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Optimization of the Use of Medical Equipment as an Effort to Increase the Efficiency and Accuracy OF Doctors' Work in the Operating Room at Hastien Rengasdengklok Hospital

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Abstract
The optimization of medical device utilization in hospitals is often hindered by limited medical staff training, unintegrated equipment management, and inadequate infrastructure. These factors contribute to low efficiency in doctors' performance and declining quality of healthcare services. This study aims to explore hospital strategies for optimizing the use of medical devices in operating rooms and to understand doctors' perceptions of their effectiveness. The qualitative study was conducted at Hastien Rengasdengklok Hospital over one month starting June 1, 2025. Data were collected through in-depth interviews, observations, and documentation involving the hospital director, management, specialists, nurses, and patients. Validity was maintained through triangulation and member checks, while research ethics were upheld through confidentiality and informed consent. The hospital's optimization strategy includes regular training, equipment maintenance, SOP standardization, and cross-professional collaboration, reflecting a comprehensive managerial transformation based on technical, ethical, and epistemological approaches. This strategy aligns with the Utilization Management and Technology Acceptance Model theories. However, challenges such as substandard equipment and uneven training remain. The hospital responds with innovations like hybrid training and digital technology integration. Doctors perceive medical devices as essential tools that extend their professional responsibility and are viewed as strategic assets in line with the Resource-Based View approach. These perceptions, rooted in direct experience, support the principles of Total Quality Management and foster a learning organizational culture focused on delivering high-quality and sustainable services.

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1. INTRODUCTION

In the era of modernizing healthcare services, the use of sophisticated medical equipment has become a key indicator in improving the quality of hospital services. Advances in medical technology have enabled doctors to perform diagnoses and interventions more quickly and accurately. The availability of medical equipment such as MRIs, CT scans, and digital monitoring devices contributes to the effectiveness of real-time patient care. Therefore, optimizing the use of medical equipment is not simply a technological investment but also an integral part of a strategy to improve the efficiency and accuracy of medical personnel [1].

Various previous studies have examined the importance of utilizing medical devices in improving the quality of hospital services. For example, a study by Hartono et al. (2020) found that the use of digital diagnostic technology significantly accelerated the disease identification process and reduced patient hospitalization times. Another study by Lestari and Mahendra (2021) showed that integrating medical devices with hospital information systems improved physicians' operational efficiency, particularly in clinical decision-making. Meanwhile, research by Santosa and Dewi (2022) emphasized the importance of ongoing training for medical personnel to optimize the functionality of available medical devices. While these three studies make important contributions, there is a gap in the lack of a comprehensive approach that simultaneously combines technical, managerial, and human resource aspects in optimizing medical devices. This can be caused by various factors, such as a lack of user training, limited device maintenance, or even obstacles in integrating health information systems. However, if medical devices are used optimally according to their functions and technology, the potential for increasing physician productivity is significant [2]. In other words, optimization encompasses not only technical aspects but also managerial and human resource competencies.

One clear example of suboptimal use of medical devices that seriously impacts the efficiency and accuracy of doctors' work occurred in the case of patient Syarifudin Pane at Haji Pondok Gede Hospital, East Jakarta. In 2010, Syarifudin underwent surgery for a broken leg and was fitted with a pin (bone-connecting device) that was suspected to be used and non-sterile. Several months after the operation, the patient's leg developed a serious infection characterized by bleeding and pus. After undergoing surgery to remove the pin at another hospital, doctors stated that the infection was caused by the non-sterile pin. This case reflects a failure in medical device management, from selection to sterilization, which resulted in post-operative complications and decreased patient confidence in medical services. This incident highlights the importance of standard procedures in the use of medical devices to ensure patient safety and the efficiency of medical personnel [3].

A similar phenomenon was also found at Hastien Rengasdengklok Hospital, Karawang Regency, West Java, where several medical devices procured in the 2022 fiscal year, such as digital ECGs and electric suction pumps, were reportedly not being utilized optimally by medical personnel. Based on observations and interviews with hospital staff, this was due to a lack of technical training for general practitioners and nurses, as well as the lack of integration of these devices with the hospital's manual information system. As a result, despite the hospital having technologically advanced equipment, medical care practices still relied on conventional methods, which slowed the diagnostic process and increased the workload of medical personnel. This situation was further exacerbated by the limited number of medical equipment technicians at the local level, which left equipment prone to damage or lack of regular calibration. The case at Hastien Hospital reflects complex structural issues and emphasizes the need for research into strategies for optimizing medical device use as part of improving management and enhancing the performance of physicians in regional hospitals.

