

# Addressing Health Equity through E-Patient Solutions in West Sulawesi

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**Abstract** The World Health Organization (WHO) promotes three key points to ensure that the global community receives adequate health services: equality in health access, quality of health services, and protection of patients' financial risks. The problems with the ongoing health development in Indonesia are essentially the same as those that the government of West Sulawesi is dealing with, namely the lack of optimum access, affordability, and quality of healthcare services. This study aims to determine the needs of users to design intervention media in the form of e-patient development at the West Sulawesi Regional General Hospital. The research was conducted using a qualitative approach with in-depth interviews and focus group discussions (FGD) conducted from January to February 2023. Thematic analysis was performed using n-Vivo. The result of the study shows that users of hospital services benefit greatly from the e-patient application, which reduces waiting times. Therefore, it must be improved in terms of the application's form and appearance/display. There are chat services that enable interaction with doctors, and the development of e-patients has been made simple so that it is easily understood and accessed by society from various educational backgrounds. In conclusion, it is vital to develop e-patient applications while considering the needs of the patients.

**Keywords** E-Patients, Health Applications, Smartphones, Telemedicine

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## 1. Introduction

The World Health Organization (WHO) promotes three key points to ensure the global community receives adequate health services. The three points are equality in health access, quality of health services, and protection of patients' financial risks. There are significant differences between developed and developing countries in terms of access to healthcare services [1].

Today, technology plays an essential role in dealing with many health issues [2]. It relates to promoting, preventing, diagnosing, and treating different disease symptoms found through technology. The rapid growth of the internet and the spread of technology [3] are expanding the possibilities for combining everyday use of technology with healthcare, including hospital patient care [4].

The use of health services in developing countries is restricted by the distance traveled, the lack of optimal access, and insufficient use of access according to regulations by officers. In developed countries, the issue is related to the difficulty of scheduling a doctor's appointment, particularly after working hours due to the busy schedule [5]. Access to health care is a critical health determinant [6]. Therefore, it is necessary to remove the barriers to health access equality. The government of West Sulawesi is dealing with the same issue: a lack of optimal access, affordability, and quality of health services. This is

caused by a number of factors, including the community's inability to fully access the network of health service facilities, such as hospitals and health centers, particularly those relating to costs and distances.

The development of technology with quality network services allows health workers to improve health services and facilitate access for all levels of society [7]. However, there will be several obstacles to revamping the health care system, including connectivity, which is the leading cause of digital health systems, particularly in remote areas where there should be the same health access as urban communities and insufficient technology utilized in health services. The Indonesian service system will be more evenly distributed and integrated offline and online if the previously mentioned obstacles can be successfully overcome [8].

One of the potential causes of dissatisfaction is the length of patient wait times. Long patient wait times are increasingly attracting public attention because they have an impact on patient satisfaction with health care services. Patients will judge health services negatively if their pain is not relieved, there are long queues, and health workers are not friendly, even if they are professionals [9]. If the waiting time in the outpatient medical record is excessive, it will reduce patient comfort, affecting the hospital's image. E-Health as the basis for the development of e-patients was proposed by the World Health Organization (WHO) as "the use of information and communication technologies (ICT) for health to, for example, treat patients, pursue research, educate students, track diseases and monitor public health." Meanwhile, in Indonesia, e-health is stipulated in Minister of Health Regulation Number 192/Menkes/SK/VI/2012 which states that eHealth makes use of information and communication technology (ICT) in the health sector, particularly to improve health services.

This, therefore, will have an impact on patient utility in the future [10]. Given this situation, it is expected that services to preventive, promotional, and treatment efforts in improving health services in West Sulawesi will be developed by utilizing advances in online-based digitalization technology through the development of telemedicine. The large number of patients resulted in the accumulation of patients in both internal medicine and surgical clinics, so the average waiting time was above 60 minutes, while the waiting time in Indonesia was set by the Ministry of Health of the Republic of Indonesia through minimum service standards. According to Ministry of Health Number 129/Menkes/SK/II/2008, the minimum outpatient service is less than or equal to 60 minutes. E-patient is a solution proposed to address the issue. The e-patient application is a technology that can help people access curative services such as education and preventive medicine. This study aims to determine the needs of users to design intervention media in the form of e-patient development at the West Sulawesi Regional General Hospital.

The primary distinction between this study and others is

that it attempts to design intervention media based on the results of in-depth interviews with respondents who are also users. The design of intervention media does not use special applications, but rather the development of existing and widely used applications in West Sulawesi and Indonesia, notably WhatsApp.

