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# Mobile Based Health Monitoring Application Development

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**Abstract:** The development of information technology has had a significant impact on healthcare services, particularly through the use of mobile-based health applications. Mobile applications offer easy access to information, improve communication between patients and medical personnel, and enable regular health monitoring. This study aims to develop a mobile-based health monitoring application that can support health programs managed by the Department of Health. This application is designed to periodically monitor public health conditions, remind people to undergo health checks, and provide relevant health information. The waterfall method was chosen in developing this application due to its structured structure and the ease of access provided by the mobile platform. The developed application is expected to be integrated with medical devices such as heart monitors, body temperature sensors, and blood pressure sensors, to support the regular collection and analysis of public health data. It is hoped that the results of this study will provide an innovative solution for the Department of Health in improving public health services through mobile technology.
**Keywords:** Information Technology, Health Applications, Health Monitoring, Mobile Health, Health Services.

## INTRODUCTION

Mobile-Based Health Monitoring Applications have great potential in supporting health programs managed by health services. This application can be used to monitor public health conditions periodically, remind people to have health checks, and provide relevant health information. In addition, this application can also be used as a communication tool between health experts and patients, thus facilitating the consultation process and follow-up care. However, until now, several Health Services have not fully utilized mobile technology in their operational activities. This is the background to the need to develop a mobile-based health monitoring application that can be integrated with existing systems, and adjusted to the needs of communities in various places.

According to Hendryani (2020), in her journal entitled development of an Android-based mobile health application for stunting monitoring and evaluation, this study succeeded in developing an Android-based health application to combine and prevent stunting in children, with research conducted at the Jakarta II Ministry of Health Polytechnic during 2019. This application was built using qualitative methods and FAST system development, allowing mothers to access important information about stunting prevention in the first thousand days of a child's life. Testing shows that the application functions well as a monitoring and education tool, supporting government and media efforts to increase knowledge about stunting in the community.

Evaluation reveals positive changes in participants' understanding and attitudes, as well as increased confidence in facing health challenges. Hence, a socialization activity was conducted using the method of Socialization of Health Application Usage as a Tool for Monitoring and Education Proper Drug Use.

Digital technology is increasingly developing as an important solution to address challenges in the health sector. Mobile applications are one innovation that can facilitate real-time monitoring of the health of pregnant women, thereby helping to improve access to and the quality of maternal health services. These applications are designed with a user-friendly interface and provide important features such as daily health recording, reminder notifications for check-ups and medication consumption, and health reports that can be accessed by medical personnel.

The author chose to use a Mobile-Based Application in conducting this research to allow the collection and analysis of health data directly from various connected medical devices, such as heart monitors. body temperature

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sensors, and blood pressure sensors other data relevant to health services, therefore researchers are interested in designing and creating a "Mobile-Based Health Monitoring Application Development" system.

## LITERATURE REVIEW

### Definition of Health

According to Endang Kusuma Astuti (2020: 55) the definition of health is very broad and is a subjective concept, and is influenced by various factors, such as geographical, cultural and socioeconomic factors. By because it is difficult to determine what is included in the right to health. For this reason, experts, activists and UN agencies have tried to make details about the core content of the right to health. The core content consists of a set of elements that must be guaranteed by the state under any circumstances, regardless of the availability of resources, which consists of health care:

1. Maternal and child health care, including family planning.
2. Immunization.
3. Appropriate action for common diseases and accidents.
4. Provision of essential drugs, (Astuti, E. K., 2020, The Role of BPJS Kesehatan in Realizing the Right to Health Services for Indonesian Citizens, J-PeHI: Indonesian Legal Research Journal Volume 01, No. 01 Year 2020).

### Body Temperature

According to Arif Ardiyanto et al (2021:12) Temperature is a quantity that states the degree of heat or cold of an object. One of the tools used to measure temperature is a thermometer. In the past, measuring temperature was more often done using the sense of touch. However, with the development of technology, a tool in the form of a thermometer was created to measure temperature validly. Temperature shows the degree of heat in an object. Or simply, the higher the temperature of an object, the hotter the object is. Microscopically, temperature shows the energy possessed by an object. Each atom in an object moves, either in the form of displacement or movement at the location of vibration

### Heart Rate

According to Muchamad Adwin Nurahman et al (2021:59) Heart rate is an important indicator that reflects a person's cardiovascular health condition. In general, a healthy heart rate ranges from 60 to 100 times per minute when the body is at rest. However, this number can vary depending on a person's age, fitness level, and physical activity. In addition to being an indicator of heart health, heart rate can also be used to monitor the effectiveness of an exercise program. By monitoring your heart rate during exercise, you can ensure that you are in the appropriate heart rate zone to achieve your fitness goals, such as burning fat, increasing endurance, or strengthening your heart. Heart rate measurements are also very useful in detecting potential health problems such as arrhythmias or abnormal heart rhythms. Therefore, maintaining your heart rate within a healthy range through an active and regular lifestyle can help prevent various cardiovascular diseases.