Several studies published in the Indonesian Journal of Hospital Management and Administration (MARSI) show that optimizing the use of medical devices and information systems plays a crucial role in improving the efficiency and accuracy of medical personnel, particularly doctors. Research by Yanuar and Grace (2019) highlighted delays in the medical record recording system that hampered doctors' efficiency, while Marpaung and Kodyat (2025) emphasized that the use of electronic medical records (EMRE) can reduce workloads if supported by adequate human resources. Prabowo and Junaedi (2025) added that good medical logistics management directly impacts equipment availability and

smooth service delivery. Furthermore, Serafina et al. (2025) revealed that human factors and methods in medical record management pose challenges in maintaining the quality of medical documentation. However, there is a gap between the availability of rapidly developing medical technology and equipment and the adaptability and readiness of medical personnel to operate these devices optimally. This indicates the need for a more integrated approach between technology investment, medical personnel training, and improvements in hospital operational management.

Amidst technological advances and the modernization of healthcare services, a major problem remains that hinders the optimization of medical equipment in hospitals: low utilization due to limited infrastructure and management. According to a report by the Financial and Development Supervisory Agency (BPKP, 2022), approximately 40% of medical equipment in government hospitals is not optimally utilized due to damage, a lack of technicians, and specifications that do not match medical needs. This problem is exacerbated by the discovery of sophisticated medical equipment that is left idle because medical personnel do not receive adequate training in its operation. This condition has a domino effect, ranging from decreased diagnostic accuracy to delays in patient treatment. This inefficiency demonstrates that the procurement of medical equipment does not automatically guarantee improved service quality if not accompanied by an integrated management and utilization system. Therefore, this study stems from concerns about the disparity between the availability of medical technology and the reality of its utilization in the field, which ultimately impacts physician productivity and patient safety [4].

Physician work efficiency can be achieved by reducing diagnostic time, minimizing procedural errors, and reducing administrative burdens. The use of digital-based medical tools, such as electronic medical records (EMR) and decision support systems (DSS), has been shown to reduce time in the medical decision-making process [5]. Furthermore, this technology also supports cross-professional collaboration in hospitals, allowing for more accurate and structured medical decisions.

In addition to efficiency, accuracy in medical practice is crucial, particularly in the context of early diagnosis and therapy delivery. The use of imaging technology and automated diagnostic tools has been shown to provide more precise results than manual methods. Diagnostic errors that can lead to malpractice or delayed treatment can be reduced through the use of this technology [6]. Therefore, investment in medical device technology needs to be accompanied by a strategy for optimizing its use so that its benefits are fully realized.

Optimizing medical devices is also closely related to hospital management systems. Hospitals that effectively implement a hospital management information system (SIMRS) will be better able to manage medical device usage efficiently, including in terms of maintenance, spare parts availability, and patient data integration. This system allows for a more systematic physician workflow, thereby minimizing the risk of data duplication or input errors [7]. Therefore, medical device technology cannot stand alone without the support of a good management system.

Human resources are also a key factor in the success of optimization. Doctors, nurses, and medical technicians need regular training on equipment operation, technology updates, and an understanding of usage protocols. Without adequate competency, the presence of sophisticated medical equipment can become a cost burden and risk service failure [8]. Therefore, an optimization approach must also include ongoing education for medical personnel in hospitals.

This location was chosen based on the need to explore in-depth the implementation of optimizing the use of medical devices in a Type C hospital with limited resources but a high service load. The focus of managerial strategies includes policies on procurement,

maintenance, and distribution of medical devices, while the aspect of physician perception is reviewed in terms of work efficiency, diagnostic accuracy, and job satisfaction which are influenced by the availability and quality of medical devices. This study does not discuss the specific technical aspects of the equipment such as its technological specifications, but rather focuses on how managerial policies and practices support its effective use in the medical service process. Furthermore, this study does not include non-physician medical personnel such as nurses or other technical personnel, so the results are focused on the experiences and perspectives of physicians as the primary users of medical devices in clinical activities. With these limitations, it is hoped that the results of this study can provide a tangible contribution to the development of hospital management policies and strategies to improve the quality of medical services based on equipment efficiency and physician work support.

The urgency of this research lies in the need to formulate effective strategies for optimizing the use of medical devices to optimally support physicians' work. In Indonesian hospitals, budget constraints and uneven distribution of devices also pose challenges. Therefore, this study is crucial for providing practical, data-driven recommendations regarding the use of medical technology to improve the efficiency and accuracy of physician services [9].

By exploring the relationship between medical device optimization and physician performance, this research is expected to contribute to the formulation of internal hospital policies and future strategies for human resource and technology development. This research also provides an important basis for designing a healthcare system that is adaptive to technological developments and promotes sustainable resource efficiency [10].

2. RESEARCH METHOD

This study used a qualitative approach to understand the experiences and perceptions of medical personnel in using medical devices at Hastien Hospital, Rengasdengklok, with a focus on efficiency and accuracy in the operating room. Data were collected through in-depth interviews with doctors, nurses, and hospital management, as well as direct observation and documentation studies related to medical devices. The research design was exploratory, with data analysis through descriptive-analytical data reduction, presentation, and conclusion drawing. Source and method triangulation techniques, as well as the use of NVivo software, were applied to ensure data validity and reliability. This study aims to provide in-depth insights into the factors influencing medical device use, as well as optimization strategies that can improve the quality of medical services in the operating room.