## 2. Method

This research was conducted using a qualitative approach with in-depth interviews conducted from January to February 2023 after obtaining permission from the Health Research Ethics Committee. The qualitative method in the form of in-depth interviews and focus group discussion was chosen because it enables the collection of very thorough and clear data about informants' experiences with e-patients.

We chose informants purposively by considering the diversity of educational backgrounds, professions, and the interactions in the use of this e-Patient. We also selected participants who had a variety of experiences in patient care at the hospital. Informants in this study included health professionals from the West Sulawesi Provincial House, such as Physicians in Charge of Service of Internal Medicine, Physicians in Charge of Service of Surgeons, internal medicine clinic patients, surgical and surgical clinic patients, and IT Experts. The informants were interviewed to determine users' needs when developing intervention media through e-patient development. The number of informants selected is determined by the conditions or facts/phenomena experienced by the informant in relation to the development of e-patients.

This in-depth interview is conducted by asking detailed and open questions to the informant face-to-face. Before the interview, we provided information about the purpose of this study and explained the research procedures, namely: filling in informed consent, as well as an explanation of e-Patient. Participants used the application by reading all of the content and exploring all of the features of e-Patient. All informants gave their consent to informed consent which includes anonymous publication of information.

Interviews were conducted until the data-saturated and no new information was generated [11], [12]. FGD was utilized in interviews with respondents to provide convenience and opportunities for researchers to build openness and trust, as well as fully understand respondents' perceptions, attitudes, and experiences. The research team was guided by interview guidelines that included a list of questions that had been prepared in advance when conducting in-depth interviews. Informed consent is explained to informants by (1) clearly explaining information, (2) ensuring that research subjects understand the information provided regarding the research, and (3) voluntary participation of research subjects without pressure from any party. The following are the probing questions used in in-depth interviews:

**Table 1.** Probing items in in-depth interviews

Informant	Probing Item
Physicians in Charge of Services (DPJP) of Internal Medicine and Surgery Clinic	The addition of features to the e-Patient that doctors require to reduce patient waiting time
	E-patient development in terms of display quality
	E-patient development in terms of usability
	E-patient development in terms of integration
	E-patient development in terms of balance
Patients of internal medicine and surgery clinic	E-patient development in terms of form
	Concerning the development of e-patients to facilitate access to health services at West Sulawesi Regional General Hospital
	E-patient development in terms of display quality
	E-patient development in terms of usability
	E-patient development in terms of integration
	E-patient development in terms of balance
	E-patient development in terms of form

E-Patients is an application designed to improve the access and knowledge of the general public, especially users of West Sulawesi Regional General Hospital in accessing services in the hospital. Before conducting interviews with all informants, researchers with the IT team of West Sulawesi Regional General Hospital have made a draft of e-patient development on smartphones making it easier for informants to assess the e-patient application to be designed. After the design of the e-Patient development application was completed, the trial stage of the e-Patient development application was carried out via the official website of the West Sulawesi Regional General Hospital, which can be accessed via a smartphone. This stage is also carried out to ensure that this application is feasible for use as a tool to reduce waiting times at internal medicine and surgical clinics of West Sulawesi Regional General Hospital.

**2.1. Coding and Analysis**

After the interview process, all transcripts were reviewed by the research team to assess their accuracy and completeness and then uploaded to the NVivo software. NVivo enables organized and structured data processing in the data coding process because NVivo software facilitates the categorization and comparison of code for data analysis. The coding process was carried out deductively and inductively. The initial deductive code was taken from a literature review conducted by the research team. However, the majority of the code was developed through an inductive approach carried out in encoding participant transcripts so as to allow the code to remain accurate and relevant, and represent the reality of the participants. The development of themes from various pre-compiled codes is

