

Item	Before 6S site management (n = 11)	After 6S site management (n = 13)	t-value	p-value
Hospital A				
Adverse event	6.55 ± 4.30	5.08 ± 2.72	0.979	0.342
Hospital B				
1. Number of late cases	116.16 ± 112.36	220.15 ± 134.14	-2.741	0.009
2. Hospital-acquired infections	92.95 ± 12.29	99.75 ± 0.29	-3.496	0.001
3. Antimicrobial drug utilization rate	50.51 ± 6.85	44.94 ± 3.86	2.783	0.008
4. Number of antimicrobial drug use	847.37 ± 106.78	726.00 ± 158.06	3.008	0.004
5. Antimicrobial drug delivery rate	9.25 ± 15.60	26.24 ± 8.94	-3.718	0.000
6. Nosocomial infection rate	0.74 ± 0.28	0.69 ± 0.19	0.654	0.516
Hospital C				
1. Problematic cases	32.00 ± 5.23	32.77 ± 8.93	-0.262	0.796
2. Single negative case	1.18 ± 1.78	1.62 ± 1.39	-0.671	0.509
3. Total hospital-wide end-of-life medical record cases	68.27 ± 7.38	74.92 ± 27.83	-0.828	0.422
4. Proportion of problematic cases	90.40 ± 4.73	85.50 ± 11.46	1.321	0.200
5. Proportion of handover cases	10.61 ± 21.44	4.39 ± 9.00	0.953	0.351
6. Proportion of difficult cases	36.18 ± 31.40	24.32 ± 24.64	1.036	0.311
7. Proportion of problematic critical-value cases	3.03 ± 10.04	3.30 ± 6.27	-0.08	0.937
8. Clinical pathway access rate	78.55 ± 5.72	83.82 ± 3.81	-2.696	0.013*
9. Clinical pathway completion rate	90.84 ± 3.75	95.87 ± 3.52	-3.386	0.003**
10. Clinical pathway management rate	52.53 ± 6.16	59.33 ± 6.62	-2.587	0.017*
11. Medically unsafe events	12.36 ± 4.80	10.00 ± 3.27	1.429	0.167
12. Nursing adverse events	3.82 ± 2.27	2.77 ± 1.64	1.311	0.203
13. Outpatient clinic prescription compliance rate	91.88 ± 7.94	99.23 ± 1.72	-3.01	0.012*
14. Outpatient antimicrobial drug utilization rate	15.38 ± 2.64	15.18 ± 3.50	0.161	0.874
15. Antimicrobial drug utilization rate in wards	43.12 ± 7.16	36.27 ± 12.45	1.61	0.122
16. Antimicrobial drug microbial delivery rate	25.97 ± 4.62	35.17 ± 6.99	-3.723	0.001**
17. Hospital-acquired quality control inspection problems	45.73 ± 8.03	32.23 ± 16.96	2.552	0.020*
18. Hand hygiene compliance	49.45 ± 18.78	62.91 ± 16.27	-1.883	0.073
19. Correct hand hygiene rate	74.41 ± 13.14	91.05 ± 9.03	-3.663	0.001**
20. Infection rate (usually of a disease)	0.28 ± 0.16	0.11 ± 0.16	2.445	0.023*
21. Drug-to-medicine ratio	18.66 ± 2.15	13.68 ± 2.15	5.655	0.000**

Note: * significant at 0.05; ** significant at 0.01.

Although there were no statistically significant differences in adverse events for hospital A and no variations in the nosocomial infection rate for hospital B, hospital B showed significant improvements in other elements of medical quality. The study also assessed the effects of 6S site management on different areas of hospital operations. It found notable enhancements in 9 out of 21 aspects, such as the clinical pathway access rate, clinical pathway completion rate, clinical pathway management rate, outpatient clinic prescription compliance rate, and correct hand hygiene rate. The data indicate that implementing 6S site management can enhance hospital operations (Sun et al., 2022).

4.2. Results of economic performance indicators

The study assessed the influence of 6S site management on economic performance indicators in

hospitals A, B, and C (refer to Table 2), noting considerable disparities in multiple areas after its adoption. Hospital A experienced positive changes in total business volume, outpatient volume, number of admissions, and ward income. However, there was a decline in the proportion of Western medicines proprietary to Chinese medicines and the percentage of Chinese medicine drinking tablets. Hospital B experienced enhancements in outpatient income, outpatient volume, and outpatient examination income. Hospital C exhibited notable disparities in the proportion of outpatient Chinese medicine prescriptions to total prescriptions, the proportion of discharged patients who utilized Chinese medicines, and the drug-to-medicine ratio. The findings indicate that using 6S site management can result in enhancements across multiple dimensions of economic performance and healthcare operations (Wang & Liu, 2023).