### Blood Pressure

According to Tresna Komalasari et al (2021:185) Blood pressure is a measure of how hard the blood pumped by the heart is against the walls of the arteries as it circulates throughout the body. In general, blood pressure is expressed in two numbers: systolic and diastolic. Systolic pressure measures the pressure in the arteries when the heart beats and pumps blood, while diastolic pressure measures the pressure in the arteries when the heart is resting between beats. Normal blood pressure values are usually around 120/80 mmHg. However, blood pressure can vary depending on many factors such as age, physical activity, diet, emotional state, and a person's overall health condition. High blood pressure, or hypertension, can cause various serious health complications such as heart disease, stroke, and kidney damage if not managed properly. Conversely, low blood pressure, or hypotension, can also cause symptoms such as dizziness, weakness, and loss of consciousness.

### Mobile

According to Aap Ardian & Yusra Fernando (2020:13) Mobile applications, or often referred to as mobile applications, refer to software specifically designed to run on mobile devices such as smartphones or tablets. This definition includes applications that can be downloaded and installed by users through application stores, such as the Google Play Store or Apple App Store. Mobile applications can have various purposes and functions, ranging from productivity, entertainment, health, communication, to games. In addition, mobile applications can also include features that utilize the capabilities of mobile devices, such as sensors in smartphones (such as GPS, accelerometer, or camera), cellular network connectivity or Wi-Fi, and integration with mobile operating system features that support a better user experience. Mobile applications have the advantage of being flexible, in accordance with the lifestyle of users who often move from one place to another. The small size and the ability to be easily accessed make mobile applications a popular solution in meeting various user needs in today's digital era, (Ardian, A., & Fernando, Y., 2020, Mobile-Based Vehicle Auction Management Information System (Case

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Study of Mandiri Tunas Finance), Journal of Technology and Information Systems (JTSI) Vol. 1, No. 2, December 2020, 10-16).

**Android**

According to A. Yudi Permana & Puji Romadlon (2019:155) Android is a mobile operating system developed by the Open Handset Alliance, led by Google. This operating system is specifically designed for mobile devices, such as smartphones and tablets. Android is based on the Linux kernel and uses a touch-based user interface optimized for touch screens. Here are some of the characteristics of Android:Sumber *Open Source*. Android is open source, meaning that its source code is publicly available. This allows developers to access, modify, and contribute to the development of the operating system.

1. Google Play Store. Android provides a large app distribution platform through the Google Play Store. Users can download and install a variety of apps, from productivity apps to games, to extend the functionality of their devices.
2. Android Versions. Android has a series of versions that are released periodically. Each version usually comes with feature updates, security enhancements, and bug fixes. The names of previous versions of Android were inspired by desserts, but the number-based naming choice has been adopted for more recent versions.
3. User Interface Customization. Android device manufacturers have the freedom to customize their own user interfaces. For example, Samsung has a user interface called One UI while Google uses a stock interface known as Stock Android or Vanilla Android.
4. Multitasking Capabilities. Android supports multitasking, allowing users to run multiple apps simultaneously and quickly switch between them.
5. Google Services Integration. Android is tightly integrated with Google services, such as Gmail, Google Maps, Google Drive, and more. This provides a unified and easy-to-use experience for users who use the Google ecosystem of services.
6. Large Developer Community. Being open source, Android has a large developer community. This has driven innovation and the development of diverse applications in the Android ecosystem.

Android has become one of the most popular mobile operating systems in the world, used by various device manufacturers and widely adopted by various types of mobile devices, (Permana, A. Y., & Romadlon, P., 2019, Design of Housing Sales Information System Using SDLC Method at PT. Mandiri Land Prosperous Based on Mobile, SIGMA - Jurnal Teknologi Pelita Bangsa, Volume 10 Number 2 December 2019 ISSN: 2407-3903).