3. RESEARCH RESULTS AND DISCUSSION

3.1.Research result

Table 1. Interview Results with Hospital Director: Triangulation Matrix and NVivo Coding Simulation

Theme/ Category	Interview Results	Observation	Node NVivo
Availability and Procurement of Tools	Procurement of equipment through submission from the user to management, then forwarded to the vendor/PT.	The procurement document states that the equipment submission procedure must be approved by the Head of the Room and the finance manager.	Equipment Procurement

Tool Use Training	Every new device must be accompanied by training/in-house training for medical personnel.	The routine training schedule is listed in the hospital's internal training documents.	Technical Training
Handling Equipment Damage	If damaged, report it to the Head of the Operating Room, then forward it to management for technical/repair action.	The OK room logbook shows the flow of equipment failure reporting.	Tool Repair
Periodic Maintenance	Maintenance is carried out annually to ensure the equipment remains functioning optimally.	There is an annual schedule and a list of tools that the in-house technician must check.	Equipment Maintenance
Effectiveness and Physician Response	Evaluation was conducted through morning reports and surveys of doctors' responses to the tool.	Physician survey templates are available within the hospital quality system.	Medical Device Evaluation
Response to Feedback	If technical problems are found, the report will be followed up by the internal technical team and, if necessary, the vendor will also be involved.	There is a record of technical correspondence between the hospital and the vendor in the equipment audit documents.	Technical Follow-up
Repair Response Time	The average tool repair process takes 1–3 days, depending on spare parts availability.	The daily report records the estimated response time from the technical vendor.	Technical Response Duration
Service Commitment	The hospital is committed to maintaining the efficiency of doctors' work and the quality of operating room services through optimal equipment availability and maintenance.	The hospital's mission statement lists service efficiency and quality as management's primary commitments.	Service Commitment

Source: Processed Data, (2025)

Table 2. Results of Interviews with Hospital Management Using Triangulation Matrix and NVivo Coding Simulation

Category	**Informant 1**	**Informant 2**	**Observation**	**Node NVivo**
Repetitive Training	Explains that every procurement of new equipment is always accompanied by basic technical training.	Adding that training is repeated if the user does not understand how the tool works.	Inhouse training schedule and attendance list.	Repetitive Training
Tool Usage Monitoring	The head of the room carries out routine monitoring of the use of medical equipment.	Monitoring also involves the installation manager to ensure the equipment is used according to its function.	List of periodic monitoring from the head of the room/installation.	Tool Usage Monitoring

Limited SOP	Acknowledging that not all medical equipment in the operating room has a written SOP.	Confirming that most of the SOPs are still in the process of being drafted and adapted to new tools.	Medical device SOP document; SOP completeness evaluation form.	Limited SOP
Handling Equipment Damage	The room head reports to the general section for initial technical action by ATEM.	If it is not handled internally, the device is handed over to the vendor for further repair.	SOP for reporting equipment damage and damage report log.	Handling Equipment Damage
Technical Vendor	Official vendors are used only in cases where the equipment is damaged quite badly.	Mentioning vendor cooperation is prioritized because of the tools from official procurement.	Cooperation contracts and list of medical equipment vendors.	Technical Vendor
Doctor Feedback	Doctors convey complaints or input through informal discussions or morning reports.	Doctors' responses are usually used as material for medical device management evaluation meetings.	Doctor feedback form template and evaluation meeting minutes.	Doctor Feedback
Effectiveness-Efficiency Evaluation	Management assesses the effectiveness of the tool if there is input from users.	Evaluation is done based on the doctor's clinical input and the results of use in several cases.	Evaluation results of tool utilization; clinical indicators and time of use.	Effectiveness-Efficiency Evaluation
Managerial Decisions	If the tool proves efficient, it is proposed to be procured again in the next procurement.	The proposal is forwarded to the hospital owner for consideration of updating or adding equipment.	Procurement meeting minutes; recommendation document from management to the foundation/hospital owner.	Managerial Decisions
Management Quality Commitment	Emphasizes the importance of rapid response to breakdowns as part of the service commitment.	Stating that the involvement of doctors in equipment evaluation is a participatory form of improving the quality of operating room services.	Statement of service quality in hospital accreditation documents.	Management Quality Commitment

Source: Processed Data, (2025).