Table 2. The paired samples t-test of economic performance indicator before and after applying the 6S site management

Items	Before 6S site management (n = 11)	After 6S site management (n = 13)	t-value	p-value
Hospital A				
1. Total business volume	4789893.81 ± 1211610.78	5889488.27 ± 921532.13	-2.524	0.019*
2. Outpatient volume	16444.36 ± 2261.05	20598.38 ± 1789.24	-5.026	0.000**
3. Number of admissions	1347.64 ± 92.46	1530.08 ± 86.63	-4.985	0.000**
4. Ward income	9739341.36 ± 939056.57	11819513.85 ± 557161.29	-6.725	0.000**
5. Business volume of Chinese medicine tablets	519143.91 ± 104302.03	492472.54 ± 53269.75	0.768	0.455
6. Proportion of Western medicines proprietary to Chinese medicines	0.27 ± 0.02	0.24 ± 0.01	4.971	0.000**
7. Percentage of Chinese medicine drinking tablets	0.04 ± 0.01	0.06 ± 0.01	-3.78	0.001**
Hospital B				
1. Outpatient income	43632.88 ± 356.01	44439.46 ± 118.89	-12.364	0.000
2. Outpatient volume	19817.58 ± 3364.79	23987.46 ± 2534.12	-4.096	0.000
3. Outpatient drug ratio	27.64 ± 5.11	27.07 ± 3.67	0.37	0.713
4. Outpatient examinations income	2450455.20 ± 374440.19	3188432.23 ± 213865.80	-6.73	0.000
5. Business income	21282159.98 ± 3306407.11	25908719.69 ± 1377406.43	-7.145	0.000
6. Ward drug ratio	25.45 ± 2.98	23.38 ± 1.45	3.34	0.002
7. Number of discharges	1928.92 ± 333.40	2212.00 ± 202.13	-2.883	0.006
8. Hospitalization days	8.59 ± 0.37	9.94 ± 0.45	-10.882	0.000
9. Number of cases	33.89 ± 25.33	12.58 ± 5.21	4.754	0.000
Hospital C				
1. Discharge medical records	404.64 ± 54.22	472.46 ± 108.75	-1.977	0.063
2. Ratio of outpatient Chinese medicine prescriptions to total prescriptions	38.23 ± 8.17	48.91 ± 4.79	-3.816	0.002**
3. Proportion of discharged patients who used Chinese medicines	55.15 ± 7.55	76.57 ± 17.35	-4.022	0.001**
4. Drug-to-medicine ratio	18.66 ± 2.15	13.68 ± 2.15	5.655	0.000**
5. Total revenue	5212409.09 ± 505406.86	5811084.62 ± 924057.62	-1.916	0.068

Note: * significant at 0.05; ** significant at 0.01.

4.3. Results of hospital satisfaction indicator

The study provides the p-values of the paired samples t-test for hospital A's satisfaction indicators

before and after implementing the 6S site management (see Table 3). The results indicate significant disparities in patient satisfaction, doctor satisfaction, and nurse satisfaction.

Table 3. The paired samples t-test of hospital satisfaction indicator before and after applying the 6S site management

Items	Before 6S site management (n = 11)	After 6S site management (n = 37)	t-value	p-value
Hospital A				
Patient satisfaction	0.90 ± 0.03	0.92 ± 0.03	-2.105	0.041*
Doctor satisfaction	0.89 ± 0.03	0.91 ± 0.03	-2.224	0.031*
Nurse satisfaction	0.89 ± 0.03	0.91 ± 0.04	-2.294	0.026*
Hospital B				
Patient	0.91 ± 0.02	0.93 ± 0.00	-4.875	0.000
Doctor	0.89 ± 0.02	0.90 ± 0.00	-4.125	0.000
Nurse	0.90 ± 0.02	0.91 ± 0.00	-4.124	0.000
Hospital C				
Overall	94.24 ± 5.93	98.22 ± 0.18	-2.226	0.05

Note: * significant at 0.05; ** significant at 0.01.

More precisely, all three aspects show a notable rise following the alteration in management. After implementing 6S site management, hospital B experienced statistically significant differences in all elements of the hospital satisfaction indicator. However, hospital C did not show a statistically significant difference in the hospital satisfaction indicator before and after implementing 6S site management. This suggests that while 6S site management had a significant impact on hospitals A and B, it did not have a similar effect on hospital C.

