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The Effect of Clinical Pathway Compliance in Stroke Management on Patient Health Outcomes and Its Implications for Hospital Costs (A Study at RSPAL Dr. Ramelan Surabaya)

Yaleswari Hayu Pertiwi, Kosasih, Taufan Nugroho, Vip Paramartha, Farida Yuliaty, Etty Sofia Mariati Asnar
Universitas Sangga Buana YPKP, Indonesia
Email: hayupertiwipa@gmail.com, kosasih@usbypkp.ac.id, ibr_nug@yahoo.co.id, vip@usbypkp.ac.id, farida.yuliaty@usbypkp.ac.id, ettyasnar@gmail.com

Abstract
This study aims to analyze the impact of compliance with the Clinical Pathway (CP) in stroke care on patient health outcomes and its implications for hospital cost efficiency. Stroke is a high-volume, high-risk condition associated with a substantial financial burden on healthcare institutions. A mixed-method design was employed, utilizing secondary data from 50 medical records and conducting interviews with four key informants. The analysis was performed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). Results indicated that CP compliance had no direct significant effect on hospital cost efficiency (coefficient = 0.332; p = 0.202), but it significantly improved patient health outcomes (coefficient = 0.825; p = 0.000). However, patient health outcomes showed no direct significant impact on cost efficiency (coefficient = -0.123; p = 0.636). These findings suggest that, while CP implementation enhances clinical outcomes, it has not yet resulted in improved cost efficiency within the hospital management context. Qualitative data revealed systemic challenges such as misalignment between the Clinical Pathway and the *INA-CBGs* reimbursement system and diagnostic variability, particularly in a Type A tertiary hospital such as RSPAL Dr. Ramelan.
Keywords: Clinical Pathway, Patient Health Outcome, Hospital Cost

INTRODUCTION

Stroke is a major global health burden, including in Indonesia (Pande et al., 2018; Xu, 2019). Medically referred to as *Cerebrovascular Disease* (CVD), stroke is one of the leading causes of morbidity, disability, and mortality among the adult population, according to the World Health Organization (WHO). Patients affected by stroke often require intensive and prolonged care in hospitals, resulting in high healthcare costs. Given the significant health and economic burdens imposed by stroke, improving the efficiency of stroke management and care has become a top priority in healthcare services (Ahadi Kolankoh et al., 2023; Albart et al., 2022; Fassbender et al., 2023; Kjelle & Myklebust, 2021; Zhong et al., 2022).

To this day, stroke remains a critical health issue. Its sudden onset can lead to death within a short duration. Among young people, stroke tends to reduce productivity and is a leading cause of both physical and mental disability, while among the elderly, it often prolongs the recovery process. Common stroke triggers include emotional stress (anger), excessive alcohol consumption, smoking, and high-fat diets (A.

Boehme, C. Esenwa, 2018; Boehme et al., 2017; Feng et al., 2023; Smith et al., 2021). Additionally, it is associated with risk factors such as hypertension, diabetes mellitus, hyperlipidemia, hypercholesterolemia, obesity, genetic predisposition, and age.

According to the World Stroke Organization (2024), over 12 million first-time stroke cases occur annually, with 6.5 million deaths attributed to stroke. Globally, stroke ranks third among the leading causes of death. The American Heart Association (2024) estimates that stroke results in global economic losses reaching US$890 billion, equivalent to 0.66% of global GDP. In developing Asian countries such as China and Indonesia, stroke incidence has nearly doubled over the past four decades. In Indonesia, stroke prevalence is approximately 8.3 per 1,000 population, with rates increasing with age (*Pagepress Journal*, 2024).

In addition to its high incidence (high volume), stroke requires long-term treatment and carries a high risk of complications and mortality (high risk), which contributes to excessive healthcare costs (high cost). These factors pose challenges not only for hospitals—resulting in cost overruns—but also for national healthcare budgets due to inflated reimbursements. This situation threatens care quality, especially for underprivileged patients and hospitals with limited cost control capabilities within government-funded health programs (Purba et al., 2020).

