Navigating Healthcare through Clinical Pathways and Cost Awareness in Daily Activity for Sustainable Healthcare

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Abstract: - The shifting paradigm in implementing strategic management accounting (SMA) has become a shared orientation and leads to sustainability. Empirical studies accordingly are needed to elaborate SMA techniques, especially in hospital services. The aim of the research is to analyze the position of clinical pathways and cost awareness in daily activities for sustainable healthcare which is mediated by cost reduction strategies. A mixed method with an exploratory design was chosen based on existing literature studies. Data was collected by distributing questionnaires to 171 respondents selected from the professional caregiving (Profesional Pemberi Asuhan/PPA) population using the Slovin method, Focus Group Discussions, and semi-structured interviews with purposively selected informants. A total of 8 informants came from PPA and 7 others from management, selected based on the research objectives with thematic and regression analysis. The research results show that the shifting paradigm in the accounting management system encourages changes in health services that lead to sustainability. Clinical pathways and cost awareness are designed to support hospitals' efforts to reduce costs while constantly remaining patient-centered. Clinical pathways and cost awareness partially influenced changes in sustainable healthcare through cost-reduction strategies developed by the hospital.

Key-Words: - Clinical Pathways, Cost Awareness, Cost Reduction, Coronary Artery Bypass Graft (CABG), Coronary Angiography Percutaneous Coronary Intervention (**CAG-PCI**), Sustainable Healthcare, Strategic Management Accounting.

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1 Introduction

The increasing operational costs for disease management in healthcare services inflict the shifting paradigm in financial statements and cost analysis. [1], state that strategic management accounting (SMA), the concept introduced for the first time by [2], focuses on the importance of providing relevant and timely information in strategic decision-making. Strategic management accounting involves generating and analyzing internal accounting data of the company and its competitors, in order to assist in formulating and monitoring the company's business strategies. The research emphasizes the important values of strategic management accounting as a tool to analyze the internal and external conditions of the company to develop appropriate business strategies, [3]. However, there are conceptual differences regarding definitions, according to [4], that is still no definition agreed upon by experts regarding SMA, including healthcare. The application of SMA is still relatively new, especially in developing countries, [5]. Despite the critical role in providing strategic information, initiating and implementing AMS practices, [3]. SMA is required to encounter shifting demands, [6], [7].

One of the several applications of SMA in healthcare services is a strategic costing and customer profitability, where customer assessment is served as an asset, [8]. The operationalization of SMA includes Clinical Pathways (CPs) and Strategic costing. Clinical pathways are multidisciplinary clinical management tools necessary for patient care management, the intention is to detail the best practical pathways within a healthcare organization regarding a disease or complex clinical situation, [9]. According to [10], clinical pathways a collaborative guidelines that elaborate diagnosis, treatment, and care steps for patients with specific clinical problems. It is a

structured combination of care standards followed by healthcare providers.

The main characteristic of clinical pathways is to be focused on patients; and provide organized, consistent, and sustainable services. The implementation of clinical pathways is able to manage hospital service quality and costs [11], [12] and ameliorate quality of life and patient satisfaction [13], [14] suggest that clinical pathways aim to minimize variations, improve care quality, and optimize outcomes for specific patient groups. Clinical pathways can enhance quality, cost efficiency, and patient satisfaction. [15], clarify that clinical pathways promote the implementation of the most effective and relevant diagnostic strategies.

However, implementing clinical pathways strategies can be arduous, [16], [17]. The successful implementation of Clinical Pathways depends on several factors such as developing accurate guidelines, the flexibility in adaptation to patient needs individually, as well as continuous evaluation and improvement, [12], [18] complement the complexities in defining clinical pathways by taking into consideration the patient's state of affairs. To assure balance when utilizing economic and health assessments in accordance with the treatment classifications and patient conditions can be very challenging. [14], reveal the potential barriers to operationalizing clinical pathways. Designing clinical pathways requires a deep understanding of chronic obstructive pulmonary disease diagnosis and treatment processes, [19].

There is extensive disagreement about the impact of clinical pathways on hospital resources and patient outcomes, leading to confusion among researchers and healthcare professionals about what clinical pathways entail, [20], [21], [22], [23]. There is an urgency to define and operationalize patient-focused clinical pathways. However, this concern should also consider one crucial aspect of the healthcare system, health sustainability issues that include specialized hospitals that manage heart diseases in Indonesia. Heart disease is one of the leading causes of death. In 2023, the Indonesian Ministry of Health recorded that the number of deaths due to this disease reached 650,000 annually in Indonesia. The application of clinical pathways is limited to a certain hospital with specific resources, regarding the hospital type hierarchy in Indonesia. Based on the Basic Health Research (Riskesdas) in 2013 and 2018 it showed an increasing incidence of heart disease trends, from 0.5% in 2013 to 1.5% in 2018. Heart disease accounts for the highest financial burden, as seen in BPJS Health data for 2021 and 2022.

