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# The Influence of Service Process Management Factors on Patient Satisfaction in Malaysia

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**Abstract**

The main objective of this research is studying the effects of process standardization, process efficiency, process flexibility, and process quality control on patient satisfaction in Malaysia's healthcare contexts. A quantitative cross-sectional design was adopted in this research, via a structured 5-point Likert-scale questionnaire to collect data from 400 adult patients across public and private healthcare institutions in urban and rural areas of Malaysia. Data was also examined using SPSS 26.0 through descriptive statistics, reliability and validity tests, Pearson correlation, and multiple linear regression as well. The findings indicate that all four service process management factors have a significant positive relationship with patient satisfaction in Malaysia. Process flexibility and process quality control demonstrated the strongest predictive effects, followed by process efficiency and process standardization. The regression model explained 87.3% of the variance in patient satisfaction ($R^2 = 0.873$). The findings featured importance of effective service process management in enhancing patient experiences within Malaysia's diverse healthcare environment. The study contributes to the literature by examining service process management in the Malaysian healthcare facilities and provides practical implications for healthcare institutions seeking to improve service delivery and patient satisfaction. This research is also related to the Sustainable Development Goal 3 (SDG 3) "Good Health and Well-being", specifically Target 3.8, which stresses the importance of universal health coverage and access to essential healthcare services of high quality. Within this framework, the management of healthcare service processes can help achieve higher quality, efficiency, responsiveness, and consistency of healthcare service provision. Therefore, process standardization, process efficiency, process flexibility, and process quality control may be essential for improving patients' experience and satisfaction with healthcare services.

**Keywords:** Service Process Management Factors; Process Standardization; Process Efficiency; Process Flexibility; Process Quality Control; Patient Satisfaction, SDG 3

## 1. Introduction

One of the most important indicators of healthcare service quality is patient satisfaction as healthcare systems increasingly emphasize patient fixed care and improvements in service delivery. Adequate service process management is particularly important because the organization and delivery of healthcare services can influence waiting times, service consistency, responsiveness, resource utilization, and patients' overall experiences (Alibrandi et al., 2023). The World Health Organization has also emphasized the importance of high-quality healthcare services in supporting better health outcomes and sustainable healthcare development (WHO, 2025). However, weaknesses in healthcare service processes remain a concern in many developing and emerging economies, where healthcare institutions may face increasing demand alongside limitations in resources and service capacity.

Malaysia provides an important context for examining service process management because its healthcare system consists of both public and private providers and serves a culturally diverse population. Although Malaysia's healthcare sector has developed considerably, challenges remain in areas such as waiting times, service process consistency, resource allocation, and differences in healthcare provision between urban and rural areas (Aktar, 2021; Begum et al., 2021). Public healthcare facilities may experience high patient volumes and lengthy waiting times, while private healthcare institutions, despite having advantages in service quality, may still face challenges relating to process flexibility and cost control. These conditions can influence patients' perceptions of healthcare services and their overall satisfaction.

Service process management encompasses several dimensions that are relevant to patient satisfaction. Process standardization promotes consistency by ensuring that healthcare services follow established procedures and standards, potentially reducing variations and service-related errors (Alomari & Hamid, 2022). Process efficiency concerns the effective use of healthcare resources and the reduction of unnecessary waiting and delays, which are particularly important in healthcare environments experiencing increasing demand (Shin et al., 2024). Process flexibility refers to the ability of healthcare providers to adapt service processes according to patients' individual needs and circumstances, supporting the patient-centered approach increasingly emphasized in modern healthcare (Jameel et al., 2025). Process quality control involves monitoring, evaluating, and continuously improving service processes to maintain the safety, reliability, and quality of healthcare services (Rahman et al., 2025).

Previous research in developed healthcare systems has demonstrated the relevance of effective service process management to healthcare quality and patient experiences. Studies have examined process standardization as a means of improving service consistency and reducing errors, while other research has highlighted the role of process efficiency and digital management systems in reducing waiting times (Almass et al., 2022). Asian healthcare systems have similarly explored flexible service processes and quality monitoring mechanisms to respond to patients with different needs and improve healthcare experiences (Lee & Yoon, 2023; Kim et al., 2021). These studies indicate that effective management of healthcare service processes can contribute to improved service delivery and patient satisfaction.

Despite this evidence, comparatively limited research has examined the combined relationship between specific service process management dimensions and patient satisfaction within the Malaysian healthcare context. Existing studies have often focused on overall healthcare service quality rather than examining process standardization, process efficiency, process flexibility, and

process quality control as distinct factors (Aktar, 2021). Furthermore, Malaysia's multicultural population and differences in healthcare resources between urban and rural areas create a distinctive environment in which patients may have different expectations regarding service consistency, responsiveness, personalization, and quality (Zakaria et al., 2021). Consequently, findings from Western healthcare systems may not be directly applicable to Malaysia, highlighting the need for further empirical investigation within the Malaysian context.

The problem addressed by this study is therefore the limited empirical understanding of how specific service process management factors are associated with patient satisfaction in Malaysian healthcare facilities. Although service process management is recognized as an important component of healthcare service delivery, challenges such as inconsistent processes, lengthy waiting times, limited flexibility, and weaknesses in quality control may continue to affect patients' experiences (Alkhashan et al., 2021; Edgman-Levitan & Schoenbaum, 2021). Differences in healthcare resources and service conditions between urban and rural areas further reinforce the importance of examining these relationships within Malaysia (Begum et al., 2021). In addition, the multicultural nature of Malaysian society means that healthcare institutions must respond to patients with different expectations and service needs.

Accordingly, this study examines the relationships between process standardization, process efficiency, process flexibility, process quality control, and patient satisfaction among patients receiving healthcare services in Malaysia. Specifically, the study examines whether process standardization, process efficiency, process flexibility, and process quality control have significant positive relationships with patient satisfaction. The study seeks to provide empirical evidence concerning the role of these four service process management factors and to contribute to a better understanding of patient satisfaction within Malaysia's public and private healthcare sectors.

The study has both theoretical and practical significance. From a theoretical perspective, it integrates four service process management dimensions within a single framework and extends existing research by examining their relationships with patient satisfaction in a multicultural healthcare environment. This provides additional empirical evidence from a developing healthcare context and contributes to the broader literature on service management and patient satisfaction. From a practical perspective, the findings can assist healthcare managers and administrators in identifying service process areas that require improvement. Strengthening process standardization may support consistency in service delivery, while improving process efficiency may reduce unnecessary waiting and enhance resource utilization. Greater flexibility in processes may allow healthcare providers to respond more competently to individual patient needs, while active quality control may support continuous monitoring and improvement of healthcare services. The Sustainable Development Goal 3 is also aided by these improvements as its relevance helps in promoting good health and well-being.