**XAMPP**

According to Parjito et al (2022:356) XAMPP, which stands for "X" (referring to various operating systems), "Apache," "MySQL,", "PHP," and "Perl," is open source software designed to provide a complete and easy-to-use web development environment. Developed by Apache Friends, XAMPP aims to simplify the process of installing and configuring web servers and databases, which generally involve components such as Apache HTTP Server, MySQL Database, PHP, and Perl. The importance of XAMPP lies in its ability to provide a complete software package, so that users do not need to manually install and configure each component separately. XAMPP provides a practical solution for web developers and beginners who want to create and test local web applications without having to deal with the complexity of manual server installation and configuration processes. Through the auto-configuration feature, XAMPP automatically installs and configures Apache, PHP, and MySQL, making it easier to use for users who do not have in-depth knowledge of server configuration. Thus, XAMPP becomes a very useful tool in supporting the development and testing of web applications on various operating systems., (Parjito, Rahmawati, O., & Ulum, F., 2022, Design and Construction of E-Agribusiness Applications to Increase Sales of Horticultural Crops, Journal of Informatics and Software Engineering (JATIKA) Vol. 3, No. 3, September 2022, 354-365).

## METHOD

**Problem Analysis**

In developing a mobile-based health monitoring application that includes body temperature, blood pressure, and heart rate, there are several problem analyses that need to be considered. First, the main challenge is ensuring the accuracy of data collected from mobile devices, because health data is very sensitive and errors in measurement can have serious consequences. In addition, the integration of hardware such as blood pressure, heart rate, and body temperature measuring devices with mobile applications requires a stable and reliable communication protocol to ensure that data is sent in a timely and accurate manner. Second, the aspect of data security is also an important issue, because personal health information is very vulnerable to misuse. Therefore, developers need to ensure that this application has a strict privacy policy to protect user data. Third, the problem of compatibility between various mobile device models must also be considered, considering that this application must be able to run on various platforms and different types of devices. In addition, this application must have an interface that is easy to use by various groups, including users who may not be very familiar with technology. Fourth, the

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availability of a stable internet network in various regions is a challenge, especially if this application is used in areas with limited internet access. The application must be designed in such a way that it continues to function optimally even in less than ideal network conditions

**System Design Planning**

The design of this system can be described using the Unified Modeling Language (UML) which includes use case diagrams, class diagrams, activity diagrams, and sequence diagrams

**Use Case Diagram**

A diagram that depicts actors, use cases and their relationships as a sequence of actions that provide measurable value to the actor. A use case is depicted as a horizontal ellipse in a UML use case diagram, as seen in Figure 1.1 below.