In addition to clinical pathways, cost awareness is no less important in healthcare services, especially in heart disease management. To manage administrative expenses efficiently in a hospital means that every individual both medical and administrative, must acknowledge the implications of their actions in regard to administrative expenses, [24]. Cost awareness served as a directive instrument that emphasize monitoring and evaluating all expenses incurred due to activities in the hospital.

This research contributes to the development of the Strategic Management Accounting (SMA) concept in healthcare services, based on empirical evidence from the implementation of SMA strategies through clinical pathways and cost awareness. These findings can be used as a fundamental ground to create value through utilizing resources efficiently, in accordance with evolving management accounting methodologies and practices in various regions, as outlined by [6]. Many researchers confirm that strategic management accounting techniques have the ability to provide important strategically oriented information systems for decision-making and strategic control, [5]. The objective of this research is to analyze clinical pathways and cost awareness in daily activities for sustainability healthcare at the Jakarta Heart Hospital.

2 Methodology

This research utilizes a mixed methods approach with an exploratory sequential design according to [25]. The advantages of using the mixed methods with exploratory sequential design comprise providing high-accuracy information, supporting interpretation, and indicating potential causal directions. The research design is as follows:

[26], clarify that the initial step involves exploring and examining qualitative data, continued by the collection and evaluation of quantitative data, as shown in Table 1. The qualitative approach engages interviews:

a. To formulate interview questions as a data source for doctors, nurses, and patients. Semi-structured questions related to issues of cost reduction and hospital service sustainability.
b. To determine data source based on purposive and snowball techniques to assure data credibility: doctors (4), nurses (3), pharmacist (1), director (1), and Manager (6) with the following criteria:
   - Minimum 1 year of service in the unit that serves as the research corpus.

  - To possess knowledge and understanding of the research focus.

c. To design the interview system such as video conference meetings. To record the interviews, transcribe, and validate data sources in order to avoid misconception.

d. To analyze data corpus with the grounded theory method by:
  - Transcribe the collected data from interviews with open coding to enable further analysis. The data obtained is then broken down into small parts or elements. Each data element is labeled with a code representing its meaning. The researcher then assigns labels or keywords to each concept that emerges from the data.
  - Applying axial coding technique to create grouping codes. The codes from the previous stage are organized based on their relationships and interconnections. This process identified patterns and associations among the coded concepts.

e. The theory development is based on the identified data and categories, establishing the foundation for theory formation. The researcher attempts to comprehend and clarify the relationships between concepts as well as to elaborate narrative or theoretical structure originating from the data. The researcher constructs theoretical frameworks organized into a conceptual model, to provide visualization of the relationships between concepts.

The second stage comprises a quantitative approach by using a survey of 171 randomly selected respondents, including Attending Physicians, Resident Medical Officers (RMOs), nurses, as well as staff from the nutrition, medical rehabilitation, and pharmacy departments. The research steps are as follows:

a. To develop hypotheses based on the clinical pathways framework, to examine the qualitative result that elaborates the relationships between variables and constructs of each variable based on empirical qualitative data analysis and relevant theories.

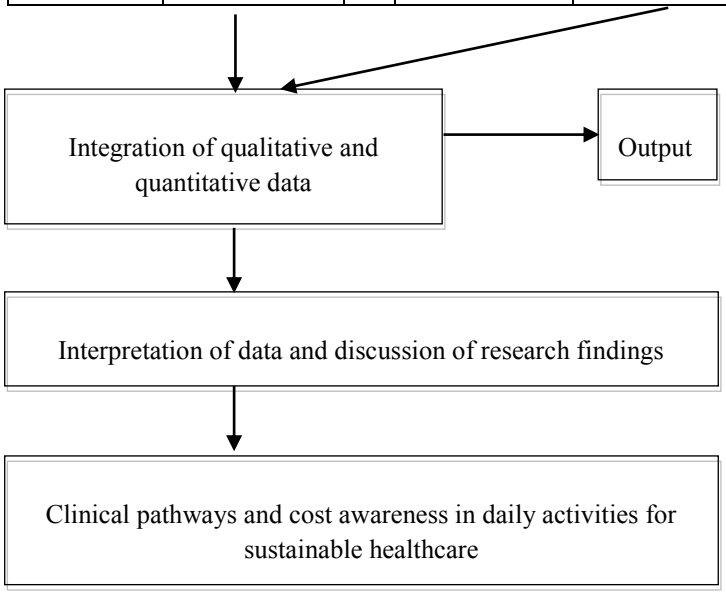
b. Developing a questionnaire based on insights generated from the qualitative phase. Questionnaire items are defined based on concepts using a five-point Likert scale (one meaning "strongly disagree" and five meaning "strongly agree"). The questionnaire is filled out by data sources based on their experience and sufficient knowledge about the efforts to implement clinical pathways and cost awareness.

c. To test the structure of the developed conceptual model, the organized sample consists of nurses, doctors, and other healthcare professionals.

d. The third stage is data analysis. Qualitative data analysis is conducted by formulating patterns emerging from the interview data (validated through design and analysis validity). Subsequently, data transformation practices are carried out, converting these concepts into numerical codes that can be quantitatively tested and statistically explained. In the quantitative analysis stage, regression is utilized.

