

ORIGINAL ARTICLE

IMPROVING QUALITY HEALTH CARE SERVICES BY IMPLEMENTING DMAIC APPROACH IN PAEDIATRIC CARDIOLOGY DEPARTMENT OF PUBLIC HOSPITAL OF SINDH, PAKISTAN: A CASE STUDY

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Objectives: The hospital industry has changed its dimension from diagnosis to complete total patient satisfaction. This study aims to identify the critical variables that can enhance overall patient satisfaction in the hospital industry. The study identified three critical factors for any hospital to provide quality service.

Methodology: The study adopted the lean Six Sigma process improvement methodology to identify the critical service factors in hospitals. Lean Six Sigma is a flexible problem-solving tool that comprehensively solves any problem. DMAIC process improvement methodology is used to define, measure, analyze, improve, and control the overall experience in the hospital. CTQ (critical to quality) was defined and represented by Kano methodology. After filtration through cause and effect analysis, three core dimensions and 25 sub-dimensions of critical quality were identified. The impacts of these 25 sub-dimensions were evaluated and prioritized using the Kano Model of patient satisfaction. This identifies the most critical service requirement. This study is an initiative for service quality improvement in the hospital industry. In the future, this technique can be modified and adopted by different public and private hospitals to enhance the practical implementation.

Results: Findings indicate that healthcare organizations demonstrate enhanced system-wide capabilities, optimizing resource utilization. Understanding patient needs propels satisfaction and delight. Three overarching factors, with 25 sub-factors, significantly impact patient satisfaction, predominantly yielding positive effects across the categories.

Conclusion: This research concludes that providing quality service is critical in the hospital industry. Quality service is pivotal in the evolving hospital industry, transitioning from a focus on diagnosis to holistic patient satisfaction. This study aims to identify critical variables essential for enhancing overall patient satisfaction, pinpointing key factors crucial for delivering quality service in any hospital.

Keywords: Hospital quality, Quality Improvement, Kano Model, Lean- Six Sigma (LSS), DMAIC, Patient satisfaction, Total Quality Management

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INTRODUCTION

Healthcare is a one-of-a-kind service industry that deals with arduous duties; healthcare firms must use quality improvement tools to complete challenging tasks.¹ Healthcare quality and costs are a growing problem in Pakistan. Pakistan is the world's sixth most populous country, and health human resources are inadequate to meet the population's needs.² The

Pakistani government spends 3.1% of GDP on economic, social, and community services and 43% on debt repayment. About 0.8% is spent on medical care, even less than 1.2 in Bangladesh.³ The government of Pakistan (GOP) and provincial governments (PGs) spend large amounts of budget on the health care industry (HCI) to facilitate the fundamental rights of people. However, technological advancements and factors like economic, social,

political, environmental, and liberalization rules have drastically modified the fitness care state of affairs everywhere. Management of exceptional in each quarter is a crucial problem irrespective of public or personal organizations. Nevertheless, it is inevitable here as well when it comes to HCI. However, private hospitals are more focused on giving adequate competition to public hospitals in Pakistan by implementing different quality management methods, especially in the financial city of Pakistan which it is Karachi, where the Provisional Government of Sindh (PGOs) has given PKR 139bn for healthcare to maintain and provide quality healthcare services to people of not merely Sindh but coming from all over Pakistan. Today's healthcare sector is dynamic and exciting, with numerous opportunities and challenges.^{4,5} On the one hand, opportunities are to deliver high-quality patient care with the latest technical, diagnostic, therapeutic, management, and leadership innovations. On the other hand, if there are challenges to patients, groups of patients should be given precedence.⁴

The doctor-to-patient ratio in Pakistan is 1:1300, the doctor-nurse ratio is 1:2.7, and the nurse ratio is 1:20.⁶ Healthcare systems are complex daily. Errors of any type, such as medical or administrative, are unignorable. To meet quality services and provide-centered care will take successful strategies, error-free operations, mistake communication, integrated departments, teamwork, and a strong culture in the organization, which can be achieved by implementing the lean Six Sigma DMAIC approach in HCI. Improving quality within the healthcare system would increase the value of the care.⁶

