

## Design of a Web-Based Medical Warehouse Inventory System at Bhayangkara TK-II Hospital Medan

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### ABSTRACT

The development of information technology has driven a transformation in healthcare service management, including in the management system of medical warehouse inventory in hospitals. Bhayangkara Hospital TK II Medan, as a referral hospital, has complex and ongoing medical logistics needs, requiring an effective and accurate inventory management system. However, inventory systems that are still manual or semi-computerized pose various problems, such as discrepancies between stock data and physical conditions, delays in information on item availability, difficulties in monitoring expiration dates, as well as the risk of stock shortages or overstocking. This study aims to design a web-based medical warehouse inventory system capable of managing data centrally and in real-time. The research methods used include system requirements analysis, system design, and web-based system implementation. The results of this study are expected to produce an inventory system that facilitates recording of incoming and outgoing goods, monitoring of stock and expiration dates, and the presentation of accurate reports. With this system, it is anticipated that the management of the medical warehouse inventory at Bhayangkara Hospital TK II Medan will become more effective and efficient and support improvements in healthcare service quality.



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### INTRODUCTION

The development of information technology today has brought significant changes in various sectors, including the healthcare sector. Hospitals, as healthcare service institutions, are required to provide fast, precise, and accurate services to support patient safety as well as operational efficiency [1]. One important aspect of supporting healthcare services is the management of medical warehouse inventory, which includes recording, storing, distributing, and controlling the stock of medicines and medical equipment [2].

Bhayangkara Hospital TK II Medan, as a referral hospital serving the general public and police institutions, has complex and ongoing medical logistics needs. The availability of adequate medicines and medical equipment is a crucial factor in supporting smooth medical services. However, in practice, the management of medical warehouse inventory often still faces various problems, especially if the system used is not yet optimally integrated and still relies on manual or semi-computerized recording [3]. Common problems that often arise in managing medical warehouse inventory include discrepancies between stock data and the physical condition in the warehouse, delays in obtaining information on item availability, difficulties in monitoring the expiration dates of drugs, as well as the risk of stockouts or overstocking [4]. This condition can have a direct impact on the quality of hospital services, operational cost efficiency, as well as managerial decision-making that may be less accurate. In addition, an inventory management system that is not web-based has limitations in terms of accessibility and information flexibility. Inventory data that cannot be accessed in real-time makes it difficult for management and warehouse staff to monitor and plan medical needs effectively. This situation is further exacerbated by the increasing number of patients and the complexity of healthcare services, which require a reliable and integrated information system.

Therefore, a web-based medical warehouse inventory system is needed that can manage data centrally, accurately, and in real-time. This system is expected to facilitate the process of recording incoming and outgoing goods, monitoring stock and expiration dates, generating reports, and supporting quick and precise decision-making. With a web-based medical warehouse inventory system, Bhayangkara Hospital TK II Medan is expected to improve the efficiency of medical logistics management, minimize recording errors, and enhance the overall quality of healthcare services.

Based on the description above, the research entitled 'Designing a Medical Warehouse Inventory System at Bhayangkara TK II Medan Hospital Based on a Website' becomes important to conduct as an effort to utilize information technology in improving the effectiveness and efficiency of inventory management in the hospital environment.

## METHODS

### 1. Metode SDLC (System Development Life Cycle)

The System Development Life Cycle (SDLC) method is a systematic approach used in information system development through structured and sequential stages. This method aims to produce a system that meets user requirements, has good quality, and is easy to manage and maintain [5].

In the study on the Design of a Medical Warehouse Inventory System at Bhayangkara TK II Medan Hospital Based on a Website, the SDLC method is used because it can provide a clear picture of the system development process from the planning stage to the maintenance stage. The use of SDLC is expected to minimize design errors, improve system effectiveness, and ensure that the system built meets the operational needs of the hospital's medical warehouse.

The SDLC method applied in this study includes several main stages, namely [6]:

#### a. Planning Stage

The planning stage is the initial phase in system development aimed at determining the scope and objectives of the system to be built. At this stage, problems occurring in the management of medical warehouse inventory at Bhayangkara TK II Hospital Medan are identified.

