Webology (ISSN: 1735-188X)
Volume 19, Number 2, 2022

Integration Of Patient Medical Record Data Between Health Centers

Harco Leslie Hendric Spits Warnars[1], Erwin Phanglius[2], Mahendra Dwisaputra[2], Rizki Dhermawan[2], Eric Stefanus Suwarno[2]

[1]Doctor of Computer Science, BINUS Graduate Program, Bina Nusantara University, Jakarta, Indonesia

[2]Information System Department, School of Information Systems, Bina Nusantara University, Jakarta, Indonesia 11480,

Abstract

We proposed a model platform that can unite all health centers in Jakarta to share data with the patient as it will benefit the patient, the health workers, and the government. When you are sick and come to the practicing doctor, you will get the same problems: queues. Besides that, you are faced with the same repeated questions such as the history of illness and drug allergy if you are a new patient, especially for the problem of queues, especially during the Covid19 pandemic, where people gathering is prohibited everyone must keep their distance. In this case, public health centers or healthcare centers, clinics, and sometimes recognized as community health centers or PUSKESMAS (Pusat Kesehatan Masyarakat) must unite to share patient care health information queues and patient handling. Besides this, it can protect the patients themselves in an emergency, and competition between health workers can run fairly and be more professional. The business process was designed using a Use case diagram, while the database model was designed using a class diagram.

Keywords Health information systems; sharing public health data; Healthcare information systems.

INTRODUCTION

In rational thinking, all humans want to live healthily. Health is the capital to work and live to develop offspring. As technology progresses, we must use as much technology as possible so that the problems faced can be adequately resolved. This system will become beneficial for both patients and the hospital. The system will integrate all the patient's data to be easily transferred from hospital to hospital. It can help the patients if they want to move from one hospital to another. We adopt this technology to improve the capability side of the hospitals.

The low quality of hospital health services motivates us to make this system. The desire to be healthier is manifested in the behavior of seeking medical help. Health conditions by medical workers must receive medical treatment for every patient. Hospital services fulfill the needs of service users who expect healing and recovery from their illness. This service focuses on patient satisfaction in data collection of the patients' data to be more accessible in all hospitals.

It is rather challenging to find data on the number of public health centers, clinics, and doctors' practices in Jakarta, and several sources may also be questioned. For example, there are 404 main clinics in 2020 taken from https://data.jakarta.go.id/dataset/daftar-klinik-main-di-dki-jakarta-years-2020 / resource / 1be0bb37-271c-41ce-bb1b-f9874530a420 . According to the association of clinics and health facilities in Indonesia, a system is needed that can unify all patient health data. There are various problems in the Health Effort subsystem regarding clinics and primary health care facilities, including there are various clinical terms: medical centers, maternity homes, inpatient clinics Basic Medical Services, Department Clinics & Company & Workplace Clinics, Specialist Clinics, Family Doctor Clinics, Social Security Clinics, Aesthetic Clinics, Alternative Complementary Medicine Clinics, TNI-POLRI Clinics, Dental Clinics, Joint Specialist Practices; and the use of the term Clinic for activities not in the form of medical health services, such as Tire Clinic, Jeans Clinic, Accu Clinic, Mobile Clinic, Male Specialist Indian Clinic, TORCH Shaman Clinic, TCM Clinic, Alternative Stroke Clinic, Massage Clinic, Love Clinic, Jeng Clinic. Ana, and so on.

In accordance with Presidential Regulation Of The Republic Of Indonesia Number 72 the Year 2012 Concerning National Health Systems is the embryo of regulations that strengthen the national health system through the Health Social Security Administering Body or recognized as BPJS (Badan Penyelenggara Jaminan Sosial Kesehatan), which regulates public health insurance with affordable contributions in all economic levels. However, BPJS, with its various problems, is faced with bills from hospitals that are continuously increasing every year, and often the government is in arrears for BPJS bills to hospitals or clinics. This is partly due to the absence of sharing of patient data among public health provider institutions and the need for regulations that can cover this, which in turn will help the government in reducing the increasing BPJS bill, making it easier for Public Health providers and the community itself[1].

Regulation of the Minister of Health of the Republic of Indonesia Number 269 / Menkes / Per / Iii / 2008 concerning Medical Records has not regulated the unification of patient medical record data throughout Indonesia and instead this regulation inhibits sharing of patient data in Indonesia where in article 10 medical record information can be disclosed for the benefit of patients and with the patient's consent. However, in article 13, medical records can be used without the patient's consent for educational and research purposes[2].