Quality-improvement professionals have existed since at least the mid-nineteenth century; some are still well-known today. During the Crimean War (1854–1856), Florence Nightingale (1820–1910) worked as a nurse in the Scutari hospital in Turkey. There were filthy beds, clogged latrines, terrible food, and other filthy conditions for the wounded soldiers, and 43 percent of the admitted men died. In a well-known study, she hypothesized that bad sanitation was the reason for the high mortality rate; she had the hospital cleaned and sanitized and noted that the mortality rate dropped to a mere 2 percent. It was a formidable success that probably also saved many lives.³ The well-known Ernest Codman (1869–1940) was a Boston surgeon who owned a private hospital called End Result Hospital. During the six years from 1911 to 1916, he discharged 337 patients, recorded 123 disabilities, and measured these results. He lacks knowledge, skills, lack of surgical judgment, care, lack of equipment, lack of diagnostic skills. These

errors were identified to be acknowledged and prevented from happening next time.⁷

Six Sigma implies different things to various people.⁸ Today, many organizations are focusing on improvement programs. Most companies prefer Six Sigma because it has various areas of improvement to reduce deviations. Six Sigma can be applied to both continuous improvement and breakthrough initiatives. The emphasis on variance reduction assumes that the mean initially improved to an acceptable level.⁹ Motorola Company developed the Six Sigma approach (SSA) in the 1980s. SSA has been used to improve quality, processes, services, and patient satisfaction in organizations since its establishment. SSA focuses on flaws per million opportunities. Six Sigma is based on quality statistics equivalent to 3.4 defects (DPMO) per million opportunities. This is the target performance level for the process.¹⁰ This is a reasonably high level, as the industry standard at the time was around 35,000. DPMO.¹¹ Motorola reaped the benefits of Six Sigma's achievement. As a result, many Fortune 500 businesses adopted Six Sigma in the 1990s, and it helped them achieve considerable gains. Among the companies on the list were well-known names like AlliedSignal (now Honeywell), GE, and 3M. At the same time, Six Sigma underwent a considerable transformation. GE, in particular, improved Six Sigma by implementing several new procedures. According to the company, Six Sigma has become a fundamental element of GE's business culture and strategy.¹²

According to a more typical definition, Six Sigma is a set of tools and strategies for problem-solving and process improvement, e.g. (Das et al., 2008). DMAIC is so well-known that many people mistake it for Six Sigma. In a service-oriented organization, the Six Sigma concept can be utilized.¹³ DMAIC is a six-sigma process. Each phase includes detailed strategies that guide project managers through the quality improvement process.¹⁴

Healthcare systems are fragile and need more attention and care than any other industry because a single mistake can cost a person's life, which is why endless efforts are being put in to make this industry error-free. The objective of this research is to increase awareness, and the methodology shared in this research will enhance the knowledge of people, employees, and management working in health care management systems and those keen to strive to improve the quality of health care services, processes, and operations in health care systems and those putting endless efforts to increase patient-centered care simultaneously. Nevertheless, this approach will

also help healthcare service providers reduce unnecessary operations, activities, and wastage and focus on the essential things to utilize and allocate resources accordingly, saving time, money, and numerous lives. This article examines how lean Six Sigma DMAIC methodology can be implemented to improve the quality of healthcare services and management operations, reduce unnecessary chores and errands, and improve patient-centered care.

The significant contribution of this study is to advance the understanding of healthcare workers and management to improve quality services so that the people of Karachi and Pakistan can benefit from the public hospitals of Karachi. However, it helps in decision-making, identifying the problem's root causes, and creating a road map to address issues, saving time and money.

