



Implementation of Digital Information System to Enhance Quality of Patient's Nutrition Service

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Abstract

Hospital nutrition services aim to optimize patient's nutritional status through the provision of appropriate diets. Currently, technological advancements can be utilized to support the management of nutrition services by developing digital information systems for meal provision. This study aims to describe the information systems that have been developed for hospital nutrition services and their benefits. The method used is a scoping review. Articles were collected from 3 databases: Scopus, PubMed, and Google Scholar. The keywords used in the search were: "Electronic Food Service" AND "Hospital" and "Nutrition Information System" AND "Hospital" AND "Service". A total of 10 relevant articles were selected. The findings show that the developed information systems can be used by staff and patients. Systems for dietitians are designed to assist in assessing nutritional status and planning dietary interventions, while systems for patients enable them to choose and order their meals independently. The benefits include reducing staff workload, ensuring timely food distribution, decreasing errors in food delivery and food waste, and improving patient satisfaction. The conclusion, information systems provide valuable support in enhancing the quality of nutrition services and patient satisfaction.

Keywords: Hospital, Information System, Nutrition Service, Scoping Review.

INTRODUCTION

Hospital nutrition services are the activities of providing meals to patients that aim to optimize their nutritional status by providing an appropriate diet based on their clinical condition, nutritional status, and metabolic status (Familta et al., 2019). Patients require nutritional intake appropriate to their condition. Adequate nutritional intake is essential for accelerating the healing process, shortening hospital stays, reducing mortality and morbidity, and thus saving on medical costs (Suhendra, 2022).

Keputusan Menteri Kesehatan RI No. 129 Tahun 2008 stipulates three standards for hospital nutrition services: $\geq 90\%$ on-time food distribution, $\leq 20\%$ on patient food waste, and 100% on-time diet delivery (Menteri Kesehatan RI, 2008). However, not all hospitals meet these three standards, a contributing factor being inadequate hospital facilities (Mardianingsih et al., 2020). A study conducted in an Australian hospital found that more than 85% of patients received food that did not meet their nutritional needs. (Larby et al., 2016).

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The most common causes of errors in patient feeding are errors in the transcription process, resulting from communication using illegible paper notes (Putri et al., 2024). Nutritionists also mistranslate information related to the patient's diet (Carrera-Gil & Prieto Rusca, 2024). This is also due to a poor patient meal ordering system (Larby et al., 2016). An example of a bad system is ordering food manually by hand writing (Cavalcanti Sampaio & Spinillo, 2022).

The manual food ordering system results in discontinuous information being generated due to illegible handwriting (Cavalcanti Sampaio & Spinillo, 2022). This is what makes it difficult for nutritionists to read written information so that the information produced is inaccurate and misinterprets the information, the impact of which is the presentation of food that does not meet the patient's nutritional needs (Tonjang & Thawesaengkulthai, 2019; Yee & Zainal Abidin, 2020).

The manual patient meal ordering system also doesn't support real-time data, requiring staff to spend significant time searching for data on the patient's diet, especially if there's a change in diet (Malini et al., 2022; Wahyudin & Rahayu, 2020). Using a manual system also prevents patients from choosing their meals, which can lead to decreased appetite, consequently impacting nutritional intake (Barrington et al., 2018).

Providing nutrition services in hospitals requires support staff, one of which is computer technicians. Peraturan Menteri Kesehatan RI No. 78 Tahun 2013 explains that food development and management can be accomplished through, among other things, the use of computerized programs or software. Computerized food management programs include patient mobilization, food logistics, recording and reporting, a nutritionist database, and more (*Permenkes Nomor 78 Tahun 2013 Tentang Pedoman Pelayanan Gizi Rumah Sakit*, n.d.).

Now, rapid advances in science and information technology (IPTEK) allow us to process data and information quickly and accurately. These advances can be leveraged to assist nutrition service management through the development of information systems. Developing an information system for patient nutrition services can be beneficial for increasing efficiency in time and effort, and providing electronic data. All of this can improve patient food service (Aroni et al., 2016).