Adult patients aged 18 years and above are focused on the study, who receive healthcare services from public and private medical institutions in Malaysia. Broader representation of healthcare experiences is provided by considering patients from different demographic and cultural backgrounds and from both urban and rural areas. The study examines process standardization, process efficiency, process flexibility, and process quality control as independent variables and patient satisfaction as the dependent variable. Data collection and analysis are conducted from January to March 2026 using a quantitative cross-sectional research design.

The research objectives are to examine the relationship between process standardization and patient satisfaction, process efficiency and patient satisfaction, process flexibility and patient satisfaction, and process quality control and patient satisfaction in Malaysian healthcare facilities. Correspondingly, the research questions examine whether each of these four service process management factors has a positive relationship with patient satisfaction in Malaysian healthcare facilities. These objectives and questions provide the basis for the subsequent development of the study's conceptual framework, hypotheses, and empirical analysis.

The study is subject to several limitations. The sample is drawn from selected public and private healthcare institutions in Malaysia and may therefore not fully represent patients from every geographical region or healthcare facility. The use of self-reported questionnaire data may also introduce response bias because participants evaluate healthcare services according to their individual experiences and perceptions. Additionally, constrained insights into deeper experiences and perceptions underlying patient satisfaction were provided by the cross-sectional quantitative design. The analysis also limits to only the Malaysian healthcare background, meaning that its findings may not be directly generalizable to other countries or healthcare systems with different cultural, institutional, and resource conditions. Nonetheless, empirical evidence provided regarding the relationship between service process management and patient satisfaction and offers a basis for further research and improvement in Malaysian healthcare facilities transmission.

### 1.1 Hypothesis

H1: Standardization has a significant positive relationship with patient satisfaction.

H2: Efficiency has a significant positive relationship with patient satisfaction.

H3: Flexibility has a significant positive relationship with patient satisfaction.

H4: Quality control has a significant positive relationship with patient satisfaction.

## 2. Literature Review

### 2.1 Overview

Service process management has received increasing attention in healthcare research because the way medical services are organized and delivered can directly influence patients' experiences and satisfaction. This study focuses on four dimensions of service process management: process standardization, process efficiency, process flexibility, and process quality control, and examines their relationships with patient satisfaction. Existing studies across different healthcare systems generally indicate that effective management of these dimensions can improve service consistency, reduce waiting time, respond to individual patient needs, and strengthen service quality and safety. The literature review therefore examines international and regional evidence, the meaning and role of patient satisfaction, the four service process dimensions, and the theoretical foundations supporting the proposed relationships.

### 2.2 Global and Regional Perspectives

International research provides considerable evidence of positive relationships between service process management and patient satisfaction. Research on Lean primary care redesigns in the United States found improvements in patient satisfaction, staff helpfulness, and waiting times following process improvements ((Hung et al., 2021). Similarly, research on patient flow in emergency departments has identified relationships between healthcare service quality, patient flow, and patient satisfaction (Al Owad et al., 2022). These findings suggest that reduced variations in service delivery and reinforce patients' experiences of healthcare services by standardizing and efficiently managing diagnosis, medication, and nursing procedures.

Research has shown that patient waiting times and satisfaction can be improved by enhancing appointment scheduling and resource allocation (Jain et al., 2022). Similarly, improving healthcare workflow can enhance patient experiences while reducing waiting times as demonstrated by research on Lean process redesign (Hung et al., 2021). In China, research has also demonstrated the importance of process quality in healthcare. Wang et al. (2022) found that process quality in primary care was associated with patients' perceptions of family doctor services in urban Beijing, while another study found positive associations between process and diagnosis quality and patient satisfaction in rural Western China (Wu et al., 2024). Research on an upgraded outpatient information system in China further demonstrated that optimizing service processes reduced waiting times and improved patient satisfaction (Shen et al., 2021).

Chinese research similarly demonstrates the importance of service process management across different healthcare environments. Wang et al. (2022) found that process quality in type 2 diabetes care in Beijing was associated with patient-perceived attributes of family doctor services, particularly accessibility, continuity, and team-based care. Shen et al. (2021) reported that an Internet-based care delivery approach simplified outpatient treatment processes, reduced waiting times, and improved patient satisfaction. Similarly, research on AI-assisted outpatient processes demonstrated the potential of digital systems to reduce patient waiting time by reorganizing the sequence of diagnostic examinations and tests (Li et al., 2021). Overall, the international and regional literature provides evidence that different dimensions of service process management including process quality, efficiency, digitalization, and service organization are relevant to patient

satisfaction, although their importance may vary according to healthcare systems, patient characteristics, and local service conditions.

### 2.3 Patient Satisfaction

Patient satisfaction represents patients' overall perception and evaluation of healthcare services and includes aspects such as service processes, service quality, staff attitudes, and medical outcomes (Akhtar, 2021). Higher patient satisfaction can intensify the trust and loyalty toward healthcare institutions, improve cooperation with treatment, and contribute to the sustainable development of healthcare services (Alomari & Hamid, 2022).

Both patient and service factors influence patient satisfaction. Evaluation and expectations of healthcare services can be shaped by individual characteristics such as age, gender, and cultural background. For example, the elderly patients may place greater emphasis on safety and convenience, whereas the younger patients may place greater importance on efficiency and personalization (Zakaria et al., 2021). The patients who have different levels of illness may also evaluate service processes differently (Edgman-Levitan & Schoenbaum, 2021). Consequently, healthcare institutions need to manage service processes in ways that address both general service requirements and differentiated patient needs.

The measurement of patient satisfaction has also developed from simple overall satisfaction scores toward multidimensional approaches. Alibrandi et al. (2023) identified service process satisfaction, service quality satisfaction, medical outcome satisfaction, and service attitude satisfaction as important dimensions. One of the most widely used methods was survey questionnaire, although online evaluations, interviews, and focus groups can provide additional evidence as well (Ferreira et al., 2023). Existing research further demonstrates that optimizing the healthcare processes can significantly improve patient satisfaction (Shin et al., 2024; Jameel et al., 2025). It is necessary to mention that there are efficient healthcare processes that play a significant role in patients' experience and satisfaction. According to the findings of Yu et al. (2026), there are efficient processes, less time of waiting, and efficient administrative support that may result in improving patients' experience in healthcare services.