METHODOLOGY

Lean Six Sigma in the healthcare system: The healthcare sector is a critical cornerstone of modern society, and the primary goals of a health organization are to diagnose, cure, rehabilitate, and educate. Several instruments have been developed in the past to measure the level of quality in the healthcare industry. However, the specific tool of measurement still needs to be clarified.^{15,16} The well-known gap model or SERVQUAL model was developed to evaluate the quality in a business environment. However, nowadays, healthcare researchers widely adopt this model to evaluate the gap between the perception of the patient/customer and the actual level of service provided.^{17,18} In Iran Mosadeghrad,¹⁹ this study looks at the elements determining healthcare quality in Iran's hospitals. In eight Iranian hospitals, 222 healthcare stakeholders, including healthcare practitioners, policymakers, and managers, were involved in identifying these characteristics. It also found that more resources are needed to improve the quality of healthcare services. Furthermore, suppose healthcare organizations are to provide high-quality services. In that case, they must make essential adjustments in several healthcare system components. In India, Rohni and Mallikarjun,²⁰ this study has implemented the Six Sigma DMAIC approach in corporate hospitals situated in Bangalore, India. To identify reasons for case delay and cancellations in operation theatre considering data of 6 months. Furthermore, this study involves the before and after implementation of the corrective actions, which shows a positive change in cases of delay, cancellation, and cost incurred.

In Turkey Çimen, Mesut & Deniz, Serkan²¹ discussed a few case studies of hospitals that implemented Six

Sigma to achieve positive results. A hospital improved its surgical supply chain management and obtained a \$1 million saving. Another health service was achieved to reduce the length of time to recovery. Stanford Hospital and Clinic have saved \$15 million annually by introducing Six Sigma during coronary artery bypass graft surgery. Furthermore, Stanford reduced the mortality rate from 7.1 percent to 3.7 percent and saved \$25 million annually by implementing Six Sigma to standardize its purchasing processes. The Six Sigma approach is one of the best tools that could be used to achieve goals like maximum employee efficiency and reducing costs, inferiority, repetitive transactions, and waste ratio. In Bangladesh, Selim Ahmed¹ also suggests that the Six Sigma DMAIC approach helps improve healthcare organizations' internal and external performance.

Nevertheless, it also helps in continuous healthcare quality performance and creates a unique competency that can be adequately difficult for competitors to adopt. Rosas Hernández et al.²² show that implementing the lean health DMAIC method positively reduces waste and time and improves process efficiency. Furthermore, results show that it directly impacts reducing costs, improving resource utilization, and reducing staff processing time.

Momani et al.²³ enquired that creating up-to-date, realistic emergency plans and specialized training to cover the primary types of safety concerns can significantly increase emergency readiness. Furthermore, with intervention, the hospital staff became more conscious of safety risks. A significant success aspect was frontline personnel's ongoing participation in the data collection process and the execution of improvement plans. Following the intervention, the hospital staff became more conscious of safety risks. A significant success aspect was frontline personnel's ongoing participation in the data collection process and the execution of improvement plans. Corbett²⁴ scored the greatness of the business by the award-winning Quality Association using Lean Six Sigma, using a context-sensitive research approach, and leveraging information from interviews and public workshops. We suggest finding out how we support our efforts to improve. In addition, freely accessible materials such as funding applications were analyzed. Two federations were considered. One is New Zealand, and the other is the United States. The results show that Lean Six Sigma can significantly contribute to all classes of business standards for outstanding execution. There was no evidence of similarity issues between the Lean segment and the Six Sigma segment.

Data Analysis Method

The DMAIC (Define, Measure, Analyse, Improve and control): DMAIC problem-solving technique is used, which drives lean Six Sigma. It is a five-phase technique (Define-Measure-Improve-Control).¹ The DMAIC technique in this study is implemented for problem-solving, product/service, and process improvement. Six Sigma Methodology, with a special emphasis on the DMAIC approach, which is a key component of its implementation. A case study approach was used to determine whether and how the LSS technique could be extended to the Paediatric Cardiology Department (PCD) to improve services in a healthcare organization. It will also open up the chances for future suggestions to make the improvement cycle more effective. This research is based on a case study of the Pediatric Cardiology department of a world-recognized tertiary hospital providing endless support and free-of-cost cardiac services to the people of Pakistan.

The National Institute of Cardiovascular Diseases (NICVD) has played a pivotal role in caring for patients with heart disease in Pakistan. NICVD has been the primary heart-care provider for Pakistanis for over 50 years. NICVD has 21 chest pain units and nine satellite centers. In general, 3.8 million patients were treated free of cost in 2019 and 2020. The Pediatric Cardiology department of NICVD was extremely busy with numerous flows and limited pediatric specialized staff and doctors, making it challenging to provide quality patient services.