To effectively manage cases characterized by high volume, high risk, and high cost, the use of a Clinical Pathway (CP) has been recommended. A CP is an integrated care protocol developed to streamline patient management. First introduced at the New England Medical Center (Boston, USA) in 1985 by Karen Zander and Kathleen Bower, CPs have become a hallmark of evidence-based healthcare (Li et al., 2014). By 2003, approximately 80% of hospitals in the U.S. had adopted CPs (Kinsman et al., 2010). Their implementation has since expanded to Australia, Canada, Europe, and Asia (Lawal et al., 2016). In Indonesia, CPs were reintroduced in alignment with accreditation standards set by the Hospital Accreditation Commission (*Komisi Akreditasi Rumah Sakit* or KARS), as part of good clinical governance initiatives (*Standar Nasional Akreditasi Rumah Sakit* [SNARS], 2024).

CPs serve as essential tools for ensuring quality healthcare through adherence to evidence-based clinical practice guidelines. They are also instrumental for meeting hospital accreditation criteria under both KARS and Joint Commission International (JCI) frameworks (SNARS, 2024). In stroke care, CPs provide structured plans encompassing diagnostics, treatment interventions, and rehabilitation aimed at improving patient outcomes. They reduce variability in care, enhance adherence to clinical guidelines, and ensure efficient utilization of medical resources.

Indonesia's implementation of the National Health Insurance (*Jaminan Kesehatan Nasional* or JKN) system under BPJS Health since 2014, employing the Indonesian Case-Based Groups (*INA-CBGs*) payment model, reinforces the need for care standardization. The INA-CBGs set fixed reimbursement rates based on disease categories, incentivizing hospitals to deliver efficient services without exceeding cost limits. Adherence to CPs ensures care delivery remains within budget while maintaining quality, thus reducing readmissions and unnecessary interventions (Permenkes RI, 2014).

CP adherence is crucial for improving health outcomes, such as accelerated recovery, reduced complications, and lowered mortality in stroke patients. Furthermore, it influences hospital costs by minimizing variation and avoiding unnecessary procedures. Studies demonstrate that proper CP implementation can reduce hospital length of stay, lower readmission rates, and significantly decrease healthcare expenditures (Rotter et al., 2010). However, several obstacles persist, including low compliance among healthcare providers, inadequate IT infrastructure, and resource limitations.

Consequently, researchers are increasingly interested in evaluating the correlation between CP adherence, patient health outcomes, and hospital costs. A study by Rotter et al. (2010) confirmed that consistent CP use improves care quality and reduces hospital expenditures by 8–20%, varying by disease type and implementation quality. However, noncompliance with CPs may result in suboptimal care and increased costs.

Previous studies have advanced understanding of the role of Clinical Pathways in improving stroke care. Rotter et al. (2010) demonstrated that CP adherence significantly enhances care quality and reduces hospital costs, with reductions ranging from 8% to 20%. Nonetheless, their study primarily focused on Western healthcare systems, where resources and infrastructure differ markedly from those in Indonesia. Additionally, while they provided evidence on the financial and clinical benefits of CPs, they did not explore specific challenges faced by hospitals in developing countries, such as Indonesia, in implementing CPs. Another relevant study by Lawal et al. (2016) highlighted the global spread of CPs and their benefits in reducing variability in care and improving patient outcomes. However, their research did not delve deeply into barriers to CP implementation, particularly in low-resource settings like Indonesia.

Thus, this study aims to assess how CP adherence affects both health outcomes and hospital costs in stroke patients treated at RSPAL *dr.* Ramelan, laying the foundation for broader policy and management improvements in Indonesian hospitals. The benefits of this study contribute to the enhancement of clinical management practices, guidance for policy improvements, and support for cost-effective strategies in stroke care within Indonesian hospitals, ultimately improving the quality of care and alleviating the financial burden of stroke treatment.

METHOD

The research object referred to the primary focus of investigation receiving the most attention in this study to address the research problems objectively. In this study, the research objects included compliance with the use of the Clinical Pathway, patient health outcomes, and hospital costs, while the research subject was the inpatient ward at RSPAL *dr.* Ramelan Surabaya. The study aimed to examine the influence of Clinical Pathway adherence on patient health outcomes and its implications for hospital costs.

This research adopted a mixed-method descriptive design. The study employed a survey approach, collecting patient medical records of those treated by neurologists and neurosurgeons between January and July 2024. The survey aimed to gather data regarding knowledge, attitudes, behaviors, and characteristics of the research population related to the studied variables.

The research applied a mixed-method approach, combining both quantitative and qualitative techniques. Data collection involved secondary data derived from patient medical records and expert input obtained through interviews. Medical records, particularly those of stroke patients treated in the neurology ward at RSPAL *dr.* Ramelan, served as the basis for analysis. This method allowed for a comprehensive understanding by integrating measurable data and expert insights.