### 2.4 Service Process Management Factors

Process standardization refers to the use of consistent procedures, clearly defined practices, and established standards that ensure that the healthcare services are delivered in a reliable and uniform manner (Leotsakos et al., 2014). The standardized healthcare processes help in reducing unwanted variation, improving patient safety, and promoting consistency in the service delivery (Leotsakos et al., 2014; Ghosh et al., 2021). Ghosh et al. (2021) found that implementing a standardized nursing process improved the quality of information transfer and it was associated with positive patient experiences. Similarly, the standardization of the healthcare practices has been identified as an important approach to reducing variation and improving the reliability and safety of care (Leotsakos et al., 2014). Standardized procedures may therefore contribute to the patients' satisfaction by creating more predictable, safe, and consistent healthcare experiences.

Process efficiency refers to the ability of healthcare organizations to deliver services with minimal unnecessary delays and effective use of available time and resources. Long waiting times can negatively affect patients' experiences and satisfaction, whereas streamlined processes can

improve service accessibility and efficiency (Sharma et al., 2022). Sharma et al. (2022) found that patients using an online registration system experienced substantially shorter waiting times and higher satisfaction than patients using conventional walk-in registration. Patient dissatisfaction is contributed by long queues and inefficient registration processes as the most recent research from a tertiary hospital in India is indicated (Amin et al., 2026). Efficiency in processes such as registration, consultation, examination, treatment, and discharge therefore reduces unnecessary delays and inconvenience and contributes to a more positive patient experience.

Process flexibility refers to the capability of the healthcare providers to adapt the services to patients' individual needs, preferences, and circumstances. It is also particularly important because patients differ in their health conditions, personal characteristics, expectations, and preferences for care. A research on personalized healthcare shows that adapting care to individual patient needs can improve experiences and satisfaction of the patients (Bilenler & Ates, 2024; Liu et al., 2025). A systematic review by Liu et al. (2025) found a consistent positive relationship between the personalized nursing care and the patient satisfaction, with individualized care plans and tailored health guidance among the interventions examined. Flexible and personalized healthcare processes can therefore enhance the patient satisfaction by increasing patient involvement, addressing individual needs, and enabling healthcare providers to respond more appropriately to different patient circumstances.

Process quality control involves the systematic monitoring, evaluation, and improvement of the healthcare processes to maintain and improve the quality and safety of services (World Health Organization, 2025). Continuous monitoring of the quality can help healthcare organizations identify gaps in care, reduce errors, and implement improvements in delivery service. Dorimain et al. (2023), for example, reported that the reduction in errors and improvements in perceived safety, reliability, and efficiency is associated with a quality-improvement intervention. The World Health Organization (2025) also highlights the importance of measuring and monitoring healthcare quality to identify the areas requiring improvement and to support continuous quality improvement. The Quality monitoring, staff training, appropriate maintenance of healthcare resources, patient feedback, and continuous process improvement can therefore contribute to safer, more reliable, and more satisfactory healthcare experiences.

## 2.5 Theoretical Justification

### 2.5.1 Service Management Theory

Service management theory emphasizes the effective management of service activities to improve service quality and customer satisfaction (Rust & Zahorik, 1993). In healthcare, service processes represent an important mechanism through which service quality is experienced by patients. Effective management of service processes can promote consistency, efficiency, responsiveness, and continuous improvement, all of which are important aspects of delivering quality services (Zeithaml & Bitner, 2000; Parasuraman et al., 1985)

This theoretical perspective provides a foundation for examining the four service process management dimensions in relation to patient satisfaction. Standardization is consistent with improving reliability and reducing service variation, while efficiency supports customer-oriented and convenient service delivery (Zeithaml et al., 2000). Flexibility reflects responsiveness to

individual customer needs (Bitner et al., 1994), and quality control reflects continuous improvement of service quality (Parasuraman et al., 1985). Thus, service management theory supports the expectation that effective management of these four dimensions can improve patient satisfaction.

### 2.5.2 Patient Satisfaction Research Theory

Patient satisfaction research theory, associated with Donabedian's (1980) framework, emphasizes the relationship between healthcare structure, process, outcomes, patient expectations, and actual experiences. Because the service process is a direct point of patient interaction with healthcare institutions, the quality of process management can influence patients' experiences and satisfaction (Donabedian, 1980; Cleary & McNeil, 1988).

Within this framework, standardized processes can promote consistency and reduce uncertainty, while efficient processes can reduce unnecessary waiting and inconvenience. Flexible and personalized service processes can better address individual patient needs, and quality control can support safer and more effective healthcare delivery (Donabedian, 1980; Cleary & McNeil, 1988). Research reviewing patient satisfaction has also identified expectations, interpersonal aspects of care, and the delivery of healthcare services as important factors influencing satisfaction (Sitzia & Wood, 1997). Therefore, the patient satisfaction perspective provides additional theoretical justification for examining how the four dimensions of service process management may influence patient satisfaction.

## 2.6 Hypothesis Development

Based on the literature and theoretical perspectives, four hypotheses are proposed.

Process standardization is expected to positively influence the patient satisfaction because standardized procedures can reduce medical errors, improve service consistency, and strengthen patient trust (Alomari & Hamid, 2022; Granero Jiménez et al., 2022). Therefore:

**H1: Process standardization has a significant positive impact on the patient satisfaction at medical institutions in Malaysia.**

Process efficiency is expected to positively influence the patient satisfaction because shorter waiting times, better resource allocation, and faster service responses can reduce inconvenience and improve the healthcare experience (Shin et al., 2024; Almass et al., 2022). Therefore:

**H2: Process efficiency has a significant positive impact on the patient satisfaction at medical institutions in Malaysia.**

Process flexibility is expected to positively influence the patient satisfaction because Malaysia's multicultural healthcare environment involves patients with diverse needs and expectations. The ability to adapt service processes and provide personalized care may therefore improve patients' experiences (Zakaria et al., 2021; Jameel et al., 2025; Lee et al., 2023). Therefore:

**H3: Process flexibility has a significant positive impact on the patient satisfaction at medical institutions in Malaysia.**

Process quality control is expected to positively influence the patient satisfaction because systematic monitoring, evaluation, and improvement can enhance healthcare safety, effectiveness, and reliability (Rahman et al., 2025; Alkhashan et al., 2021). Therefore:

**H4: Process quality control has a significant positive impact on the patient satisfaction at medical institutions in Malaysia.**

### 2.7 Research Framework

The research framework integrates the service management theory and the patient satisfaction research theory to examine the relationship between the four independent variables process standardization, process efficiency, process flexibility, and process quality control and the dependent variable, patient satisfaction. The four independent variables represent different aspects of healthcare service process management. The process standardization focuses on consistent procedures and clears the responsibilities; the process efficiency concerns waiting time, resource utilization, and the response speed; the process flexibility reflects the ability to adapt services to individual patient needs; and the process quality control emphasizes monitoring, evaluation, and continuous improvement.

