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IMPLEMENTATION OF THE COMSTOCK METHOD FOR ANDROID BASED PATIENT LEFTOVERS FOOD MANAGEMENT
(Case Study : Condong Catur Hospital of Yogyakarta)

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Abstract

Nowadays, nutritionists should count manually to know how much nutrition they get as the development of technology, social work easier likewise in calculating the patient's food waste so it will be more efficient and not waste much time. This research aims to build an application that can help nutritionists calculate food waste using the Comstock method. The system is designed to use Unified Modeling Language (UML) and programming language Hypertext Preprocessor (PHP) and Hyper Markup Language (HTML). In this paper, we develop a system to enable nutritionists to calculate food waste at the hospital using the Comstock method.

Keywords

Patients, Comstock, Nutritionists, Food waste

1. Introduction

Technological developments are progressing very rapidly, especially in telecommunications, one of which is a cell phone [21][22][23]. At present mobile phones are better known as smartphones. One of the capabilities of smartphones is to search for information on the internet. Smartphones require an operating system to run various applications contained therein. An android operating system is widely used because it is open source so that it helps developers create applications for various smartphones that use the Android operating system.

Along with the rapid development of technology, Android has also become one of the human needs in everyday life. Android is a Linux-based operating system made for smartphones. Android is a system that open-source can be developed freely by anyone and freely distributed through the Play Store Google's official Android site. Android can also be easily integrated easily and quickly into Google products such as Google Docs,

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Gmail, Google Reader, Blogger, and others. Currently, Android is widely used in the field of education where we have met many learning applications that have been developed, the economy in this field many sellers use smartphones to expand trade areas, and health in the health field many applications are developed to facilitate doctors, patients, and hospitals in service.

Condong Catur Hospital is a privately owned public hospital and is a type D hospital established by PT. Karya Mitra Pratama, inaugurated on June 30, 2006, and already has a permanent operational permit from Yogyakarta District Health Office, Yogyakarta. This hospital is located in the Gempol region, Condong Catur, Sleman, Yogyakarta. This hospital provides services in health, supported by specialist doctors' services and supported by other medical facilities. [13]

Patient food service is one of the services provided by hospitals, aiming to meet patients' nutritional needs to support the healing process and achieve optimal nutritional status. The number of patient's leftovers in the hospital shows that the quality of food in the hospital is not yet optimal because the patient's leftovers can be an indicator of the success of the organization of food in the hospital. Comstock is one method that can be used to measure the patient's leftovers, while Comstock's understanding is a method of assessing food consumption by looking at the patient's leftovers during hospitalization. The purpose of measuring the patient's leftovers is to determine the patient's acceptability of eating, know the amount of nutrition consumed, and know the loss of food provider institutions. The calculation of the remaining food used in the RSCC is to count manually. Based on the description of the problems above, this study was conducted to assist hospitals in making applications that can help nutritionists calculate the patient's leftovers quickly and accurately without calculating manually. It will be able to help the hospital in managing food intake for patients.

In this paper, we propose the Comstock method to calculate the amount of nutritionist intake in the patient's body and estimate the amount of subsequent nutritional intake needed by the patient. By using the system, the patient can heal faster through an Android smartphone so that the nutritionist itself can quickly work out the patient's meal report and can shorten the time in calculating the amount of intake and nutritionist.

2. Related Works

The organization of food in the health services group is carried out by hospitals, health care centers, or care clinics. Among the three types of services, the organization of hospital food is the most complex in terms of management aspects of its implementation, because the more the number of its workforce, the number of patients and the type of menu processed is also more varied. [2]

Providing food in the hospital aims to provide appropriate food for the sick, supporting the disease's healing. The purpose of providing food in the hospital :
They were providing food under the nutritional needs of patients to accelerate the healing of diseases, shorten the stay, and provide food for hospital employees to meet nutritional needs. Achieve maximum effectiveness and efficiency in using food costs. [2]

Food is a form of therapy that aims to maintain normal or optimal nutritional status despite an increase in nutritional needs due to illness. Besides that, to improve the occurrence of nutritional deficiencies and the patient's excess or underweight. [1] Database consists of 2 words, namely base and data. The base can be interpreted as a headquarters or warehouse, a nesting or gathering place. In comparison, data is a representation of real-world facts that represent an object such as humans (employees, students, buyers, customers), goods, animals, events, concepts, and conditions in the form of numbers, letters, symbols, text, images, sound, or a combination. A database is a data collection

that can be described as one or more related organizations' activities. Based on literature studies, three studies serve as a reference and at the same time, develop research as follows:

Research on "Factors Associated with Food Remaining Inpatients at Sambang Lihum Mental Hospital" conducted by Khairunnisa (Department of Nutrition, Husada Borneo Banjarbaru College of Health Sciences). This study aims to determine the factors influencing the rest of the inpatients' food in RSJ Sambaing Lihum. Research on "Overview of Food Time and Food Quality Provided by Nutrition Installations at the General Hospital, Dr. Kariadi Semarang, "conducted by Niken Puruhita, Hagnyonowati, Sigit Adianto, Etisa Adi Murbawani, Martha Ardiaria (Medical Department of Diponegoro University). This research is a descriptive study conducted for 11 days using approach *cross-sectional.* This study aims to determine one of the factors of the majority of patients ' leftovers, the results of this study are that the majority of patients' leftovers come from vegetables and animal side dishes, so the nutritional installation needs to process these foods more varied. A study aims to determine the costs wasted due to patient food scraps. Simple survey study *cross-section with* 68 subjects. Data on patients' leftovers were obtained by the method with *Comstock,* a 6-point scale.

Android is an operating system for Linux-based mobile devices that includes an operating system, middleware, and applications. Android provides an open platform for developers to create their applications. Initially, Google Inc. Bought Android Inc., which is a newcomer who makes software for cellphones/smartphones. The Open Handset Alliance, a consortium of 34 hardware, software, and telecommunications companies, including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile, and Nvidia. The first Android phone went on sale in October 2008. (5) Android is a device operating system *mobile* Linux-based that covers operating systems, middleware, and applications. Nvidia [10] Android is an operating system for Linux-based mobile devices that includes an operating system, middleware, and applications. Android is an operating system for cellular phones based on Linux. Android provides an open platform for developers to create their applications. It was originally developed by Android Inc., a newcomer company that makes mobile phones software, which were later bought by Google Inc. For its development, the Open Handset Alliance (OHA), a consortium of 34 hardware, software, and telecommunications companies including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile, and Nvidia. [18]. Android's open nature has led to the emergence of many application developer communities to use Android as a basis for project creation applications, by adding new features for Android on devices that are officially released using other operating systems. [19].

HTML (Hyper Markup Language) is a popular language used in site development. Usually have the extension. Htm, Html, Shtml [11]. HTML or *HyperText Markup Language* is one of the formats used in making documents and applications that run on the web page. This document is known as a web page. PHP is a programming language used to create website-based applications. As an application, the website should have a dynamic and interactive nature. [6]. UML (Unified Modeling Language) is a set of structures and techniques for modeling program object-oriented(OOP) design and its applications. UML is a methodology for developing an OOP system and a group of devices to support its development. UML as the Object Management Group, an organization that has been developing OOP models, technologies, and standards since the 1980s. Now UML has begun to be widely used by OOP practitioners. UML is the basis for object-oriented design tools from IBM. [18] MySQL is an implementation of a relational database management system (RDBMS) that is distributed free of charge under the GPL (General Public License) license. [20] Each user can freely use MySQL, but its limitations may not be used as a commercial derivative product. [8]. Database as a collection of information that useful is organized into specific settings [9]. Database as a collection of

Information that useful is organized into specific settings [9] Understanding Database; according to Winarno and Utomo (2010: 142) "Database or commonly called a database is a collection of interconnected data. The data is usually contained in tables that are interconnected, using fields/columns in each existing table ". According to Anhar (2010: 21), "MySQL (My Structured Query Language) is a database management system software SQL Database Management System or DBMS from many DBMS such as Oracle, MS SQL, Postgre SQL, and others". [3] A database has a function to collect much data. At the same time, data is defined as a description of objects, events, activities, and transactions, which have no meaning or direct effect on the wearer. McFadden et al defines information as data that has been processed in such a way that increases the knowledge of someone who uses it. [4]

3. Our Method

Comstock is a method of evaluating food consumption by estimating the amount of food leftover for each food group or type of dish [1]. The Comstock method is a visual estimation method used to measure each food waste in one menu cycle. [1]
Evaluate the patient's leftovers using the method of seeing food left on the patient's palate and assessing the remaining amount, at the leaning chess hospital itself using seven scales in describing the patient's leftovers; the following is the scale used at the chess leaning hospital :

