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Medical Record System for Pregnancy Antenatal Care

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1. **Abstract**: Nowadays, medical aspects seem to become more important in human being life as all types of ages, but the process of managing the medical record is longer in terms of time taken for an appointment. Therefore, this project aims to develop the medical record system for pregnancy antenatal care, which helps in reducing the time process of managing the medical record in the government health clinics. The images of the medical record are captured using the camera mobile phone, upload, retrieve, display and delete in the developed an application that is also connected to the database platform to store the images uploaded. The performance of the proposed method is evaluated through recording time taken to complete whole process in application. The proposed method provides excellent results, as the time taken for completing the whole process in the application did not exceed nine minutes. The result shows that the proposed method may have a potential contribution to overcome the problems in managing the medical record for pregnancy antenatal care in government health clinics and in order to increase the performance of the system, the real testing of application should be conducted on the health clinic staff to collect the real-time process using the developed system.

Keywords: Medical Record, Antenatal Care, Government Health Clinics

1. Introduction

Medical is defined as something related to science or practice in medicine and is also one of the important aspects of human being life [1]. Record system is known as an information storage system that is an authoritative data source for a piece of information [2]. Pregnancy is defined as the condition or state of carrying a developing embryo or fetus in the female's gender body [3]. Antenatal care is the (i) routine health control of presumed healthy pregnant women without symptoms, (ii) to diagnose diseases or to complicate obstetric conditions without symptoms, and (iii) to provide information about lifestyle, pregnancy and delivery [4].

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1.1 Problem statement

The hospital usually makes two sets of record basically for the use of the hospital and one more copy for being kept by the patients (mother) [5]. Making two sets of record manually causes increasing processing time of recording the data of the patients on both cards.

1.2 Aim, objectives and project contribution

The aim of this project is to develop the medical record system for pregnancy antenatal care which helps in reducing the processing times managing the medical record in the health clinics. The objectives of this project are; (i) to develop a database for pregnancy antenatal care record, (ii) to develop a medical record system for pregnancy antenatal care and (iii) to evaluate the performance of the developed system. The system created is hoped to help in terms of reducing the processing time of managing the medical record.

2. Materials and Methods

2.1 Techniques for hardware and software

iPhone camera been chosen to obtain the test image of medical record card samples as the Apple's AppStore for iOs been chosen as the mobile distribution platform. Next, saving and storing the recorded image will be done by two difference database which are the Thunkable and Cloudinary as the Thunkable will store the information of the registered patient and the information date of the image as well as link of the image that been generated by Cloudinary. The Cloudinary will also store the image uploaded. Lastly, uploading, displaying and retrieving the patient record will be completed by using the Thunkable software. All the interface starts from the staff Log-In until the interface for the uploaded the image created by the Thunkable.

2.2 Methods

By referring to the flowchart in Figure 1, the medical record system data entry, retrieval and modification process could be divided into nine parts that consist of Part 1: Staff Login; Part 2: Open patient record; Part 3: Select the parts or section for Uploading Image; Part 4: Handwritten record image acquisition; Part 5: Upload record image to the application; Part 6: Stored image to the individual patient record in the database; Part 7: Display patient record Part 8: Retrieve image in the application (delete/edit/save); Part 9: Staff Logout. Thunkable will play the whole part of the role while Firebase will play its role in Part 2, Part 6, and Part 8. Lastly, as shown in Figure 1, the Cloudinary will involve in Part 6 only.

