



## ANALYSIS OF MEDICAL EQUIPMENT CONTROL THROUGH HANDOVER TOOLS IN THE INPATIENT WARD OF HOSPITAL

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### ABSTRACT

Medical equipment control is a crucial aspect in supporting the continuity and effectiveness of nursing services in inpatient wards. This study aimed to evaluate internal and external factors influencing the effectiveness of medical equipment control and to formulate the need for developing a structured, documentation-based handover tool. This preliminary study was conducted in hospital inpatient wards involving Nurse Unit Managers (NUMs) and staff nurses. Data were collected through in-depth interviews, field observations, and questionnaires. Medical equipment control processes were examined using the POSAC management framework. Questionnaire data were analyzed descriptively, while overall data were analyzed using POSAC and SWOT analyses, followed by IFE and EFE matrices to formulate improvement strategies. Data validity was ensured through source and method triangulation. The findings indicated that medical equipment control had not been optimally implemented due to the absence of standard operating procedures, inconsistent documentation, unequal distribution of equipment, and the lack of routine evaluation. Analysis of external factors revealed significant opportunities, including government regulations, accreditation requirements, technological advances, and increasing public expectations for fast and accurate services. A standardized, user-friendly, and integrated medical equipment handover system is required to improve efficiency, accuracy, and the overall quality of nursing services.

Keywords: handover tools; medical equipment; nursing services; system evaluation; work efficiency

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## INTRODUCTION

The development of handover tools in nursing logistics needs to be designed based on Healthcare Logistics principles, integrated with Supply Chain Management (SCM) concepts and the 7 Rights of Logistics. These principles ensure that the right items are available in the right quantity, in appropriate conditions, at the right place and time, for the right user, and at an efficient cost. This approach has been widely implemented in healthcare logistics systems to ensure service efficiency and continuity (Jarosz et al., 2025). In nursing practice, applying the 7R principles can facilitate systematic logistics handover processes, reduce repeated requests, and enhance patient safety. Several studies have demonstrated that the implementation of e-logistics and tele-logistics plays a significant role in the effective planning, control, and tracking of medical equipment (Eva et al., 2022; Milulu et al., 2024).

From a methodological perspective, the design of logistics handover tools is recommended to adopt an evidence-based approach, involving nurses as the primary users through iterative methods such as the Plan–Do–Check–Act (PDCA) cycle or the Knowledge-to-Action (KTA) framework (Eva et al., 2022; Gagliardi et al., 2016). Tool validation can be conducted through factor analysis, reliability testing, and the application of SBAR- or ISBARR-based checklists to ensure information

quality (Kim et al., 2023). The integration of these approaches enables the development of handover tools that are effective, user-friendly, and capable of positively impacting the efficiency of medical equipment management and the quality of nursing services.

Medical equipment readiness plays a crucial role in the effectiveness of nursing care delivery in inpatient wards. Studies have shown that delays in nursing interventions are often caused by unavailable, damaged, or malfunctioning equipment (Woldeyohanes et al., 2025; Khajoe et al., 2025). The absence of an organizational structure and standard operating procedures (SOPs) governing medical equipment control further exacerbates the situation, resulting in poorly documented inter-shift information and an increased risk of missed nursing care. Other studies report that more than 50% of nursing actions are delayed due to equipment unavailability, while 25–26% of equipment does not function optimally because of inadequate training, maintenance, and storage policies (Abere et al., 2024; Kuswantoro et al., 2021).

These conditions highlight the need for a structured, standardized, and well-documented medical equipment control system to improve efficiency and the quality of nursing services. Such a system includes clear organizational structures for equipment logistics, uniform SOP implementation, and digital documentation based on cloud technology or the Internet of Things (IoT) to accelerate tracking and maintenance processes (Lin et al., 2023; Shen et al., 2021). An integrated equipment control system not only supports operational effectiveness but also enhances patient safety. Therefore, this study aims to evaluate the medical equipment control system in inpatient wards as a basis for developing efficient nursing logistics management oriented toward improving the quality of nursing care.

## **METHOD**

This study employed a preliminary study approach aimed at exploring in depth the process of medical equipment control in hospital inpatient wards based on the POSAC management function framework (Planning, Organizing, Staffing, Actuating, and Controlling). This approach was chosen because it allows researchers to obtain a comprehensive understanding of actual field conditions, nursing staff perceptions, and various issues arising in the implementation of medical equipment control (Creswell, 2018).