Table 3. Results of Interviews with Specialist Doctors Using Triangulation Matrix and NVivo Coding Simulation

Category	**Informant**			**Observation**	**Node NVivo**
	Surgical Specialist	**Anesthesiologist**	**Obstetrician/ Gynecologist**		

General Condition of Medical Equipment in OK	Sufficient for general surgical procedures in type C hospitals.	Anesthesia equipment is available and sufficient for elective procedures, but there are limitations for complex cases.	Generally adequate for basic obstetrics and gynecology procedures.	The main tools are available and used routinely according to standard procedures.	Facilities, Basic Equipment, RS Type C
Outstanding Equipment	Anesthesia machines and cauters are very helpful in the surgical process.	Modern ventilators and vital monitors are very supportive in maintaining patient stability.	Modern cauterization machines and obstetric instruments are very useful.	The tool is in good condition and is frequently prioritized for use.	Cauter Usefulness, Anesthesia Machine
Tool Weaknesses	Some devices such as mesh and bipolar are best for single use.	Some circuit tubes and masks are reused, so there is a risk of them being non-sterile.	The quality of some gynecological instruments needs to be improved.	There are tools that have been used repeatedly and appear physically worn.	Equipment Limitation, Disposable Needs
Effectiveness compared to Manual Method	Medical devices speed up and simplify procedures, reducing the risk of bleeding.	Automated anesthesia devices reduce workload and increase the accuracy of drug delivery.	Reduced risk of complications and shorter duration of surgery.	Average action time is faster when the tool is functioning optimally.	Efficiency, Risk Reduction, Time Saving
Conditions When the Tool is Damaged/ Non-Existent	Longer surgery, higher potential for bleeding.	The anesthesia process becomes manual and less accurate, posing a risk to patient safety.	Operations become more difficult and time consuming.	There have been delays in operations due to damaged equipment awaiting repair.	Lack of Tools, Technical Difficulty
Human Resources Training for Tool Users	Medical personnel have been trained, so that the use of equipment is more optimal.	Staff understand usage due to regular training.	Training is important so that the tool is used according to its function.	Training documents are available and SOPs for tool use are displayed in the procedure room.	Staff Training, Tool Optimization

Obstacles to the Use of Medical Devices	Procurement and maintenance costs are expensive, maintenance regulations are needed.	The equipment budget is very limited, it is necessary to prioritize the maintenance of important equipment.	Needs regular maintenance, the tool is easily damaged if used continuously.	Not all tools have a regular maintenance schedule, some are left until they break down.	Cost Barrier, Maintenance Policy Needed

Source: Processed data, (2025).

Table 4. Interview Results with Operating Room Nurses Using Triangulation Matrix, Observation, and NVivo Coding Simulation

Category	Nurse Informant 1	Nurse Informant 2	Observation	Node NVivo
Preparation of Surgical Equipment	Prepare the tool set according to DPJP instructions for efficiency.	Tools are arranged in action packages, speeding up the preparation process.	There is a surgical instrument list system posted in the preparation room.	Preoperative Setup, Efficiency, DPJP Flow
Understanding the Function of Tools	Understand the function and number of tools, provide support during operations.	Can identify tools quickly and accurately during surgery.	Nurses are alert in preparing or changing equipment while the procedure is taking place.	Technical Support, Instrument Mastery
Handling of Damaged Equipment	Immediately report to your superior and then forward it to the technician/vendor.	Reporting procedure through the room head before the technician intervenes.	A log book for reporting equipment failures is available, but is not always completed completely.	Equipment Reporting, Maintenance Chain
Advanced Equipment Training	Training is provided by the vendor when new equipment arrives.	Usually the vendor explains directly and can be contacted if there are problems.	There is training documentation from the vendor, although not all staff attended.	Vendor Training, Technical Familiarization
Effectiveness of Tools in Operation	Tools are very helpful in speeding up procedures and preventing errors.	Reduce physical workload and more efficient action time.	Shorter operating times in cases with complete and optimally functioning equipment.	Efficiency, Error Reduction, Time Saving
Medical Team Coordination	Good collaboration between nurses, doctors, and equipment technicians.	Communication is smooth especially when there are technical problems.	Active coordination was seen during the operation, including the use of backup equipment.	Team Collaboration, Communication Flow

Medical Equipment Maintenance	There is no routine maintenance schedule, repairs are reactive.	Maintenance is only carried out if the equipment is damaged, there is no preventive maintenance.	No consistent equipment maintenance schedule records were found.	Reactive Maintenance, Lack of SOP
Frequently Used/Damaged Tools	Cautery is frequently used and most frequently experiences problems.	Basic instruments are very useful, but cauterizers wear out quickly.	Cauterization is often performed before and after surgery, as some backup units are not functioning.	Cauter Dependency, Instrument Priority
Factors Determining Smooth Operations	Establishing an operational plan is more influential than just the tools.	Early scheduling and coordination are key to avoiding delays.	The pre-operation briefing meeting was short but effective enough for initial coordination.	Planning Priority, Operation Scheduling

Source: Processed data, (2025)

Table 5. Results of Patient Interviews Using Triangulation Matrix, Observation, and NVivo Coding Simulation