A questionnaire survey was conducted at hospital C (Table 4) to assess levels of satisfaction among patients and hospital employees. The survey

measured satisfaction in three categories: outpatient satisfaction, inpatient satisfaction, and hospital employee satisfaction. The average outpatient satisfaction deviated from the theoretical value of 3.0 both before and after implementing 6S site management, suggesting that all six factors of outpatient satisfaction are not equivalent to 3.0. Outpatient satisfaction was significantly influenced by differences in outpatient basic information, such as age and kind of visit, but not by gender. Furthermore, variations in origin also led to disparities in outpatient satisfaction, the specific impacts of which will be explored in further detail.

Table 4. The one-sample t-test of outpatient satisfaction before and after applying the 6S site management

Case	Items	N	Mean	Std. dev.	t-value	p-value
Hospital C						
Before applying 6S site management	1. Medical environment and service process	162	3.326	0.919	4.509	0.000
	2. Medical service quality	162	3.190	0.868	2.789	0.006
	3. Satisfaction and recommendation intention	162	3.210	0.965	2.768	0.006
After applying 6S site management	4. Medical environment and service process	164	3.686	0.896	9.806	0.000
	5. Medical service quality	164	3.689	0.825	10.69	0.000
	6. Satisfaction and recommendation intention	164	3.528	0.887	7.631	0.000

According to the data in Table 5, the p-value for the relationship between medical service quality and satisfaction, and recommendation intention, based on origin, is below 0.05. This indicates a statistically significant difference in outpatient satisfaction. In contrast, the p-value for the medical

environment and service process is more than 0.05, suggesting that there is no significant difference. Regarding inpatient satisfaction, the mean values before and during the implementation of the 6S site management differ from the theoretical value of 3.0.

Table 5. The one-way ANOVA of the origin

Items	1.0 (n = 185)	2.0 (n = 90)	3.0 (n = 51)	F-value	p-value
1. Medical environment and service process	3.56 ± 0.89	3.58 ± 0.91	3.19 ± 1.01	3.707	0.026*
2. Medical service quality	3.45 ± 0.84	3.55 ± 0.83	3.22 ± 1.06	2.425	0.09
3. Satisfaction and recommendation intention	3.54 ± 0.89	3.14 ± 0.86	3.17 ± 1.13	7.017	0.001**

Note: * significant at 0.05; ** significant at 0.01.

Table 6 shows that the p-values for both the medical environment and service process, and medical service quality are roughly 0.00, which is much lower than the threshold of 0.05. This indicates that the average value of these two dimensions is not equal to 3.0. On the other hand, the p-value for satisfaction and recommendation intention is around 0.152, which is higher than

the threshold of 0.05. This indicates that the average value is equal to 3.0. The data also shows that the p-value for all aspects of inpatient satisfaction after implementing the 6S site management is roughly 0.00. This indicates a significant difference. The average inpatient satisfaction value before the implementation of 6S site management is lower than the value observed after its adoption.

Table 6. The one-sample t-test of inpatient satisfaction before and after applying 6S site management

Case study	Items	N	Mean	Std. dev.	t-value	p-value
Before applying 6S site management	1. Medical environment and service process	188	3.354	0.976	4.97	0.000
	2. Medical service quality	188	3.289	0.918	4.309	0.000
	3. Satisfaction and recommendation intention	188	3.112	1.064	1.439	0.152
After applying 6S site management	1. Medical environment and service process	188	3.563	0.81	9.516	0.000
	2. Medical service quality	188	3.523	0.854	8.388	0.000
	3. Satisfaction and recommendation intention	188	3.496	0.893	7.62	0.000

The introduction of 6S site management has resulted in a significant increase in the average value across all dimensions, as indicated by a p-value of approximately 0.00, which is well below the threshold of 0.05. Gender has no significant effect on inpatient satisfaction. However, age has a substantial impact on medical service quality, satisfaction, and recommendation intention. This is supported by a p-value that is significantly lower than 0.05. Differences in the source of patients lead to differences in their satisfaction with the quality of medical services and their intention to recommend them, but not concerning the medical environment and service process.

