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Intervention Effect Between Smartphone and the Knowledge in Chronic Obstructive Pulmonary Disease Patients at Prof Chairuddin Panusunan Lubis General Hospital

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ABSTRACT

Background: Health applications can assist in managing chronic patients such as Chronic Obstructive Pulmonary Disease (COPD). A smartphone application "Paru Sehat" is expected to help COPD patients increase their knowledge about the disease and its treatment. **Objective:** This study aims to examine the benefits of smartphone applications "Paru Sehat" on the level of knowledge of patients with the COPD about the disease and its treatment. **Methods:** A quasi-experimental studies were conducted in outpatient of stable COPD patients at Pulmonology and Respiratory Medicine Universitas Sumatera Utara Hospital. This research was conducted from March to June 2022. A questionnaire which elaborated question about COPD and its treatment were used to evaluate the level of knowledge of participants before and after 3 months of using smartphone application "Paru Sehat". **Results:** From a sample of 38 COPD patients, the average knowledge level of COPD patients before using the "Paru Sehat" application as 5.125; after using the smartphone application, it was 8.5625. The hypothesis test shows that the value of p = 0.000, indicating an increase in the level of knowledge about COPD and its treatment. Out of 38 patients, all research subjects were male with the most age being 60 to 70 years old, having a history of heavy smoking and the highest level of severity of COPD 2. **Conclusion:** "Paru Sehat" application can influence the knowledge of COPD patients about their illness and treatment as well as the patient's independence in dealing with their illness.
Keyword: COPD, level of patient knowledge, smarthphone application

ABSTRAK

Latar Belakang: Aplikasi kesehatan dapat membantu dalam menangani pasien kronis seperti Penyakit Paru Obstruktif Kronik (PPOK). Aplikasi smartphone "Paru Sehat" diharapkan dapat membantu pasien PPOK meningkatkan pengetahuannya tentang penyakit dan pengobatannya. **Tujuan:** Penelitian ini bertujuan untuk menilai manfaat dari aplikasi *smartphone* "Paru Sehat" untuk tingkat pengetahuan pasien PPOK mengenai penyakit dan pengobatannya. **Metode:** Penelitian quasi eksperimental dilakukan pada pasien PPOK stabil rawat jalan di Pulmonologi dan Kedokteran Respirasi Rumah Sakit Universitas Sumatera Utara. Penelitian ini dilakukan antara bulan Maret 2022 hingga Juni 2022. Kuesioner yang berisi pertanyaan tentang PPOK dan pengobatannya digunakan untuk mengevaluasi tingkat pengetahuan peserta sebelum dan sesudah 3 bulan menggunakan aplikasi smartphone "Paru Sehat". **Hasil:** Dari sampel 38 pasien PPOK, rata-rata tingkat pengetahuan pasien PPOK sebelum menggunakan aplikasi smartphone "Paru Sehat" adalah 5,125; setelah menggunakan aplikasi smartphone

menjadi 8.5625. Uji hipotesis menunjukkan nilai p = 0,000 yang menunjukkan adanya peningkatan tingkat pengetahuan tentang PPOK dan pengobatannya. Dari 38 pasien, seluruh subjek penelitian berjenis kelamin laki-laki dengan usia terbanyak yaitu 60 hingga 70 tahun, memiliki riwayat perokok berat dan tingkat keparahan PPOK 2 tertinggi (GOLD 2). **Kesimpulan**: Aplikasi "Paru Sehat" dapat mempengaruhi pengetahuan pasien PPOK tentang penyakitnya dan pengobatannya serta kemandirian pasien dalam menghadapi penyakitnya.
Kata Kunci: Aplikasi smartphone, PPOK, tingkat pengetahuan pasien