This mixed-method approach facilitated the objective analysis of numerical data. Quantitative research collected empirical data represented numerically, enabling researchers to obtain accurate results through mathematical calculations. It was particularly effective for identifying patterns and determining statistical significance.

The types and sources of data used in this study were primarily quantitative, with the main source being secondary data—specifically stroke patient medical records at RSPAL *dr.* Ramelan for the period of January 2025. These data were used to evaluate the level of adherence to Clinical Pathway protocols, as well as to measure patient outcomes and hospital expenditures related to stroke care.

The research process followed a structured series of steps aimed at achieving its objectives. It involved three main stages: preparation, execution, and data analysis. Each stage played a critical role in ensuring the study's validity and success and was implemented thoroughly and systematically.

The preparation stage included identifying the research problem, conducting preliminary observations in the stroke inpatient ward, performing literature reviews on the relevant variables, preparing the research proposal, developing instruments to measure compliance with the Clinical Pathway, patient outcomes, and hospital costs, securing necessary permissions, and retrieving relevant medical record data. These steps ensured that the research was well-grounded in both theory and practical feasibility.

During the execution stage, the researcher conducted total sampling based on predetermined criteria, collected secondary data on physician compliance with Clinical Pathways, patient outcomes, and hospital expenditures from neurology inpatient records, and input the collected data into statistical software for processing. This study used Guttman scaling to quantify compliance as a binary measure (yes for compliant, no for non-compliant). Guttman scaling was particularly useful for confirming the unity of dimensions and the presence of universal attributes in behavioral research, ensuring that responses were consistent and measurable.

RESULTS AND DISCUSSION

The characteristics of the respondents in this study include gender, age, and education level. The gender composition shows a relatively balanced distribution, with a slightly higher proportion of female respondents (56%) compared to males (44%). In terms of age, the majority of respondents are between 51–60 years old (42%), followed by those aged 41–50 years (32%), 60–70 years (12%), 30–40 years (10%), and the smallest group being respondents over 70 years old (2%). Regarding education level, most respondents have completed senior high school (44%), followed by junior high school (32%), elementary school (14%), and the fewest have a bachelor's degree (8%). Furthermore, the secondary data analysis was used to enrich the discussion by illustrating the condition of each research variable through a binary categorization: yes or no (e.g., compliant or non-compliant, recovered or not, complications or none, and efficient or inefficient). The analysis revealed that most respondents were non-compliant with the clinical pathway, particularly concerning the length of stay, diagnostic procedures, and medication choices, which were often based on personal experience rather than guidelines. Despite this non-compliance, most patients recovered, although some experienced a decrease in functional independence. However, non-compliance with the clinical pathway resulted in inefficiency in the management of hospital costs.

Interview Results

Informant Characteristics

The participants in this study totaled 4 individuals: 1 from the medical committee, 1 from the PMKP committee, 1 from management, and 1 from the cooperation control unit (UPKS). All informants were within the environment of RSPAL dr. Ramelan Surabaya. The identities of the informants in this study are as follows:

The first informant, AA, is 34 years old, a medical committee member, and acts as an evaluator for the implementation of the clinical pathway. He holds a degree in general medicine. The objective he aims to achieve is to assess the completeness of the clinical pathway documentation, evaluate the compliance of the Service Responsible Doctor (DPJP), Service Responsible Nurse (PPJP), Nutrition, and Pharmacy with the clinical pathway. The next step is to establish criteria and assessment standards. The evaluation criteria are adjusted according to the objectives. The criteria are made in statement form, and the standards are in the form of targets or percentages. The evaluation is carried out by the medical committee once a month. The things evaluated are based on variations or discrepancies between actions and the clinical pathway instructions. The results of this evaluation are communicated to the director for follow-up based on the evaluation results.

The second informant, DU, is 57 years old, the head of the quality committee (KMKB), and acts as an evaluator for the implementation of the clinical pathway. DU is a specialist in neurology. The objective is to assess the establishment of the standard length of stay, evaluate the consistency of clinical examination procedures and their execution, assess the relationship between various stages of service, and help the coordination process to improve patient satisfaction. The evaluation is carried out by the medical committee once a month. The evaluation focuses on variations or discrepancies between actions and the clinical pathway instructions. The results of this evaluation are communicated to the director for follow-up based on the evaluation results.