Table 1. Research Workflow

Qualitative Phase	Output		Quantitative Phase	Output
Data collection through semi-structured direct interviews.	Semi-structured questions for FGD		Semi-structured questions for Focus Group Discussions (FGDs).	Research instruments in Bahasa Indonesia for respondents.
Data source design	Identification of data sources		Identification of respondents	Employment status, length of service, gender, quantity
Validation of interview instruments	Interview instrument		Validation of instruments by experts and content, revisions, instrument pilot testing	Validation involving experts
Data collection	Interviews, observations, Focus Group Discussions (FGDs)		Offline data collection	The amount of data collected is 171 as per Slovin's method.



The key steps above (Table 1) are allows researchers to leverage the strengths of both approaches, enriching interpretation and expanding understanding of complex phenomena in daily activity for sustainable healthcare through clinical pathways and cost awareness.

3 Result

3.1 The Qualitative Phase

The efforts made to develop healthcare services that have positive impacts both on patients and hospitals have become a strategic issue in hospitals. Numerous attempts have been made to intensify service efficiency and focus on patients. According to one financial manager (AM), "It requires a financial report design transformation to render financial reports as a guide to strategic decision-making. Not only that financial reports exhibit daily financial aspects but also give direction to strategic planning for healthcare services."

One doctor (AD), although not structurally in financial departments, but still part of the hospital's financial team, emphasized the importance of strategic financial management. The reason for this is the increasing number of cardiology patients and the high demand requirement for comprehensive financial management support, which clearly demonstrates the hospital's long-term orientation. Currently, the hospital's financial statements are more transparent, but a shifting comprehension in interpreting financial reports as a basis for patient-oriented decision-making and efficient hospital resources is very crucial.

A shifted paradigm in the financial system, that focuses on creating customer-oriented value while improving resource efficiency, demands assurance for both nurses and doctors to have the same comprehension related to curative, promotive, and preventive procedures. The hospital designs a number of procedures and guidelines for the operationalization of strategic financial reporting. The hospital emphasizes the importance of compliance in following all procedures to reduce the risk of procedural errors that can generate additional costs, such as time, manpower, and equipment, and increase the risk to patients. This compliance is considered an indicator of success in implementing an accounting reporting system that focuses on long-term orientation.

To ensure that all Healthcare Providers (HPA) comply with the established procedures, effective supervision systems, both through systematic mechanisms and internal supervision, are crucial. Senior nurses, junior nurses, and doctors are responsible for consistently implementing clinical pathways for Coronary Artery Bypass Graft (CABG) and Coronary Angiography Percutaneous Coronary Intervention (CAG PCI) in hospitals. Medical service managers and ancillary personnel have a clear understanding of the procedures and guidelines in healthcare organizations. The information obtained from the world tree indicates that clinical pathways serve as a guide that establishes patient care steps in hospitals or action plans for each patient. The implementation of clinical pathways aims to minimize procedure time without compromising the quality of care while optimizing the use of resources, including equipment and personnel.

Structured and measurable procedural steps in accordance with clinical pathways help create an efficient work environment and focus on optimal outcomes for patients. Five main codes are based on frequency from the most to the least, namely: the implementation of Clinical Pathway in hospitals, the patient's influence, the barriers found in implementation, the identified solutions, and the evaluation of clinical pathways. Thus, based on the diagram, it is known that the discussion regarding the implementation of clinical pathways in hospitals dominates qualitative data findings, followed by the patient's influence, the implementation barriers, the solutions, and evaluation as the least discussed topics in the data. The evaluation of clinical pathways not only serves as a tool for monitoring and control but also as a catalyst for innovation and improvement in clinical practice. This creates a virtuous circle of assessment, learning, and sustainable improvement, which ultimately leads to improved quality of patient care and operational efficiency at Jakarta Heart Hospital.

Both clinical pathways and cost awareness are efforts made by hospitals to operationalize their strategic financial reporting system. This was stated by the Medical Service Manager: "We strive to promote transformation in our service system; based on our reporting system, we are now collecting financial report data as a basis for formulating various cost reduction strategies. There is an increase in costs along with the increasing number of patients and the level of chronic diseases. We make sure that clinical pathways, as an output of our evaluation of the financing system, are implemented. We strive to ensure that best practices are continuously implemented in relation to resource allocation to be more effective. Through routine evaluations of the accounting reporting system, our

treatment results, and our procedures, we can identify areas needed for improvement and implement necessary changes to enhance patient care."

