INFORMATION SYSTEM DEVELOPMENT TO SUPPORT NUTRITION CARE AT NUTRITION INSTALLATION IN RSU PKU MUHAMMADIYAH BANTUL, DIY

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Abstract

Based on Hospital Nutrition Guidance, nutrition care for inpatients has to be adjusted in accordance with patient clinical condition, nutritional and metabolic system. The nutritional needs for inpatients at Muhammadiyah Bantul Hospital are calculated manually by nutritionists. In our research, we have developed an information system to systematically manage the nutritional needs for inpatients based on the individual priority. The applied methods in our research combined the qualitative and quantitative approach. Qualitative method was used to identify the process in every step taken in information system development. While quantitative method was used to measure the quality of information before and after the information system development was applied with pre-experimental research design. The outcome of our research was the information system at nutrition installation in PKU Muhammadiyah Hospital, Bantul. The database parameters had been collected as input of the nutritionist information system which consisted of data from nurses and nutritionists, laboratory and radiology data, diet information, and patients' medical records. The measurement results revealed that the quality of the information was easier to be accessed from 65% to 80%, the accuracy of information increased from 52.5% to 80%, the timeliness from 50% to 80%, the completeness from 57.5% to 76.35%, the flexibility from 50% to 66.25%, and the clarity from 45% to 75%. The result of this research is useful as the application of a tool to integrate and facilitate the nutritionists to maintain patients' nutrition in a large environment such as hospital.

Keywords: **nutritional care, information system development, Hospital's Nutrition Guidance.**

Author's biography

Rinda Nurul Karimah was born in Banyuwangi in 1982. She is a lecturer in Department of Health at the State Polytechnic of Jember. She has a special interest in elucidating the Public Health and Health Informatics. Besides, she currently also works as a doctor in Clinic of Pratama Sakinah Kaliurang Jember.

INTRODUCTION

The service of nutritional care on the patients must be given and adjusted with their conditions and should be based on their medical status, nutrient status, and body metabolism status [1,2]. Patients' nutrient conditions affect a lot on the speed of their recovery progress. On the contrary, the development of illness can impact the patients' nutrient condition [1,2]. The nutritionists in performing the nutrition care should pay attention on the results of patients' clinical examination and also their laboratory tests so that the nutrition care can be given in a correct and accurate way [1, 4, 5, 6].

The preliminary study that was done in RSU PKU Muhammadiyah Bantul gave an insight that there were problems on the nutrition care for the inpatients. The nutritionists had difficulties in arranging nutrition care ideally as explained by the Hospital Nutrition Services. According to the Head of Nutrition Installation of RSU PKU Muhammadiyah Bantul, calculating each inpatient's nutrient might require a half to an hour each day. The Hospital Nutrition Services of RSU PKU Muhammadiyah Bantul is managed by four nutritionists. There are an average of 90 inpatients each day, so that the workload of each nutritionist to calculate nutrient needs range from 11 to 22 hours each day. The information that is related to the basic data of nutrient need arrangement are found in several different rooms, hence it needs another effort to gather all of them manually into one place.

Nutrition installation is related the Universal Coverage, or well-known as the Social Security Administrator or *Badan Penyelenggara Jaminan Sosial* (BPJS), which needs maximum support of nutrition care for the inpatients. [7, 8] The accurate nutrition care is expected to speed up the recovery progress of the patients. The in-depth interview that was carried out on the nutritionists at RSU PKU Muhammadiyah resulted on the essential need of the planning of information system; the need of information system support to perform the steps of nutrition care as follows: 1. The calculation of inpatient's nutrient need; 2. Data accomplishment to do nutrient intervention; 3. Data accomplishment to monitor the nutrient analysis (Nutritional Risk Screening).

The research question was the nutrition installation for the inpatients in RSU PKU Muhammadiyah Bantul had not been able to perform nutrition care ideally by referring to the hospital nutrition services. Thus, the aim of this research was to create an integrated information system in accordance of the nutritionists' need to support nutrition care for the inpatients by using hospital nutrition services. Based on the explanation above, researcher was eager to do the research with the title "Information System Development to Support Nutrition Care at Nutrition Installation in RSU PKU Muhammadiyah Bantul, DIY".

RESEARCH METHOD

This research used both qualitative and quantitative method. The qualitative method was to help identifying every step in the development of information system methodology as a support for nutrition care for the inpatients. The quantitative method was to measure the quality of the information pre- and post- the information system development using pre-experimental research design (the one group pre- and post-test design). The main informants for this research were four nutritionists in RSU PKU Muhammadiyah Bantul. The triangulated informant in this research was the Head of Hospital Management Information System and the Head of Medical Record Installation.

The data collected for this study were the primary data obtained from observation and in-depth interview. The secondary data was retrieved from documentations and forms available in each installation in regards with the system development. Those data were analyzed by documentary analysis.