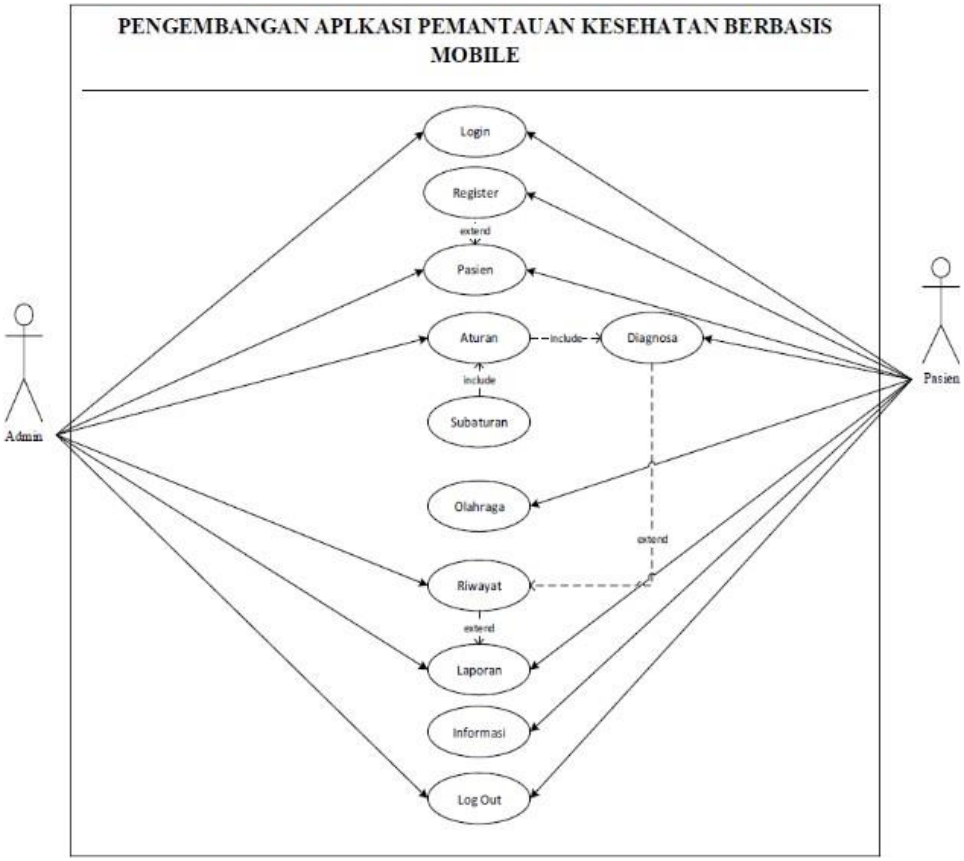


Figure 1.1. *Use Case Diagram*

**Activity Diagram**

Describes activities, objects, states, state transitions and events. In other words, the workflow diagram activity describes the system behavior for activities, here are some activity diagram images: ah this.Activity Diagram Login. *Activity diagram login* describes the activity to enter the admin and patient menus. The form of the login activity diagram that the author designed can be seen in Figure I.2 as follows

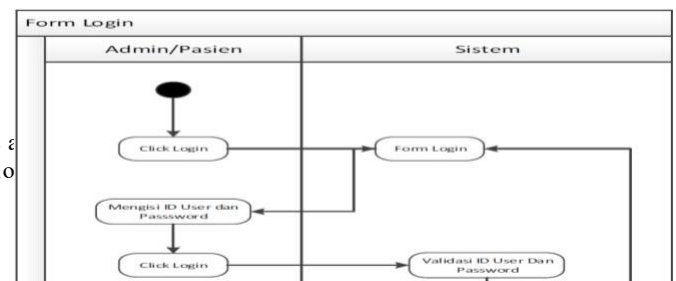

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Figure 1.2 Activity Diagram Login

**Database Design**

Contains data modeling poured into the form of a table design that can be explained as follows:

**Table Design**

This section also explains the database specifications that will be designed according to the needs of the system to be developed. Database specifications must be detailed and adjusted to the software that will be used when the implementation is carried out. The explanation of the table design used can be seen as follows:

Account Database Table

The account database table consists of 7 fields with id_akun as the primary key. The account table is the gateway to enter the system page.

Tabel 1.1 Rancangan Account Database Table

| Nama *Database* | | Db_Pemantauan_Kesehatan | | |
|---|---|---|---|---|
| Nama Tabel | | Tbl_Akun | | |
| No | Nama Field | Tipe Data | Boleh Kosong | Kunci |
| 1. | Nik | Int(11) | Tidak | *Primary Key* |
| 2. | Nama_Lengkap | Varchar(50) | Tidak | - |
| 3. | Jenis_Kelamin | Varchar(30) | Tidak | - |
| 4. | Usia | Int(11) | Tidak | - |
| 5. | Username | Varchar(50) | Tidak | - |
| 6. | Password | Varchar(30) | Tidak | - |
| 7. | Level | Varchar(20) | Tidak | - |

**Interface Design**

Contains a picture of the hierarchical structure of the entire system display that is designed, namely the menus and their submenus. The interface design can be seen as follows:

1. Login Form Design

The login form design functions to verify users who have the right to manage the system. The login form design can be seen in the following image:


Figure 1.3 Design Form Login

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## RESULT

**Result Display**

The following explains the display of the results of the system design that was built, which can be seen as follows
Initial Application Display
The initial application menu display on the system is shown in the following image:


Figure 1.4 Initial Application Display

On this main screen, there are two main options, namely Login and Register, which function to direct users to enter the application using an existing account or register as a new user. The interface design looks simple with a heart-shaped icon with a plus sign inside, symbolizing health and medical services.

**Login Menu Display**

The login menu display on the system is shown in the following image:

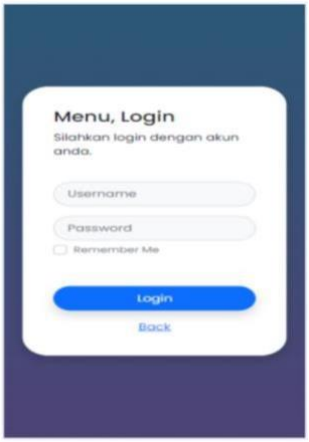


Figure1.5 Menu Login Display

On this page, users are asked to enter the Username and Password that have been registered previously. In addition, there is a Remember Me option that allows users to stay logged in to the application without having to re-enter their credentials every time they want to access it. The design of this login form is simple and clear, with the use of white on the form background that contrasts with the blue gradient background, thus creating a login element.