Data collection methods included in-depth interviews with Nurse Unit Managers (NUMs), field observations, and questionnaire distribution to staff nurses. In-depth interviews were conducted from 28–30 May 2025 with inpatient ward NUMs to explore information related to planning, organising, implementation, supervision, and barriers in medical equipment control. Semi-structured interview guidelines were used to provide flexibility for in-depth exploration of participants' responses.

In addition to interviews, field observations were carried out to examine daily operational activities related to medical equipment control in the wards. Observations focused on inter-shift equipment handover mechanisms, equipment availability and readiness, documentation workflows, and staff involvement in equipment management. The POSAC management function framework guided observations to identify potential systemic weaknesses in planning, organising, staffing, actuating, and controlling medical equipment.

The third method involved distributing questionnaires to staff nurses in the hospital. The questionnaire was designed to assess nurses' knowledge, attitudes, and practices related to medical equipment control based on POSAC aspects. Questionnaire data were analyzed descriptively to provide a quantitative overview of perceptions, compliance, and challenges faced by nurses in managing medical equipment, thereby strengthening findings from interviews and observations.

All collected data were analyzed using POSAC analysis, followed by SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) to identify internal and external factors influencing the medical equipment control system. The SWOT results were further elaborated through the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices to determine the organisational position and formulate appropriate and sustainable improvement strategies. To ensure data validity and trustworthiness, this study applied source and method triangulation by comparing findings from interviews, field observations, and questionnaires. This comprehensive methodological approach is expected to provide an accurate depiction of the medical equipment control system in the hospital and serve as a foundation for systematically and sustainably improving the quality of medical equipment management.

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## RESULT

Tables 1 and 2 summarize interview and observation findings across POSAC function

Table 1.

Interview Results by POSAC Function

POSAC function	Key Findings
Planning	- There is no medical device management planning document. - There is no identification of device needs or efficiency targets. - There is no SOP related to device control.
Organizing	- There is no logistical organisational structure in the treatment room. - There is no division of tasks or a person in charge of equipment per shift. - Equipment transfers are not documented, so that information between shifts is often lost.
Staffing	- There is no special staff to handle medical equipment. - Training regarding equipment management and documentation has not been carried out. - Staff do not have adequate competence in equipment control.
Actuating	- Minimal direction and supervision from management regarding tool transfers. - No motivation or encouragement to build a culture of tool documentation between shifts. - Staff involvement in tool management is still low.
Controlling	- There is no periodic evaluation system for medical devices. - There is no monitoring of device readiness or reporting of damage. - There are no routine reports regarding device management.

The interview results in Table 1 indicate that medical device management has not been effective across all aspects of the POSAC. In terms of planning, there are no planning documents, identification of equipment needs, or SOPs for equipment control. In terms of organisation, there is no logistical structure, division of tasks, or person responsible for equipment per shift, resulting in undocumented equipment transfers and frequent disconnection between shifts. Staffing also appears weak, as there are no dedicated staff members to handle equipment and no training on equipment management and documentation. In terms of mobilisation, management has not provided sufficient direction or encouragement to build a culture of equipment documentation, resulting in low staff engagement. Control is also not yet effective, as evidenced by the lack of monitoring, periodic evaluation, or reporting of equipment damage.

Table 2.  
Observation Results by POSAC Function

POSAC Function	Key Findings
Planning	- There is no tool operation system between shifts. - There is no SOP for tool operation. - There is no integrated information system plan for tool tracking.
Organizing	- No work structure regulates the monitoring of equipment between shifts. - There are no forms, spreadsheets, or digital systems available to record equipment conditions. - Information about equipment between shifts is not communicated well.
Staffing	- Staff awareness of the importance of tool documentation varies. - Training or technical briefing regarding tool management has not been carried out. - The division of tool management tasks is not clear.
Actuating	- There is no reward/punishment system related to tool reporting. - Low staff motivation to report tool conditions. - A work culture related to tool operations has not been formed.
Controlling	- There is no integrated monitoring system (barcode, spreadsheet, audit).- There is no routine evaluation of the condition and availability of equipment.- There is no follow-up on damage findings or operation reports.