DISCUSSION

The aim of system development is to arrange a new system to replace the old one wholly or to fix the prevailing system. The pushing factors of system development consist of problems, opportunity, and directive. [9, 7, 10]

Based on the need of the nutritionists regarding to information as a way to support nutrition care, there was a system planned with systematic steps with FAST methodology. The result of the research using FAST methodology was as follows:

Sphere Definition

The first stage is the sphere definition, which is done to gather information to be observed in a feasible way by using the sphere. The aim is to notice the problem, the opportunity, and the aim of the users. In this research, problem digging was done using guided interview. The result of it was several issues, among them was the required information was not accurate enough to perform nutrition care, and the data management was still done manually as well as the absence of database system. A hardship was found in the process of calculating the nutrient need. It was because of the calculation process was manually done by using calculator. Error on calculating and analysis data occurred including in noticing the large amount of numbers of the inpatients and the instability of the system because of its minimum capacity.

The sphere of this research was the system model that would be developed and used to support the nutrition care in nutrition installation for the inpatients in RSU PKU Muhammadiyah Bantul. One of the stages in developing information system is the quality assuring study. There are four criteria for the assurance to support information system development, namely, technical assurance, operational assurance, financial assurance, and timing assurance.

The development of the information system is adequately accurate to be implemented in RSU PKU Muhammadiyah Bantul. The quality assurance study was done and evidenced to be well implemented from those 4 criteria. The technical assurance includes the technology supply and the ability of the operators. Operational assurance includes the ability of the officers, the ability of the system to create information, and the efficiency of the system.

Problem Analysis

The stage has a basic step to do which is to identify the problems, to understand the system, and to identify the prevailing information system before the new system model. Information system in nutrition installation is needed to support the nutrition care, because there is a wide gap between the human resource and the number of the inpatients. Information system development is highly expected to be a breakthrough to solve the problem.

There were problems on the prevailing system; the data input was inaccurate (sometimes the data in ER was different from the data in the room), the data management process was still done manually and not all of them used DBMS so that an extra effort was

required to gather the entire information because they were in several different rooms. Aside from that, the calculation process of the nutrient need and nutrient status was performed manually. The output (information) was not compatible with the need in nutrition installation, particularly to support nutrition care. The available information was dietary regulation and the data of the new inpatients.

The supporting information to nutrient care like advanced exam result (laboratory and radiology) cannot be accessed in real time. As the result, the nutrition care cannot be performed ideally by the nutritionists in utilizing the hospital nutrition services.

Problem-solving identification resulted from the causes can be seen in Table 1.

Table 1. Problem

No	Problems	Solutions
1.	Easy to access	Computer system that is compatible; makes it easier to data searching in nutrition care.
2.	Accuracy	Data management like calculating amount of nutrient need and nutrient status, helped by the application system based on the used formula.
3.	Time accuracy	The serve of nutrient care ideally by hospital nutrition services can be accurate in time with the help of computerization system. (Whenever the information is needed, it can be easily accessed).
4.	Comprehensive	• The data recording of the inpatients will follow the guidance of the manual registration form in the available computer • The resulted information is much more complete (only a click for the needed reports)
5.	Flexibility	User (the nutritionist) will easily adopt the information system because of the manual program.
6.	Clarity	A standardized form with the right amount of number so there will be no misinterpretations.
7.	Meaning accuracy	The application system was created to be compatible with the need of the users (nutritionists), so the available information will fulfill the nutrition care.

Requirement Analysis

This stage has to be done in order to identify kinds of information needed by the users (nutritionists) using observation and interview. There are several steps and the first step is to collect and analyze the forms related to the nutrition care. On this step, the form that is used in nutrition care will be discussed by the users of the system. The available forms before the system developments could not fulfill their needs. The forms should be renewed in accordance to the users' need. The second step is to collect and to analyze all required data elements to the nutrition care. The needed data elements in nutrition care will be analyzed and adjusted with the need of the users using discussion process with the users, hence several data elements will come out, such as: laboratory data, medical record data, radiology data, physician data, officer data, nursing data, dietary information, inpatients information, and nutritionists data. This step was done using observation, interview, and discussion with the users of information system in regards to nutrient need.

The required information is that the information system that was planned can fix the data management on serving the data on time, clear, and accurate (the information is free from any mistake) to support nutrition care program. Other need is that the information system

should result on correct and accurate calculation and consideration of the inpatients' nutrient status. This is to implement the standard hospital nutrition services. Besides, this should ease the users to re-access the data and information in a simple operation.

Logical Design

This is to transform the needs from the requirements analysis phase to the newly planned model. The result of the plan in this result is using steps as follow:

The first is to make a contextual diagram. Contextual diagram is a basic diagram from information system that pictures data flow inside and or outside the external entities. The processes and the data flows occurred in information system in nutrition installation will be illustrated logically in a form of data flow diagram (DFD) using methodology and symbols.