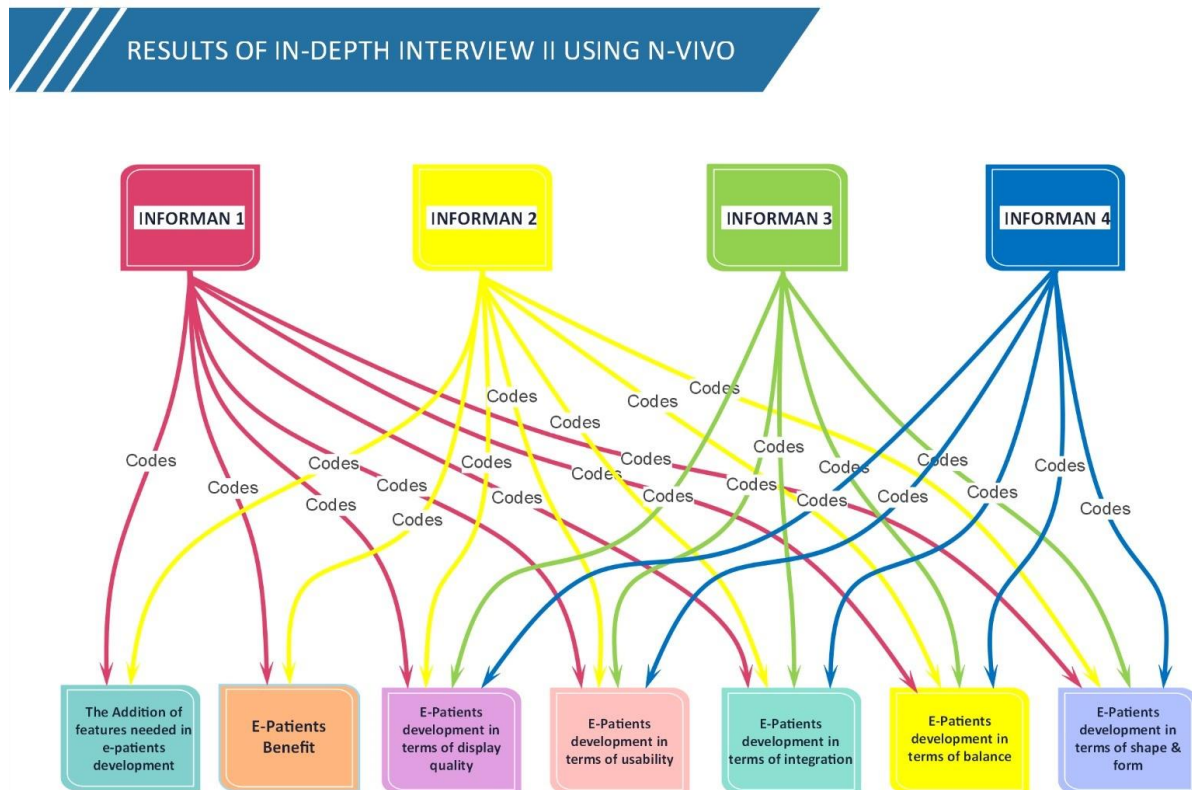
a crucial analytic step. Figure 1 displays the themes that developed as a result of the analysis performed using the NVivo program.

The trial steps will be carried out based on the above indicators, beginning with evaluating communication experts, IT experts, patients, and Physicians in Charge of Service (DPJP) before and after development. If the results are valid, the process will continue with a patient trial so that the application of e-Patient development is considered feasible for patients who will visit the internal medicine and surgery clinic. The expected output indicator from this stage is the formation of the design of e-Patient development through smartphones to improve internal medicine and surgical clinic services in West Sulawesi Regional General Hospital.

**3. Result and Discussion**

This study aims to design the needs of intervention media (e-Patient development) to reduce waiting time in internal medicine and surgical clinics at West Sulawesi Regional General Hospital. Patients and health workers in the West Sulawesi Regional General Hospital must be involved in getting perfective of their needs for developing this e-patient application [13].

A thematic analysis was used in this study to discover qualitative information patterns from informants, resulting in interpretations of the phenomena being studied. All informants’ opinions, inputs, and suggestions for designing e-patient development applications to reduce waiting times in internal medicine and surgical clinics are identified and confirmed during this stage. How data is processed from the interviews is shown in Figure 1.



**Figure 1.** Results of In-depth Interview II Using N-Vivo

Based on the results of interviews with all informants, the following information was obtained:

**A.** Features that must be included in the development of e-patients

The results of interviews with Physicians in Charge of Service of internal medicine and surgical stated that:

*"The features we have now are actually quite good. It's just that the information, particularly the availability of doctors, is outdated. Currently, the condition of the e-patient application, in my opinion, is not updated in the menu, so the patient is not receiving enough information. Secondly, this application is unable to communicate directly. It will be good if this application can provide direct communication services with the doctor. We recommend that there is service innovation through chat between doctors and patients. So, it may be possible in the future to design for the cost of online consultation services and patient payment methods"* (FB, Physicians in Charge of Services of Surgery).