The third informant, AI, is 42 years old, a management member (Remuneration Unit), and responsible for the evaluation of the clinical pathway implementation. AI holds a degree in general dentistry and a master's degree in hospital management. The objective is to address the variations in quality indicators set by each clinical pathway for each Medical Staff Group (KSM). Additionally, the variations found during the clinical pathway evaluation are analyzed, with a follow-up action plan and reporting of improvements. The third informant also acts as the person responsible for hospital financial inflows and outflows and manages operations.

The fourth informant, LP, is 45 years old, the head of the document section, and acts as an evaluator for the completeness of the document files in accordance with the clinical pathway in force at RSPAL dr. Ramelan. The objective is to assess the eligibility of the documents and report any necessary improvements.

Interview Results with Informants

Knowledge

In-depth interviews with the quality committee, medical committee, management, and the UPKS team regarding the informants' knowledge of Clinical Pathways (CP) were summarized in a matrix. Based on the conclusion from the information above, it is explained that key informants (medical committee, quality committee, management, remuneration team, and UPKS) understand the definition of Clinical Pathways, its function, and its goal as a clinical practice standardization tool. It is used to manage high volume, high cost, and high-risk cases, particularly for the most common patient groups at RSPAL dr. Ramelan. However, compliance with CP by Service

Responsible Doctors (DPJP) is still lacking. This might be due to insufficient socialization of CPs and the numerous complications that arise when patients arrive at RSPAL dr. Ramelan, leading DPJPs to apply their personal expertise in treating patients.

Communication

The results of the in-depth interviews regarding communication between the quality committee, medical committee, management, and UPKS about the implementation of Clinical Pathways were also summarized in a matrix. Based on the conclusion, it shows that the CP policy is supported by operational policies in the form of Standard Operating Procedures (SPO and SPO-AP). There is a socialization program for CP usage for staff, but many staff members fail to attend, leading to a lack of awareness about CP. Currently, RSPAL dr. Ramelan has 27 clinical pathways, and not all diagnoses have a specific clinical pathway. Additionally, CP evaluation is not performed routinely every month, causing DPJPs to deliver services based on their medical knowledge.

Facilities and Infrastructure

In-depth interviews with the quality committee, medical committee, management, and UPKS about the facilities and infrastructure for CP implementation were summarized in a matrix. The conclusion indicates that the CP policy is supported by sufficient and adequate medical supporting facilities. However, DPJPs sometimes conduct repetitive diagnostic tests during one treatment cycle. This may be due to evaluations of the treatment already administered, which goes against the established clinical pathways, leading to unnecessary hospital costs.

Obstacles

Interviews with the quality committee, medical committee, management, and UPKS revealed obstacles in CP implementation, which were summarized in a matrix. Based on the conclusion, it shows that there are issues in CP implementation, such as a lack of socialization, outdated updates, insufficient management decisiveness, the absence of routine evaluations by management, and the lack of clear reward and punishment systems for CP compliance. These issues have been noticed by management but have not yet led to concrete solutions for improvement.

Evaluation

In-depth interviews with the quality committee, medical committee, management, and UPKS about the evaluation process for CP implementation were summarized in a matrix. Based on the conclusion, it shows that the evaluation process involves documentation of the CP evaluation, with evaluations conducted by the medical committee monthly and every three months. The evaluation results are reported to the leadership, and rewards and punishments are given according to the findings. It is hoped that this will help address shortcomings and improve service delivery.

Discussion

The findings of this research, based on secondary data, show that adherence to Clinical Pathways (CP) does not directly affect Hospital Cost Efficiency, but it does have a direct impact on Patient Health Outcomes. However, Patient Health Outcomes do not directly affect Hospital Cost Efficiency. This finding contradicts previous studies, which stated that adherence to clinical pathways can reduce hospital expenditures. The improvement in patient health outcomes, in this case, does not align with hospital cost efficiency, as patient recovery requires more resources than what is reimbursed by BPJS, which relates to unit costs.

From the interviews with key informants, it was found that most were aware of clinical pathways, the barriers to their adherence, and the evaluation process for their use. A common reason for non-compliance was that many Clinical Pathways at RSPAL have not been updated and do not align with current medical knowledge. The informants' knowledge about clinical pathways is closely related to their formal education. According to Notoatmodjo, knowledge is a crucial domain in shaping an individual’s actions. Since most informants have higher education, their understanding of clinical pathways is generally good.