The development of an information system in the nutrition installation is very helpful for officers in carrying out their duties, such as processing patient food request data which will be more effective and minimize the number of errors in patient nutrition services (Ofei et al., 2015).

Many hospitals have developed information systems to support patient nutrition services, but there is no mapping of how these systems are implemented and their benefits for improving the quality of patient nutrition services. Therefore, this article will identify and mapping the information systems that have been developed and their benefits for improving the quality of patient nutrition services.

METHOD

This article was written using the scoping review method. The article search was conducted in May 2025 through 3 journal portals, namely PubMed, Scopus, and Google Scholar. The keywords used to search for articles in PubMed and Scopus were "*Electronic Food Service*" AND "*Hospital*", while the search for articles through Google Scholar used the keywords "*Nutrition Information System*" AND "*Hospital*" AND "*Service*". The inclusion criteria used to select articles were that the article was an *original article*, written in English or Indonesian, and discussed the implementation of information systems in nutrition installations.

The search results yielded 2,677 articles from PubMed, 297 from Scopus, and 1,530 from Google Scholar. Articles were then screened using Zotero and found 856 duplicate articles. Screening based on the title and abstract of the articles resulted in 3,583 articles with title is irrelevant to the scoping review theme, 23 articles that were not original articles, 24 articles that were neither in English nor Indonesian, and 8 articles that were excluded because they only discussed about information systems development. The final results showed that 10 articles met the inclusion criteria. Thus, only 10 articles were selected, as they were deemed to possess the most accurate relevance and focus to address the objectives of this scoping review.