*"Yes... this e-patient application makes it very simple for patients. However, it must still be developed as the doctor's schedule is constantly updated."* (H, Internal Medicine Patient)

*"I believe it is critical to develop an online registration system so that we can see the number of patients who have registered as well as the sequence number. So the patient can register a few days before the visit."* (HS, Physician in Charge of Service of Internal Medicine).

Based on this information, it is possible to conclude that it is necessary to improve the feature, especially about doctors who provide services at the clinic at the time. Furthermore, additional features are expected to be developed to allow doctors and patients to communicate by considering doctor services online. For this e-patient application to reduce wait times, the number of patients who register on a given day must be added, and patients can view updates on patients who receive treatment on that day. Thus, the patient can predict when he will arrive at the clinic to receive health services.

**B.** This e-patient development makes it easier for patients

The development of *e-patients* could make it easier for patients to obtain health care at West Sulawesi Regional General Hospital. Here are some of the statements made by the informant.

*"This application aims to greatly simplify patient registration and service delivery to reduce patient waiting time."* (HS, Physician in Charge of Service of Internal Medicine).

*"Yes, this simplifies things for us. What matters is that we already know how to use it. So, we don't have to wait in line anymore"* (M, Surgical Patient).

It can be concluded that the development of e-patients can make it easier for patients to get health services at West Sulawesi Regional General Hospital. The app can help patients pick up queue numbers and save time queuing.

### C. E-patient development in terms of display quality

In this interview, all informants were asked questions about how to develop e-patients from the perspective of display quality. The researchers obtained the following results:

*"Regarding app display quality, the doctor's photos still use avatar photos rather than real doctor photos. I think the doctor's photo is essential. It is better to show the doctor's photo with the best image quality. Furthermore, the doctor's practice schedule has not been updated following the current schedule."* (HS, Physician in Charge of Service of Internal Medicine).

*"In terms of its display, I expect it to be easier to understand."* (M, Surgical Patient)

*"In terms of quality, I think it's good enough. However, I suggest that this e-patient application be as simple and easy to use as possible so that patients from all levels of society and education can use it. This application should also include educational features and information about various patient complaints and diseases, as well as a feature for patient advice and recommendation and a particular admin who will handle patient complaints."* (FB, Physicians in Charge of Service of Surgery).

Based on the interview results, the informant suggested that the e-patient application display high-quality photos of doctors. Images of doctors are believed to influence patients' decisions about which services to use. Furthermore, it is critical to have a feature that displays a doctor's schedule, which is continuously updated following the schedule in each poly. This application is also expected to provide media information about specific diseases. This e-patient application should include a suggestion box so that it can be adapted to the user's needs.

This interview yields information about the *navigation* of the e-patient application. Based on the data from the informant, the navigation displayed is appropriate and functioning properly. Furthermore, the "search" button or search menu must be enabled so that patients can obtain information that is relevant to their search.

### D. E-patient development in terms of usability

At this stage, all informants provide information about the design of e-patient development applications from the usability perspective. The information obtained is as follows:

*"So, the schedule information should be continuously updated for the development of e-patients. The doctor's photo should use a real photo. And most importantly, the marketing. So, at the very least, this app is being promoted on hospital social media. On Instagram, on Facebook."* (FB, Physicians in Charge of Service of Surgery).

*"Yes, this app is beneficial... I always use it if I want to go to this hospital."* (M, Surgical Patient).

*"This e-patient application will make it easier for patients to seek treatment at this hospital."* (HS, Physician in Charge of Service of Internal Medicine).

Information related to the usability aspects of e-patients can be developed with additional information about the simplicity of the display and display characteristics. In terms of simplicity, the smartphone display is already simple. It just needs to be completed with excellent services and a doctor's practice schedule. The e-patient application's interface is already simple and straightforward.

### E. E-patient development in terms of color integration and navigation

Based on the results of interviews with all informants, information regarding color integration in the e-patient development application was obtained as follows:

*"I don't think there's a big deal about the color. It should be fine as long as it can read all the information. From the combination of color gradations, I don't think there's a problem. It's already good enough. It's just that there isn't much information displayed right now"* (FB, Physician in Charge of Service of Surgery).

Information on the integration of e-patient application navigation obtained from all informants is as follows:

*"The navigation part is already enough. It's just that the current features need to be improved and simplified"*. (FB, Physicians in Charge of Service of Surgery)

*"The app's symbols are clear, so we can easily choose. The color is good too."* (H, Internal Medicine Patient).