The evaluation of clinical pathways at Jakarta Heart Hospital not only serves as a formal procedure but also as a proactive initiative to ensure compliance with established standards and to improve efficiency and quality of care. This involves regular internal audits, reviews by medical committees, and reflection sessions with the care team. Each evaluation generates valuable data for further financial reporting analysis. In addition, cost reduction is also a concern of hospital management. From the data, we found an increasing cost, but from the financial report perspective, there is also an increase in efficiency. The ratio of operational expenses to overall hospital revenue is decreasing. There is a downward trend, but it is done carefully not to forfeit healthcare processes that under certain circumstances significantly exhaust resources, such as in emergency situations. Overall, during the study period, compliance and conformity trends for CAG-PCI increased. The hospital strives to ensure a sustainable service system, as well as in curative effectiveness, preventive, and promotive functions as an effort to reduce healthcare financing for the community. Doctors and nurses are directed to realize the importance of treatment costs to be managed more effectively.

The success of optimizing costs cannot be separated from the role of nurses, doctors, managers, and hospital management. I see the efforts to increase cost awareness, especially through socialization and education. However, there is still room for improvement in providing a deeper understanding to medical staff about the clinical decisions' impact on overall treatment costs. Although the main goal is to improve service quality, we also hope to control costs more effectively. To date, significant impacts on cost reduction are still under surveillance. One obstacle in implementing cost reduction strategies is resistance to change, especially in adopting new technologies.

To overcome this, adequate socialization and training provisions are needed, as well as communication about the long-term benefits of these changes to all staff. Through the use of words like 'efficiency,' 'reduction,' and 'control,' we gain a clear understanding of the integration of cost awareness into hospital practices. This awareness is manifested not only in strategic thinking and planning but also in daily actions, and interactions between medical staff, management, and patients. However, the presence of the words 'not yet' and 'must' may indicate a gap between awareness and action, between what is recognized as ideal and the reality of daily practice. This prompts deeper questions, "To what extent is this level of cost awareness translated into actual actions that take effect to overall cost reduction strategies?".

From this research, we conclude that Jakarta Heart Hospital has a robust fundamental of cost awareness, which is significant as a first step in formulating effective cost reduction strategies. However, the gap between awareness and action, represented by the lower number of 'Solutions' and 'Barriers,' indicates opportunities to develop more innovative and comprehensive strategies that not only acknowledge costs but also proactively overcome challenges and embrace the potential solutions. In the consultation rooms and managerial corridors of Jakarta Heart Hospital, 'cost awareness' has become more than just a phrase; it has become a mantra for those who manage both lives and budgets. With 11 recorded entries, there are layered narratives waiting to be exposed and reveal how doctors make resource-use decisions, how nurses assess intervention value, and how managers prioritize budget allocation.

Thematic study results reveal that 'cost reduction strategies' are a theme with loaded potential findings. From interviews with GR, a heart surgeon, it was revealed that compliance with clinical pathways is crucial, not only to improve cost efficiency but also as guidance in implementing appropriate clinical practices. This underlines that every cost reduction strategy must be aligned with clinical standards to make certain that cost efficiency will not compromise the quality of care. Medical team members have shown a deep understanding that "by managing costs wisely, hospitals can provide affordable services without compromising quality of care." The approach settles a commitment to efficiency and dedication to ethical principles in providing sustainable patient care. Various barriers, from cost management, and practice standardization, to compliance with procedures, represent the complexity that hospitals face in implementing cost reduction strategies oriented towards sustainability.

The hospital's director (AS) conveys that compliance and cost reduction efforts become challenging if there is resistance from organizational members. Barriers to implementing clinical pathways include operational issues, staff training needs, and resistance to change, as revealed by Ns. AY, a nurse. Furthermore, TD, a doctor, emphasized resistance to change as a challenge commonly faced

by every organization, especially in a hospital environment that highly prioritizes procedures. “The changes demand time and patience. We strive to build a culture where every member of the team feels empowered to make an improvement contribution and not afraid to speak up their concerns.”

At the operational level, continuous implementation for sustainable improvement that focuses on patients and is evidence-based. Studies showing a decrease in the number of complaints and effectiveness through achieving zero errors in procedures indicate the hospital's commitment to sustainable improvement oriented towards patient-centered quality standards. Active participation of nurses in the improvement process encourages the creation of a culture of learning and continuous improvement, allowing each team member to share insights and ideas to enhance care processes. The hospital also strives to redesign its organizational processes to create a culture where cost efficiency and care quality can go hand in hand. These efforts not only focus on cost reduction but also on creating value for patients by providing high-quality care cost-effectively.