Define: In the defining phase, the PCD team wanted to know which specific quality gap they wanted to close with LSS. The PCD team discussed and filled improvement chances by implementing the Voice of Patient (VOP) and Voice of Hospital (VOH) tools. The process flow is depicted in Figure 1.

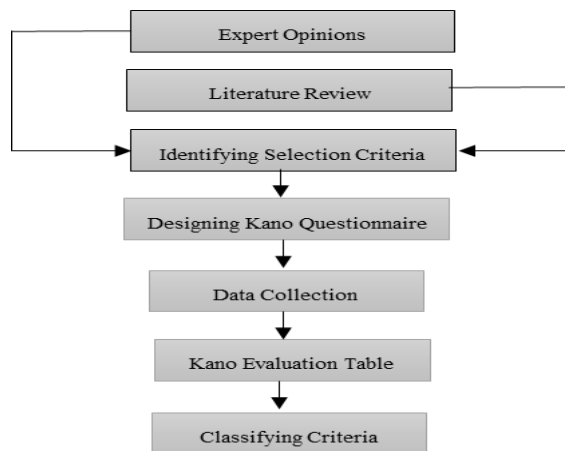


Figure 1: The Research flow

Measure: In the Measure phase, a cause and effect (C&E) matrix, important causes driving longer reaction times, and mismanagement were identified. This section will use a fishbone diagram to identify several reasons for dissatisfaction. The fishbone diagram used represents the cause-and-effect relationship of different variables. See Figure 2.

Analyze: In the analysis phase, the Kano model is used to increase satisfaction. Norakai Kano proposed the Kano model in 1984.²⁵ It is a set of ideas and methods for measuring customer satisfaction with product features. Kano is a Japanese word that means "to (1984). Although it was first proposed for tangible items or objects, it has now been expanded to cover services, as demonstrated in the example below.^{26,27}

The Kano model was used to analyze consumer satisfaction with hospital service quality in the service region in this study. Five different types of product/service attributes are depicted in the model. Figure 3 shows the five categories: (1) Must-be, (2) One-dimensional, (3) Attractive, (4) Indifferent, and (5) Reverse. It shows a schematic representation of the process. According to Figure 3, an attribute is a Must-be attribute if its absence causes complete discontent and its presence does not improve contentment. Suppose the fulfillment of an attribute contributes to a higher level of satisfaction. In that case, it is termed a one-dimensional attribute, and vice versa. Suppose an attribute contributes to higher pleasure but is not expected to be in the product. In that case, it has been deemed an Attractive attribute. If the presence or absence of an attribute has no significant impact on consumer pleasure, it is classified as Indifferent. If the presence of a characteristic creates dissatisfaction and vice versa, it is considered a Reverse attribute²⁸. As a result, for the VOP to be meaningfully integrated into the following product development processes. It is critical to take the following steps: Remember the qualities that must exist. Add a lot of One-dimensional and Attractive characteristics to your character. As many indifferent traits as possible should be avoided. Reverse qualities should be avoided.

The Kano model is a framework used to determine the quality attributes of a product or service based on customer needs and preferences. The model uses a structured questionnaire with pairs of functional and dysfunctional questions on each quality attribute.^{29,30} The questionnaire asks respondents to

rate each quality attribute by choosing one of the following options: (1) I like it that way; (2) It must be that way; (3) I am neutral; (4) I can live with it that way; and (5) I dislike it that way. Based on the responses, the attributes are classified into one of the following categories: Must-Haves, Performance Attributes, Attractive Attributes, Indifferent Attributes, and Reverse Attributes. Must-haves are attributes that are considered essential by customers, and their absence would lead to dissatisfaction. Performance Attributes directly impact customer satisfaction, and their presence enhances satisfaction, but their absence does not necessarily lead to dissatisfaction. Attractive Attributes surprise and delight customers, and their presence leads to high levels of satisfaction, but their absence does not necessarily lead to dissatisfaction. Indifferent Attributes are those that do not affect customer satisfaction in any significant way, and customers are indifferent towards their presence or absence. Reverse Attributes are those that lead to dissatisfaction when present and lead to satisfaction when absent. If a respondent gives conflicting