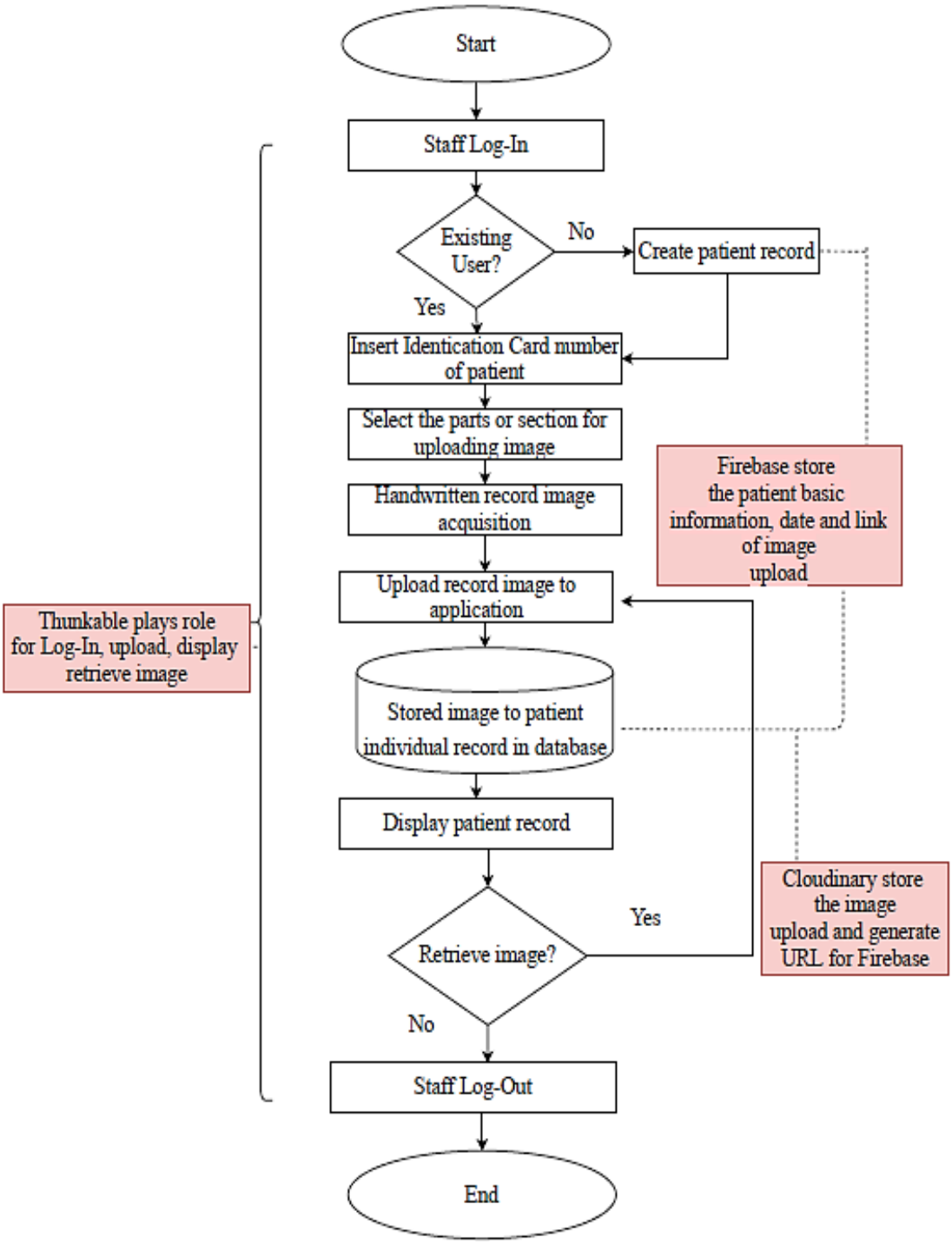

Figure 1: The overall flowchart of the process of medical record system data entry, retrieval and modification

3. Results and Discussion

3.1 Results

Five times testing has been conducted. The tests start with testing and recording the processing times of the system to complete the staff Log-In process and enter the patient process's identity card number. Table 1 shows the result of the processing time and the average process time for the system to complete the staff Log-In process and enter the identity card number of the patient process.

Table 1: The processing times for staff log-in and entering the patient identification card number

Number of Test	Time taken for staff Log-In (*TLI* = Time Taken Log-In) (sec)	Time taken for entering patient Identification Card number (*TIC* = Time Taken IC) (sec)	Total time ($TLI + TIC$) (sec)	Average time ($\frac{TLI+TLC}{2}$) (sec)
1	3.00	2.79	5.79	2.90
2	2.87	2.17	5.04	2.52
3	1.81	1.11	2.92	1.46
4	3.09	3.23	6.32	3.16
5	2.07	1.76	3.83	1.91

The result shows that the longest average time taken for the processing times of system to complete the staff Log-In process and entering the identity card number of the patient process is 3.16 seconds, and the shortest one is 1.46 seconds. This shows that this application is effective in completing the two earliest processes of using the application as the time taken for both processes is not quite long.