Based on interviews, observations, and documentation studies, this research yields four important themes: first, compliance with guidelines and procedures; second, increased cost awareness for patient service effectiveness; third, ethical awareness integration in healthcare services as part of a sustainable system; and fourth, hospital efforts in developing norms and values supporting the implementation of procedures and guidelines, while also increasing cost awareness. The hospital institutionally expands opportunities for reflection and improvement, aiming to design solutions that not only solve current problems but also enhance the institution's ability to provide sustainable healthcare at all levels, both managerial and operational. Proactively, the hospital makes strategic decisions based on the developed financial reporting system analysis. This allows Jakarta Heart Hospital to continue implementing sustainable and responsible cost management practices, while ensuring high standards of patient care.

3.2 Quantitative Phase

3.2.1 Clinical Pathways have a Positive Correlation with Sustainable Healthcare

Clinical pathways (CPs) as the most effective and relevant diagnostic strategy are crucial for disease management, [15]. It's a methodology for joint decision-making and care organization for well-defined patient groups, [19], [21]. In addition, it's a pattern of diagnostic and therapeutic processes that require intensive knowledge. CPs enhance the effectiveness and efficiency of healthcare services, making them highly profitable for patients.

The integration and operationalization of clinical pathways with the concept of healthcare sustainability can form the basis of an efficient, effective, and socially, economically, and environmentally responsible healthcare system. Organizations need to establish systems and procedures to ensure clear accountability and transparency at every stage of the care pathway to ensure healthcare sustainability, [27]. CPs assist in designing and implementing efficient procedures in delivering healthcare under various conditions, [9]. CPs are designed based on scientific evidence and best practices in healthcare, [12], [16]. CPs are a potentially important strategy for effectively translating knowledge into practice, [17], [22]. CPs reduce the risk of errors that could increase costs and reduce customer profitability. [28], assert it as a typical clinical service for sustainability. The hypothesis proposed is

Ha1: Clinical pathways have a positive influence on sustainable healthcare.

3.2.2 Cost Awareness has a Positive Relationship with Sustainable Healthcare

Cost awareness is a technical operationalization carried out based on strategic management accounting (SMA). Costing and strategic costing are techniques in SMA developed based on the orientation of strategic public services, [3], [8], including in hospitals, [7], [29], stated managerial accounting as an essential component of hospital transformation towards sustainability, playing a complex role in decision-making through accounting processes. Cost awareness is a technical dimension of concern in SMA to achieve sustainable healthcare. The sustainability of healthcare systems can be enhanced in various ways, broadly and inclusively related to costs, [30]. The proposed hypothesis is:

Ha2: Cost awareness has a positive influence on sustainable healthcare.

3.2.3 Cost Reduction Strategy Mediates the Influence of Clinical Pathway and Costs Awareness on Sustainable Healthcare

Clinical pathways (CPs) serve as appropriate tools to enhance quality management, reduce costs, and increase patient satisfaction, [13], [18], [23], [31] state that compliance with real-time cost reporting in intervention settings affects the use of equipment

and materials, leading to cheaper yet equally effective choices when interventionists are given options. By optimizing steps and reducing variation in care, clinical pathways can enhance efficiency in resource utilization, including time and manpower, assisting in managing the use of healthcare resources sustainably. Clinical pathways serve as the operationalization of strategic management accounting for enhancing the quality of care provided to patients and contributing to sustainable public health. The proposed hypothesis is:

Ha3a: Cost reduction strategy mediates the influence of clinical pathways on sustainable healthcare.

Cost awareness influences costs. [31], state that cost awareness by physicians directly impacts decision-making, resulting in an overall reduction of healthcare costs. Cost awareness serves as a strategy to reduce the burden of healthcare costs and enhance efficiency in managing healthcare resources. Cost awareness drives the successful implementation of strategies that lead institutions toward sustainable healthcare services, [32]. Broader awareness within the healthcare system about the economic implications of medical decisions creates more responsible and financially aware medical practices, [33]. Cost awareness minimizes the risk of errors that impact cost escalation. [34], argue for the importance of cost awareness among healthcare professionals to achieve quality healthcare services. [35], affirm that cost awareness regarding the expenses of general operation supplies like surgical instruments, and the desire to enhance this knowledge. This cost awareness is deemed crucial to reduce waste in supply choices during operations and enhance value. High-cost awareness among medical staff and management drives wiser decision-making in resource utilization, directly resulting in cost reduction [36], [37] suggest that the key to efficient resource allocation for cost reduction is cost awareness. [38], proposes that cost awareness among healthcare providers is driven by high healthcare costs and efforts to support sustainability in the healthcare service system. Efficiency supports cost reduction, reduces doctors' workloads, and supports a sustainable healthcare system, [27], [38].