Patient satisfaction represents patients' overall evaluation of healthcare services, including service processes, quality, staff attitudes, and medical outcomes. The research framework proposes that each of the four service of process management dimensions has a positive relationship with the patient satisfaction. The framework therefore provides the basis for subsequent empirical testing through questionnaire data and statistical analysis.

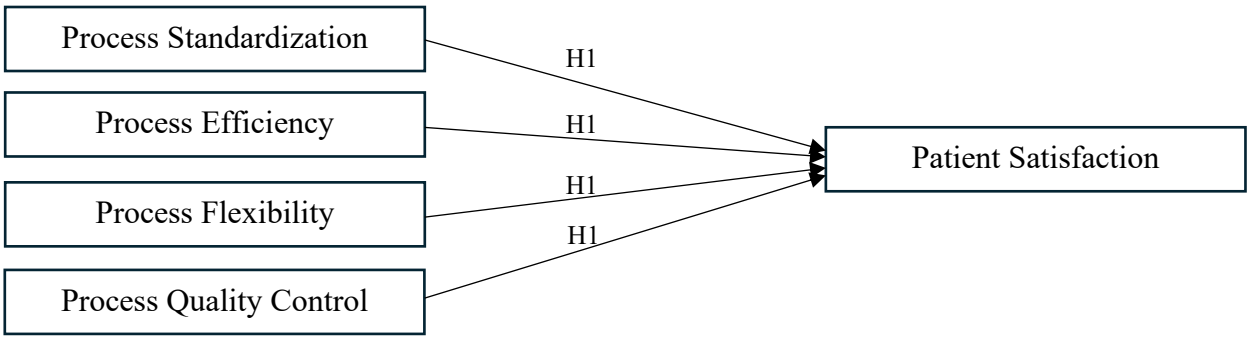



**Figure 1: Research Framework**

### 2.8 Summary

The literature reviewed in this chapter indicates that service process management is closely associated with patient satisfaction across different healthcare settings. Existing studies provide evidence that process standardization can improve consistency and safety, process efficiency can reduce waiting and inconvenience, process flexibility can address differentiated patient needs, and process quality control can strengthen healthcare safety and continuous improvement. The literature also demonstrates that patient characteristics and healthcare contexts can influence how these processes are experienced and evaluated.

Service management theory and patient satisfaction research theory provide complementary explanations for the proposed relationships. On this basis, four hypotheses were developed concerning the positive effects of process standardization, process efficiency, process flexibility, and process quality control on patient satisfaction in Malaysian medical institutions. The research

framework integrates these relationships and provides the conceptual basis for the empirical investigation presented in the subsequent sections of the study.

## 3.0 Research Methodology

### 3.1 Research Design

This study adopted a quantitative, cross-sectional research design to examine the relationships between four service process management factors process standardization, process efficiency, process flexibility, and process quality control and patient satisfaction in Malaysian medical institutions. As the study aimed to test theoretically derived hypotheses, a quantitative approach was used through standardized measurement and statistical analysis (Bryman, 2012). Data was collected from the patients within a particular period of time from January to March 2026 by a cross-sectional design which allowed relationships between the independent and dependent variables to be examined at a specific point in time (Cooper & Schindler, 2003).

The study followed the research sequence of theoretical development, hypothesis formulation, data collection, and statistical verification. The research design also considered Malaysia's multicultural population and differences in healthcare resources between urban and rural areas. SPSS 26.0 was used for data analysis, with descriptive and inferential statistical techniques applied to examine the proposed relationships.

**Table 1. Research Design**

| **Dimension** | **Specific Content** |
|---|---|
| Research Title | The Influence of Service Process Management Factors on Patient Satisfaction in Malaysia |
| Research Type | Quantitative Study |
| Data Collection Tool | A structured questionnaire (Likert 5-point scale) |
| Research Location | Malaysia |
| Research Object | Patients aged 18 and above in public and private medical institutions |
| Sample Size | Expected sample: 357; Expected distributed questionnaires: 400 (to ensure |

| | |
|---|---|
| | valid samples) |
| Variable Measurement Tool | IV: Process Standardization; Process Efficiency; Process Flexibility; Process Quality Control.<br>DV: Patient Satisfaction. |
| Statistical Analysis Tool | SPSS 26.0 |
| Statistical Analysis Methods | Descriptive statistics; Pearson correlation analysis; Multiple linear regression analysis; Independent samples t-test; One-way ANOVA |
| Ethical Considerations | Anonymous questionnaire filling; Informed consent; Encrypted data storage; Academic use only for data |
| Pre-survey Plan | To optimize questionnaire items by inviting 3 medical management experts and 2 statistical experts to evaluate the content validity of the questionnaire |

### 3.2 Population and Sampling

The target population consisted of Malaysian patients aged 18 years and above who received medical services from public and private healthcare institutions. Both outpatients and inpatients were included to capture differences in perceptions of healthcare processes. Patients below 18 years were excluded because their evaluations of healthcare services may be represented primarily by guardians rather than by independent assessments. This age criterion is consistent with research involving adult patient-reported experiences and satisfaction with healthcare services.

The study employed stratified proportional sampling to improve representation across important subgroups. The sampling structure is considered region (urban/rural), healthcare institution type (public/private), and treatment type (outpatient/inpatient). This approach was selected because Malaysia has differences in healthcare resources and service characteristics across locations and institution types (Sekaran & Bougie, 2025).

Based on the target population of approximately 4,500, the Krejcie and Morgan (1970) sampling table indicated a minimum sample size of 357. Accordingly, 400 questionnaires were planned for distribution to account for potentially invalid responses. The proposed distribution consisted of 60% urban and 40% rural respondents, equal proportions from public and private institutions, and 70% outpatients and 30% inpatients.

### 3.3 Research Instrument

A structured questionnaire based on a five-point Likert scale ranging from 1, “strongly disagree”, to 5, “strongly agree” was used to collect data. The questionnaire abided 30 items across the six sections: demographic characteristics, process standardization, process efficiency, process flexibility, process quality control, and patient satisfaction. Existing measurement scales were

adapted to the Malaysian healthcare context, with linguistic and cultural considerations incorporated into the questionnaire design (Oppenheim, 1992).

The process standardization items were adapted from Bhatia & Swaminathan (2026). Process efficiency was measured using items assessing the efficient use of time and resources and the smooth delivery of healthcare services. Process flexibility was measured using items developed from established literature on healthcare process adaptation and the ability of service processes to respond to variation in patient needs and circumstances. Process quality control was measured using items assessing the monitoring, evaluation, and control of healthcare service processes to maintain consistent service quality. Patient satisfaction items were adapted from the Patient Satisfaction Questionnaire developed by Ware et al. (1983) and assessed patients' overall perceptions of healthcare services, willingness to revisit, and willingness to recommend the institution.