**Home Menu Display**

The home menu display on the system is shown below:

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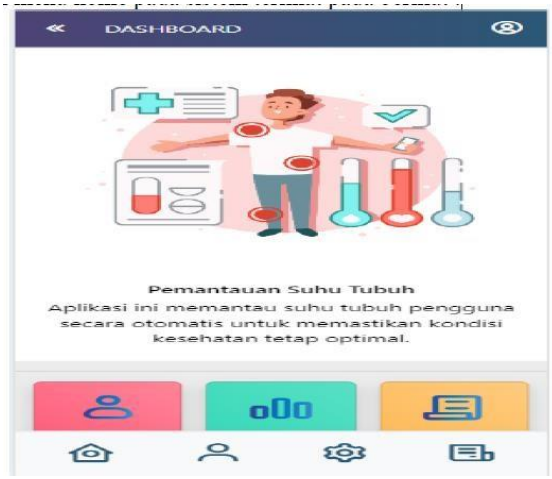


Figure 1.6 Home Menu Display

The Dashboard page of a mobile health monitoring application, focusing on the Body Temperature Monitoring feature. At the top, there is a navigation with a back button on the left and a profile icon on the right, allowing users to access their account information or return to the previous page. The main part of the page displays an illustration depicting the body temperature monitoring process, where the user holds the device used to automatically measure body temperature.

**Patient View**

The patient view on the system is shown in the following image:

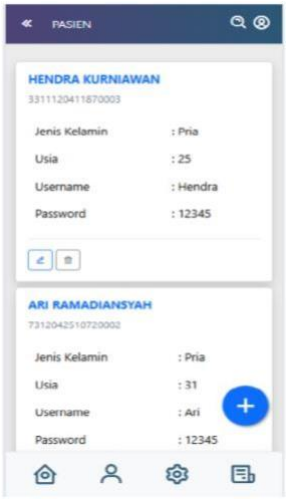


Figure 1.7 Patient View

Patient Page in a mobile-based health monitoring application. On this page, detailed information about a patient named Hendra Kurniawan is displayed, including Gender, Age, Username, and Password. This information is arranged in a simple and easy-to-read format, with the patient's name displayed in bold blue letters for emphasis. Below the patient information, there are two icons, namely the edit icon that allows users to update patient information, and the delete icon that functions to delete patient data if necessary. The design of these icons is simple and easy to access, making data management functions more intuitive. At the bottom right of the screen, there is a blue circle-shaped button with a plus (+) icon, which appears to function to add new patient data to the system.

**Diagnostic Data Display**

The display of diagnostic data on the system is shown in the following image:

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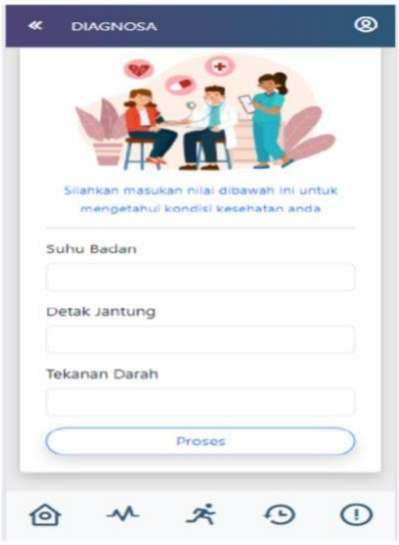


Figure 1.8 Diagnostic Data Display

On this page, users are asked to enter their Body Temperature, Heart Rate, and Blood Pressure values to get real-time health information. At the top of the screen, there is an illustration of a doctor performing a medical examination on a patient, reinforcing the function of this page as a health diagnostic tool. Just below the illustration, there is an instruction text that reads "Please enter the values below to find out your health condition", giving users clear directions on what steps to take. After entering the relevant health data, users can press the Process button to run an analysis based on the input. At the bottom of the screen, there is a navigation menu with icons that allow users to navigate between the main features of the application, such as home, health diagnosis, physical activity, health history, and additional information.