Category	Patient 1	Patient 2	Observation	Node NVivo
Understanding Medical Devices	Not understanding the type or function of the tool, only the doctor explained the surgical procedure.	I've asked the nurse, but the explanation was general.	There is no specific communication about medical devices between medical personnel and patients.	Patient Awareness, Communication Gaps
Trust in the Medical Team	Feel safe because the results of the operation are satisfactory, there are no complications.	Trust because the action runs smoothly even though you don't understand the tools used.	The patient's attitude shows dependence on the professionalism of medical personnel.	Patient Awareness, Communication Gaps
Pre and Post-Operative Information	The procedure information was conveyed well by the doctor.	The explanation of the medical equipment is minimal, but the process is explained quite completely.	Doctors focus more on explaining procedures than on technology or equipment.	Pre/Post Op Explanation, Limited Detail
Impressions on Action Efficiency	Fast process, not much waiting, recovery is going well.	The procedure went smoothly, without any delays or disruptions.	Waiting times in the pre-operative and post-operative rooms are quite short.	Operational Efficiency, Recovery Speed
Comfort in the Operating Room	Feel comfortable with clean room conditions and friendly nurses.	The operating environment supports a sense of calm and is non-stressful.	The cleanliness of the room was maintained, and the nurses' interactions were supportive.	Patient Comfort, Hospital Environment

Perception of Medical Devices	Don't know what tools were used, but the results were good.	The tool is considered helpful because the surgical process feels fast and there is no pain after the procedure.	Patients attribute positive experiences to the end result, not to understanding the device.	Indirect Evaluation, Satisfaction Bias

Source: Processed data, (2025).

3.2.Discussion

1.Hospital Strategies for Optimizing the Use of Medical Equipment in the Operating Room to Improve the Accuracy of Doctors' Diagnosis and Medical Actions

The use of medical equipment in the operating room is a concrete manifestation of the concept of *Utilization Management.* The results of interviews with the Hospital Director indicate that optimization strategies are implemented through strengthening aspects of availability, training, and technical reporting. This reflects the application of the principles of *efficiency* and *effectiveness* in the operational management of medical devices as explained by Marzuki's (2020) theory of medical device utilization. Internal training procedures, such as in-house training and damage reporting mechanisms, demonstrate the existence of an internal quality control system aimed at maintaining the continuity of medical device function in supporting clinical interventions.

From the perspective of medical device maintenance theory, the hospital's strategy of conducting annual maintenance and repair procedures through external vendors demonstrates an integrated *preventive maintenance* and *corrective action* approach aligns with the WHO (2011) concept of medical device health maintenance, which emphasizes the importance of continued device function through routine maintenance programs. Thus, hospitals strive not only to respond to device failures but also to systematically anticipate potential device failures to ensure patient safety.

The importance of training in the use of medical equipment, as expressed by hospital management, also strengthens the relevance of *Technology Acceptance Model*(TAM) proposed by Davis (1989). Acceptance and successful use of medical devices depend heavily on the perception of their usefulness and ease of use by medical personnel. When training is provided consistently, the level of technology acceptance increases, which in turn positively impacts the quality of surgical care and operational efficiency in the operating room.

Interview narratives with operating room nurses demonstrate the significant contribution of nursing staff to the operationalization of medical equipment. Nurses' knowledge of the number and function of equipment reflects the successful transfer of knowledge from vendors and previous internal training. This corroborates the theory of *Human Capital.* In the context of healthcare, it emphasizes that the quality of human resources is the primary determinant of success in optimally utilizing medical technology. Nurses are not merely passive users of equipment, but rather active actors in an adaptive and responsive medical equipment management system.

Furthermore, interviews with specialist doctors strengthened the concept of *evidence-based medical device utilization*, namely that the availability of medical devices is not only assessed by quantity, but also by aspects of quality, clinical

suitability, and material efficiency. Critical notes from doctors regarding the need to improve the quality of devices such as mess and bipolar indicate a gap between the availability of devices and ideal standards of medical treatment. This demonstrates the importance of a comprehensive approach of *clinical governance in* the procurement of medical equipment so that hospitals not only prioritize administrative aspects, but also clinical and scientific aspects in decision making.

The perspective of the specialist doctor is also closely correlated with the concept*Weight Tariff Adjustment (WTA)*in the INA-CBGs system. When the equipment used is not appropriate for the complexity of the case, an imbalance occurs between the financing claims and the service burden borne by the hospital. Physicians, as clinical practitioners, are most vulnerable to the technical and financial implications of an unadjusted claims system, especially if the quality of the equipment impacts the effectiveness of the surgical procedure. Therefore, the effectiveness of equipment utilization must be balanced by a relevant and adaptive tariff policy.