Before formal data collection, the questionnaire underwent language adaptation and expert review. English items were translated into Malay and Chinese and subsequently backtranslated by bilingual experts to assess semantic consistency. Three medical service management experts and two statistical experts were also expected to assess the relevance, clarity, and appropriateness of the questionnaire items. Their feedback was used to refine the questionnaire for the Malaysian multicultural context.

### 3.4 Data Collection Procedure

Data collection was planned from January to March 2026 over an eight-week period using an online questionnaire platform. The process consisted of questionnaire preparation, formal data collection, and supplementary collection. The questionnaire included instructions, informed consent information, and response requirements. During the formal collection period of data, invitations were distributed through healthcare institution networks, social media platforms, and clinic-based QR codes.

Responses were screened for quality, with questionnaires completed unusually quickly or displaying identical responses across all items identified for exclusion. This procedure was intended to improve the quality and reliability of the final dataset.

### 3.5 Data Analysis

SPSS 26.0 was used to analyze the collected data. Descriptive statistics were first used to summarize respondent characteristics and the distribution of the study variables. Frequencies and percentages were calculated for demographic variables, while means, standard deviations, skewness, and kurtosis were used to describe the continuous research variables.

Pearson correlation analysis was then conducted to examine the direction and strength of relationships between the four independent variables and patient satisfaction. Multicollinearity was assessed using variance inflation factor (VIF), with values below 5 considered indicative of no serious multicollinearity problem (Tabachnick & Fidell, 2021).

Multiple linear regression was subsequently used to test the proposed relationships between process standardization, process efficiency, process flexibility, process quality control, and patient satisfaction while controlling for relevant demographic characteristics. The regression results were used to evaluate hypotheses H1–H4. Independent-samples t-tests were also planned to examine

differences in patient satisfaction between urban and rural respondents and between public and private healthcare institutions, while one-way ANOVA was used to examine differences across demographic groups such as age and cultural background.

### 3.6 Validity and Reliability

The validity of the questionnaire was assessed through content, construct, and criterion validity. Content validity was examined through expert evaluation, with the content validity index used to assess the relevance of questionnaire items (Flanagan & Beck, 2024). Exploratory factor analysis and confirmatory factor analysis were used to plan construct validity. Factor loadings above 0.5, together with acceptable model-fit indicators such as RMSEA, CFI, and TLI, were used as the criteria for evaluating the construct validity (Hu & Bentler, 1999). Criterion validity was assessed by examining the relationship between the patient satisfaction and the willingness to revisit the healthcare institution.

Reliability was evaluated using the Cronbach's alpha to assess the internal consistency of the five principal constructs: process standardization, process efficiency, process flexibility, process quality control, and patient satisfaction. A Cronbach's alpha value above 0.70 was considered acceptable (Nunnally, 1994). Split-half reliability was also planned as an additional assessment of overall questionnaire reliability.

### 3.7 Ethical Considerations and Methodological Limitations

The study regarded principles of informed consent, voluntary participation, anonymity, confidentiality, and responsible data management. No, the study did not intend to collect directly identifiable information. Participants were informed about the purpose of the study, how their data would be used, and their right to withdraw at any time. Data was planned to be encrypted and used solely for academic purposes. The study also considered Malaysia's multicultural and religious context when designing the questionnaire and collecting responses.

Acknowledgement of several methodological limitations should be considered. The cross-sectional design limits conclusions regarding temporal causality. The online questionnaire collection may underrepresent groups with limited internet access, particularly some elderly or rural patients. The quantitative design does not capture the deeper subjective experiences that the qualitative interviews could provide. Finally, the study focuses on selected Malaysian healthcare settings, which may limit the generalizability of the findings to all the healthcare institutions in the country.

## 4. Results

### 4.1 Respondent Characteristics

The analysis was based on 400 valid questionnaires. A range of demographic and healthcare characteristics were represented by the respondents. In terms of gender, males constituted 54.0% (n = 216) of the sample, females 42.3% (n = 169), and respondents identifying with other genders 3.8% (n = 15). And in terms of age, 44.5% were aged 18–30 years, 28.75% were aged 31–45 years, 22.25% were aged 46–60 years, and 4.5% were over 60 years.

Ethnic diversity was also reflected in the sample, comprising Malay (19.5%), Chinese (35.5%), Indian (12.25%), and other ethnic groups (32.75%). There was an equal distribution of respondents between public and private healthcare facilities, with 49.3% (n = 197) reporting visits to public

institutions and 50.7% (n = 203) to private institutions. In terms of treatment, 26.8% (n = 107) received outpatient treatment, while 73.3% (n = 293) experienced inpatient treatment. Ultimately, the sample provided representation across major demographic and healthcare-service categories relevant to the study.

### 4.2 Descriptive Statistics

The study examined four dimensions of the medical service the process standardization (IV1), the process efficiency (IV2), the process flexibility (IV3), and the process quality control (IV4) as predictors of patient satisfaction (DV). All constructs were measured using five-point Likert scales.

**Table 2. Descriptive Statistics**

Table 4.2 The Result of Mean And Standard Deviation

**Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Process Standardization | 400 | 1.80 | 5.00 | 3.7555 | .81103 |
| Process Efficiency | 400 | 1.20 | 5.00 | 3.9170 | .80157 |
| Process Flexibility | 400 | 1.80 | 5.00 | 4.1890 | .87062 |
| Process Quality Control | 400 | 2.00 | 5.00 | 4.2860 | .71756 |
| Patient Satisfaction | 400 | 2.00 | 5.00 | 4.1345 | .88406 |

The mean scores indicated generally positive perceptions of medical service processes and patient satisfaction. Process quality control recorded at the highest mean (M = 4.286, SD not reported), thereafter by process flexibility (M = 4.189), process efficiency (M = 3.917), and process standardization (M = 3.756). Patient satisfaction also demonstrated a relatively high mean score (M = 4.135, SD = 0.884). The standard deviation for process standardization was 0.811, while the reported dispersion for the other constructs was generally moderate. The observed values ranged from 1.20 to 5.00, indicating that responses covered the available scale without evidence of values outside the expected measurement range.

Respondents generally perceived healthcare service processes positively as suggested by these findings, although the process standardization received comparatively lower evaluations than flexibility and quality control.