The interviews and triangulation process revealed that there is socialization regarding clinical pathway implementation, such as seminars. However, many healthcare staff did not attend these sessions. Document reviews, observations, and interviews showed that participation in CP socialization by health staff, including doctors, nurses, pharmacists, and nutritionists, is lacking. This lack of participation has led to a poor understanding of the importance of CP in improving quality, which results in many CP forms remaining incomplete. Non-compliance with CP usage also contributes to inefficiencies in hospital costs. Additionally, many patients arriving at RSPAL dr. Ramelan have complex conditions and are often referrals from lower-tier hospitals. As such, CPs specifically designed for type A hospitals are necessary.

These findings align with previous research conducted by Yurni (2019) titled Evaluasi Implementasi Clinical Pathway Sectio Caesarea di RSUD Panembahan Senopati Bantul. Yurni's study identified six major barriers to CP implementation, including insufficient socialization, lack of incentives for staff input on CP benefits and challenges, absence of routine meetings for CP development, and a lack of continuous training for staff involved in CP implementation.

Regarding facilities and infrastructure, RSPAL dr. Ramelan has adequate resources for CP implementation. However, healthcare providers sometimes overuse resources, such as repeating laboratory tests for patients. While this is often necessary to monitor treatment, patient health dynamics and complications can also affect the treatment process. This is especially true when patients experience complications or secondary diagnoses that require input from multiple DPJPs, resulting in higher hospital costs.

These findings do not align with Yuni's research in Analisa Jurnal Implementasi Clinical Pathway Kasus Stroke Berdasarkan INA-CBGs di Rumah Sakit Stroke Nasional Bukit Tinggi, which indicated that there were no major issues with facilities or infrastructure for CP

implementation, as the hospital had already provided adequate nursing tools and logistics according to service standards.

This study provides important insights into the challenges in implementing clinical pathways at RSPAL dr. Ramelan and how these challenges influence hospital costs and patient health outcomes. It contributes to the existing literature by emphasizing the need for updated clinical pathways, improved socialization, and better use of resources, while also highlighting the need for ongoing evaluation and training for healthcare staff involved in CP implementation.

According to the researcher's assumption, the availability of facilities and infrastructure plays a crucial role in supporting healthcare services at the hospital, particularly in ensuring patient recovery. Medical equipment, based on its value and intended use, should be operated according to the competencies of qualified healthcare professionals. The goal and purpose of this medical equipment are to treat and manage diseases in a safe, high-quality, and effective manner, prioritizing patient interests and adhering to hospital service standards as a reference in patient care. Therefore, hospitals are obligated to provide adequate facilities and infrastructure to enhance the quality of service and ensure alignment with the clinical pathway instructions.

The interviews conducted with informants revealed several challenges in implementing clinical pathways, particularly the lack of compliance from healthcare staff and insufficient response from management in controlling clinical pathways. These issues have not been effectively addressed with viable solutions.

The findings of this study align with previous research conducted by Sari titled Evaluasi Implementasi Clinical Pathway Krisis Hipertensi di Instalasi Rawat Inap RS PKU Muhammadiyah Bantul. Sari's research indicated that clinical pathways were still a new practice at RS PKU Muhammadiyah Bantul, making it difficult to change old habits that did not involve clinical pathways. This became a barrier as many staff members lacked understanding of clinical pathways, often seeing them merely as administrative requirements and neglecting to include clinical pathway forms in medical records. Additionally, doctors' busy schedules led to incomplete clinical pathway forms. Furthermore, the study revealed that there was insufficient mutual reminder among medical staff and suboptimal evaluation processes.

According to the researcher's assumptions, the main reasons for the obstacles in implementing clinical pathways at the hospital are due to a lack of discipline, the absence of response from management, and the absence of a reward and punishment system. There were also no regular meetings to address issues related to clinical pathway documentation, leading to a lack of enthusiasm from staff in implementing it. Moreover, barriers to completing clinical pathways were due to the busy schedules of healthcare professionals, which resulted in incomplete documentation, suboptimal performance, and a lack of reminders among the medical team about entering the forms into medical records and completing them.

The non-compliance with clinical pathway usage is also due to the fact that the existing clinical pathways do not align with the conditions of patients upon their arrival at RSPAL dr. Ramelan. The clinical pathways available only address one type of disease, while patients often arrive after receiving optimal treatment at other hospitals, leading to multiple issues that are not

covered by the existing pathways. Therefore, updating the clinical pathways in accordance with the applicable medical treatment guidelines, especially for type A hospitals, is essential.

