

# The Role of Decision Support System in Improving Efficiency and Quality of Hospital Services in Developing Countries: A Literature Review

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## ABSTRACT

**Background:** The development of information technology, especially the Decision Support System (DSS), has had a significant impact on improving the quality of health services in hospitals. DSS supports data-based decision making, allowing for more accurate diagnosis and efficiency in managing hospital resources. However, the implementation of DSS in developing countries faces technical challenges and resistance from medical personnel. This study aims to explore the benefits and constraints of DSS implementation in a hospital context, with a focus on developing countries.

**Methods :** The method used is a systematic literature review , where related articles are collected from the PubMed, Google Scholar, and ScienceDirect databases. Articles are selected based on relevant inclusion criteria and then analyzed to identify thematic patterns and factors that influence the success of DSS implementation .

**Results :** research shows that DSS can improve operational efficiency and accuracy in clinical decision making. However, challenges include limited technology infrastructure, high training requirements, and high implementation costs. More intensive collaboration between technology developers and end users is needed to maximize DSS acceptance and overcome existing resistance .

**Conclusion :** DSS has great potential in improving the quality of hospital services in developing countries. However, infrastructure readiness and intensive training support factors need to be considered to ensure successful and sustainable implementation .

**Keywords:** Decision Support System , Hospital, Health Services, Developing Countries, Technology Implementation, Clinical Decision Making

## INTRODUCTION

Digital transformation in the Industrial Revolution 4.0 era has penetrated various sectors, including the health sector. This change is driven by advances in information technology that integrates the physical and digital worlds, and utilizes artificial intelligence (AI) to support smarter and more responsive decision-making. In the health sector, the Decision Support System (DSS) is one of the most significant innovations. DSS is a computer-based system that helps health professionals make decisions based on real-time data analysis and evidence-based information. This aims to improve efficiency, speed, and accuracy in diagnosis and treatment planning in hospitals.

According to the World Health Organization (WHO), implementing DSS in hospitals can help overcome challenges faced by the current health system, such as the need for faster and better quality health services. AI-powered DSS allows complex data processing and provides evidence-based recommendations, which help doctors make more precise and effective clinical decisions. This is evident in a number of studies showing that DSS can reduce the risk of medical errors, improve the quality of services, and support the optimization of existing resources. However, the implementation of DSS in developing countries, including Indonesia, still faces several challenges. Limited technological infrastructure, high implementation costs, and the need for intensive training for medical personnel are obstacles that need to be overcome. In Indonesia, the Ministry of Health has promoted the use of health information technology through e-health policies, but the implementation of DSS is

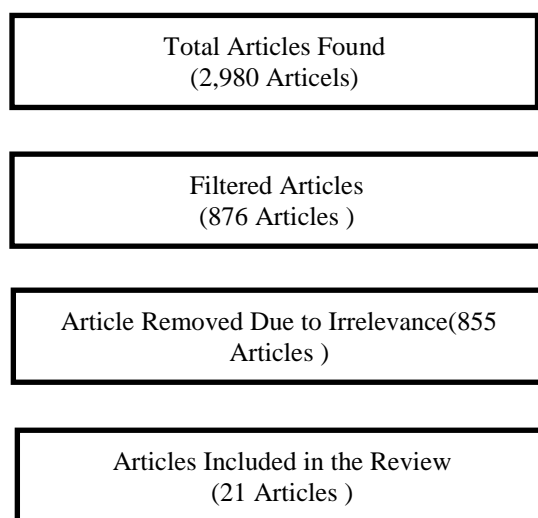
not evenly distributed and is still in the early stages of development in many hospitals. Therefore, this study aims to examine the role of DSS in improving hospital management information systems in Indonesia and identify factors that influence its implementation, including technical, human, and organizational aspects.

Thus, a deep understanding of DSS and the challenges of its implementation in hospitals is expected to provide comprehensive guidance for developing effective and sustainable DSS implementation strategies in Indonesia. This will also support efforts to improve the quality of health services as a whole and make DSS an integral element in modern and efficient hospital management.

### Search Method

This study uses a literature review method to identify the role of Health Information Systems based on Decision Support System (DSS) in hospitals. Data sources were obtained through electronic database searches such as PubMed, Google Scholar, ScienceDirect, and WHO Database, which are commonly used in health research. The inclusion criteria in literature selection are original and open articles published in the last 5 years, and are relevant to the topic of DSS in hospitals. The literature review process begins with determining the topic and building research arguments.

### Article Screening Process: Literature Review



The data were analyzed using the matrix analysis method, which helped in grouping the research results based on relevant themes, such as the effectiveness of DSS in improving service quality, implementation challenges, and its impact on hospital management efficiency. The selected literature was then synthesized to draw conclusions regarding the role of DSS in hospital decision making, as well as its benefits and constraints in implementing this system.

### RESULTS

Based on the results of the literature review, the implementation of Decision Support Systems (DSS) in hospitals has shown a significant impact in improving the quality of health services. The findings show that DSS helps facilitate more accurate and efficient clinical decision-making, relying on real-time data analysis to support diagnosis, treatment planning, and overall hospital management. This system has been shown to reduce medical errors and increase accuracy in clinical processes, which has a direct impact on improving patient safety.