1. Introduction

Several studies show that a lack of knowledge about the disease causes patients to be non-compliant with treatment, depression, and reduced resistance to stress. Thus, it requires sufficient knowledge about the disease to change this behavior. Along with the development of technology, the role of technology is very useful, especially in health aspect. Various health applications have been made by medical personnel that aims to improve the management of therapy with various focuses on attention, such as for disease diagnosis, medication adherence, education on how to use inhalers, physical exercise and so on. In this digital era, smartphone applications are increasingly facilitated with various features, including health applications to assist the management of chronic patients such as Chronic Obstructive Pulmonary Disease. The application is expected to help patients increase their knowledge about COPD disease and treatment. Along with technology development, technology plays important roles in the health sector. For example, Sihombing O. et al. developed a web-based expert system application called the certainty factor for diagnosing lung disease. This application is able to analyze the disease experienced by the user based on the symptoms inputted by the user. Furthermore, this expert system can be a consideration for diagnosing pulmonary disease by the user and facilitate experts in treating the disease.[1]

Meanwhile, an Android application called "Ngobat" helps patients adhere to treatment regimens. This solves the problem related to the factors affecting the lack of adherence to treatment regimens.[2] Lee et al. (2018) conducted a systemic review of strategies for providing effective behavioral interventions using health applications for chronic disease management. It was reported that chronic disease management was promising in improving self-management and health status.[3] Various publications shows current health applications, Winiski et al. studied the quality and completeness of the highest-rated application. They suggested that it was necessary to evaluate the use of the application to make it better.[4]

A systematic review by Mosa et al. found such as 83 health applications for smartphones, including 57 healthcare apps, 21 disease diagnoses apps, six drug references apps, eight medical calculator apps, six literature search apps, three clinical communication apps, four hospital information systems apps, two medical training apps, seven general health care apps, 11 apps for medical or nursing students, and 15 apps for patients on chronic disease management. Some applications are considered useful for health services and medical or nursing students, including health applications that offer health diagnoses, drug references, and medical calculator applications. Furthermore, they concluded that smartphone use focusing on health services and medical applications is more frequent in treatment and as an easy clinical communication tool. In addition, smartphones have become educational tools and control for the patient disease.[5]

Health applications can help assume rules actively in managing their health in collaboration with health professionals. In addition, mobile health application facilitates the relationship between patients and service providers in a positive and centralized health service. In practice, the implications of using electronics can help patients in terms of self-management, accessing healthcare facilities, and improving health service relationships, both outpatient and inpatient.[6] Smartphone applications which can be obtained from the internet network in digital era are easier. From the aforementioned problems, researchers have created health applications that can be used to improve the management of patients with chronic lung disease, such as Chronic Obstructive Pulmonary Disease (COPD).

This study aims to examine the benefits of smartphone applications "Paru Sehat" on the level of knowledge of patients with the chronic obstructive pulmonary disease about the disease and its treatment.

2. Method

This research uses a quasi-experimental study that aims to assess the effectiveness of an Android application called the "Paru Sehat". This research was carried out for three months, starting from March 2022 to June 2022, at Pulmonology and Respiratory Medicine Universitas Sumatera Utara Hospital The sample for this

study was determined using a non-probability sampling technique with consecutive sampling types of samples that met the inclusion and exclusion criteria. Patients were asked to fill out a questionnaire before and after using the application for three months.

The inclusion criteria and exclusion criteria in this study are patient diagnosed with stable COPD (GOLD I to IV), aged 40 to 80 years old, treated based on COPD group from the outpatient polyclinic, able to operate Android smartphone applications, patients who are willing to become participants and signed an informed consent.

The exclusion criteria are COPD patients who are participating in pulmonary rehabilitation program, COPD patients with malignancy, COPD patients with cognitive impairment, COPD patients on long-term oxygen therapy.

An application which called as "Paru Sehat" has been developed which has become part of the health promotion facility in the Department of Pulmonology & Respiratory Medicine, Faculty of Medicine, Universitas Sumatera Utara which can be downloaded via PlayStore and can be utilized by patients with chronic lung disease in Indonesia or anywhere but who are able using Indonesian language, because there is no English version yet. This application aims to monitor patients who have been diagnosed with COPD, provide education, as a treatment reminder and self-management (Figure 1).