responses, such as "I like it that way" and "I dislike it that way" on both sides of the same issue, it is called a questionable (Q) response. These responses are analyzed separately as they indicate a need for more understanding or consistency in the respondent's preferences. Overall, the Kano model helps companies understand customer needs and preferences and prioritize their efforts to improve the quality of their products or services. By focusing on the Must-Haves, Performance Attributes, and Attractive Attributes, companies can improve customer satisfaction and loyalty while reducing costs and improving efficiency.

The patient satisfaction index (PSI) is investigated in the next stage. The PSI states whether satisfaction can be increased by providing quality attributes or whether fulfilling quality attributes only prevents the patient from being dissatisfied. A satisfaction increment index (SII) determines whether enhancing a specific quality improves patient satisfaction. An SII close to 0 indicates a quality attribute with a weak positive effect.

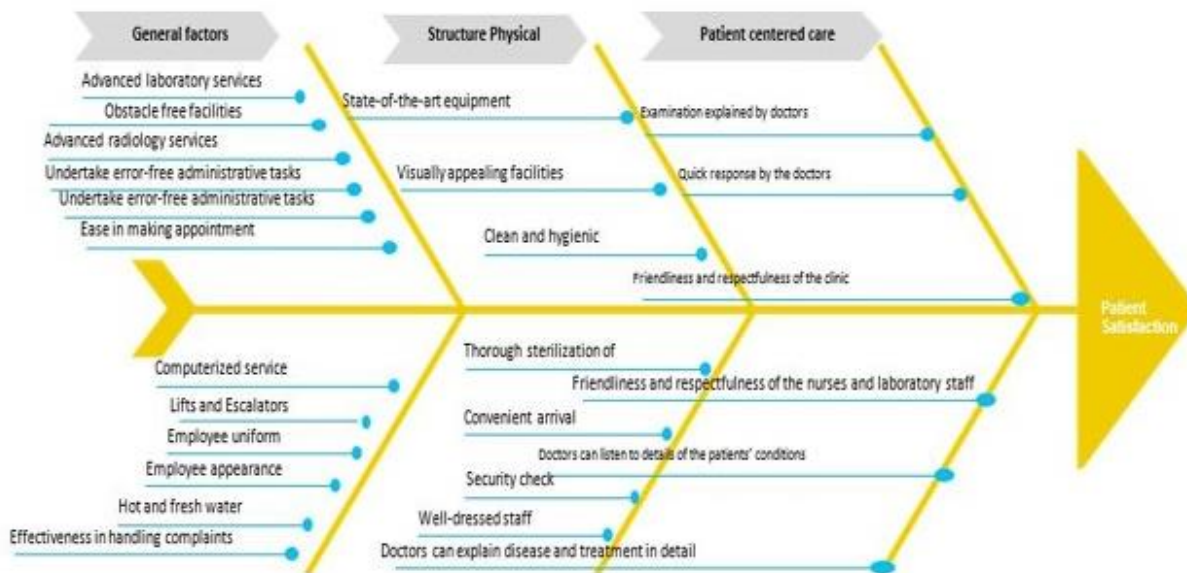


Figure 2: (Fishbone Diagram)

Patient Satisfaction Index: In the case of patient satisfaction, a SII near 1 indicates a quality feature that has a reasonably strong positive impact on patient satisfaction. Furthermore, a low SII of a quality trait does not imply discontent. On the other hand, the dissatisfaction decrement index (DDI) determines whether patient satisfaction may suffer if a specific quality feature is not adequately delivered. A DDI close to 0 indicates a quality trait that has a minor impact on patient satisfaction. However, a DDI close to 1 means that the provision

of the quality attribute can decrease patient dissatisfaction. Furthermore, a low DDI can dissatisfy patients. SII and DDI can be calculated as follows:

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$$SII = (A + O) / (A + O + M + I) \quad \text{Equation: 1}$$

$$DDI = - (O + M) / (A + O + M + I) \quad \text{Equation: 2}$$

Table 1: Kano evaluation table showing the many existing combinations and categories

| Attribute | Dysfunctional | | | | |
|--------------------------|-----------------------|------------------------|-----------------|-------------------------|--------------------------|
| | 1. I like it that way | 2. It must be that way | 3. I am Neutral | 4. I can live with that | 5. I dislike it that way |
| 1. I like it that way | Q | A | A | A | O |
| 2. It must be that way | R | I | I | I | M |
| 3. I can live with that | R | I | I | I | M |
| 4. I can live with that | R | I | I | I | M |
| 5. I dislike it that way | R | R | R | R | Q |

A=attractive; I=indifferent; M=must-be; O=one-dimensional; Q=questionable; R=reverse.

Table 2: Analysis of responses and categories of features, including satisfaction increment index and dissatisfaction decrement index

| S No. | Requirement | A | O | M | I | R | Q | Category | SII | DDI |
|-------|--|-------------------|----|----|----|----|------|----------|------|--------|
| | General factors | Percentage | | | | | | | | |
| 1 | Advanced laboratory services such as cultures | 17 | 46 | 28 | 9 | | 0 | O | 0.63 | (0.74) |
| 2 | Advanced radiology services such as MRI | 36 | 11 | 49 | 3 | | 1.79 | M | 0.47 | (0.61) |
| 3 | Obstacle free facilities | 21 | 8 | 60 | 11 | | 0.89 | M | 0.29 | (0.68) |
| 4 | Computerized services | 0 | 55 | 43 | 2 | | 0 | O | 0.55 | (0.98) |
| 5 | Lifts and Escalators | 55 | 13 | 25 | 7 | | 0 | A | 0.68 | (0.38) |
| 6 | Employee uniform | 0 | 27 | 17 | 56 | | 0 | I | 0.27 | (0.44) |
| 7 | Employee appearance | 0 | 32 | 4 | 63 | | 0 | I | 0.32 | (0.37) |
| 8 | Hot and freshwater availability | 64 | 5 | 29 | 1 | | 0 | A | 0.70 | (0.35) |
| 9 | Undertake error-free administrative tasks | 12 | 6 | 79 | 0 | | 2.68 | M | 0.18 | (0.88) |
| 10 | Accurate records | 21 | 7 | 69 | 3 | | 0 | M | 0.29 | (0.76) |
| 11 | Ease in making an appointment | 44 | 5 | 49 | 0 | | 1.79 | M | 0.50 | (0.55) |
| 12 | Effectiveness in handling complaints | 44 | 15 | 35 | 5 | | 0.89 | A | 0.59 | (0.50) |
| | Structure Physical characteristics | | | | | | | | | |
| 13 | State-of-the-art equipment | 52 | 6 | 37 | 4 | | 1.79 | A | 0.59 | (0.44) |
| 14 | Visually appealing facilities | 54 | 10 | 34 | 3 | | 0 | A | 0.63 | (0.44) |
| 15 | Clean and hygienic appearance | 21 | 10 | 69 | 0 | | 0 | M | 0.31 | (0.79) |
| 16 | Thorough sterilization of instruments | 58 | 23 | 19 | 0 | | 0 | A | 0.81 | (0.42) |
| 17 | Convenient arrival | 32 | 11 | 55 | 2 | | 0 | M | 0.43 | (0.66) |
| 18 | Security check | 10 | 6 | 27 | 8 | 49 | 0 | R | 0.32 | (0.65) |
| 19 | Well-dressed staff | 10 | 13 | 17 | 61 | | 0 | I | 0.22 | (0.29) |
| | centered care | | | | | | | | | |
| 20 | Examination explained by doctors | 42 | 8 | 37 | 13 | | 0 | A | 0.50 | (0.45) |
| 21 | Quick response by the doctors | 32 | 4 | 64 | 0 | | 0 | M | 0.36 | (0.68) |
| 22 | Friendliness and respectfulness of the clinic receptionist | 38 | 5 | 57 | 0 | | 0 | M | 0.43 | (0.63) |
| 23 | Friendliness and respectfulness of the nurses and laboratory staff | 48 | 4 | 46 | 0 | | 0.89 | A | 0.53 | (0.51) |
| 24 | Doctors can explain disease and treatment in detail | 42 | 25 | 33 | 0 | | 0 | A | 0.67 | (0.58) |
| 25 | Doctors can listen to details of the patients' conditions | 64 | 3 | 33 | 0 | | 0 | A | 0.67 | (0.36) |