#### b. Requirements Analysis Stage

The analysis stage aims to collect and analyze user requirements for the system to be developed. At this stage, direct observation, interviews, and document studies related to the management process of medical warehouse inventory are conducted.

c. System Design Phase

The system design stage aims to design the system technically based on the results of the needs analysis. The design is carried out to illustrate how the system will work and be implemented.

d. Implementation Stage

The implementation stage is the stage of applying the system design into a usable application. In this stage, the coding process is carried out using programming languages and web-based supporting technologies.

e. System Testing Phase

The testing phase aims to ensure that the system operates according to requirements and is free from errors. Testing is carried out to evaluate the system's functions thoroughly.

f. Maintenance Stage

The maintenance phase is the final stage in the SDLC method, aimed at keeping the system's performance optimal after implementation. Maintenance is carried out regularly to adjust the system to the evolving needs of users.

## 2. Data Collection Method

The data collection method is an important stage in research that aims to obtain accurate and relevant information as a basis for designing a medical warehouse inventory system. The collected data is used to analyze existing problems, identify system requirements, and determine solutions that are suitable for the operational conditions at Bhayangkara Hospital TK II Medan. The data collection methods used in this study are as follows [7]:

a. Observation

Observation was carried out by directly observing the process of managing medical warehouse inventory at Bhayangkara TK II Medan Hospital. This observation included the processes of recording incoming and outgoing goods, storing items, distributing medical logistics, as well as controlling stock and the expiration dates of medicines. Through observation, the researcher obtained a clear picture of the workflow and the common problems that occur in inventory management.

b. Interview

Interviews were conducted with parties directly involved in managing the medical warehouse, such as warehouse staff, pharmacy staff, and relevant management personnel. The interviews aimed to obtain in-depth information about user needs, challenges faced, and expectations for the inventory system to be developed. The data from the interviews were used as material for system requirements analysis.

c. Documentation Study

Documentation study was conducted by examining documents related to the management of the medical warehouse inventory, such as stock cards, inventory reports, incoming and outgoing goods reports, as well as the standard operating procedures (SOP) applicable in the hospital. This documentation data was used to understand the data format, the types of information being managed, and as a comparison between the existing system and the system being designed.

d. Literature Review

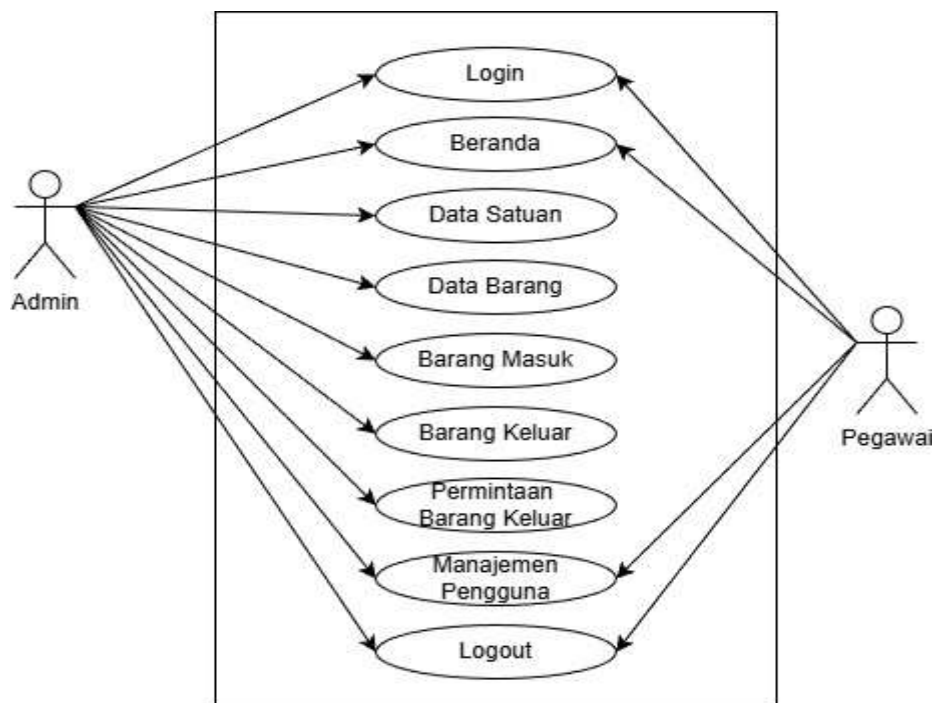
A literature study was conducted by examining various relevant references, such as books, scientific journals, and previous research related to inventory systems, hospital information systems, and the SDLC method. The literature study aims to strengthen the theoretical foundation and serve as a reference in designing a web-based medical warehouse inventory system.