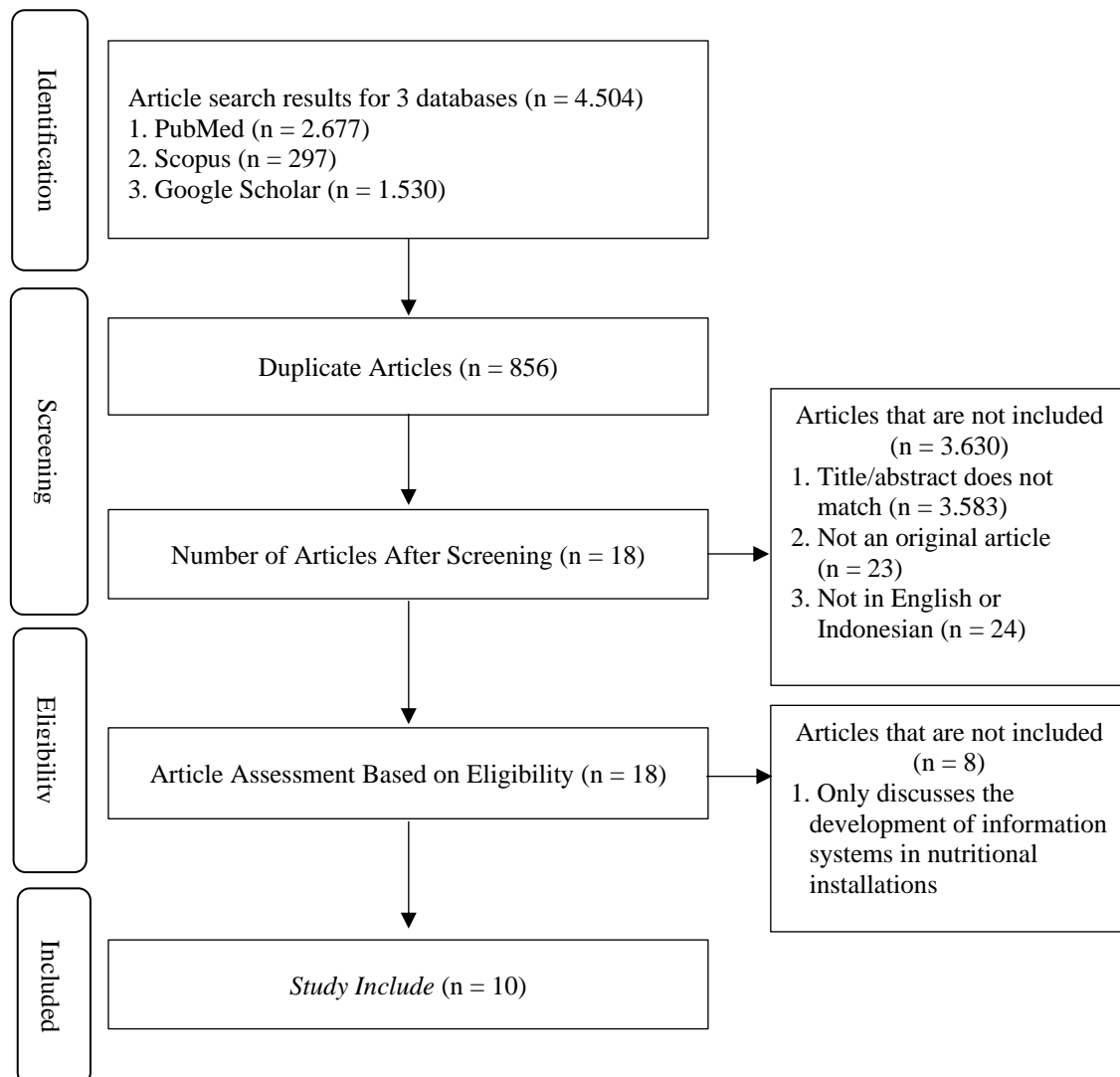


Figure 1. PRISMA Diagram

RESULT

The article search yielded 10 articles deemed accordance with the inclusion criteria. All articles were then analyzed to determine the types of information systems installed in hospitals and their impact on patient nutrition services. The article analysis revealed several types of information systems developed for patient nutrition services. The use of these information systems has been shown to improve patient food intake, reducing the frequency of food waste, ensuring timely feeding, and improving the accuracy of patient diets.

Table 1. Results of Articles Analysis

No	Author Name (Year)	Article Title	Objectives & Methods	Developed System	Findings
1	SIJ Van Bakel et al. (2024)	Personalization in Mitigating Food Waste and Hospitalization Costs	Objective: To determine patient food waste and its impact on hospital finances before and after the use of a digital food service system. Method: Quasi-experimental and quantitative evaluation	The digital system used by patients to order their food	Patients had less food waste after using the digital food ordering system.
2	V. Barrington et al. (2018)	Engaging the Patient: Improving Dietary Intake and Meal Experience Through Bedside Terminal Meal Ordering for Oncology Patients	Objective: To determine the impact of using an electronic food ordering system on food intake, food waste, and patient dining experiences. Method: Observational and quantitative evaluation	Electronic Bedside Meal Ordering System that allows patients more flexibility in ordering their meals	There was an increase in patient food intake and patient eating experience.
3	Lina Ferryana et al (2022)	The Impact of Digital Food Ordering Systems on Timeliness of Food Delivery and Patient Satisfaction	Objective: To determine the relationship between the use of a digital meal ordering system and the timeliness of patient meal delivery. Method: Parallel concurrent mixed method	Digital patient meal ordering system	There was an increase in the timeliness of patient feeding after using the digital patient meal ordering system.