        Scale 0 : remaining 0% or (only consumed 100% by the patient)
        Scale 1 : remaining 10% or (only consumed 90% by patients)
        Scale 2 : remaining 25% or (only 75% consumed by patients)
        Scale 3 : remaining 50% or (only 50% consumed by patients)
        Scale 4 : remaining 75% or (only consumed 25% by patients)
        Scale 5 : remaining 90% or (only 10% consumed by patients)
        Scale 6 : remaining 100% or (not consumed by the patient)

In this study using a formula in the calculation of the patient's leftovers, as for the formula used in the Condong Chess Hospital, there are two namely for general patients and DM patients, the following is the formula used in the Condong Catur Hospital in the application :
General Patient Formula for
BEE Men   : 66 + (13,7 x BB) + (5 x TB) - (6,8 x umur)
TEE   : BEE x FA x FS =   Kkal
BEE Female   : 665 + (9,6 x BB) + (1,7 x TB) - (4,7 x umur)
TEE   : BEE x FA x FS =   Kkal
FA : bed rest, 12; mild activity 1,3; moderate activity 1,4-1,5; activity strenuous 1,75
FS : healthy 1; OP kel 1,2; trauma 1,35; cancer 1,3-1,5; burns 2,1; sepsis 1,6.

Explenation :	BEE	*: Basal Energy Expenditure*
	TEE	*: Total Energy Expenditure*
	FA	: Activity Factor
	FS	: Stress Factor

DM Patient Formula
BBR% = BB / (TB-100) x 100%
Remarks: BB less (BBR <90%) = 40-60 Kcal
normal BB (BBR 90% - 110%) = 30 Kcal

BB more (BBR > 110%) = 20 Kcal Obese
BB /*Obese* (BBR> 120%) = 15 Kcal

Protein, Fat, and Carbohydrates
How to determine the need for protein, fat, and carbohydrates, according to WHO is as follows:
protein: 10-15% of total energy needs. If the energy requirement in a day is 2450 Kcal, the energy derived from protein should be 245-368 Kcal or 61-92 grams of protein.
Fat: 10-25% of total energy requirements. If the energy requirement in a day is 2450 Kcal, the energy derived from fat should be 245-613 Kcal or 27-68 grams of fat.
Carbohydrates: 60-75% of total energy needs have been reduced by energy derived from protein and fat. If the energy requirement in a day is 2450 Kcal, then the energy derived from carbohydrates should be 1470-1838 Kcal or 368-460 gr carbohydrates. [2]
In assessing patient food waste, the Comstock method is widespread and is usually used by nutritionists to determine the amount of nutritional intake that a patient enters or needs to be based on the number of food leftovers of the patient.

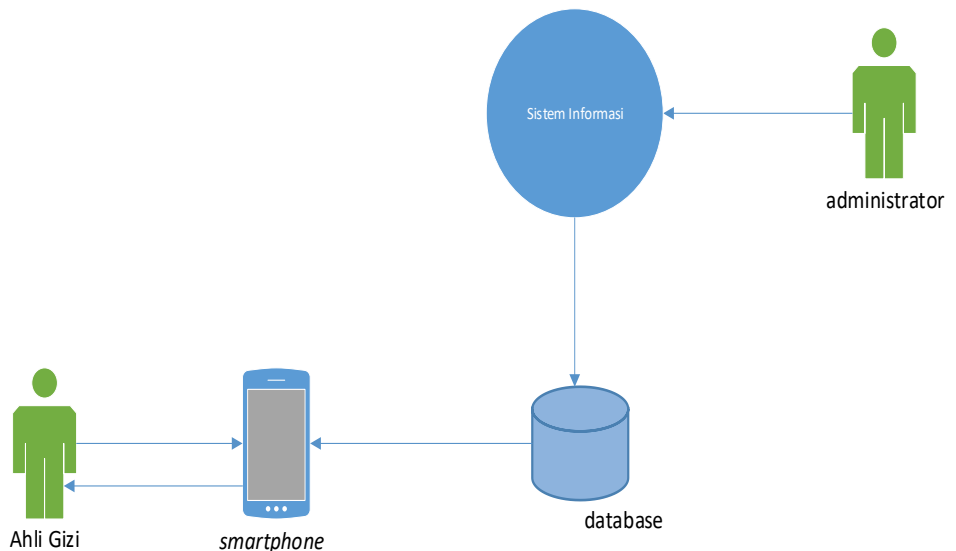The system architecture is a picture of the system that will run. System architecture design

Fig. 1 Architecture of Patient Food Time Management Applications

Figures 1 explains the process by which the administrator will enter information and data relating to the management of the patient's leftovers and the nutritionist accesses the application on a smartphone that has the patient's leftovers management application installed, the nutritionist can calculate how much patient food remains according to the calculation and the application will report the results of the leftovers patient food.