Furthermore, the Regulation of the Minister of Health of the Republic of Indonesia Number 36 of 2012 concerning Medical Secrets, where all parties involved in medical services and/or using data and information about patients must keep medical secrets. However, the disclosure of medical secrets can be done with the patient's consent, or his immediate family or guardian can give it while the patient is incapable of giving consent[3].

Based on these government regulatory data, the Indonesian government must create a legal umbrella that can create a national health database where patient health data are guaranteed by law and used entirely to benefit the patient and the community. Misuse the use of patient data for inappropriate purposes, and in the context of fraud, a law is given as severely as possible to educate the public that the national public health data is held for the benefit of the community, nation, and state large.

Moreover, coupled with the current Covid-19 pandemic situation where patient handling can be carried out quickly and immediately by viewing previous disease data, it is easier for doctors to handle patients in emergency conditions. Furthermore, the condition of people with COVID-19 is exacerbated where several congenital diseases such as high blood pressure, diabetes, chronic respiratory disorders, cardiovascular disease, kidney disease, cancer, and others can worsen and increase exposure to COVID19.

Currently, there is a falsification of a covid19-free certificate needed for those who have to travel during this Covid19 period. So that the unification of patient medical record data can help the government monitor and differentiate between people affected by Covdi19 and free of Covid19 and it is hoped that the filling of these data can be carried out directly by designated official health workers and falsification of data will be punished as severely as negligence of abuse will result fatal and increases the spread of the Covid19 disease.

PREVIOUS AND CURRENT SIMILAR RESEARCH

High technology can be the primary key to solving many problems that humans cannot. The high technology brings the idea of processing data and gives the critical result for making well-made decisions. The system used with the right policy and the proper implementation can make doing something practical and more efficient[4]. One of implementing technology to provide good information is integrating the system. So the system is connected very well to each other. The integrated system will make the data flow better and more accurate. The integration system brings us the idea to solve every hospital's problems. With implementing the integrated system, the patient’s data can easily access hospital by hospital, so the accessibility for entering, leaving, or moving can be quickly done[5].

The integrated system can solve the problem of accessibility, capacity, capability, and affordability. The system can make the patient flow from hospital to hospital. With the system, the hospital's operation can be improved as well, and the patient with prioritizing will get treatment as soon as possible and can be handled with no more extended time[6]. The good for capability side is that the hospital can have a “stronger” to give treatment to their patient, such as if the one hospital cannot solve the patient’s diseases. They can move the patient to another hospital with a better capability to be well-handled because the system is integrated so various hospitals can access the patient's data.

The other functions are the system can provide the schedule of which hospital has the available doctor specialist (every hospital has its specialist). The system also can operate the hospital data and patient data so the patient with immediate care can be prioritized so the patient will no longer wait for the treatment[7]. Hospitals system integration means each hospital's data is synchronized and more structured, so every hospital does not have their data again of the patients. This method is intended to eliminate the manual process by replacing it with an automation process to improve health services. The system will provide us the benefit on the inner side and the outer side. The inner side, such as the data flow, will be more proper to prevent data issues, and the outer side is the operational process will be improved and more efficient.

This system information will record the information of all of the patients, doctors, and the hospital every time and everywhere so the information will be more accurate, and the data will continually be updated[8].

This system is intended to improve the quality of hospital services wherever they are because the quality of hospital services can support the quality of patient satisfaction[9]. The purpose of this system integration about the patient's data is to minimize the accessibility problem such as bad service of the hospital, and it is about to improve the quality, also the operational. The more accurate and updated data is the central part of this system.

The system will integrate the doctor's data to provide and handle the doctor's schedule, providing us with some capability to maintain the doctors. The goals of integrating doctors data are:

- The first one is that the doctor's schedule will be more structured.
- Easily connect with the doctor's specialist.
- The doctor's schedule can easily access in every hospital.
- The doctor's experience will be expanded, and the quality of the doctors will be improved.

This hospital system will connect data to the internet network and all hospitals. The hospitals are not his data anymore, but the whole hospitals will have the same data. The advantages can be felt inside and outside. The inside is the administration, the scheduled doctor, and the operation will be better. It can make the patient’s data more flexible from the outside because other hospitals can access it [10].

Every hospital has its way of controlling the operation and handling the doctor. This fact is to bring the challenge to apply the system process. Many hospitals do not have strong enough capability to implement it because they need to re-engineer the business process. So, this integrating system will be designed as suitable enough to fit their business process. Technology and information systems are experiencing very rapid development. Information systems at this time become very needed by an organization, company, and individual to get the ease, speed, and accuracy in processing and obtaining data and or information[11].