The proposed hypothesis is:

Ha3b: Cost reduction strategy mediates the influence of cost awareness on sustainable healthcare.

The framework of this study can be seen in Figure 1.

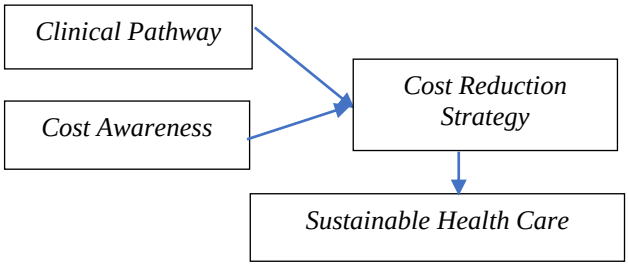


Fig. 1: Proposed Model

The Framework of proposed model (Figure 1) provides a logical and theoretical basis for research and provides guidance for collecting and analyzing data. The framework of thinking also aids in understanding the relationships between variables and provides direction for research development.

3.2.4 Description of Research Variables

This study measures the economic impact of implementing clinical pathways by investigating various financial parameters, such as medication costs, consumables costs, and laboratory costs, as well as comparing the duration of patient hospitalization. To evaluate the cost differences before and after the implementation of clinical pathways, Mann-Whitney U statistical analysis was used. The results of this analysis not only provide insights into the effectiveness of clinical pathways from a clinical perspective, including compliance and suitability but also highlight its economic impact. This helps hospitals make informed and strategic decisions to achieve long-term financial sustainability.

The implementation of clinical pathways at Jakarta Heart Hospital showed a significant increase in compliance and suitability of care. For CAG-PCI procedures, the compliance rate increased from 95% to 98% and suitability from 93.60% to 94.20% within two months. Meanwhile, CABG procedures recorded 100% compliance with suitability around 88%. Although there is high compliance, there is still room for improvement in suitability, indicating the importance of continuous improvement in clinical pathways to achieve optimal outcomes and greater cost efficiency. The comparison of Length of Stay (LOS) before and after the implementation of clinical pathways is shown in Table 2.

Statistical analysis indicates a significant change in the length of stay (LOS) for patients after the implementation of the clinical pathway (Table 2). For CAG-PCI patients, the duration of hospitalization decreased from 1-5 days to 1-3 days, with an average decrease from 2.3 days to 1.3 days, indicating more consistent handling. CABG patients also experienced similar improvements. Before the

clinical pathway, patients were hospitalized for 6-18 days with an average of 9.92 days. Afterward, patients were only hospitalized for 6-10 days with an average of 7.14 days, indicating more uniform care. This demonstrates that clinical pathway enhances care efficiency and yield more consistent and predictive lengths of hospital stay. The p-value from the statistical test is 0.000, indicating that the reduction in patient length of stay after the implementation of the clinical pathway is not coincidental. This suggests that the clinical pathway successfully shortens hospital stays, which is crucial for healthcare resource management as it means patients spend less time in the hospital, potentially reducing costs and improving healthcare service quality.

Table 2. Comparison of LOS before and after the implementation of clinical pathways

	LOS			SD	95% CI Mean	P Value
	Min	Max	Mean			
Coronary Angiography Percutaneous Coronary Intervention (CAG-PCI)						
Before CP	1	5	2,3	0,6	2,22 s/d 2,38 days	0,000
After CP	1	3	1,3	0,5	1,24 s/d 1,36 days	
Coronary Artery Bypass Graft (CABG)						
Before CP	6	18	9,92	3,8	8,68 s/d 11,16 days	0,000
After CP	6	10	7,14	0,6	6,96 s/d 7,32 days	

Source: Data processed by the author using SPSS 25 (2023)

The survey results regarding cost awareness concluded that the level of cost awareness among Healthcare Providers (HPs) and management in hospitals falls into the category of moderate, with a percentage value of 73.8%. The detailed frequency distribution of cost awareness in this analysis highlights the level of cost awareness among Healthcare Providers (HPs) and management. With an average value of 39.53 and a 95% confidence interval ranging from 38.78 to 40.30, the findings indicate that the majority of HPs and management have moderate cost awareness, with a percentage of around 73.8%. These findings emphasize that most staff members are sufficiently aware of costs, but there is still potential to enhance this awareness further.