In addition to the benefits in clinical operations, DSS also supports hospital management in optimizing resources through workflow monitoring and logistics management. The use of DSS allows for higher efficiency in the use of labor and inventory management, such as in drug and medical equipment inventory systems. This system also supports long-term strategic planning based on historical data and projected needs.

However, despite the benefits, DSS implementation in developing countries, including Indonesia, faces challenges including limited infrastructure, the need for training for medical personnel, and high costs for system procurement and maintenance. The findings also suggest that there is a need to improve user readiness in adapting to new technologies through more intensive training and ongoing support.

DSS Research Results Table

Author Name	Research Title	Subject	Objective	Method	Results
Elisa G. Liberati, et al.	What hinders the uptake of computerized decision support systems in hospitals?	Doctors, nurses, and information technology staff	Examining barriers and facilitators for CDSS	Qualitative study with in-depth interviews	Identify six key barriers
Winnie Chen, et al.	Barriers and enablers to implementing and using clinical decision support systems for chronic diseases	Health care providers	Synthesizing CDS experiences for chronic diseases	Qualitative data meta-aggregation	177 findings, 29 categories, 8 synthetic findings
Pierre-Yves Meunier, et al.	Barriers and Facilitators to the Use of Clinical Decision Support Systems in Primary Care	Primary Care Professionals	Identifying barriers and facilitators in CDSS	Systematic review and mixed-methods analysis	186 barriers and facilitators identified
Muhammed Ordu, et al.	A comprehensive and integrated hospital decision support system for healthcare services	Hospital Management	Developing an integrated DSS system in hospitals	Discrete event forecasting and simulation	Increase in BOR and income
Gustavo de Carvalho Duarte, et al.	Implementation of a patient blood management program based on a low-income country-adapted clinical decision support system	Patient management and medical audit	Evaluating PBM programs with the CDS system	Prospective study of program implementation	Reduction of blood transfusions and improvement of transfusion practices
Hamidreza Abtahi, et al.	Development and evaluation of a mobile-based asthma clinical decision support system	Researchers in the field of asthma	Developing an asthma-specific CDSS	Evaluation based on KTA model	Mobile-based asthma CDSS improves accuracy
Zhilian Huang, et al.	Are physicians ready for precision antibiotic prescribing?	Doctors in India and Singapore	Evaluating the acceptability of CDSS in antibiotic prescribing	In-depth interview	AI use in antibiotic prescribing
Emilio Flores, et al.	Clinical Decision Support systems: A step forward in establishing the clinical laboratory as a decision maker hub	Clinical laboratory management	Demonstrating the benefits of CDS in clinical laboratories	Descriptive, utilizing CDS	CDS protocols in clinical laboratories
Guardian Yoki Sanjaya, et al.	Using Hospital Claim Data To Develop Referral Decision Support Systems	Primary care physician	Developing a DSS for patient referrals	Prototyping method	DSS for referrals helps doctors
Tobias Skuban-Eiseler, et al.	Artificial Intelligence-Based Clinical Decision Support Systems in Geriatrics: An Ethical Analysis	Geriatrics	Ethical analysis of CDSS in geriatrics	Principle-based ethical analysis	Unsystematic ethical considerations
Gaud Cathoa, et al.	Factors determining adherence to antimicrobial guidelines and adoption of computerized decision support systems	Hospital doctors in three countries	Identifying factors for adherence to antimicrobial guidelines	Semi-structured interviews	Antimicrobial compliance is affected
Stuti M. Tanya, et al.	Development of a Cloud-Based Clinical Decision Support System for Ophthalmology Triage	Ophthalmology references	Developing a cloud-based triage CDSS	Development of cloud-based decision tree algorithm	Cloud CDSS for ophthalmology triage
Abdelmalek Mouazer, et al.	Decision-support systems for managing polypharmacy in the elderly	Polypharmacy in the elderly	Analyzing DSS for polypharmacy in the elderly	Scoping review	Approaches to the management of polypharmacy in the elderly

Sjoerd de Vries, et al.	A semi-supervised decision support system to facilitate antibiotic stewardship for urinary tract infections	Patients with UTI	Developing a CDSS for antibiotic management of UTIs	Semi-supervised machine learning	CDSS is accurate for UTI
Guangyao Wu, et al.	Development of a clinical decision support system for severity risk prediction and triage of COVID-19 patients	COVID-19 Patients	Developing a CDSS for COVID-19 severity risk prediction	Retrospective design	CDSS for triage of COVID-19 patients
TKJ Groenhof, et al.	A computerized decision support system for cardiovascular risk management 'live' in the electronic health record environment	Patients with cardiovascular risk	Testing the effectiveness of cardiovascular DSS	Retrospective observational	DSS CVRM in EHR environment
Lina Nilsson, et al.	Decision-makers and mediators in a home healthcare digitization process: nurses' experiences of implementation	Home health care nurse	Describes nurses' experiences with DSS	Qualitative design	DSS usage experience
Janice L Kwan, et al.	Computerized clinical decision support systems and absolute improvements in care: meta-analysis of controlled clinical trials	108 controlled clinical studies	Reporting improvements from CDSS across multiple settings	Systematic review and meta-analysis	CDSS improves care
Lorenzo Moja, et al.	Effectiveness of a Hospital-Based Computerized Decision Support System on Clinician Recommendations	Hospital patients	Assessing the effectiveness of CDSS in hospitals	Randomized clinical trial	CDSS is effective for clinical recommendations
Sanjuluca, THP, et al.	Assessing the Use of Hospital Information Systems (HIS) to Support Decision-Making	Seven hospitals in Angola	Analyze the use of HIS as a decision making tool	Questionnaire-based cross-sectional	HIS supports management decisions
Kathrin M. Cresswell, et al.	Sustained User Engagement in Health Information Technology: The Long Road from Implementation to System Optimization	Clinical users and support staff in the UK	Understand user involvement in CPOE and CDS	Qualitative case study	Ongoing user engagement in CDS