Based on these findings, it is possible to conclude that the color selection and gradation are pretty good. It is already appropriate because the color scheme is soft and does not strain the eyes, and the ease of navigation is excellent.

### F. E-patient development in terms of balance

Questions regarding the balance aspect are essential for gaining an overview in designing the development of e-patients by looking at button placement, display size, font size, and writing layout.

*"The symbols are displayed clearly, but I think it's a little too big."* (H, Internal Medicine Patient).

*"Because the doctor's profile picture is too large, it is out of proportion to the caption. In addition, the doctor's Medical License number should also be removed."* (FB, Physicians in Charge of Service of Surgery)

According to the results of the interview, it can be concluded that the aspect of button placement is acceptable, but the display of the image should be reduced. The display of the doctor's image is too large and should be simplified. The letter size is appropriate. The writing layout takes up much space, so it should be simplified by removing the doctor's Medical License number. The writing layout balance must be improved on the right side of the writing (right alignment).

### G. E-patient development in terms of form

Based on the interview results, it can be concluded that from the aspect of letter accuracy, the information is considered appropriate to use in the application. From the

aspect of readability of text or sentences, it is good enough because informants can read it.

*"I don't think there is a problem with the font size. The most important thing is that all information can be read well. (FB, Physicians in Charge of Service of Surgery).*

*"It is already very clear. The words and language are easy to understand." (H, Internal Medicine Patient).*

Regarding e-patient development methods, the study's key findings emphasize the importance of using *WhatsApp Bot/ChatBot* to improve the registration process. Regarding ease and convenience in registering at the West Sulawesi Regional General Hospital, the *WhatsApp Bot* could be a solution for developing e-patients. *WhatsApp Bot* is extremely simple because it only uses the *WhatsApp* application. Uploading photos and other documents can be done through *WhatsApp Bot*, allowing patients to upload referral letters and speed up the service process.

*WhatsApp Bot* will be integrated with e-patient applications that have been made before by providing *middleware* so that *bridging* can be done with applications that are already available under the supervision of the Hospital Management Information System (SIMRS) of West Sulawesi Regional General Hospital. However, an unstable network frequently turns into a barrier. An unstable network will slow down the transmission of data and the response back from SIMRS. This can be anticipated by setting up a backup provider, and the West Sulawesi Regional General Hospital currently has two internet network service providers, namely Icon and Telkom.

To reduce wait times, this e-patient application must include a feature that displays the number of patients who register on a specific day, and patients can view updates on patients who receive treatment on that day. Thus, the patient can predict when he will arrive at the clinic to receive health services. The e-patient application is one type of telemedicine development, a health service that can be performed remotely using gadgets. We can contact the doctor via telemedicine, consult about health conditions, and obtain treatment advice, drugs, and medical measures [14].

All required to practice telemedicine is a telemedicine provider platform or application, a computer or device, and a good internet network [15], [16]. Following telemedicine, all data will be automatically stored in the application, creating an online medical record that can be accessed whenever necessary. This stored information can be shown to a specialist doctor during a physical examination. As a result, the patient will not have to keep as many documents pertaining to his personal medical history. Telemedicine technology is also used for medical purposes and to improve patient compliance [17].

### 3.1. This E-Patient Development Makes It Easier for Patients to Get Health Services

The development of e-patients is one of the keys to making it easier for people to get health services online.

This application allows you to consult with your preferred doctor without visiting the clinic or hospital. The operational system is designed to be simple and easy to use, making it easy for users to access its features. Health services can be obtained comprehensively, including consultation, treatment, and pre and post-treatment examinations [16].

The existence of this e-patient development application can reduce distance and time barriers, potentially saving many lives. Furthermore, it promotes a healthy lifestyle in the community. Easy access to health information will provide education and raise public awareness of healthy living.

### 3.2. E-Patient Development in Terms of Display Quality

Regarding display quality, replacing the doctor's photo with the most recent photo of the doctor would be more appropriate. Photos of doctors are thought to influence patients' decisions about which services to use. In addition, it is necessary to add a schedule of doctors who perform services at the clinics to be visited [14]. As for the display, the quality of the application on the smartphone is good enough. It should be as simple and applicable. "Applicable" means that the application can do many things and is easy to learn at all levels of education [18]. This application is also expected to provide media information about specific diseases. This e-patient application should include a suggestion box so that it can be adapted to the user's needs [19]. An attractive display can improve the quality of the application itself because it reflects the quality of health services offered by the hospital [20].