Figure 1. First page of "Paru Sehat" Application

Information and Educational Videos at a Glance were divided into 3 sections including pulmonary disease Asthma, COPD, and Post-TB. Each section has information related to the disease and an educational video that briefly explains the disease (Figure 2).

Figure 2. Overview Page of Information and Educational Video

This application was also provided community menu which expected to increase the enthusiasm of community about reminding each other to stay healthy every day. Various menu were provided including information, programs, and documentation of the Paru Sehat Community. A call center / WhatsApp group service were also available in Community menu (Figure 3).

Figure 3. Overview of Community Menu

3. Result

From a sample of 38 COPD patients, all research subjects are male, mostly aged 61-70 years (55.3%), unemployed and self-employed, categorized as having the same employment status (26.3% and 26.3%), co-morbid hypertension (52.6%), smoking history with severe IB degree (81.6%), and severity of GOLD 2 (44.7%). The results of the hypothesis test show that the value of p = 0.000, indicating the increase in the level of knowledge about COPD and its treatment (Table 1).

Table 1. Distribution of Frequency and Percentage of Research Subjects

Characteristic		**Total**	**Percentage (%)**
Age (Years)	51-60	5	13.2%
	61-70	21	55.3%
	71-80	12	31.6%
Gender	Male	38	100%

	Female	0	0%
Occupation	Unemployed	10	26.3%
	Self-employed	10	26.3%
	Seller	1	2.6%
	Retired Civil Servant	6	15.8%
	Farmer	4	10.5%
	Civil Servant	3	7.9%
	Retired Army	1	2.6%
	Engineer	1	2.6%
	Construction labor	1	2.6%
	Retired Police	1	2.6%
Comorbidity	None	8	21.1%
	Hypertension	20	52.6%
	Pulmonary TB	10	26.3%
	DM type II	3	7.9%
	Hepatitis C	1	2.6%
	Hyperuricemia	1	2.6%
	CHF	1	2.6%
Smoking Degree	IB Lite	2	5.3%
	IB Moderate	5	13.2%
	IB Severe	31	81.6%
COPD Group	Group A	6	15.8%
	Group B	22	57.9%
	Group C	0	0%
	Group D	10	26.3%
Obstruction Degree	GOLD 1	0	0%
	GOLD 2	17	44.7%
	GOLD 3	10	26.3%
	GOLD 4	11	28.9%

Table 2. Changes in Knowdledge Level Before and After Using a Smartphone

	Mean +SD	**P**
Before Using App	5.125	-4.424
After Using App	8.5625	0.000

From a sample of 38 COPD patients, the average knowledge level of COPD patients before using the smartphone application was 5.125, while after using the smartphone application was 8.5625. Furthermore, the results of the hypothesis test show that the value of p = 0.000, indicating an increase in the level of knowledge about COPD and its treatment.

4. Discussion

Currently, fast-paced technological advances could increase the possibility to monitor COPD through telemedicine. Some technologies, such as the development of smartphone applications could improve the medication adherence, have been proven to increase medication adherence rates. In addition, this application allows teleconsultation with nurses using video calls to follow-up treatment and training in self-management in patients with COPD. In this study, communication between patients and health workers was carried out through the WhatsApp group and this application also included a WhatsApp number for information or as a call center.