### 4.3 Reliability and Construct Validity

The measurement scales demonstrated strong internal consistency. The Cronbach's alpha coefficients were 0.854 for process standardization, 0.857 for process efficiency, 0.916 for process flexibility, 0.861 for process quality control, and 0.888 for patient satisfaction. All coefficients indicated satisfactory to excellent internal reliability by exceeding the commonly accepted threshold of 0.70.

**Table 3. Internal Consistency Using Cronbach's Alpha**

Table 4.3 Evaluate Internal Consistency Using Cronbach's Alpha

| Construct | Number of Items | Cronbach's Alpha | Reliability Status |
|---|---|---|---|
| Process Standardization | 5 | 0.854 | Reliable |
| Process Efficiency | 5 | 0.857 | Reliable |
| Process Flexibility | 5 | 0.916 | Reliable |
| Process Quality Control | 5 | 0.861 | Reliable |
| Patient Satisfaction | 5 | 0.888 | Reliable |

Construct suitability for factor analysis was also supported. The Kaiser Meyer Olkin (KMO) measure was 0.874, exceeding the recommended minimum level, while Bartlett's test of sphericity was statistically significant, $\chi^2$ (300) = 10,396.074, $p < .001$. The indications of these results show that the observed variables were sufficiently interrelated for factor analysis and provide evidence supporting the construct validity of the measurement instrument.

**Table 4. KMO and Bartlett's Test**

**KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .874 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 10396.074 |
| | df | 300 |
| | Sig. | .000 |

### 4.4 Correlation Analysis

Pearson correlation analysis was conducted to examine the associations between the four medical service process dimensions and the patient satisfaction. All four independent variables were positively and significantly correlated with the patient satisfaction at the 0.01 level.

**Table 5. Results of Correlation Analysis**

Table 4.5 The Result Of Correlation Analysis Of The Study

**Correlations**

| | | Process Standardization | Process Efficiency | Process Flexibility | Process Quality Control | Patient Satisfaction |
|---|---|---|---|---|---|---|
| Process Standardization | Pearson Correlation | 1 | .686** | .768** | .508** | .783** |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 |
| | N | 400 | 400 | 400 | 400 | 400 |
| Process Efficiency | Pearson Correlation | .686** | 1 | .842** | .457** | .794** |
| | Sig. (2-tailed) | .000 | | .000 | .000 | .000 |
| | N | 400 | 400 | 400 | 400 | 400 |
| Process Flexibility | Pearson Correlation | .768** | .842** | 1 | .583** | .876** |
| | Sig. (2-tailed) | .000 | .000 | | .000 | .000 |
| | N | 400 | 400 | 400 | 400 | 400 |
| Process Quality Control | Pearson Correlation | .508** | .457** | .583** | 1 | .730** |
| | Sig. (2-tailed) | .000 | .000 | .000 | | .000 |
| | N | 400 | 400 | 400 | 400 | 400 |
| Patient Satisfaction | Pearson Correlation | .783** | .794** | .876** | .730** | 1 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | |
| | N | 400 | 400 | 400 | 400 | 400 |

**. Correlation is significant at the 0.01 level (2-tailed).

The strongest association with the patient satisfaction was demonstrated by process flexibility ($r = .876$, $p < .01$), followed by process efficiency ($r = .794$, $p < .01$), process standardization ($r = .783$, $p < .01$), and process quality control ($r = .730$, $p < .01$). Preliminary support was provided by these findings for the proposed positive relationships between the medical service process dimensions and patient satisfaction.

The correlations among independent variables ranged from .457 to .842. Even though some relationships were relatively strong, none exceeded .90, suggesting that the severe intercorrelation was unlikely to compromise the subsequent regression analysis. Multicollinearity diagnostics from the regression model further indicated acceptable VIF values.

### 4.5 Multiple Linear Regression Analysis

Multiple linear regression analysis was conducted to examine the simultaneous relationship between process standardization, process efficiency, process flexibility, process quality control, and patient satisfaction. The patient satisfaction was specified as the dependent variable, while the four medical service process dimensions were entered as independent variables.

#### 4.5.1 Model Summary

**Table 6. Model Summary**

Table 4.6 present the result of $R^2$

**Model Summary[b]**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .934[a] | .873 | .871 | .31718 |

a. Predictors: (Constant), Process Quality Control, Process Efficiency, Process Standardization, Process Flexibility

b. Dependent Variable: Patient Satisfaction

The regression model produced an R value of .934, an $R^2$ of .873, and an adjusted $R^2$ of .871. The standard error of the estimate was 0.31718. The $R^2$ value indicates that the four medical service process dimensions collectively explained 87.3% of the variance in patient satisfaction.

The relatively small difference between $R^2$ (.873) and adjusted $R^2$ (.871) shows that the model retained a high level of explanatory power after adjustment for the number of predictors. Overall, the model provides substantial statistical evidence of an association between the selected medical service process dimensions and patient satisfaction.

### 4.5.2 Analysis of Variance (ANOVA)

**Table 7. ANOVA Results**

Table 4.7 The ANOVA Result

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 272.107 | 4 | 68.027 | 676.209 | .000[b] |
| | Residual | 39.737 | 395 | .101 | | |
| | Total | 311.844 | 399 | | | |

a. Dependent Variable: Patient Satisfaction

b. Predictors: (Constant), Process Quality Control, Process Efficiency, Process Standardization, Process Flexibility

The ANOVA results were used to determine whether the regression model was statistically significant overall. The regression sum of squares was 272.107, with 4 degrees of freedom, while the residual sum of squares was 39.737, with 395 degrees of freedom. The total sum of squares was 311.844 with 399 degrees of freedom.

The regression model was statistically significant, $F(4, 395) = 676.209$, $p < .001$. This result indicates that the set of four independent variables, considered collectively, significantly explained variation in patient satisfaction. Thus, the regression model provides an appropriate basis for examining the individual contribution of each medical service process dimension.

### 4.5.3 Regression Coefficients

**Table 8. Results of Coefficients**

Table 4.8 Result of Coefficients of the Study

**Coefficients[a]**

| Model | | Unstandardized Coefficients B | Unstandardized Coefficients Std. Error | Standardized Coefficients Beta | t | Sig. |
|---|---|---|---|---|---|---|
| 1 | (Constant) | -.819 | .105 | | -7.828 | .000 |
| | Process Standardization | .220 | .031 | .201 | 7.075 | .000 |
| | Process Efficiency | .225 | .037 | .204 | 6.066 | .000 |
| | Process Flexibility | .366 | .041 | .360 | 8.973 | .000 |
| | Process Quality Control | .400 | .028 | .325 | 14.534 | .000 |

a. Dependent Variable: Patient Satisfaction

The results of the regression coefficient demonstrated that all four independent variables had statistically significant positive relationships with the patient satisfaction.