No	Author Name (Year)	Article Title	Objectives & Methods	Developed System	Findings
4	Su-E Kuo et al (2017)	A Clinical Nutritional Information System with Personalized Nutrition Assessment	Objective: To determine the impact of using a patient nutrition assessment information system on improving patient nutrition. Method: Research & Development and quantitative evaluation	Clinical Nutritional Information System to assess patient nutrition	The use of information systems makes it easier for nutritionists to calculate patients' nutritional needs accurately so that the quality of patient nutritional interventions improves.
5	Sally McCray et al. (2018)	Bedside Menu Ordering System Increases Energy and Protein Intake while Decreasing Plate Waste and Food Cost in Hospital Patients	Objective: To evaluate the impact of using a digital food ordering system on nutritional intake, meal waste, patient and staff satisfaction, and patient meal costs. Method: Observational and quantitative evaluation.	Bedside Menu Ordering System that allows patients to choose their own food	The use of the Bedside Menu Ordering System increases nutritional intake and patient satisfaction, while reducing food waste and patient meal costs.
6	Heather Hartwell et al (2016)	E-Menus Managing Choice Options in Hospital Foodservice	Objective: To evaluate the impact of using electronic menus Method: One group pretest-posttest	Patient food ordering system using touch screen TV technology that allows patients to order their own food	Patients tend to be satisfied with the use of the Bedside Menu Ordering System.
7	Maria Skouroliak	The Development	Objective: To develop DIET	software to calculate	Implementing a DIET can

No	Author Name (Year)	Article Title	Objectives & Methods	Developed System	Findings
	ou et al (2009)	and Implementation of a Software Tool and Its Effect on the Quality of Provided Clinical Nutrition Therapy in Hospitalized Patients	software and evaluate its use. Method: Research & Development and quantitative evaluation	patient's nutritional needs and daily menu automatically	reduce errors in determining diets, increase data accuracy, and reduce the time spent planning meal menus.
8	Kirsty Maunder et al (2015)	Energy and Protein Intake Increases with Bedside Spoken Meal Ordering System Compared to a Paper Menu in Hospital Patients	Objective: To compare food intake and patient satisfaction and the role of nutrition assistants using the Bedside Spoken Meal Ordering System using paper or manual. Method: Quasi-experimental and quantitative evaluation	Bedside Spoken Meal Ordering System	There was an increase in energy and protein intake of patients after using the Bedside Spoken Meal Ordering System.
9	Megan Rattray et al (2018)	Identifying Errors in Meals Provided to and Sourced by Patients on Therapeutic Diets in Hospital	Objective: To determine the prevalence of patient feeding errors after the implementation of an electronic food service system. Method: Prospective observational	Electronic Food Service System used to order and serve patient food	After using the Electronic Food Service System, patient diet planning errors are almost non-existent.
10	Dyta Malini et al (2022)	Designing an Information System for	Objective: To design and create an	Patient diet menu distribution	Data management, distribution

No	Author Name (Year)	Article Title	Objectives & Methods	Developed System	Findings
		Scheduling Patient Diet Menu Distribution at Kramat Hospital Using the Laravel Framework	information system to make work in the hospital more efficient. Method: Research & Development	scheduling information system	processes, menu selection, and scheduling become more efficient.

DISCUSSION

Digital Information System in Nutrition Installation

When planning patient meal plans, the nutrition facility requires calculating the type of food based on the day, room class, and serving time. This process is labor-intensive and time-consuming, impacting patient meal distribution. To improve the quality of nutrition facility services, an information system can be developed to enhance accuracy and timeliness (Sidiq et al., 2024).

In carrying out their duties, nutritionists have the primary responsibility of assessing a patient's nutritional status to plan dietary interventions. Each stage of a patient's nutritional intervention must be documented, including nutritional calculations, evaluations, and dietary recommendations. Paper-based recording is time-consuming. Based on Su-E Kuo et al, developed an information system to assist nutritionists in assessing patient nutrition. The information system was designed by adopting the nutritional care form and patient nutritional diagnostic data format regulated by the local Ministry of Health (Kuo et al., 2018).

In addition to assessing the patient's nutritional needs, there is also an information system that is able to automatically design a patient's menu based on their nutritional needs, as well as provide reports regarding the patient's previous food menu and its costs (Skouroliakou et al., 2009).

In addition to developing an information system for nutritionists, an information system for patients is also available. This information system allows patients to choose their own meals by selecting them on a touchscreen television located at their bedside. The patient's menu order is then assessed for nutritional content (Barrington et al., 2018). The menu is directly connected to the nutrition installation system. The television screen also provides information to patients regarding the meals provided (McCray et al., 2018).