### 3. System Design

System design is carried out as a subsequent stage after system requirements analysis. This stage aims to visually depict the system model so that the process flow, user interactions, and system structure can be clearly understood before the implementation stage. In this research, system design uses the UML (Unified Modeling Language) model, which consists of 4 diagrams discussed in this study, namely Use Case Diagram, Sequence Diagram, Activity Diagram, and Class Diagram [8][9].

#### a. Use Case Diagram Design

The Use Case Diagram is used to illustrate the interaction between actors and the medical warehouse inventory system. The actors involved in this system consist of Admin and Warehouse Staff. The Admin has access rights to manage user data and inventory data, while the Warehouse Staff is responsible for recording incoming and outgoing goods and monitoring stock. This diagram shows the main functions of the system, namely medical warehouse inventory management, which includes processing data on goods, stock, and reports.



**Figure 1.** Use case diagram of the medical warehouse inventory system

#### b. Class Diagram Design

The Class Diagram illustrates the class structure within the medical warehouse inventory system along with the relationships between classes. In this system, there are main classes such as Item and User. The Item class stores attributes related to inventory data, while the User class stores system user data and their access rights. The relationships between classes show the data connections within the system. The Class Diagram serves as a basis for database design and system implementation.

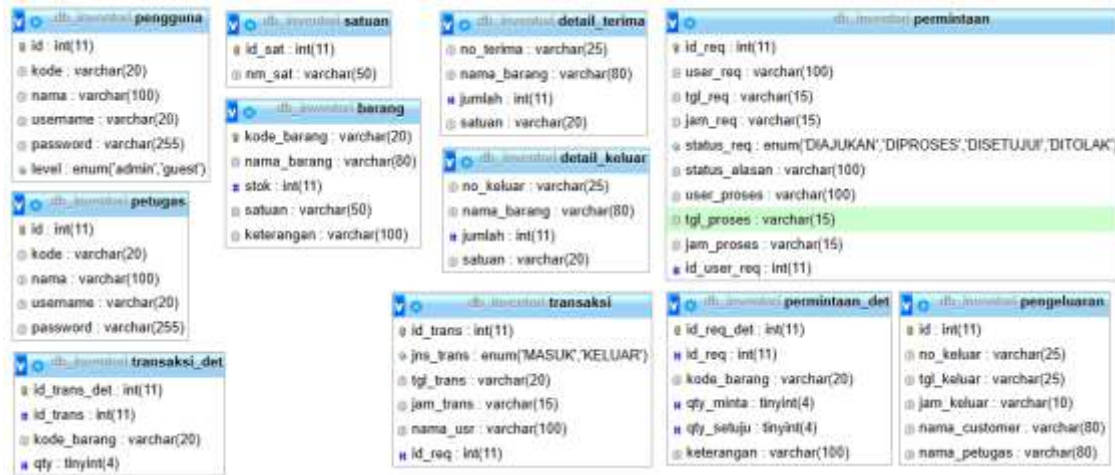


Figure 2. Class diagram of the medical warehouse inventory system

c. Activity Diagram Design

The Activity Diagram is used to illustrate the flow of activities or work processes in a medical warehouse inventory system. The process begins with the activity of inventory data input by the user, then the system processes the data, and subsequently, the data is stored and can be displayed again in the form of stock information and reports. This diagram provides an overview of the system's workflow from the beginning to the end of the process.