4. Result

Program implementation is the final stage that is ready to be applied to the actual situation. Based on the analysis and design made previously, the system has following hospital nutritionists' needs. In this application, there are two factors, namely admin and user.
Admin

    a)   Administrator Page

This menu admin will log into the system, where the admin himself is the head of the hospital's nutrition installation. Can be seen in Figure 2:
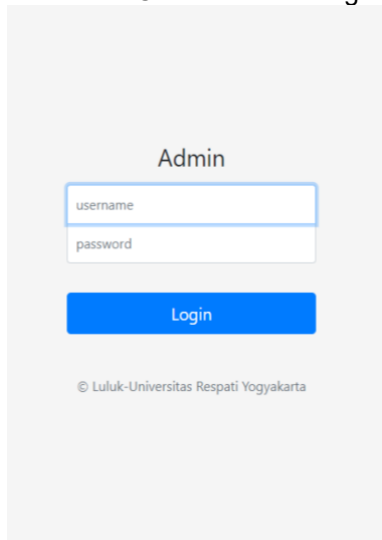

Fig. 2 Admin Login Menu

    b) Report Admin Page Comstock

On the report admin page, it Comstock contains patient food report data that has been entered by the user, on the admin page only the admin can add, edit, and delete report data. Can be seen in Figure 3 :
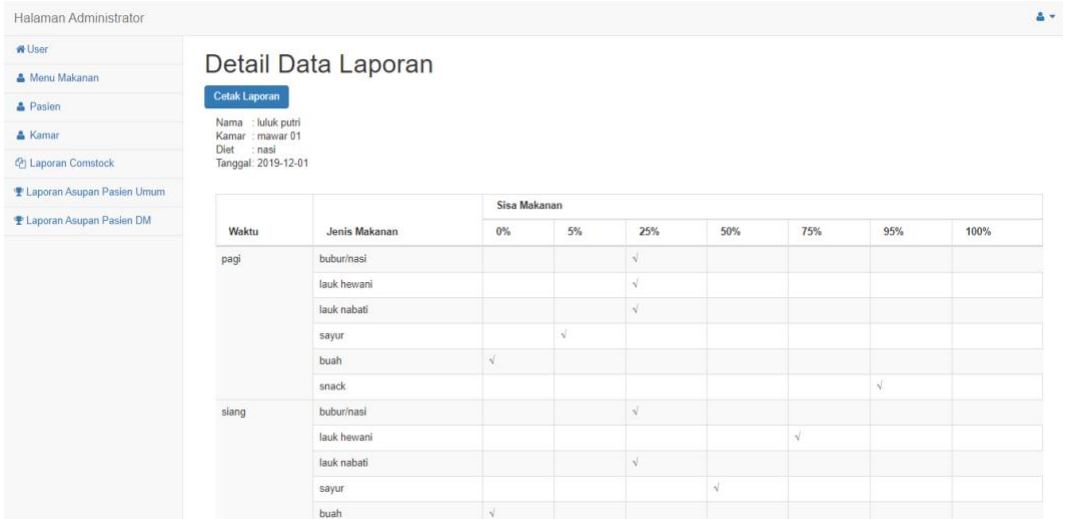
- User
- Menu Makanan
- Pasien
- Kamar
- Laporan Comstock
- Laporan Asupan Pasien Umum
- Laporan Asupan Pasien DM

Detail Data Laporan

Cetak Laporan

Nama : luluk putri
Kamar : mawar 01
Diet : nasi
Tanggal: 2019-12-01

Waktu	Jenis Makanan	Sisa Makanan						
		0%	5%	25%	50%	75%	95%	100%
pagi	bubur/nasi			√				
	lauk hewani			√				
	lauk nabati			√				
	sayur		√					
	buah	√						
	snack						√	
siang	bubur/nasi			√				
	lauk hewani					√		
	lauk nabati			√				
	sayur				√			
	buah	√						

Fig. 3 Comstock Report Admin Page

c) Admin Page General Patient Intake Report
On the admin page, general patient intake report data contains general patient report data that has been entered by the user, on the admin page only admins can add, edit, and delete patient data. Can be seen in Figure 4 :