Benefits of Using Information Systems for Patient Nutrition Services

Currently, information systems are widely developed in hospitals to provide faster and more accurate care. By using information systems, nutritionists no longer need to spend time calculating nutritional needs and planning patient menus (Skouroliakou et al., 2009). Nutritionists simply input anthropometric data, biochemical information, dietary intake, nutritional diagnosis, and the patient's treatment plan. The system then processes the data and provides nutritional intervention recommendations, making the provision of patient nutrition services more effective and efficient (Kuo et al., 2018).

Implementing an information system can also help staff monitor patient food waste by utilizing data on patient menus before and after consumption. This also helps management determine strategies to reduce food waste by taking actions such as modifying menus for foods that are less popular with patients (Malini et al., 2022).

The use of information systems in nutrition facilities has been proven to improve the timeliness of patient meal delivery. With the information system, food ordering and data collection for patient meals are faster, and the food distribution process is faster and more scheduled. This results in more timely patient meal delivery (Ferryana et al., 2022).

The use of information systems for patient nutrition services can also increase patient participation in food selection (Maunder et al., 2015). The development of information systems allows patients to order meals directly, and this information is automatically sent to the nutrition facility's existing system (Hartwell et al., 2016). However, the system restricts patients to selecting meals only according to the predetermined therapeutic diet type, which prevents patients from ordering menu items inconsistent with their therapeutic diet. This has been shown to significantly reduce the rate of patient's feeding errors (Rattray et al., 2018).

The use of a patient's information system for ordering meals has been shown to reduce food waste (van Bakel et al., 2024). This is because patients can choose foods according to their preferences (Barrington et al., 2018). This convenience has also been shown to significantly increase patient's food intake (Maunder et al., 2015). This increase in patient's food intake can help reduce and address the risk of malnutrition. Patients whose nutritional intake is met also improve their recovery process, thereby reducing the length of stay (Maunder et al., 2015; McCray et al., 2018).

Patient involvement in selecting their meal plans through an information system has been shown to increase patient satisfaction with the services provided. Previously, many patients complained of dissatisfaction with meal services because they were unable to choose their preferred meal plans. Even though patients were free to choose their own, they struggled to choose because they lacked sufficient information and had difficulty filling out paper meal order forms. Through the use of an information system, these issues can be addressed (McCray et al., 2018).

The adoption of information system technology, particularly in hospital foodservice departments has not been as rapid as the development of meal ordering systems in commercial settings (Hartwell et al., 2016). Hospitals face various challenges when developing information system technology for patient services. Inadequate hospital technology infrastructure is a major barrier to implementing information systems. This infrastructural limitation also carries the risk of patient data loss in the event of system disruption or damage, posing a significant threat to patient data security. Another challenge is the lack of staff with adequate information technology expertise in hospital. Staff who have not received adequate training regarding the use of information technology in patient care tend to lack confidence in utilizing the system. Furthermore, a lack of incentive support from hospital management also affects the motivation of hospital employees in managing the existing information systems (Harikatang et al., 2024).

CONCLUSION

Information systems for nutrition services have been widely developed. Nutritionists can use these systems to assess patient's nutritional status and plan dietary interventions, and some systems have been developed for patients to select and order their own meals. The use of these information systems in nutrition services offers many benefits, including reducing the workload of staff, ensuring more timely and scheduled meal distribution, reducing feeding errors, reducing food waste, and increasing patient satisfaction. Based on these benefits, hospitals can consider using information systems for nutrition services and examine the barriers and challenges to using these systems.

Limitations

This study has limitations regarding the scope of articles included. Although the article search was conducted systematically, we only selected articles published in English and Indonesian, and only three journal databases were utilized. These limitations potentially led to the omission of relevant literature published in other languages that aligns with the objectives of this scoping review.

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