Table 7 shows that the p-values for medical environment and service process, and satisfaction and recommendation intention, when divided into groups based on type of visit, are roughly 0.010 and 0.022, respectively. The values fall below the crucial threshold of 0.05, indicating a statistically significant difference in inpatient satisfaction based on the type of visit. On the other hand, the p-value for medical service quality is around 0.536, which is higher than the threshold of 0.05. This suggests that there is no significant difference. The implementation of 6S site management has resulted in a difference between the average values of hospital employee satisfaction

and the expected value of 3.0. Although the p-values for leadership and management evaluation, and information disclosure and employee benefit evaluation are greater than 0.05, indicating that the mean value of these two dimensions is consistent with 3.0, the p-value for employee work

environment and development evaluation is significantly less than 0.05, indicating a significant difference. This indicates that the management of the 6S site has a significant impact on the level of satisfaction experienced by hospital employees.

Table 7. The independent samples t-test of the type of visit

<i>Outpatient satisfaction</i>	<i>First diagnosis (266)</i>	<i>Others (110)</i>	<i>t-value</i>	<i>p-value</i>
1. Medical environment and service process	3.39 ± 0.95	3.63 ± 0.76	-2.582	0.010*
2. Medical service quality	3.39 ± 0.91	3.45 ± 0.86	-0.619	0.536
3. Satisfaction and recommendation intention	3.23 ± 1.00	3.49 ± 0.98	-2.305	0.022*

Note: * significant at 0.05; ** significant at 0.01.

Table 8 shows that the p-values for all aspects of hospital employee satisfaction are approximately 0.00, which is much lower than the threshold of 0.05. This indicates that the average values of these dimensions increase after implementing the 6S site

management. Discrepancies in fundamental details of hospital employees, including gender, marital status, age, and job type, have the potential to impact the level of satisfaction among hospital employees.

Table 8. The paired samples t-test of hospital employee satisfaction before and after applying the 6S site management

<i>Items</i>	<i>Before applying 6S site management (n = 172)</i>	<i>After applying 6S site management (n = 173)</i>	<i>t-value</i>	<i>p-value</i>
1. Leadership and management evaluation	3.12 ± 0.98	3.66 ± 0.87	-5.356	0.000
2. Employee work environment and development evaluation	3.14 ± 0.95	3.42 ± 0.83	-2.864	0.004
3. Information disclosure and employee benefit evaluation	3.10 ± 0.94	3.53 ± 0.89	-4.331	0.000

The research demonstrates that both gender and marital status do not have a significant impact on hospital employee satisfaction, as indicated by p-values that are higher than the threshold of 0.05. On the other hand, the age of hospital employees has a substantial impact on the evaluation of their leadership and management skills in terms of their satisfaction, as shown by a p-value that is lower than the threshold of 0.05. Age has no substantial impact on the evaluation of the employee work environment and development, as well as the evaluation of information disclosure and employee benefits. In addition, the type of job does not have a major impact on the satisfaction of hospital employees. The results emphasize the effectiveness of the 6S site management strategy in improving hospital employee satisfaction. Additionally, they show that factors like gender, marital status, age, and job type do not always lead to substantial differences.

5. DISCUSSION

This research investigates the impact of TQM practices, specifically 6S site management, on service quality in Chinese public hospitals. It measures the effectiveness of 6S across three areas: medical care quality, economic performance, and satisfaction levels. The study finds that 6S enhances hospital operations, improves economic performance, and significantly increases Satisfaction among patients, doctors, and nurses. Thus, the data indicates that 6S site management substantially improves the overall hospital experience.

The introduction of 6S site management greatly improved healthcare quality in specific hospitals. These benefits were demonstrated by decreases in the number of late case submissions, enhancements in testing for hospital-acquired infections, streamlining the use of antimicrobial medications, and higher rates of successful deliveries. From an economic standpoint, the introduction of

6S resulted in significant growth in outpatient revenue, visits, admissions, and business income, demonstrating its favourable influence on hospitals' economic performance (Sun et al., 2022). After the adoption of 6S site management, the study saw a noteworthy rise in the percentage of outpatient Chinese medicine prescriptions out of the total prescriptions, as well as the percentage of discharged patients' visits that used Chinese medicine. Moreover, there was a decrease in the ratio of pharmaceuticals used in the ward after the installation of 6S site management. This indicates a shift towards more sensible use of drugs, aiming to improve patient outcomes and lower expenses (Van Nguyen et al., 2023; Piccarozzi et al., 2021).