The research findings regarding cost reduction strategies show significant cost reductions. The average cost of Coronary Artery Bypass Grafting (CABG) for medication, which previously stood at 7,687,204, with a variation shown through a 95% confidence interval between 7,241,660 and 8,132,748, decreased to 5,956,939 after the implementation of the clinical pathway. The narrowing of the 95% confidence interval to 5,698,224 to 6,215,654 after the implementation of the clinical pathway, along with a very small P-value (0.0000), states unequivocally that the reduction in medication costs is significant and directly related to the effects of the clinical pathway implementation. For the Consumables (BMHP) cost of Coronary Artery Bypass Grafting (CABG), the analysis also indicates a significant decrease from 33,369,788 to 29,124,444, with a P-value of 0.004, confirming this cost reduction as significant. The adjustment of the 95% confidence interval reflects increased efficiency, shifting from a range of 32,948,390 to 33,791,186 before the clinical pathway to 28,868,221 to 29,380,667 after the clinical pathway, indicating increased consistency and predictability in consumables cost management. As for the laboratory cost of Coronary Artery Bypass Grafting (CABG), the observed decrease is striking, from an average of 9,246,499 to 6,765,609, with a P-value touching zero (0.0000). The shrinkage of the 95% confidence interval from 8,693,858 to 9,799,140 before the clinical pathway to 6,522,247 to 7,008,971 after the clinical pathway reinforces that the reduction in laboratory costs is not only significant but also indicates an increase in efficiency in laboratory procedures resulting from the implementation of the clinical pathway.

3.2.5 Inferential Analysis

1. Clinical pathway and cost reduction strategy

By using multiple linear regression analysis, the data processing results showed that CPs have a significant influence on cost reduction strategy, the results are shown in Table 3.

Table 3. The Results of the Partial Regression Testing

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1 (Constant)	13.186	2.077		6.349	.000
Clinical Pathway	.575	.062	.581	9.287	.000

a. Dependent Variable: Cost. reduce
Source: Data processed by the authors using SPSS 25 (2023)

The t-value for the clinical pathway has a t-value of 9.287, and the significance value for the independent variable and the constant is 0.000. The t-value is greater than the critical t-value (9.287 >

1.96), and the significance value is 0.000, which is less than 0.05 (α) (Table 3).

2. Cost awareness and cost reduction strategy

Based on the partial test analysis, it can be concluded that cost awareness significantly influences cost reduction strategy, the results are shown in Table 4.

Table 4. The Results of Partial Regression Testing

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1 (Constant)	11.129	1.338		8.315	.000
Cost Awareness	.537	.034	.776	15.995	.000

a. Dependent Variable: Cost. reduce
Source: Data processed by the authors using SPSS 25 (2023)

From the analysis, a significance value of 0.000 was obtained, indicating that cost awareness has a statistically significant influence on cost reduction. This is based on the fact that the t-value (15.995) is greater than the critical t-value (1.65381), and the significance value is 0.000, lower than 0.05 (α). This indicates that this variable has a significant impact on cost reduction (Table 4).

3. Cost reduction strategy partially mediates the influence of clinical pathway and cost awareness on cost reduction strategy

The cost reduction strategy expands hospitals' opportunities to achieve sustainability. Mediation analysis using the Sobel test indicates that cost reduction mediates the influence of clinical pathways on sustainability the results are shown in Table 4.

Table 5. Result of the Mediation Test Results

Path					Z Score
Sustainable Health Care	<---	Cost Reduction	<---	Clinical Pathways	3.403
Sustainable Health Care	<---	Cost Reduction	<---	Cost Awareness	5.254

Source: Data processing results

The mediation test results indicate that the Z-score is within the acceptance region of Ha, suggesting that cost reduction partially mediates the influence of clinical pathways and cost awareness on sustainable healthcare (Table 5).

4 Discussion

The implementation of Strategic Management Accounting (SMA) in healthcare services is a reflection of the strategic effort to achieve a sustainable healthcare system. The research results indicate differences in the technical application of SMA through clinical pathways and cost awareness. In accordance with that, SMA implementation leads to sustainable healthcare. Parallel with the concepts proposed by [1], [2] and [3], regarding hospital services, the implementation of SMA with clinical pathways and cost reduction techniques which is moderated by kaizen culture drives sustainability. The concept of SMA is highly relevant to the need, especially in developing countries, to ensure sustainability. Consistent with [5], [6], [7], SMA directs hospitals to meet the alteration demands for sustainability in hospital service systems. SMA implementation in hospitals represents a paradigm shift in understanding financial reporting systems. SMA provides relevant and timely information crucial for strategic decision-making to achieve healthcare sustainability.

The implementation of SMA through the clinical pathway and cost reduction widened the insights about the value of the dynamic required by the market, and the analysis of patient needs as customers and healthcare stakeholders. The effectiveness of hospital business strategies can be evaluated sustainably to align with organizational goals and needs. In line with [29], who proposed strategic accounting practices in healthcare raise changes in the entirety healthcare system that lead to sustainability.