Interviews with patients revealed an epistemological dimension of medical care, namely the knowledge gap between medical personnel and recipients. Patients' lack of knowledge about the equipment used during surgery reflects the limitations of technical communication within an outcome-oriented care system. Although patients were satisfied, these narratives opened up discussions about the need for improvement of *health literacy* And *informed consent* more holistic approach, including an understanding of the tools and technologies used during medical procedures, as recommended in the ethical principles of modern medical bioethics.

Furthermore, patient narratives also touch on philosophical issues of trust in the system. Patients reported feeling safe despite not technically understanding the equipment used. This suggests that patients' perceptions of the quality of hospital services are determined more by outcomes and interpersonal interactions than by technical knowledge. However, this also demonstrates the potential for increased transparency in services, particularly in the context of the National Health Insurance (JKN), where the public has a right to understand the equipment funded by collective social funds.

Reviewing the overall interview results, it appears that the hospital's medical equipment utilization system is still in the transition process from an administrative approach to a systemic, data-driven one. Imperfections in standard operating procedures (SOPs), inconsistent training, and suboptimal equipment quality indicate that medical equipment management in the operating room still has efficiency gaps that can be addressed through: *continuous quality improvement*. This is where the *Surgical Site Infection* (SSI) theory is important: because the quality of the equipment and the skill of the user determine the risk of surgical wound infection, every element of equipment management has a direct impact on patient safety.

The interview results above demonstrate the importance of cross-professional collaboration and comprehensive policy support to optimize medical equipment in the operating room. Previous theories have emphasized that medical equipment management is not merely a technical issue but also a systemic one, involving human resources, financing, regulations, and work culture. Therefore, an interdisciplinary approach is essential in creating a healthcare system that is not only efficient and effective, but also equitable and focused on patient quality of life.

Optimizing the use of medical equipment in the operating room is a crucial strategy for improving work efficiency and the accuracy of physicians' medical procedures. Based on the concepts of technical and allocative efficiency, utilizing appropriate, timely, and optimally maintained equipment allows medical personnel to achieve maximum output without increasing the input burden. At Hastien Rengasdengklok Hospital, this efficiency is evident in efforts to reorganize surgical preparation procedures, regular instrument maintenance, and training nursing staff in equipment management. When medical equipment is available in adequate quality and quantity and used appropriately, the process from intraoperative diagnosis to surgical procedures can be more precise, minimize risk, and save time. Thus, this optimization not only reflects efficiency in resource use but also supports the accuracy of physicians' work, which is the spearhead of successful medical procedures. This aligns with the *data envelopment analysis (DEA)* approach which assesses operational performance based on the ratio of output to input, where the integration of tools, procedures, and the expertise of health workers is the main determinant of productivity and quality of service.

The use of medical devices in the operating room is a fundamental pillar of the modern healthcare system. Philosophically, medical devices are not merely technical instruments, but rather extensions of the medical will, which ultimately leads to saving lives and restoring the patient's quality of life. Hastien Rengasdengklok Hospital understands that efficiency and accuracy in medical procedures are largely determined by how medical devices are prepared, used, and maintained. Therefore, based on the above findings, the strategy for optimizing medical devices should not be understood as merely a technical procedure, but as a form of institutional ethical responsibility for patient safety and the professionalism of physicians, which the researchers outline as follows:

Table 6. Optimization Strategy for Medical Equipment in the Operating Room at Hastien Rengasdengklok Hospital

Strategic Aspects	Tactical Steps
Reformulation of Medical Device Management	Real-time inventory audit and digital tracking system for medical devices.
Improving the Quality of Human Resources (HR)	Hybrid training based on cases and the use of medical device simulation technology.
Standardization of Operational Protocols	Development of AI-based SOPs that are adaptive to the type of operation.
Interprofessional Collaboration	Implementation of integrated digital communication systems in the operating room (such as the Smart OR System).
Periodic Maintenance and Calibration	The use of IoT sensors to automatically monitor the calibration period of tools.
Clinical Risk Management	Integration of clinical risk management software based on predictive algorithms.
Evidence-Based Management (EBM) Evaluation	Tool performance evaluation dashboard with dynamically updated efficiency and accuracy metrics.

Source: Processed Data, (2025).

With these strategies, Hastien Rengasdengklok Hospital not only demonstrates technological readiness but also transcends conventional approaches to adaptive, reflective, and visionary medical device governance. This optimization strategy

represents a form of institutional renewal that integrates technical, ethical, and epistemological aspects into medical service practices. In the long term, these efforts are believed to be able to increase public trust, strengthen physician professionalism, and create an operating room ecosystem that is not only cost-efficient but also clinically and humanely superior.

2. Doctors' Perceptions of the Effectiveness of Using Medical Equipment in Operating Rooms to Support Doctors' Work Efficiency in Hospitals

Doctors' perceptions of the effectiveness of medical devices in the operating room reflect the close interdependent relationship between technology and clinical practice. For doctors, medical devices are not merely supporting instruments, but rather extensions of their professional skills. When devices function optimally, doctors' capacity for clinical decision-making becomes more precise, faster, and oriented toward patient safety. Philosophically, this demonstrates that health technology is not neutral, but rather contributes to shaping the quality of the relationship between the subject (doctor) and the object (patient) through the mediation of the device.