**DISCUSSION**

The results of a review of 21 studies on the implementation of Decision Support Systems (DSS) in hospitals revealed several important patterns regarding the benefits, barriers, and factors influencing DSS implementation in a healthcare context:

- (1) **Benefits of DSS in Improving Service Quality and Operational Efficiency:** Many studies have highlighted that DSS helps in making more precise and faster clinical decisions. For example, it was found that implementing DSS increased the Bed Occupancy Rate (BOR) and hospital revenue through resource optimization. Other studies, such as those conducted by, revealed that DSS can reduce the need for blood transfusions while improving the quality of transfusion practices.



The image above is an infographic that displays the main benefits of Decision Support Systems (DSS) in hospitals, including Improved Clinical Decision Making, Increased Efficiency, Optimized Resource Management, and Reduced Medical Errors.

- (2) Support in Specific Disease Management: DSS shows potential in the management of specific diseases, such as asthma and COVID-19. DSS provides real-time data-driven recommendations that help physicians plan more appropriate care for patients. In addition, disease-specific DSS improve diagnostic accuracy and speed up treatment response, especially in emergency situations.
- (3) Challenges of DSS Implementation: Several studies, such as those conducted by Liberati et al. (2017) and Meunier et al. (2023), identified major barriers to DSS implementation in hospitals. These barriers include resistance from healthcare professionals due to concerns about professional autonomy and significant changes in workflow. Other factors identified were limited infrastructure and high implementation costs. This suggests the need for stronger support in terms of training and education to encourage technology acceptance among healthcare professionals.
- (4) The Need for Collaboration between Developers and End Users: To address these challenges, several studies have suggested the importance of collaboration between technology developers and end users. This collaborative approach allows for the customization of DSS features to be more relevant to the clinical and operational needs of the hospital. For example, the adaptation of a DSS for managing polypharmacy in the elderly showed that systems designed with user input were more effective in their implementation.
- (5) User-Friendly Interface Design: Several studies have also emphasized the importance of user-friendly interface design. An easy-to-use system will facilitate the adaptation of healthcare personnel to the DSS and reduce the learning burden required. An intuitive interface will accelerate the integration of the DSS into daily workflows, thereby improving the operational efficiency of the hospital.



**Figure 1:** implementation of the Decision Support System (DSS)

This figure illustrates the collaborative approach recommended in the implementation of Decision Support System (DSS) in hospitals. The diagram shows three main components that are interconnected in a continuous cycle: Training of Medical Personnel, Collaboration with Technology Providers, and Design User Friendly Interface<sup>30-43</sup>

## CONCLUSION

This study reveals that Decision Support System (DSS) plays a significant role in improving the efficiency and effectiveness of healthcare services in hospitals. DSS enables faster and more accurate decision-making, which contributes to improving the quality of patient care and reducing the risk of medical errors. In addition, DSS supports hospital management in optimizing resource use through integrated data analysis.

However, the implementation of DSS in hospitals still faces several challenges, especially related to resistance from medical personnel and limitations of technological infrastructure. Concerns about reduced professional autonomy and increased workload indicate that cultural acceptance of this technology needs to be improved. In addition, the success of DSS is highly dependent on the readiness of the infrastructure, which must be able to integrate various types of clinical and operational data.

To overcome these challenges, a more collaborative approach between technology developers and end users, as well as intensive training for healthcare professionals, is needed. Strong managerial support is also important to encourage DSS acceptance and create a work environment that is adaptive to technological change.

Overall, DSS has great potential to improve hospital management and the quality of health services, especially in developing countries. With special attention to technical, organizational, and cultural aspects, DSS can be optimized to make a significant contribution to a more modern, efficient, and responsive health system to patient needs.

### Ethical Considerations

The authors have ensured full compliance with various ethical issues, such as plagiarism, informed consent, misrepresentation, falsification or fabrication of data, multiple publication or submission, redundancy, etc.

### Confession

All authors in this manuscript have disclosed any potential conflicts of interest, financial or personal, with other organizations or individuals that might be influenced by their work. They have also disclosed any financial support received for the preparation of this review article. The authors assert that there are no relevant conflicts of interest that could affect the objectivity of this paper.

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