Health application was cost-effective in treating COPD patient rehabilitation since it could increase exercise performance, reduce dyspnea, reduce exacerbations, and improve health-related quality of life. Moreover, pulmonary rehabilitation is the initial management of acute exacerbations. Research in Saudi Arabia determined the eligibility and compliance rate of COPD patients was 57%. However, some obstacles emerged, such as transportation, trained health professionals for pulmonary rehabilitation services, and difficulty reaching the hospital from home.[7]

In “Paru Sehat” application, sports videos were provided and how to use the inhaler correctly so that patients can get information easier. Kooperschoek et al. studied the perceptions of COPD patients and their health workers regarding using the mHealth application for self-therapy in dealing with exacerbations. The results show that patients and health workers almost got the same benefits and challenges in treating exacerbations independently.[8]

In this study, the benefits of education for patients were obtained so that the workload of health workers to improve patient self-management could be decreased. Moreover, Fen Yang et al. stated that mobile applications could reduce the risk of hospitalization for COPD patients since mobile applications can improve patients’ self-management abilities in dealing with COPD exacerbations.[9]

Koopershoek et al. tested the application on six COPD patients. The COPD app consists of an 8-week program including pulmonary exacerbation, education, treatment overview, video consultation, and questionnaire (monitored by a nurse). Patient satisfaction was assessed using a questionnaire after 8 weeks at baseline and 20 weeks at end. Mobile applications were assessed using questionnaire data and acceptance rates from the electronic medical record. After leaving the hospital, COPD patients were given weekly questions that appeared on the mobile application. The survey results show that patients were satisfied with the service. Moreover, the use of mobile applications decreased over time as knowledge and lifestyles changed significantly over time. Therefore, future research on digital self-management interventions in clinical practice should focus on more difficult target population subgroups, multidisciplinary approaches, and technology-related aspects.[10]

This study was conducted for three months. A baseline was examined in the first month and followed up in the second and third months. This is in line with Din et al., who carried out a protocol evaluating the use of COPD patient management applications in Briton, Australia, where all patients underwent baseline examination at three and six months.[11]

Meanwhile, Claire et al. said that many patients dropped out during the study because many patients did not understand how to use the application. In our study, no patients were discharged, and we met them every two weeks to give them some eggs. In addition, we helped guide patients and their families in using the mobile health application within the WA Group. In addition, several research members were also in the WA Group. This study shows limitations, including a small sample of 38 patients and a short research time.[12] Compared to Hong et al., they had one year study, showing a higher level of change in patient knowledge.[13]

It is suggested that the developer of a mobile application needs to consider the initial design of an integrated system to increase understanding and help carry out self-management at home. Drishthy et al. suggested observing other mobile health applications for considerations in making the application which is better and easier to use by COPD patients in self-management at home.[14]

Many applications are available, but the purposes of use are different, including for sports, detecting exacerbations, and education, depending on the research designer. However, applications can be further developed from the initial purposes, such as sports applications can be developed into education apps or even to detect exacerbations. This requires hard work with the programmer, which requires much cost, so the more benefits, the greater the cost. If more specific data is needed, the symptoms felt by the patient per day can be recorded through the application. Hermosa et al. made an application that directs COPD patients to daily input symptoms felt in the application so that they can detect patient exacerbations.[15][16]

Moreover, Sönnerfors et al. stated that Swedish people had used health applications, with around 81% using smartphones and > 90% using the Internet. Meanwhile, only 23% of Indonesian people use health applications.[17]

Smartphone applications play important roles in the health sector. Wang et al. in China stated that, even though the smartphone application tested was still limited in providing information and content, COPD patients found the health application was very useful for extending the hand of COPD patients in terms of long-term therapy in patient self-management.[18]

5. Conclusion

From the study results, it can be concluded that the patients' education level had a major influence on getting better results in supporting patient independence in dealing with COPD relapses and assisting in using the application. [19] It can be concluded that health applications can be used to assist/improve in management of chronic lung disease. The health application "Paru Sehat" can increase the knowledge of COPD patients about the disease and its treatment as well as the patient's independence in dealing with the disease.

We suggested that upcoming studies will be carried out in different settings, different communities, and different conditions of health facilities so that the more diverse problems could be captured and also could improve the "Paru Sehat" application in the future as a means of education for COPD patients.

6. Recommendations

Recommendations for further research, screen time and the frequency an using the application will be data (for upgrades and better awareness.

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