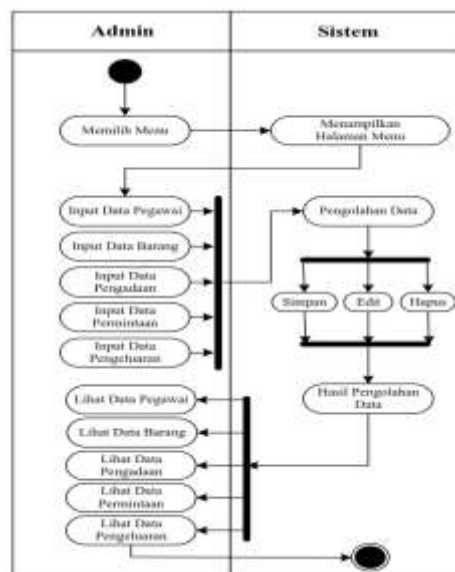
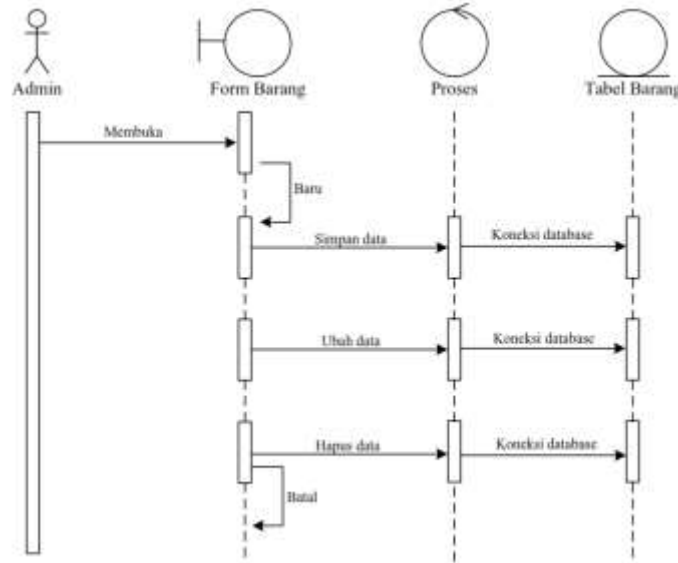


Figure 3. Activity diagram of the medical warehouse inventory system admin

d. Sequence Diagram Design

A Sequence Diagram illustrates the order of interactions between users, the system, and the database in carrying out a process. In a medical warehouse inventory system, the process begins with the user inputting data through the system interface, then the system processes that data and stores it in the database. After that, the system provides a response in the form of information or reports to the user. This diagram emphasizes that the system operates in a structured and integrated manner between the user and the database.



**Figure 4.** Sequence diagram of item data in the medical warehouse inventory system

## RESULTS AND DISCUSSION

The development results of the Medical Warehouse Inventory System at Bhayangkara TK-II Medan Hospital, based on a website, show that the interface design has been successfully implemented according to the needs of users in the hospital environment. The system interface is designed with a user-centered design principle, making it easy to understand, consistent, and supportive of the medical warehouse staff's work efficiency.