Supporting software (case tools) in system development is using ideas modeler software 4.80 and DIA 0.97. The softwares were chosen as they are compact, light, and easy-to-use case tools. These softwares can make more than 20 diagrams whether it is included in structured based programming (DFD, ERD, and so on), or object based (use case diagram, sequence diagram, activity diagram, and so on).These softwares could also allow to export the diagrams to any types of file image, thus, they are freeware by license. [12, 13]

The second step is making Nutrient Monitoring Application ERD. Generally, there are two steps on making ERD. First is to make the beginning ERD to create a database plan to at least according to the need on keeping the data in the system. The next step is to optimize E-R diagram as a final design. [14, 15, 16]

Decision Analysis

This stage is to determine candidates of the software and hardware which later will be chosen and used as the system implementation as the solution of those problems and requirements that were defined in previous stages. [9, 3]

Table 2. Analysis of the Decisions

No	Analysis of The Decisions	Explanation
1.	The selection of the information system development's model.	Development model using top-down approach Model
2.	The selection of operation system	Linux (PClinuxOS, Vector, slax)
3.	The selection of tools (software)	Programming language used in Java web (framework zk), database used is mysql server 5.5

The selection of the information system development model is to approach using top-down, meaning the approach will be done from the very top of the management (head of nutrition installation) to the lower step of it (the nutritionists). [326]

The operating system is a program acting as a media between the users and computer hardware. The aim of the operating system is to create a sphere that allows users to run the program easily. The well-known and widely used operating systems are DOS, Linux, and Windows.

This research chose Linux with consideration that it has been already implemented in RSU PKU Muhammadiyah Bantul since 2007, so the users in that hospital are used to operate

the system. Other thing that makes Linux is chosen because of its open source, so it is inexpensive, quite stable, and easily to be developed. Additionally, it is more resistant to viruses. [17, 18, 19]

The selection of Java web (framework zk) as the programming language and mysql server 5.5 as the database is to continue the prevailing system. This is to adjust the regulation of SIMRS installation in regards to the maintenance process.

Physical Design and Integration

The sixth stage is the physical design and integration. This stage is to transform the needs of the represented business as the logical design to be physical design.

The Construction And The Examination

The last stage, the seventh, is the construction and the examination. The SIMRS of RS PKU Muhammadiyah Bantul is compacted with special feature to calculate nutrients which is then used in monitoring process of the inpatients' nutrient. The SIMRS is used by the nurses, analysts, and radiologists as the input operators and, thus, is useful for the nutritionists to monitor the nutrients of the inpatients.

RESULTS

The information system development in nutrition installation in RSU PKU Muhammadiyah Bantul resulted in several kinds of data including nursing data, nutritionist data, laboratory data, radiology, dietary information, and inpatients' medical records. Each of them has permission rights to be used in accordance of its authority. The resulted information system is the integrated one which is compatible to the needs of the nutrition installation; a system that is useful to support nutrition care, a kind of application-like to calculate nutrient need and data accomplishment for doing intervention and monitory of the nutrient. The recapitulation of users' feedback about the information quality in a percentage of pre- and post- the system development is as follows: the ease to information access increased from 65% to 80%, information accuracy increased from 52.5% to 80%, time accuracy increased from 50% to 66.25%, and clarity increased from 45% to 75%. The result of the calculation of the information system's quality measurement can be seen in a form of diagram in Figure 1.
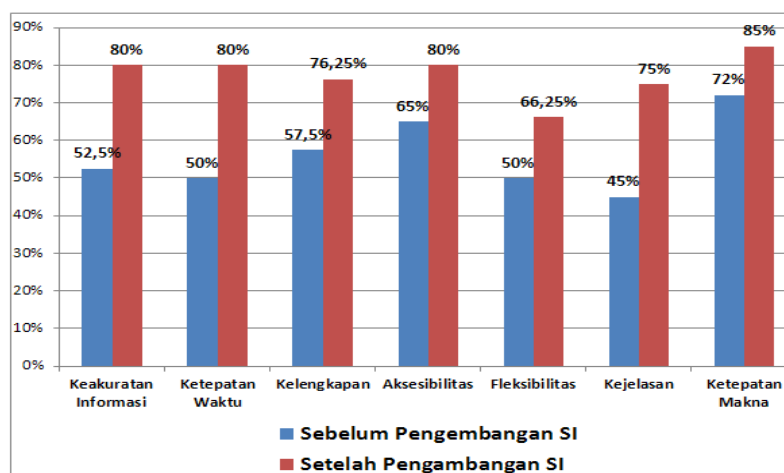

Figure 1. Pre-and-Post Information System Development

CONCLUSION

The database in nutrition installation that was developed including nursing analysis data, nutritionist data, laboratory data, radiology, dietary information, and patients' medical records. The produced information system augments the quality of the information which includes information accuracy, time accuracy, comprehensive, flexibility, and clarity.

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