One of the widely acknowledged tools playing a vital role to provide strategically oriented information systems for decision-making and strategic control is the SMA technique. However, this tool needs to be implemented, particularly in hospital services. SMA is highly complex. Clinical pathways and cost awareness are part of the implementation of strategic management accounting techniques. The clinical pathway serves as the implementation of strategic planning that standardizes care based on disease diagnosis/treatment to ensure healthcare sustainability. By means of clinical pathways, hospitals can calculate the actual cost of each activity within the clinical pathway based on resource consumption, such as the cost of heart patient care, heart surgery, and diagnostic test costs. Additionally, target costing techniques can also be used by hospitals by setting cost targets for each clinical pathway based on medical action standards and INA-CBGs tariffs as budgeting references while still considering customer profitability. Integrating various strategic accounting techniques in clinical pathways can enhance hospital service efficiency

and quality sustainably. The evaluation of clinical pathways at Jakarta Heart Hospital represents a fundamental component in ensuring that the care provided is not only effective but also remains relevant to the latest developments in sustainable medical practices.

The study results indicate that cost awareness determines the sustainability of hospital services. Consistent with the strategic demands developed in hospital work plans, cost awareness as a culture developed to support cost reduction and sustainable healthcare. High-cost awareness among medical staff and management encourages wiser decision-making in resource utilization, directly impacting cost reduction [36]. This is consistent with the findings of [37], indicating that although healthcare professionals play a key role in resource allocation, they often have a limited understanding of healthcare costs. Increased cost awareness means that medical staff and management become more sensitive to resource utilization. They are more likely to seek ways to optimize resource usage, negotiate better prices for materials and equipment, and adopt cost-saving practices without sacrificing care quality.

The standardization of care through clinical pathways and increasing cost awareness by medical staff and management can significantly contribute to operational efficiency and cost reduction that leads to sustainability. Differing to the previous studies, this research discovered that the SMA strategic framework can serve as an operational foundation for actualizing clinical pathways and cost awareness to achieve cost reduction and sustainability.

5 Conclusion

The implementation of the Strategic Management Accounting (SMA) framework can serve as a robust operational basis for realizing clinical pathways and cost awareness, with a focus on cost reduction and achieving sustainability. The evaluation of clinical pathways at Jakarta Heart Hospital demonstrates a fundamental role in ensuring the effectiveness and relevance of sustainable care. The importance of cost awareness in the sustainability of hospital services is identified as a determining factor. Cost awareness among medical staff and management promotes wise decision-making regarding resource utilization, directly impacting cost reduction. Standardization of care through clinical pathways, coupled with increased cost awareness, has the potential to significantly contribute to operational efficiency and cost reduction, thereby maintaining the sustainability of healthcare service systems.

5.1 Theoretical Implication

Although the concept of SMA has not been universally agreed upon due to the diversity of contexts in hospital services, functionally, SMA techniques developed based on paradigm shifts in understanding and implementing SMA are accepted. Clinical pathways and cost awareness for cost reduction and achieving sustainability can be developed in hospital services based on paradigm shifts in SMA. These changes are characterized by creating value through efficient resource utilization, both in the methodology of knowledge for continuously evolving clinical pathways in various work units. A conceptual framework is designed to ensure that each patient and diagnosis can be easily evaluated for various emerging possibilities, based on SMA principles. Costing design, including attribute costing, target costing, and value-chain costing oriented towards sustainability, is developed based on awareness of its implications on administrative costs, recognizing that its activities have implications on actual costs that need to be saved to achieve sustainability.

5.2 Practical Implication

The concept of SMA serves as the foundation for the development of clinical pathways focusing on sustainability through 1) efficient facility utilization, improved clinical outcomes, increased patient and practitioner satisfaction, and reduced treatment costs; 2) reduction of treatment duration and related costs as a strategy to mitigate hospital operational expenses; 3) supporting early patient discharge, improving quality of life, reducing treatment duration, enhancing clinical and economic outcomes, and eliminating non-essential procedures that disrupt healthcare service continuity.

6 Limitation

This study is limited to a specialized cardiac hospital. Generalization of findings can only be applied to that context. To gain a broader understanding, further research should be conducted in different healthcare settings. The use of the grounded theory method and open coding has its limitations. Interpretation and generalization of findings may be constrained by the researcher's perspective and the specific research context. In the quantitative stage, questionnaires were filled out by respondents based on their experiences and knowledge. However, limitations may arise if respondents lack sufficient knowledge or if there is dishonesty in providing answers. Although

regression analysis was used to test the structure of the conceptual model, the results may be influenced by a number of unmeasured variables or other factors outside the model. Research can be expanded and deepened to yield more diverse and relevant findings in the broader context of healthcare services. Focus on specific areas of SMA techniques, including their relationship with quality management and sustainability in healthcare, remains unexplored.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work the authors used ChatGPT to generate conclusions for each journal reference and to assist in simplifying the content of each journal used. After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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- Rien Agustin was responsible for funding acquisition, methodology, project administration, resources, supervision, validation, writing - review & editing.

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