A= Attractive, O= One dimensional, M= Must be, I= Indifferent, R= Reverse, Q= Questionable

RESULT AND DISCUSSION

As discussed in the previous chapter, the study's objective was to optimize the current operational activities of the National Institute of Cardiovascular Diseases (NICVD). The study adopted the lean Six

Sigma process improvement methodology. DMAIC is a comprehensive and integrated approach used in any process optimization. The result of the study is discussed. Demographics of the total 100 patients/ attendants: males were 68 and females were 32 in the age bracket: 16 were 18-25 years of age, 21 were 26-

35, 30 were 36-45, 18 were 46-55, and 15 were in the age bracket of 56 years or higher.

Identification of Hospital Service Attributes: A comprehensive set of service elements has been identified based on the literature, brainstorming, and suggestions from doctors, administration, and patients of the studied hospital. Three core factors, including general factors, physical characteristics, and patient-centered care, have been identified, which further affinities to 25 sub-factors are shown above in Figure 2.

The abovementioned factors have been analyzed using the Kano model in this step. A total of 135 questionnaires have been distributed among patients/attendants of OPD, IPD, and ICU. A total of 100 valid responses were received. The questions were asked using the typical Kano two-functional method. Responses were recorded in MS Excel and analyzed in terms of satisfaction increment index (SII) and dissatisfaction decrement index (DDI), as shown in Table 2.

A total of 100 people were enrolled, of whom 18% were patients, and 82% were attendants from outpatients and in-patient department of PCD. Patients whose stay was three days or more in the hospital were carried from in-patient, and patients who came on their follow-up were carried from OPD. 96% were married, and 4% were single. 22% were illiterate, 14% were intermediate, 26% were graduated, and 38% were Masters/PhD. 13% were students, 44% were government employees, 19% were working in the private sector, 11% were retired, and 13% were marked as others.

The top 'must be' attributes: Topmost high patient/attendants satisfaction attributes, "advanced radiology services such as MRI," "Obstacle free facilities," "undertake error-free administrative tasks," "accurate records," "ease in making appointments," "clean and hygienic appearance," "convenient arrival," "quick response by doctors," and "Friendliness and respectfulness of the clinic receptionists" are nine must-be attributes which increase satisfaction index by 0.47%, 0.29%, 0.18%, 0.29%, 0.50%, 0.31%, 0.43% 0.36%, and 0.43% respectively. This result shows that the hospital needs to work on must be attributed to increasing patient satisfaction and bringing enhancement in quality healthcare services.

The top 'One-dimensional' attributes: Top one-dimensional, "advanced laboratory services such as

cultures" and "computerized services," are one-dimensional attributes that increase the patient satisfaction index by 0.63% and 0.55% and decrease the dissatisfaction index by (0.74%), (and 0.68%) respectively. As mentioned above in Table 5, there are two one-dimensional attributes in 25 patient satisfaction elements. The more elements are provided to the hospital, the more patients are satisfied, and vice versa.

The top 'Attractive' attributes: To attractive attributes, "Lifts and Escalators," "Hot and Freshwater availability," "effectiveness in handling complaints," "state-of-the-art equipment," "Visually appealing facilities," "Through sterilization of instrument," "Examination explained by doctors," "friendliness and respectfulness of the nurses and laboratory staff," "Doctors can explain disease and treatment in detail," and "doctors can listen to details of the patient condition" are the ten attractive attributes out of total twenty-five and increases patient satisfaction index by 0.68%, 0.70%, 0.59%, 0.59%, 0.63%, 0.50%, 0.53%, 0.67%, and 0.67% respectively. Results show hospitals should provide these elements to be motivators to inspire their patients.