The observation results in Table 2 reinforce the interview findings, indicating that equipment management planning has not been implemented due to the lack of an inter-shift operating system, standard operating procedures (SOPs), or a planned equipment tracking information system. From an organisational perspective, there is no work structure that regulates equipment monitoring, and no documentation media such as forms, spreadsheets, or digital systems are available, so that information delivery between shifts is not optimal. From a staffing perspective, staff awareness regarding the importance of documentation varies, and there is no technical training to support equipment management. The mobilisation aspect is also weak because there is no reward/punishment system, and staff motivation to report equipment conditions is still low. From a control perspective, there is no visible integrated monitoring system, routine audits, or follow-up on equipment damage, so the control process has not been implemented properly.

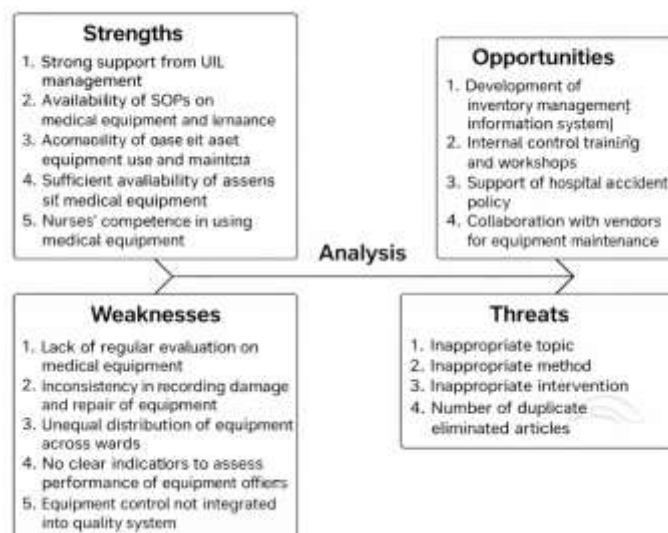


Figure 1 SWOT summary of medical equipment control

Analysis using the Ishikawa diagram (Figure 1) shows that medical device management is influenced by various factors, including strengths, weaknesses, opportunities, and threats. Key strengths include management support, the existence of SOPs, a designated person responsible for each room, adequate equipment availability, and nurse competence. However, weaknesses include the lack of regular evaluations, irregular record-keeping, uneven distribution of equipment, and the absence of an integrated quality system. Opportunities for improvement arise through the development of an inventory information system, internal training, accreditation policy support, and collaboration with vendors. Meanwhile, threats can arise from inconsistencies in topics, methods,

and interventions in the assessment process, as well as data duplication that needs to be eliminated. The diagram helps identify priority areas for more effective medical device management.

Table 3 . *Internal Factor Evaluation*

No	Internal Factors	Weight	Rating	Score
1	The existence of SOPs regarding the use of medical devices	0.1	4	0.4
2	Availability of adequate basic tools	0.08	3	0.24
3	Nurse competence in using tools	0.07	3	0.21
4	Recording system available	0.05	2	0.1
5	Management's commitment to efficiency	0.1	3	0.3
6	Periodic evaluation has not been carried out	0.1	2	0.2
7	Irregularity in tool recording	0.08	2	0.16
8	Uneven distribution of tools	0.07	1	0.07
9	There is no clear tool KPI	0.08	2	0.16
10	Tool control is not yet integrated	0.07	1	0.07

The results of the internal factor analysis in Table 3 indicate that medical device management has several strengths, such as the availability of SOPs for device use, management's commitment to efficiency, and the availability of adequate basic equipment. These factors received high scores and reflect areas that are already operating well. However, weaknesses remain more dominant, particularly related to the lack of regular evaluations, irregular equipment recording, uneven equipment distribution, and the lack of KPIs and an integrated equipment control system. These conditions indicate that despite the existence of several strong foundations, the medical device management system still requires significant improvements, particularly in aspects of supervision, equipment distribution, and consistent record keeping.

Table 4.

*External Factor Evaluation*

No	EXTERNAL FACTORS	WEIGHT	RATING	SCORE
1	Government regulations encourage efficiency in equipment management	0.1	4	1.2
2	Hospital accreditation demands for traceability of equipment	0.08	3	0.24
3	Public expectations for fast and accurate service	0.07	3	0.24
4	Competitors are already using control systems	0.05	3	0.27
5	Collaboration with medical equipment vendors	0.1	2	0.14
6	Utilisation of technology (IoT internet of Things)	0.1	3	0.21

Opportunities for improving the efficiency of medical device management. Government regulations, accreditation requirements, and public expectations are strong drivers for hospitals to improve traceability and speed of service. Furthermore, competitors already using modern control systems and technological developments, such as IoT, provide opportunities for hospitals to innovate. However, collaboration with vendors, which is still suboptimal, needs to be improved to maximise the utilisation of external opportunities.