Next, the test continues by uploading the five different images record into the application. The time process for the images to be uploaded, deleted, and retrieved has been recorded to observe the system's effectiveness. Table 2 shows the time process for uploading, deleting, and retrieve the five different images.

Table 2 shows that the longest time taken for a total of these three processes is 150.70 seconds, with an average total of 50.23 seconds, while the shortest time taken is 84.70 seconds with an average total of 29.23 seconds. This data shows that completing the process of a photo is about the range of 2 minutes and 51 seconds to 1 minute and 41 seconds only. Next, for completing those three processes with five images, the total time taken is 8.89 minutes, with an average of 2.96 minutes. All of these data prove that this system can help the medical staff complete their second copy of medical records faster than the manual handwritten system. However, the time process of using this digital system, always totally influenced by the Wi-fi connection of the place.

Table 2: The processing times for uploading, deleting and retrieving the images in application

Number of Test	Record Name	Process Time for the image to be Upload *(PTU=Process Time Upload)* (sec)	Process Time to Delete the image (*PTD = Process Time Delete*) (sec)	Process Time to Retrieve image (*PTR = Process Time Retrieve*) (sec)	Total process time (*PTU+PTD+PTR*) (sec)	Total average of the process time ($\frac{PTU+PTD+PTR}{3}$)
1	Kemasukan ke Hospital	82.00	1.81	0.89	84.70	28.23
2	Perihal Kelahiran	85.00	1.79	0.91	87.70	29.23
3	Ujian Saringan Antenatal	148.00	1.82	0.88	150.70	50.23
4	Pemantauan Kawalan Glukosa dalam Darah	99.00	1.80	0.79	101.59	33.86
5	Prenatal Update: Add Record	106.00	1.78	0.89	108.67	36.33
					Total process time of five images = 533.36sec = 8.89 minutes	Total average process times of five images =177.88sec =2.96 minutes

3.2 Discussions

An independent sample T-test is used to compare the average time process for Log-In and the whole image process. Both of the average time previously recorded for both processes were inserted into the SPSS spreadsheet for the test. The result of the independent sample T-test is shown in Figure 2.

T-Test

Group Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
AT	Log-In	5	2.3900	.69917	.31268
	Image Process	5	35.5760	8.83867	3.95277

(a) T-test result (group statistics)

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AT	Equal variances assumed	5.104	.054	-8.369	8	.000	-33.18600	3.96512	-42.32959	-24.04241
	Equal variances not assumed			-8.369	4.050	.001	-33.18600	3.96512	-44.14149	-22.23051

(b) T-test (independent sample T-test)

Figure 2: The T-test result obtained by using SPSS for comparing the average time process for log-in and the whole image process

Based on the independent sample T-test result shows above, it can be clear proof that the average or the mean of process time for image process is higher than the processing time of the log-in as the value of mean time process for log-in is 2.39 seconds and mean of time for image process is 35.57 seconds. This is because the image process involves the connection of two different databases. In contrast, for the log-in process, it just involves a single type of database only, which is Firebase. Next, from the test result above, it shows that the null hypothesis stated that there is no difference between the mean time process of log-in and the time process of the images is rejected, as the *p*-value which equals 0 that been obtained is smaller than 0.05. The result above also shows that the test is statistically significant as the value for the lower and upper 95% confidence interval is not between the values of 0. In conclusion, it can be proved that the system developed works and functions well as the time process for log-in and image processes are different, and the difference between the time processes can be related to the connection of the database.

4. Conclusion

In conclusion, the digital medical record system for pregnancy antenatal care is successfully developed and have good performance. The database is successfully performed as planned. Some recommendations are listed in this section for further improvement of the project in the future. For future work, real testing of the application on the health clinic staff to collect the real-time process using the developed system will be conducted, due to the limitation of COVID-19 Movement Control Order during the project development.

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