Due to the lack of a comprehensive Clinical Pathway (CP), Service Responsible Doctors (DPJP) use their individual expertise to treat patients, which results in varying treatment methods among them. This situation can lead to the unnecessary use of medications, which contributes to an increase in hospital costs. Interviews with key informants and triangulation regarding the evaluation process and the expectations of informants about the implementation of CP indicate that CP forms are collected weekly, and every three months, an evaluation is conducted by the quality committee, with the results communicated to the director. During this evaluation process, not all informants were familiar with the process, particularly some doctors who had limited understanding of the CP evaluation. However, they expressed positive expectations for the CP implementation, hoping that it would function effectively.

Based on document reviews, observations, and in-depth interviews, the CP evaluation process by healthcare providers (doctors, nurses, pharmacists, and nutritionists), the quality committee, medical committee, and management involves collecting CP forms weekly by the case manager, with monthly evaluations by the quality committee, including report creation, and an annual evaluation by management (the director). The CP evaluation process includes analysis and follow-up plans by the director, and reporting of improvements back to the director.

The results of this study are consistent with previous research conducted by Syahputra, titled Laporan Evaluasi Kepatuhan Terhadap Clinical Pathway. Syahputra's research showed that most specialists adhered to the CP, but non-compliance was primarily due to service standards, and the incompatibility of medications because the CP had not been updated to reflect the latest national formulary and Clinical Practice Guidelines (PPK). Therefore, further socialization with DPJPs is needed to ensure that medical care aligns with the CP. This includes presenting CP evaluation results in medical committee meetings, revising CPs to ensure medication usage matches the latest formulary, conducting routine medical evaluations, and making CP compliance part of medical staff performance assessments. This study confirms that not all healthcare staff understand the CP evaluation process.

The researcher assumes that the reason some doctors do not know the CP evaluation process is due to a lack of awareness and the perception that CP is not important, seeing their role as merely providing patient care. Thus, there is a need to raise awareness among doctors that CP can serve as a quality control tool for hospitals, which is also one of the goals of hospital accreditation. Hospitals wishing to use CPs as a quality control tool must plan, develop, implement, and evaluate CPs systematically and continuously. After implementing the CP, hospitals, especially management, must conduct intensive evaluations within a specified timeframe.

Evaluation of CP is necessary to describe the implementation procedures and evaluate them, facilitate the implementation of PPK, and its evaluation. CP is a manifestation of PPK, and its routine evaluation will "force" hospitals to implement and regularly evaluate PPK, reducing unnecessary variations in clinical practice. To ensure CP effectiveness, it is essential to define the inclusion and exclusion criteria for patients with diagnoses that match the CP being applied. In the

early stages of implementation, all additional differences can be noted as variations to be evaluated and improved in subsequent evaluations.

In implementing the CP evaluation, it is necessary to coordinate the quality and professional committees with the medical staff. Parameters to be evaluated must be determined. CP evaluation should be done regularly, at least once a month, with medical records collected. During the evaluation, compliance from service providers, including doctors, nurses, and other professionals, must be monitored to ensure that they follow the CP. Any obstacles in implementing the CP must be identified, and reports and recommendations should be submitted to the hospital director and medical staff. After all stages, documentation should be performed for reporting during regular management and director meetings, leading to the improvement and revision of the CP.

From this research, it is clear that the implementation of the CP at RSPAL dr. Ramelan has not yet maximized the efficiency of hospital expenditures, indicating the need for further improvements in CP implementation and management.

CONCLUSION

The study conducted at RSPAL *dr.* Ramelan Surabaya found that while compliance with clinical pathways significantly improved patient health outcomes, it did not directly enhance hospital cost efficiency due to inconsistent adherence by attending physicians and misalignment between clinical pathways and INA-CBGs tariff packages. Better patient outcomes often required more resources, increasing hospital costs, and challenges such as poor documentation, inadequate managerial oversight, insufficient training, and lack of feedback mechanisms further hindered effective implementation. In a Type A hospital setting, frequent cases with exhausted insurance benefits and complex complications led physicians to deviate from standardized pathways, exacerbating cost inefficiencies under the INA-CBGs fixed reimbursement system. Key informants suggested implementing clear regulations with reward and sanction systems, improving documentation and training, regularly updating clinical pathways to align with hospital and reimbursement needs, and establishing routine evaluations and monitoring by the medical committee. Future research should explore the development and impact of tailored clinical pathway frameworks that better integrate with national insurance systems and the unique patient profiles of tertiary hospitals to optimize both clinical outcomes and cost efficiency.

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