Within the theoretical framework of *Resource-Based View* (Barney, 1991), medical devices can be seen as strategic resources that have VRIN characteristics. *(valuable, rare, inimitable, and non-substitutable).* Physicians' perceptions of effective devices indicate that the hospital has managed its assets as intellectual and technical capital that supports clinical excellence. However, this perception also carries epistemic value: medical devices are seen as a representation of scientific knowledge and the organization's investment in its resource capacity.

Doctors' positive perceptions of the device's effectiveness also have an existential dimension. When the device works well, medical procedures become more than just routine procedures, but a manifestation of the doctor's ethical responsibility to save lives. This demonstrates the link between technology and professional ethics. The device not only plays a role in producing clinical outcomes but also serves as a medium for realizing moral values within the medical profession. However, this perception does not arise in a vacuum. It is the result of a systemic interaction between doctors, management, vendors, and the hospital's organizational structure of Morning *report*, for example, is viewed by doctors as a medium for democratizing technical information. Here, there is recognition of doctors' clinical experience as a valid and relevant form of knowledge in the managerial decision-making process. Thus, the perception of tools is also a form of *recognition* towards professional authority.

The technical efficiency approach according to Farrell (1957) and Coelli et al. (2005) finds its practical embodiment in physicians' perceptions of the suitability of equipment to clinical needs. Appropriate and functional equipment allows for optimization of procedure time, minimization of risk, and efficient allocation of resources. However, if equipment experiences problems, work efficiency is disrupted and can even lead to iatrogenic *errors*. Therefore, the doctor's perception becomes an important indicator in assessing technical *fit*tools in the hospital operational system.

From a philosophical perspective, physicians' perceptions of device effectiveness demonstrate that clinical knowledge stems not only from theory or protocols, but also from empirical experience, constantly interacting with technology. This process represents the epistemology of praxis: knowledge is born from direct involvement and critical reflection on real-world conditions in the operating room. Therefore, listening to physicians' perceptions is an

epistemological imperative for management in evaluating medical devices. However, physicians' perceptions also reveal a weakness in the device management system, namely the lack of a mechanism *preventive maintenance* Structured and systematic. Doctors often find themselves dealing with equipment that is deteriorating due to a lack of routine maintenance. This highlights the gap between the ideal system and actual practice. When maintenance is reactive, hospitals compromise clinical accuracy for short-term efficiency.

In the frame *Total Quality Management* (TQM), physicians' perceptions of the importance of clinical feedback and evaluation of tools reflect participatory quality practices oriented toward continuous improvement. Physicians are not only end users, but also *co-creator* in service quality systems. Therefore, hospitals that ignore this perception are essentially missing out on one of the most important sources of insight for developing clinical and technology strategies.

Managerially, the doctor's perception can be understood as *real-time feedback* which enriches the data-driven decision-making process. Hospitals that integrate the voice of doctors into their management information systems have actually adopted the principles of learning *organization*, where every actor becomes part of a collective learning process. Thus, perceptions are not merely passive data, but part of an adaptive and responsive policy architecture.

If viewed from the theory of *dynamic capabilities* Physician perception is a critical component in shaping a hospital's ability to dynamically reconfigure its resources. In rapidly changing operational situations, hospitals cannot rely solely on static SOPs but need to adopt systems based on prediction and reflection. Physician perceptions guide the types of changes needed, both in terms of technology and work procedures. However, perceptions also carry the potential for bias if not systematically processed. Individual physician experiences with equipment can be highly subjective, depending on their level of training, expectations, or even affiliation with a particular vendor. Therefore, it is important for hospitals to combine these perceptions with objective data such as equipment *downtime*, *mean time to repair*, and patient satisfaction levels, so that decision-making remains holistic and evidence-based.

From an organizational ethics perspective, a hospital's response to physicians' perceptions demonstrates the extent to which the institution upholds the values of distributive justice and accountability. When perceptions are heard and acted upon, the hospital creates an ethical, participatory space where professional actors are recognized for their role in shaping service quality. Conversely, if perceptions are ignored, technology is dehumanized, with the tools becoming essential while the human beings are marginalized.