Detail Data Laporan

Cetak Laporan

Nama : luluk putri
Kamar : mawar 02
Tanggal: 2019-12-03

Waktu	Zat Gizi	Asupan	Kebutuhan
Pagi	Kalori	:	:
	Protein	:	:
	Karbohidrat	:	:
	Lemak	:	:
Siang	Kalori	:	:
	Protein	:	:
	Karbohidrat	:	:
	Lemak	:	:
Malam	Kalori	: 487.04	: 1363.92
	Protein	: 19.065	: 51.147
	Karbohidrat	: 65.15	: 211.4076
	Lemak	: 17.23	: 22.732

Fig. 4 Admin Page for General Patient Intake Reports

d) Admin Page of DM Patient Intake Report
On the admin page of DM patient intake report data contains DM patient report data inputted by the user, only admins can add, edit, and delete patient data on the admin page. Can be seen in Figure 4:

Detail Data Laporan

[Cetak Laporan]

Nama : indah
Kamar : Lili 02
Tanggal: 2019-12-02

Waktu	Zat Gizi	Asupan	Kebutuhan
Pagi	Kalori		: 1147.5
	Protein		: 43.03125
	Karbohidrat		: 177.8625
	Lemak		: 20.4
Siang	Kalori		:
	Protein		:
	Karbohidrat		:
	Lemak		:
Malam	Kalori		:
	Protein		:
	Karbohidrat		:
	Lemak		:

Fig. 5 Admin page for DM patient intake report

User

a) User Login Menu
This menu is used by users who will log into the system, where the user himself is a nutritionist in the hospital. Can be seen in Figure 6:

User

username
password

[Login]

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Fig. 7 User Login Menu

b) Menu Calculate the Rest of the food of General Patient

The menu illustrates the display of the patient's food intake calculation, wherein this menu the nutritionist input the necessary information. Display menu count leftover food for general patients can be seen in Figure 8:

Fig 8 General Patient Food Time Calculus Menu

c) Calculate Patient Food Remains DM
   This menu has illustrated the display of patient data that needs to be inputted by the user. In this menu, a formula is used to calculate the calorie requirements for DM patients. Display the menu for calculating the remaining food of DM patients can be seen in Figure 9:
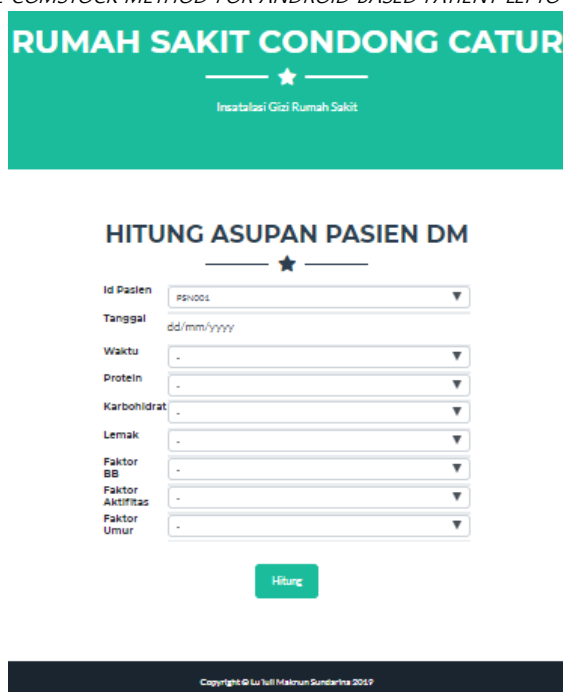
Fig. 9 DM Food Patient Count Menu

5. Conclusion

Based on the writing and research that has been done, the following conclusions can be drawn: To design the system using the methods Comstock, UML, ERD, ERT. 10 tables are formed, namely: admin table, intake table, intake table 2, table of food type, the table in the room, report table, food menu table, patient table, dm patient table, and user table. We develop the system to help nutritionists calculate the amount of patient food intake in the form of automatic calculations based on data entered by nutritionists to manage patient food scraps. Demonstrated by experiment, it allows nutritionists to calculate the amount of patient intake based on the amount of leftover food from the patient, where the nutritionist only enters the required data based on the patient's condition. The application can calculate the amount of nutritional intake consumed and make it easier for nutritionists to know their actions. Furthermore, to improve the patient's lack of nutritious intake so that the patient can recover quickly.

Acknowledgment

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