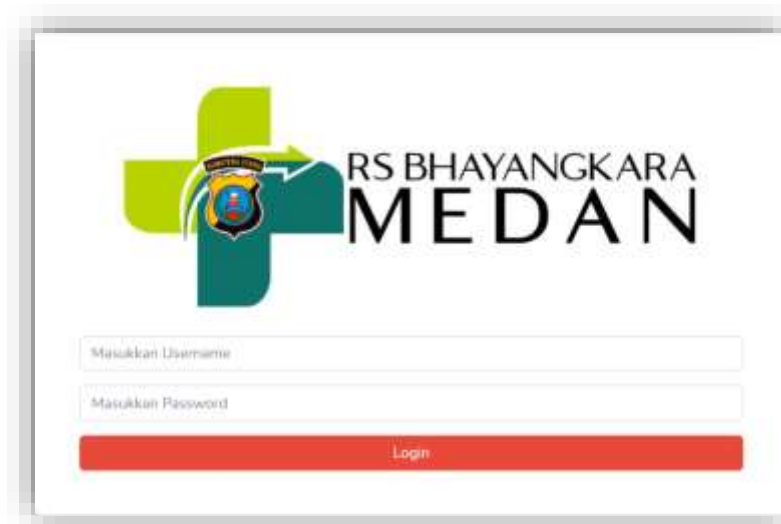
The system interface consists of several main pages, namely the login page, dashboard, medical goods data management, incoming and outgoing goods transactions, supplier management, and inventory reports. All pages can be accessed through a browser without the need for additional application installation, thus supporting flexible usage.

### 1. Admin Interface Page

The Admin interface page is a central part of the system that functions as the hub for managing all data and activities of the application. This interface is specifically designed for users with administrator access rights, so it can only be accessed after a successful authentication process. The admin page design emphasizes ease of use, clear navigation, and efficiency in system management.

#### a. Login Form Page

The login page functions as a system access security measure. Users are required to enter a username and password according to their access rights. This authentication implementation aims to protect the security of medical inventory data and restrict access only to authorized users.



**Figure 5.** Admin login page

#### b. Item Data Page

This Item Data page is used by the admin to record, monitor, and control the inventory of medical supplies used in hospital operations. The Item Data page displays real-time stock information that is directly integrated with the Incoming Items and Outgoing Items menus. With this integration, every transaction made will automatically update the item stock quantity, ensuring that the inventory data displayed is always accurate and up-to-date. The add button can be used to add item data.

No	Kode Barang	Nama Barang	Keterangan	Stok	Aksi
1	0001	Tensimeter	Alat Kesehatan	11 UNIT	<input checked="" type="checkbox"/> <input type="checkbox"/>
2	0002	Termometer Digital	Alat Kesehatan	10 UNIT	<input checked="" type="checkbox"/> <input type="checkbox"/>
3	0003	Stetoskop	Alat Kesehatan	10 UNIT	<input checked="" type="checkbox"/> <input type="checkbox"/>
4	0004	Nebulizer	Alat Kesehatan	10 UNIT	<input checked="" type="checkbox"/> <input type="checkbox"/>
5	0005	Kursi Roda	Alat Kesehatan	10 UNIT	<input checked="" type="checkbox"/> <input type="checkbox"/>
6	0006	Bed Pasien	Alat Kesehatan	5 UNIT	<input checked="" type="checkbox"/> <input type="checkbox"/>
7	0007	Tabung Oksigen	Alat Kesehatan	0 TABUNG	<input checked="" type="checkbox"/> <input type="checkbox"/>
8	0008	Masker Medis	Bahan Medis Males Pakai	48 BOX	<input checked="" type="checkbox"/> <input type="checkbox"/>