Process standardization had a standardized coefficient of $\beta = .201$ ($t = 7.075$, $p < .001$). Process efficiency also demonstrated a significant positive relationship with patient satisfaction ($\beta = .204$, $t = 6.066$, $p < .001$). Process flexibility recorded the largest standardized coefficient among the four predictors ($\beta = .360$, $t = 8.973$, $p < .001$). Process quality control also had a statistically significant positive relationship with patient satisfaction ($\beta = .325$, $t = 14.534$, $p < .001$).

The indications of these findings highlight that the higher levels of process standardization, efficiency, flexibility, and quality control were associated with higher patient satisfaction when the other predictors were statistically controlled. Among the predictors, process flexibility had the largest standardized beta coefficient, indicating the strongest statistical association with the patient satisfaction within the regression model. Process quality control had the highest t-value, reflecting its strong statistical significance.

The reported unstandardized regression constant was −0.819. However, because the predictors were measured using restricted Likert-scale ranges, the constant should not be given substantive interpretation outside the observed range of the data.

### 4.6 Hypothesis Testing

**Table 9. Hypothesis Testing Summary**

Table 4.9 The Summary Of The Hypothesis Testing of The Study

| Hypothesis | Statement | β | t-value | p-value | Result |
|---|---|---|---|---|---|
| H1 | Process Standardization→ Patient Satisfaction | .201 | 7.075 | <0.001 | Supported |
| H2 | Process Efficiency → Patient Satisfaction | .204 | 6.066 | <0.001 | Supported |
| H3 | Process Flexibility → Patient Satisfaction | .360 | 8.973 | <0.001 | Supported |
| H4 | Process Quality Control → Patient Satisfaction | .325 | 14.534 | <0.001 | Supported |

The regression results provided statistical support for all four hypotheses proposed in the study.

**H1:** Process standardization has a significant positive relationship with the patient satisfaction. This hypothesis was supported ($\beta = .201$, $t = 7.075$, $p < .001$).

**H2:** Process efficiency has a significant positive relationship with the patient satisfaction. This hypothesis was supported ($\beta = .204$, $t = 6.066$, $p < .001$).

**H3:** Process flexibility has a significant positive relationship with the patient satisfaction. This hypothesis was supported ($\beta = .360$, $t = 8.973$, $p < .001$).

**H4:** Process quality control has a significant positive relationship with the patient satisfaction. This hypothesis was supported ($\beta = .325$, $t = 14.534$, $p < .001$).

Collectively, the findings indicate that all four dimensions of the medical service process were statistically significant predictors of the patient satisfaction in the study sample.

## 4.7 Summary of Results

The results provide empirical support for the proposed relationship between medical service processes and patient satisfaction. Strong internal reliability was demonstrated by the, with the Cronbach's alpha values ranging from .854 to .916, while the KMO and Bartlett's test results supported the suitability of the data for construct analysis.

The descriptive findings showed generally positive perceptions of the medical service process and patient satisfaction. Correlation analysis demonstrated significant positive associations between all four process dimensions and patient satisfaction. The multiple regression model was statistically significant, $F(4, 395) = 676.209$, $p < .001$, and explained 87.3% of the variance in the patient satisfaction.

All four hypotheses were supported. The largest standardized coefficient was shown by process ($\beta = .360$), followed by process quality control ($\beta = .325$), process efficiency ($\beta = .204$), and process

standardization (β = .201). The results suggest that the four dimensions of the medical service process are significantly associated with the patient satisfaction and provide the empirical foundation for the discussion of theoretical implications and recommendations for the healthcare service management.

## 5. Discussion

### 5.1 Discussion of Findings

The findings provide empirical support for the proposed relationships between four dimensions of medical service process management, process standardization, process efficiency, process flexibility, and process quality control and patient satisfaction. All four dimensions demonstrated statistically significant positive relationships with patient satisfaction, supporting the four hypotheses developed in the study. The regression model explained 87.3% of the variance in patient satisfaction, indicating that the selected process dimensions collectively accounted for a substantial proportion of variation in patients' satisfaction levels.

#### 5.1.1 Process Standardization and Patient Satisfaction

Process standardization was positively associated with patient satisfaction (β = .201, $p < .001$), supporting H1. Standardized medical service processes can reduce uncertainty by establishing consistent procedures for registration, diagnosis, treatment, payment, and other service interactions. When patients encounter predictable procedures and clearly defined service requirements, uncertainty and confusion during the healthcare journey may be reduced (Rusjan & Kiauta, 2019).

The finding suggests that consistency in service delivery is an important component of the patient experience. Variations in service delivery may be reduced by standardized operating procedures and support more consistent interactions between healthcare staff and patients (Bhatia & Swaminathan, 2026; Rusjan & Kiauta, 2019). Therefore, the results reinforce the importance of establishing clear and consistent service procedures while maintaining sufficient flexibility to accommodate individual patient circumstances.

#### 5.1.2 Process Efficiency and Patient Satisfaction

Process efficiency was also positively associated with patient satisfaction (β = .204, $p < .001$), supporting H2. Efficiency in healthcare services is closely related to the time and effort required by patients to complete different stages of the medical service process. Waiting for consultations, diagnostic procedures, reports, payment, and other administrative activities can influence patients' overall service experience (Naiker et al., 2018; Riebling et al., 2019).

The finding indicates that more positive patient evaluation may be contributed to improving the efficiency of service processes. In practical terms, healthcare institutions can examine unnecessary procedural steps, reduce duplication, improve patient flow, and use appropriate information-management systems to facilitate service delivery (van Leijen-Zeelenberg et al., 2016). These improvements may be particularly relevant in outpatient settings, where patients often experience multiple service stages within a relatively short period of time.

#### 5.1.3 Process Flexibility and Patient Satisfaction

Process flexibility demonstrated the largest standardized regression coefficient among the four predictors ($\beta = .360$, $p < .001$), supporting H3. This finding suggests that the ability of healthcare institutions to adapt service processes to different patient circumstances is strongly associated with patient satisfaction.

Patients have different healthcare needs depending on factors such as patients' age, medical condition, urgency, and individual circumstances. Therefore, a standardized process may not be adequately suitable for every patient. Introducing flexibility, such as priority pathways for patients with urgent needs, adjustments for elderly patients, or modifications based on clinical circumstances, can help provide a more responsive service experience (van Leijen-Zeelenberg et al., 2016).

The relatively large standardized coefficient for process flexibility indicates that adaptability is an important dimension of medical service process management within the present sample. This also highlights the importance of balancing standardization with flexibility. Standardized processes can provide consistency, but with excessive rigidity there will be limitations to the institution's ability to respond to individual patient needs. Effective process management may therefore require a combination of consistent core procedures and appropriate opportunities for adaptation (Rusjan & Kiauta, 2019; van Leijen-Zeelenberg et al., 2016).