**History Data View**

The history data view on the system is shown in the following image:

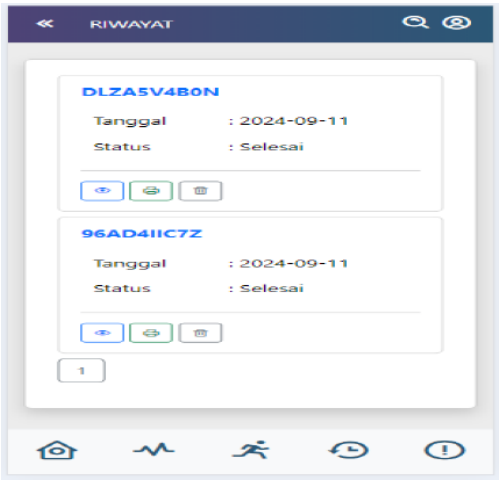


Figure 1.9 History Data View

On this page, users can view the history of specific activities or actions that have been completed. Each history entry is displayed as a card that contains some important information, such as the activity code (e.g., "DLZA5V4B0N" and "96AD4IIC7Z"), the date the activity was executed (in this example, September 11, 2024), and a status that displays "Completed" for completed activities. Each history card is equipped with three icons at the bottom: an eye icon to view more details about the activity, an edit icon (in green) that may allow users to update information related to the activity, and a delete icon (in gray) to remove the activity history from the list. At the bottom of the page, There is a navigation menu with icons for the main features of the application, such as

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home, health diagnosis, sports activities, health history, and additional information. This makes it easy for users to quickly switch between application pages.

**Report View**
The report view on the system is shown in the following image:

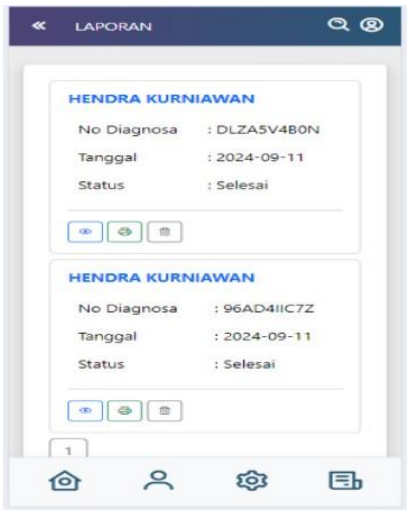


Figure 1.10 Report View

On this page, several diagnostic reports related to a user named Hendra Kurniawan are shown. Each report is displayed in the form of a card containing information on the Diagnosis Number, Diagnosis Date, and Diagnosis Status which displays "Complete". Each report card is equipped with three icons at the bottom: an eye icon to view more details of the diagnostic report, an edit icon (in green) to allow changes or updates to information, and a delete icon (in gray) to remove the report from the list. At the bottom of the page, there is a navigation menu with icons that make it easy for users to access other features in the application, such as home, user profile, settings, and report history. This page is designed to allow users to quickly view, monitor, and manage their diagnostic reports efficiently. Overall, this page has a clean and well-structured design, making it easy for users to access important information related to their health diagnosis.

**Info Display**
The display of info data on the system is shown in the following image:


Figure 1.11 info Display

On this page, there is some basic information about the three main health aspects that the app monitors: Body Temperature, Heart Rate, and Blood Pressure. In the Body Temperature section, it is explained that body temperature is a measure of the heat produced by the body as a result of the metabolic process.

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## DISCUSSIONS

**System Advantages**

1. This system allows users to monitor body temperature, heart rate, and blood pressure in real time, providing fast and accurate health information.
2. This application is designed with a simple and easy-to-understand interface, so it can be used by various groups, including those who are not very familiar with technology.
3. The application can be integrated with various health, allowing users to get more accurate and relevant data related to their health conditions.

**System Disadvantages**

The disadvantages of the system that has been created include:

1. This application requires a stable internet connection to function optimally, so in areas with limited internet access, users may have difficulty using the real-time monitoring feature.
2. Because this application collects user health data, protection of personal data and health information is very important. If security is not managed properly, user data can be vulnerable to attacks or leaks.
3. To obtain accurate health data, the application may require additional devices or sensors such as smartwatches or blood pressure monitors, which not all users have or can access

## CONCLUSION

Here are some points that can be concluded as follows:

1. The development of a mobile-based health monitoring application helps users to monitor important health indicators, such as body temperature, heart rate, blood pressure, and physical activity, in real-time and easily accessible.
2. This application allows early detection of abnormal health conditions, so that users can immediately take preventive action or seek medical help if needed.
3. The use of this application increases user awareness of the importance of maintaining health through routine monitoring, as well as providing convenience in storing and analyzing personal health data.

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