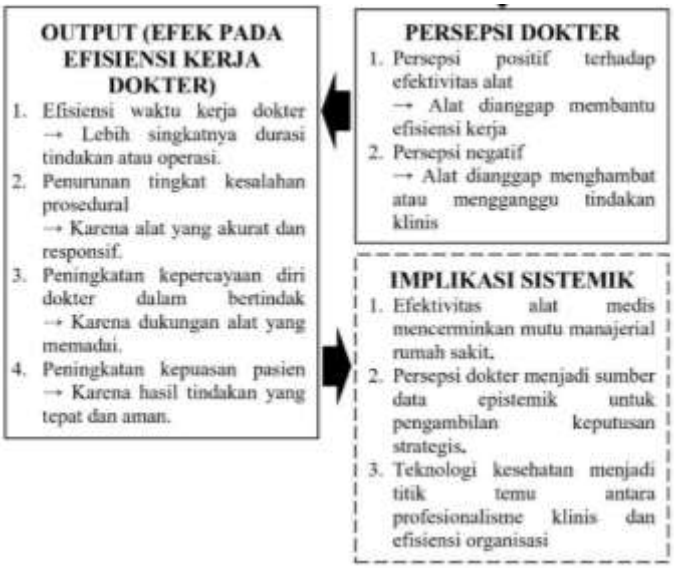
Paradigm of patient-centered *care* closely related to doctors' perceptions of the device. Although patients often don't understand the technical aspects of the device, perceived outcomes and trust in the doctor's competence are key measures of their satisfaction. Therefore, the effectiveness of a medical device isn't just about functionality, but also about how it reinforces the narrative of clinical success in the eyes of patients.

In a Type C hospital like Hastien Rengasdengklok, physicians' perceptions also illustrate the structural challenges in sustainably managing equipment. Budget constraints, dependence on external vendors, and minimal internal regulations are latent barriers that must be addressed immediately if medical equipment is to become a strategic foundation for clinical services. This is where perception plays

a crucial role as an early warning signal, allowing management to intervene before systemic failure occurs.

Thus, physicians' perceptions of the effectiveness of medical devices in the operating room are not only a reflection of the quality of the technology, but also a philosophical reflection of how the hospital defines the value of work, service quality, and human relationships in the clinical setting. Effective medical devices are a symbol of a healthy system not only technically, but also ethically, epistemologically, and managerially. Therefore, hospitals seeking to thrive must not simply provide devices but must also build a culture that values perception as a source of truth, innovation, and sustainability.

Figure 1. Model of Doctors' Perceptions of the Effectiveness of Using Medical Equipment in the Operating Room to Support Their Work Efficiency in the Hospital



4. CONCLUSION

The strategy for optimizing medical equipment in the operating room at Hastien Rengasdengklok Hospital emphasizes the importance of synergy between technological innovation, human resource development, and an evidence-based management system. Management reformulation through real-time inventory audits and a digital tracking system enables efficient equipment use, while hybrid case-based training and medical technology simulations enhance the competency of healthcare workers. AI-based standardization of operational protocols enhances service adaptation to operational needs, supported by interprofessional collaboration through an integrated digital communication system. Furthermore, IoT-enabled medical equipment maintenance ensures reliability and safety, while the integration of predictive risk management software helps minimize the potential for clinical incidents. Equipment performance evaluation through an evidence-based management dashboard provides an objective overview of the efficiency and accuracy of equipment use. With the implementation of this strategy, Hastien Rengasdengklok Hospital has the potential to create a more modern, safe, and effective operating room, while simultaneously improving the quality of healthcare services

sustainably. Physicians' perceptions of medical equipment use reflect the complex interplay between clinical professionalism, operational efficiency, and hospital managerial dynamics. On the one hand, there are positive perceptions that emphasize the effectiveness of devices as a catalyst for work efficiency, where medical technology can accelerate the process of diagnosis, intervention, and patient monitoring, thus supporting the achievement of optimal service quality. On the other hand, there are negative perceptions that highlight the potential disruption or obstacle to clinical practice, particularly when the device is perceived to limit professional flexibility or create an over-reliance on mechanistic procedures. The systemic implications of these perceptions are not only operational but also epistemological; the effectiveness of medical devices serves as an indicator of hospital managerial quality, while physicians' perceptions serve as a vital source of epistemic data for strategic decision-making. Thus, health technology has emerged as a meeting point between clinical professionalism and organizational efficiency, demanding a reflective integration of medical practice, institutional management, and ethical considerations. Therefore, every innovation or implementation of medical devices must be critically examined from both functional and philosophical perspectives in building a sustainable healthcare ecosystem.

Based on the findings and analysis conducted, Hastien Rengasdengklok Hospital needs to strengthen its medical device optimization strategy by adopting a Balanced Scorecard approach to drive sustainable performance. From an internal business process perspective, the hospital is advised to build a digital-based preventive maintenance system integrated with equipment usage records. From a learning and growth perspective, regular technical training for doctors and nurses using a hybrid-learning approach and real-case-based simulations needs to be strengthened. From a customer perspective, patient engagement through transparent communication regarding the medical devices used must be increased to strengthen public trust. Meanwhile, from a financial perspective, medical device procurement policies must involve clinical teams to ensure cost efficiency and suitability of devices to medical needs, as well as the development of data analytics-based governance to support efficiency and patient safety.

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