## DISCUSSION

The evaluation results indicate that medical equipment logistics management in the inpatient ward is not supported by adequate planning. The absence of policy documents, standard operating procedures (SOPs) for inter-shift equipment handover, and an equipment tracking information system reflects weaknesses in the planning function. Nevertheless, survey findings show that the majority of respondents (72.22%) reported understanding equipment control procedures, while 20% admitted that they did not fully understand them. This imbalance highlights insufficient and uneven dissemination of policies to all staff members.

These findings are consistent with Zhang et al. (2022), who emphasised that unit-based logistics management planning is a critical element in ensuring equipment availability and preventing service disruptions. Inadequate planning increases the risk of equipment shortages or delays when

equipment is needed. Therefore, strategic actions should include the development and formalisation of annual work plans, as well as strengthening policy dissemination through regular training sessions and routine briefings.

In terms of organising, the evaluation revealed that responsibility allocation for medical equipment management has not been clearly structured. There are no designated personnel or nurses specifically assigned to monitor equipment completeness, functionality, and inter-shift handover processes. Inconsistent documentation further impedes the transfer of complete equipment-related information to subsequent shifts. Priyadarshini et al. (2024) highlighted that the use of information technology, such as shared spreadsheets, barcode tracking, or digital reporting systems, can create more transparent and efficient workflows. In line with these findings, improvement efforts may include appointing an equipment-responsible nurse for each shift and developing a digital-based equipment handover form.

Furthermore, clear task distribution and competency delineation related to medical equipment control are lacking. Not all nurses receive technical training on documentation, monitoring, or equipment maintenance, leading to gaps in knowledge and practice. Smith et al. (2023) stated that competency-based training is essential to minimise procedural errors and improve team efficiency. Accordingly, assigning logistics roles to trained nurses on each shift and conducting regular competency assessments in equipment management are strategic steps that should be implemented.

Regarding the actuating function, the evaluation showed suboptimal managerial support. Limited leadership direction and the absence of incentive systems contribute to low staff participation in equipment handover activities. Reduced motivation results in inconsistent handover practices. Rahman and Hasan (2025) emphasised that non-financial rewards and a supportive work culture can enhance staff engagement in equipment control systems. Therefore, improvement strategies may include daily coaching by the Nurse Unit Manager (NUM), simple reward mechanisms for shifts demonstrating high-quality reporting, and fostering a documentation-oriented culture as part of routine work.

The controlling function (monitoring and evaluation) was also found to be insufficient. There is no formal evaluation system, regular audits, or well-documented equipment damage reporting mechanisms. Questionnaire results indicate that some respondents remained neutral regarding system effectiveness, suggesting that a robust control mechanism has not yet been established. Feng et al. (2023) suggested that monitoring systems based on barcode technology or digital forms can enhance internal audit effectiveness and accelerate decision-making processes. Based on these findings, recommended strategies include conducting monthly audits of equipment condition and readiness, developing an inter-shift electronic reporting system, and performing quarterly evaluations of the equipment control system by the hospital quality team.

Further evaluation was conducted to assess the usability of the inter-shift equipment handover form and to identify emerging challenges. Overall, nurses provided positive feedback; however, concerns were raised regarding user-friendliness. Some nurses reported that they needed to check equipment individually, which prolonged the process. This feedback is crucial for refining the handover form, such as by incorporating automated lists, quick checklist columns, or integration with equipment tracking applications.

## **CONCLUSION**

This study concludes that medical equipment control in the inpatient ward of Hospital X has not been optimally implemented due to weaknesses in planning, organising, actuating, and controlling functions. These deficiencies are reflected in the absence of equipment handover SOPs, inadequate inter-shift documentation, a lack of designated personnel, and limited routine evaluation and

monitoring. Nevertheless, significant opportunities for improvement exist through the utilisation of technology, regulatory support, accreditation requirements, and organisational readiness for innovation. Optimising equipment control through the development of a structured, user-friendly, and well-documented handover tool is expected to enhance nursing work efficiency, accelerate service delivery processes, and support overall quality of care and patient safety.

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