### 5.1.4 Process Quality Control and Patient Satisfaction

Process quality control was significantly and positively associated with patient satisfaction ($\beta = .325$, $p < .001$), supporting H4. Quality control encompasses the monitoring of diagnosis and treatment procedures, service delivery, safety, and other elements of healthcare provision. Patients' evaluations of healthcare services are likely to be influenced by their perceptions of safety, reliability, professionalism, and effectiveness (Donabedian, 1988; Doyle et al., 2013).

The findings demonstrate that quality control remains an important component of patient satisfaction even when the other three process dimensions are considered simultaneously. Effective quality control methods can support consistency in service delivery and reduce the likelihood of process-related errors. The result therefore highlights the importance of integrating quality monitoring throughout the healthcare service process rather than treating quality as an isolated outcome (Donabedian, 1988; van Leijen-Zeelenberg et al., 2016).

## 5.2 Theoretical Implications

This study contributes to the literature on medical service process management by examining four process dimensions within a single empirical framework. Rather than considering standardization, efficiency, flexibility, and quality control independently, the study evaluates their relationships with patient satisfaction simultaneously. The results indicate that each dimension provides a statistically significant contribution to explaining patient satisfaction.

The findings also extend the application of service-process management concepts to the healthcare context. Healthcare services are incorporated with complex interactions among patients, healthcare professionals, administrative systems, and operational processes. The findings indicate that patient satisfaction is influenced not only with the clinical outcome of treatment but also by the way healthcare services are organized and delivered (Donabedian, 1988; van Leijen-Zeelenberg et al., 2016).

In particular, the relatively larger standardized coefficient for process flexibility highlights the potential importance of adaptability within healthcare service processes. The findings suggest that process management frameworks in healthcare may benefit from considering both operational consistency and the capacity to respond to individual patient circumstances (Rusjan & Kiauta, 2019).

### 5.3 Practical Implications

The findings provide several implications for healthcare managers and administrators. First, healthcare institutions should establish clear and consistent service procedures for key stages of the patient journey. Standardized procedures can help reduce unnecessary variation and provide patients with clearer expectations regarding service delivery (Bhatia & Swaminathan, 2026).

Second, institutions should continuously examine opportunities to improve process efficiency. Reducing unnecessary administrative steps, improving patient flow, integrating information systems, and minimizing avoidable waiting times may contribute to a more convenient patient experience (Naiker et al., 2018)

Third, incorporating appropriate flexibility into standardized processes in healthcare organizations. Simultaneously, with consistency, healthcare services must also respond to differences in patient needs and clinical circumstances. A more patient-centered approach can be established with flexible pathways for urgent cases, elderly patients, and patients with specific requirements.

Finally, throughout the service processes integration of quality control should be acknowledged. Regular monitoring of clinical, administrative, safety, and service-quality procedures can help institutions identify process limitations and maintain consistent service standards (Donabedian, 1988; Doyle et al., 2013). All in all, the findings suggest that improvements in patient satisfaction require a coordinated approach rather than attention to a single process dimension.

### 5.4 Limitations and Future Research

Several limitations should be considered when interpreting the findings. First, the study focused on respondents using public and private medical institutions and did not include other healthcare settings such as community health centers, specialist clinics, or other primary healthcare providers. Consequently, the generalizability of the findings to other healthcare contexts should be established through further research.

Second, the study employed a cross-sectional research design. The data therefore capture relationships between process dimensions and patient satisfaction at a particular point in time. Although statistically significant influence was demonstrated by the regression results, they do not establish temporal or causal relationships between the variables.

Third, the study relied primarily on questionnaire responses. Patient perceptions provide important information about service experiences, but self-reported responses may be subject to individual perceptions and response biases. Objective operational indicators, such as actual waiting times, processing times, service errors, and quality-control records, were not incorporated into the analysis.

Future studies could address these limitations by expanding the sample to different categories of healthcare institutions and conducting comparative research across healthcare settings. Longitudinal research could also examine whether changes in medical service processes are

associated with changes in patient satisfaction over time. In addition, future research could combine patient survey data with objective operational indicators to provide a more comprehensive assessment of healthcare process performance.

### 5.5 Conclusion

This study examined the relationships between process standardization, process efficiency, process flexibility, process quality control, and patient satisfaction in healthcare services. The empirical findings demonstrated statistically significant positive relationships between all four process dimensions and patient satisfaction. Process flexibility recorded the largest standardized coefficient ($\beta = .360$), followed by process quality control ($\beta = .325$), process efficiency ($\beta = .204$), and process standardization ($\beta = .201$).

The regression model explained 87.3% of the variance in patient satisfaction, while all four proposed hypotheses were supported. These findings indicate that medical service process management is an important area for understanding variations in patient satisfaction within the study sample.

Overall, the findings suggest that healthcare organizations should consider medical service processes as an integrated system encompassing consistency, efficiency, adaptability, and quality control. Rather than focusing exclusively on individual aspects of service delivery, a coordinated approach to process management may provide a stronger basis for improving patients' overall service experience.

## ETHICAL CONSIDERATIONS

Informed consent was obtained before the interview, with clear explanations provided about the study's purpose, the voluntary nature of participation, and the right to withdraw at any time without any negative consequences. Confidentiality was upheld by anonymizing personal information and securely storing data, including the use of pseudonyms when necessary. Participation was entirely voluntary, and participants were assured they could withdraw from the study at any point if they chose. Ethical approval for the study was obtained from the INTI Ethics Committee, INTI International University, Malaysia. These ethical practices aligned with the guidelines outlined by the World Medical Association (2013), which stress the importance of transparency, respect, and safeguarding participant welfare.

## CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## AUTHOR'S CONTRIBUTION

P.D. conceived and designed the study, coordinated the research, conducted the bibliometric analysis, interpreted the findings, and drafted the original manuscript. H.F. contributed to the study design, data curation, literature review, and interpretation of the findings and corresponding. K.A. contributed to the methodology, data verification, analysis validation, visualization, and critical revision of the manuscript. L.L. contributed to the interpretation of the findings, manuscript review, language editing, and overall supervision. All authors reviewed and revised the manuscript and approved the final version for publication.

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## CONSENT TO PUBLISH

Not applicable

## DATA AVAILABILITY

The Data Availability Statement has been added to both the manuscript and the submission system. The statement indicates that the dataset is not publicly available due to privacy and confidentiality considerations but is available from the corresponding author upon reasonable request.

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