The top 'Indifferent' attributes: The top indifferent attributes, "Employee uniform," "Employee appearance," and "well-dressed staff" are indifferent attributes from general and structured physical characteristics, which increases patient satisfaction by 0.27%, 0.32%, and 0.22%, and dissatisfaction index ratios are decreased by (0.44), (0.37) and (0.29). It means patients/ attendants don't care if the hospital has these characteristics.

RECOMMENDATION FOR FUTURE RESEARCH

Future research can focus on collecting more responses from different hospitals in Pakistan to improve generalizability, as this research was limited to this case study in Karachi, Pakistan. The researchers can also use another method of analyzing data to reduce biases from the results, which were caused by using the convenience sampling method in this paper. Other than that, future research can collect data from more public and private hospitals in different states of Pakistan so that the conclusions and implications can be more realistic and specific. Lastly, this research thesis currently uses identified core dimensions for operational improvement, i.e., 1. General factors, 2. Structure, physical characteristics, and 3. In the future,

more factors can be identified to enhance the scope of patient-centered care and the scope of research. This current paper expects more superior studies to take into account the shortcomings of this paper and to include suggestions for future study to improve their outcomes and consequences.

LIMITATIONS

This study is an initiative to enhance hospital service quality. This research has several limitations. One is the need for previous research data literature to get insights into hospital performance. Another area for improvement is the sample size, which was limited to a small scale, focusing on a case study of NICVD Hospital in Karachi, Pakistan. Other than that, the current research used convenience sampling because of the limitation of collecting the data so that it may indicate only some hospitals comprehensively. Furthermore, we got low responses from the respondents, and a small number of samples might have produced a foundation for bias. Lastly, Time constraint was another limitation of the research, as it took much work to cover the given sample size in a limited period. This was added on with the COVID-19 pandemic. The lockdown to contain the spread of the deadly COVID-19 virus led hospitals to contain, and only a limited number of respondents responded.

CONCLUSION

The healthcare industry has shifted its focus from merely diagnosing and treating diseases to providing total patient satisfaction, leading to a greater emphasis on the quality of service hospitals provide. The three critical factors mentioned - general factors, structural physical characteristics, and patient-centered care - are all important in ensuring that hospitals provide top-notch service to their patients. General factors refer to the overall management of the hospital, including its leadership, staff training and development, and communication with patients. A hospital that has strong leadership and a well-trained staff that communicates effectively with patients is more likely to provide high-quality service. Structural physical characteristics refer to the design and layout of the hospital, including its cleanliness, organization, and accessibility. A well-designed, clean, and easy-to-navigate hospital is more likely to provide a positive experience for patients and their families. Patient-centered care is the most critical factor in ensuring quality service. This means that the hospital puts the needs and preferences of patients at the center of its

care, taking into account their circumstances, values, and beliefs. This can involve providing personalized care, involving patients and their families in decision-making, and treating patients with respect and compassion. In conclusion, providing quality service is essential in the hospital industry. The three key factors identified in this study - general factors, structural physical characteristics, and patient-centered care - can help ensure that hospitals can provide top-notch service to their patients. By focusing on these key factors, hospitals can create a culture of excellence and ensure their patients receive the best possible care.

This research employed the Lean Six Sigma process improvement methodology to pinpoint critical hospital service elements. This problem-solving technique is adaptable and supplies an all-encompassing answer to any issue. The DMAIC process enhancement procedure was adopted to define, measure, analyze, improve, and control the overall experience in the hospital. The Kano methodology identified and symbolized CTQ (Critical to Quality). After sifting through cause-and-effect analysis, the three core dimensions and 25 sub-dimensions of critical quality were identified. The effect of these 25 sub-dimensions was rated and ranked through the Kano Model of patient satisfaction, which determined the most essential service demand. This study serves as a primary step in service quality improvement for the hospital sector. This approach can be modified and embraced by different public and private hospitals in the future to facilitate practical implementation.

AUTHORS' CONTRIBUTION

FS and AS: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. FS, AS, MMBT, HB, and VK: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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