### 3.3. E-Patient Development in Terms of Usability

For this e-patient to be more practical, it is necessary to update the doctor's schedule and replace the doctor's avatar in the application with the original photo of the doctor. In addition, this application was introduced through the social media of the West Sulawesi Regional General Hospital. This e-patient application is also expected to inform of excellent services from West Sulawesi Regional General Hospital. Mobile health applications make it easier for people to get information and other health needs [21].

Healthcare applications are expected to reduce overall health costs for patients and providers. This is in line with research [22], where electronic health or e-health is defined as the use of information and communication technology that is cost-effective and safe to support various things in the health sector. In the long run, health apps can reduce overall health costs for patients and providers as more and more people seek preventive care to stay healthy.

Information about color integration in the e-patient development application is obtained based on the interview results. From this, it is known that the color selection and color gradation are good enough. The color selection is

subtle and does not hurt the eyes, and from the aspect of ease of navigation, it is already good enough. This is in line with research conducted by Permatasari and Jayadi, which stated that color composition in smartphone applications could affect the psychological state of users. Moreover, technological developments in smartphones significantly affect the outcome of color in smartphone applications [23].

The results of research conducted by Ghiffary et al. provide recommendations that orange is easier to use for mobile applications because the contrast is not too high with other color combinations. Besides, for user interface controls, controls with icons and explanatory text are easier to use since users can focus on icons for navigation and text as explainers of the icon function [19].

### 3.4. E-Patient Development in Terms of Balance

Questions regarding the balance aspect are essential for gaining an overview in designing the development of e-patients by looking at button placement, display size, font size, and writing layout. The display of the doctor's image is too large and should be simplified. The letter size is appropriate. The writing layout takes up much space, so it should be simplified by removing the doctor's Medical License number. The writing layout balance must be improved on the right side of the writing (right alignment). For photos, it is better to attach a photo of a doctor wearing a doctor's coat and a name tag.

Elements of design balance include shape, texture, value, size, and color. In a design, balance is made so that people can comfortably see it. Design is a system that applies to all types of plans where the point of concern is to see all problems not separately or separately but as a unity where one problem with another is interrelated [24].

### 3.5. E-Patient Development in Terms of Form

This study found that the online registration method for developing e-patients can be done through WhatsApp Bot/Chat Bot. WhatsApp Bot is one solution to establish e-patients in terms of simplicity and ease of registration at West Sulawesi Regional General Hospital. In line with the research conducted by Rosadi et al., the results of system testing concluded that the clinic queue system created could help Dr. Taufik Nopransyah manage the clinic queue process with a queue time that can be shortened than the manual queue system [25]. The potential for obstacles in implementing WhatsApp Bot is only on an unstable network. An unstable network will slow down the transmission of data and the response back from SIMRS. This can be anticipated by setting up a backup provider, and the West Sulawesi Regional General Hospital currently has two internet network service providers, namely Icon and Telkom.

Data ownership and privacy became common issues whenever data storage and data exchange over a computer network was planned [26]. The use of middleware is highly

needed to keep the data security of WhatsApp to SIMRS. Maintaining the security of this data is very important to prevent serious threats to patient data misuse, public health security, or even national security [27], [28].

Whatsapp Bot also helps clinical professionals detect early warning signals of critically ill patients in the inpatient ward before they experience increasingly severe clinical conditions [29]. In line with research conducted by Falah and Syamsidar, it is known that using chatbot applications effectively increases respondents' satisfaction in accessing health information from public health centers [30].

## 4. Conclusions

The implication of this finding is a reduction in waiting time at outpatient clinics in internal medicine and surgical polyclinics. The e-patient application needs to be developed by improving the quality of the application's display/appearance and shape. The most important thing is that chat services enable interaction with doctors. The development of e-patients has been made simple so that it is easily understood and accessed by society strata from various educational backgrounds. The e-patient application needs to be well developed and consider patients' needs, such as doctor's practice schedule, simplicity of display, and easy patient access. Besides, it should also provide space for patients to give advice and staff complaints to the hospital. Further research is expected to quantitatively evaluate the use of e-patients with a larger number of samples in order to gain a comprehension of the feasibility, usefulness, and effectiveness of utilizing e-patients in hospitals.

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## Ethical Approval

This study received approval from the University of Hasanuddin Indonesia Public Health Research Ethics Committee (NO: 15592/UN4.14.1/TP.01.02/2022). All patients provided written informed consent prior to enrollment in the study.

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