**Figure 6.** Item Data Page

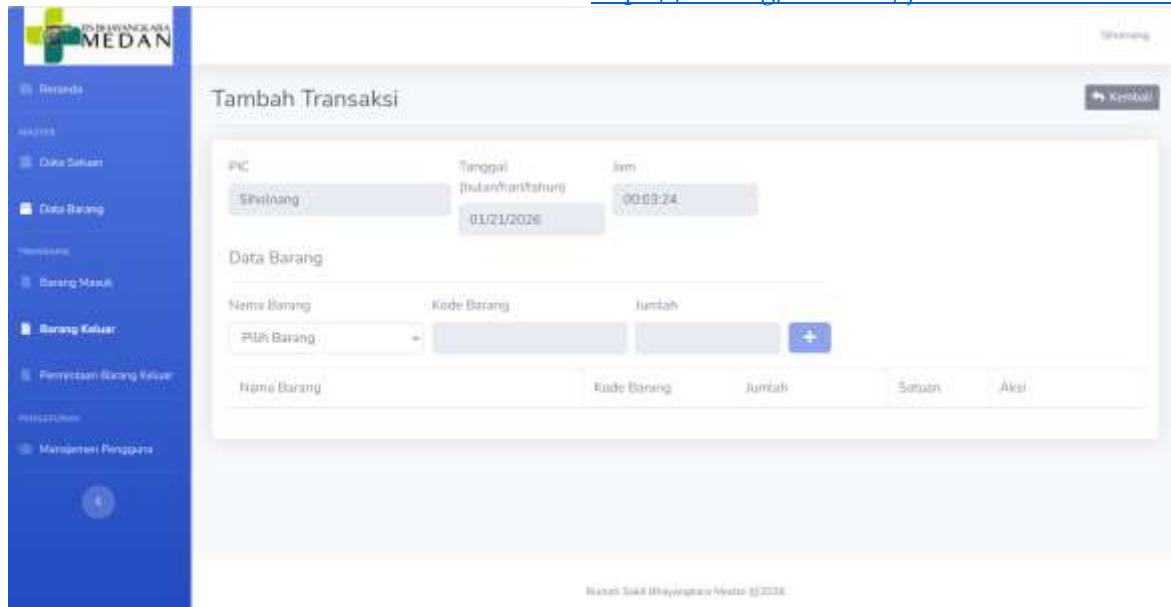
### c. Incoming Goods Page

The Incoming Goods page provides a transaction input form that includes information on the PIC (Person in Charge), date, and transaction time. This information serves as the transaction's identity, allowing each goods reception process to be clearly traced based on the responsible person's name and the time of execution, supporting accountability and transparency in inventory management. The admin can select the item name from a dropdown list, which automatically displays the corresponding item code and unit, then input the quantity of goods received, and add this data to the transaction list using the add button. This mechanism makes it easier to record multiple types of items in a single receiving transaction.

**Figure 7.** Incoming Goods Page

### d. Outgoing Goods Page

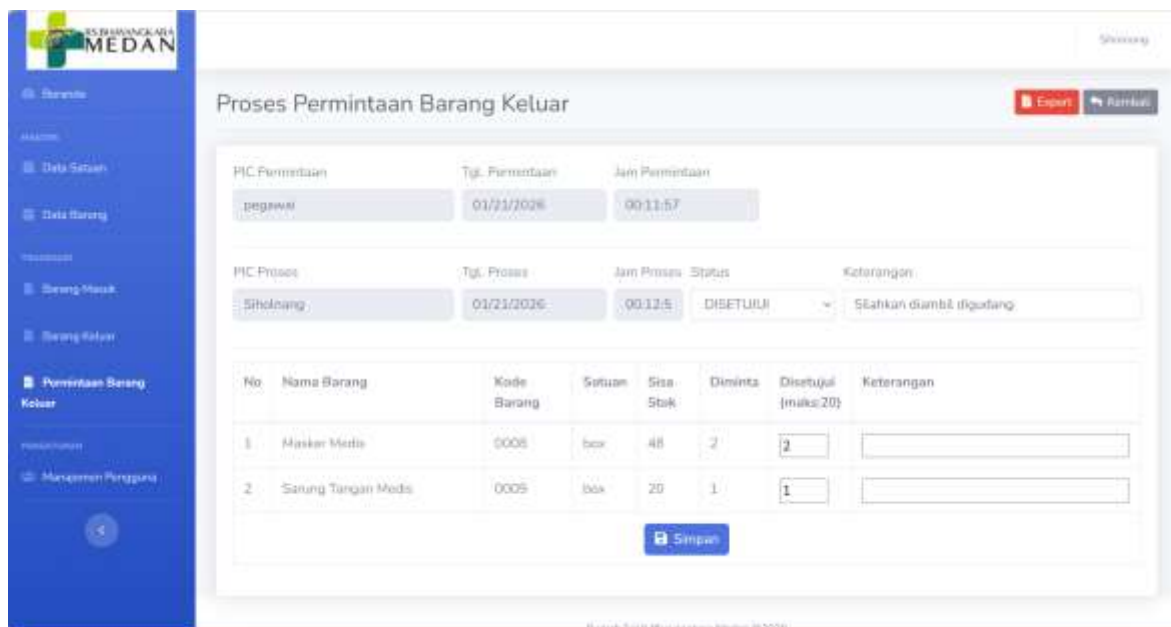
The main function of the Outgoing Goods page is to automatically reduce the stock quantity after a transaction is saved. The system will adjust the stock in the Items Data menu based on the quantity of goods issued. This mechanism ensures that the stored stock data is always accurate and reflects the actual inventory condition. The Outgoing Goods page plays a role in supporting inventory control and decision-making. With systematically recorded data on outgoing goods transactions, management can analyze item usage, monitor consumption levels, and plan procurement more effectively.