The study reveals that implementing 6S site management has a good impact on the economic performance of hospitals. However, the impacts vary among different hospitals and measures. The statement underscores the need for customized enhancements and ongoing surveillance to properly grasp the influence of 6S on patient safety (Xiao et al., 2023; Zehir & Zehir, 2023). The research establishes a basis for additional investigation, suggesting areas that can be expanded and intensified. It highlights the importance of thorough research and personalized approaches to improve the quality, effectiveness, and patient happiness in different medical settings. The study noted a rise in satisfaction levels after the installation of 6S. Hospitals that implemented 6S during the epidemic observed enhanced levels of Satisfaction (Yu et al., 2020).

In the field of medical care quality, research has shown that using 6S management principles, which combine lean principles and visual management, can dramatically improve the efficiency of adverse event closure in high-demand environments such as an adult oncology department (Wang & Liu, 2023). This methodology keeps track of crucial metrics such as the average

number of days it takes to close both medication and non-medication occurrences from the day they are reported (Huang et al., 2024). Furthermore, it has been shown to significantly increase the quality of clinical nurse management. A comparative analysis of nurse satisfaction in the ward, handover items, warehouse inventory time, ICU rescue efficiency, and the incidence of nursing adverse events before and after implementing the 6S system found significant improvements. However, these findings highlight the need for additional (Wei et al., 2020).

In terms of economic performance, using the 6S model in many industries, including manufacturing and fashion, has been found to streamline processes, decrease waste, and encourage a safer, more productive workplace (Chen, 2021). These studies focused on businesses from a wide range of industries (Alqatamin et al., 2024; Draçi & Demi, 2023). While the 6S methodology has provided major benefits, implementation issues remain, necessitating the investigation of continuous improvement strategies.

Concerning satisfaction levels, research conducted among nurses in a ward and employees in various firms compared satisfaction levels before and after the application of the 6S technique (Jiménez et al., 2019). The data show that the 6S technique improves nurse satisfaction on the ward, increases workplace efficiency and safety, and promotes overall workplace satisfaction (Nagendrakumar et al., 2023; Velte, 2022). However, there is still a need for constant improvement and adaptation to various organizational circumstances (Raman et al., 2021). This demonstrates the 6S methodology's dynamic nature and the possibility for additional development and modification.

According to the literature, the majority of the research undertaken thus far has focused on the implementation of 6S management in hospital settings in normal, non-pandemic conditions (Jiménez et al., 2019; Wang & Liu, 2023). This research has shed light on the efficacy and practicality of 6S management in such contexts. However, the current study deviates from this tendency by focusing on the unique and unprecedented environment of the COVID-19 pandemic. This shift in context and setting is significant because it enables the investigation of 6S management solutions in extreme circumstances, such as increased uncertainty and rapidly changing healthcare demands.

As a result, the findings of this study add to the current body of knowledge, broadening our understanding of the application and efficacy of 6S management in a variety of scenarios. This, in turn, strengthens the evidence base supporting

the application of Six Sigma management in healthcare settings.

6. CONCLUSION

This study looks at how TQM approaches, specifically 6S site management, are being implemented in Chinese public hospitals and how they may have a positive impact on service quality. The effectiveness of 6S site management is evaluated using three important metrics: medical treatment quality, economic performance, and patient satisfaction.

In terms of medical care, the study assesses how 6S site management affects several hospital activities, such as clinical pathway access rate, clinical pathway completion rate, clinical pathway management rate, outpatient clinic prescription compliance rate, and correct hand hygiene rate. The evidence suggests that implementing 6S site management can improve hospital operations. The second set of statistics focuses on economic performance, with favourable changes in total business volume, outpatient volume, number of admissions, ward income, and outpatient examination revenue. The findings imply that using 6S site management can improve different elements of economic performance and healthcare operations.

The final indicator looks at satisfaction levels, including differences in patient satisfaction, doctor satisfaction, and nurse satisfaction. Notably, all three aspects improve significantly after the change in management. The data reveals that implementing 6S site management has a significant impact on hospital personnel satisfaction levels.

The study has potential drawbacks. It lacks a strong framework for applying findings to various healthcare settings, making broad applicability challenging. The study is based on the limited sample size of three hospitals restricts generalizability. Furthermore, implementing 6S site management in different hospitals may provide obstacles due to differences in resources, staff training, and readiness, underscoring the need for more personalized studies and approaches.

Future studies could increase the sample size to include more varied hospitals, making the findings more generalizable. Deeper insights could be gained by investigating the effects of 6S site management in various situations and during healthcare crises. Exploring specialized solutions for hospitals with varied resources and preparedness levels, as well as analyzing patient safety and monitoring systems, could help to demonstrate the benefits of 6S site management in terms of healthcare quality, efficiency, and satisfaction.

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