**Figure 8.** Outgoing Goods Page

e. Outgoing Goods Request Page

This Outgoing Goods Request page displays information about the Request PIC, date, and time of the request, showing the identity of the requester and the submission time of the goods request. Its function is as a control and validation mechanism before the Outgoing Goods transaction occurs. Only requests that have been approved by warehouse staff can be further processed into goods issuance transactions. This improves data accuracy, maintains stock availability, and ensures that the distribution of goods is in accordance with needs and applicable policies.



**Figure 9.** Outgoing Goods Request Page

## 2. Employee Interface Page

The Employee Interface page is designed for users with access rights as employees or units using goods. This interface functions as a medium of interaction between employees and the system in carrying out activities related to requests and monitoring the use of goods, without having full authority like an administrator. To make a goods request, you can select 'Outgoing Goods Request' which will then display information in the form of a table listing previous goods requests. If you want to make a new request, you can choose 'Add' and fill out the goods request form, then save it. Subsequently, the admin will display the information of the goods request and can approve it.

The screenshot shows a web interface for adding a goods request. The title is "Tambah Permintaan Barang". The form contains the following fields and data:

- PIC:** pegawai
- Tanggal (bulan/hari/tahun):** 01/21/2026
- Jam:** 00:00:55
- Data Barang:**
  - Nama Barang:** Pilih Barang (dropdown)
  - Kode Barang:** (empty field)
  - Jumlah:** (empty field with a "+" button)
- Table of Existing Items:**

Nama Barang	Kode Barang	Jumlah	Satuan	Aksi
Masker Medis	0008	2	BOX	[-]
Sarung Tangan Medis	0009	1	BOX	[-]
- Buttons:** Simpan (Save)

**Figure 10.** Customer Home Menu Page

## CONCLUSION

Based on the results of the system design that has been carried out, it can be concluded that the web-based medical warehouse inventory system at Bhayangkara TK-II Medan Hospital was successfully designed and tested to support the computerized management of medical supplies. The benefits of having this system are:

1. This system is capable of integrating the management processes for item data, units, incoming transactions, outgoing transactions, and requests for outgoing items into a single structured platform.
2. The implementation of this web-based inventory system provides convenience for warehouse staff and employees in recording, monitoring, and controlling stock items in real-time. With features for managing master data, transactions, as well as mechanisms for item requests and approvals, the system can improve data accuracy, minimize recording errors, and speed up the distribution process of medical supplies.
3. The system is also designed to support accountability through the division of access rights between admins and employees, as well as recording user identities and transaction times. This helps create more orderly, transparent, and accountable inventory management.
4. This web-based medical warehouse inventory system is capable of improving the effectiveness and efficiency of inventory management at Bhayangkara TK-II Medan Hospital, and can also serve as a supporting solution for decision-making in the planning and control of medical supply needs within the hospital environment.

5. The implementation of the SDLC method provides flexibility in system design and testing, particularly in the development of key features such as managing item data, unit data, incoming and outgoing item transactions, as well as outgoing item requests. Through iterative stages of planning, development, testing, and evaluation, the resulting system better aligns with the workflow and operational needs of the hospital medical warehouse.

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