Hospitals have many experienced data and patient information, schedules, queues, medicines, and treatments. The problems about accessibility, capability, capacity, and affordability can be minimized, and operationalizing each hospital can be more efficient and effective[12]. These problems include the process of entering data and searching, primarily if the current hospital system has not used a computer, it will not be easy and will take a long time. The system will suit all hospitals with integrated and connected data, so the patients, doctors, and the hospitals will connect. The data of the patients and doctors will be saved in any database and will be distributed by DBMS.

The system will improve the satisfaction to a higher level of service from the data. From 31 respondents stated that the arrival of specialists to treat patients was classified as not on time. 6.5% were classified as dissatisfied with doctors, 32.3% were classified as dissatisfied, and 61.3% were classified as satisfied[13]. It can be concluded that the doctor who stated that the doctor arrived on time more stated that he was satisfied compared to the patient who stated that the doctor had arrived on time[14].

One indicator of patient satisfaction is the timeliness of doctors and queues that can be minimized. The study results showed that the delay in the doctor's arrival in the ministry affected the patients' satisfaction, but on the contrary, if the doctor arrived on time, it would increase the patient's satisfaction. Patient satisfaction with service quality affects loyalty in reusing hospital facilities[15]. Hospitals need to

establish good relationships with their patients to use their facilities because the services are good enough. Besides, that excellent service will also encourage patients to return to the hospital, and it is hoped that with this system, all patient and doctor data will be more structured and can be realized in such a way[16].

PROPOSED MODEL

Based on the explanation and understanding of previous studies, we created a model that will unify patient data for all residents of Jakarta. It is hoped that this data pooling can help the community and the government provide affordable and integrated health services. The proposed model was designed using Unified Modeling Language (UML) with the use case and class diagram where use case for promoting the business process for the proposed system while class diagram is designed for database model purposes.

Figure 1 shows the use case diagram of the proposed model where there are three actors: patient, doctor, and healthcenter. Before entering the system, the actor should do login first by entering their username or email, including the password where the system will do the authentication to check if the patient is a registered patient. A new patient should register by entering their data such as name, gender, Date of Birth, address, NIK (national ID number), phone number, email, and password. Meanwhile, the healthcenter and doctor should be registered in the systems as well, but in this case, it was registered in other systems.

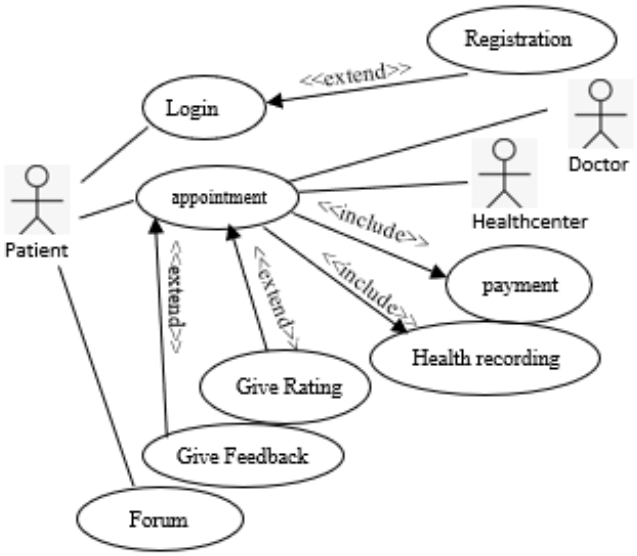
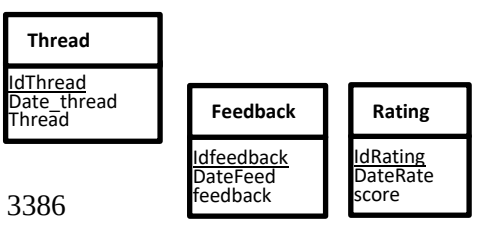


Fig. 1. Use case diagram of Integration of patient medical record data between health centers

When the patient sees the doctor, they need to make an appointment, as seen in the use case activity in figure 1, where they can choose the right healthcenter for them, including the doctor. In the appointment, the date and time for the appointment will be recorded as dealing between the patient and the doctor. After the patient sees the doctor on the appointed date and time, the doctor will save the patient's medical record and pay for the medical bills. After the consultation, the patient can give their rating and feedback for future services and recommend other patients looking for a good doctor and/or health center. Moreover, the forum will support the system as real communication among the patient, health center, and doctor.



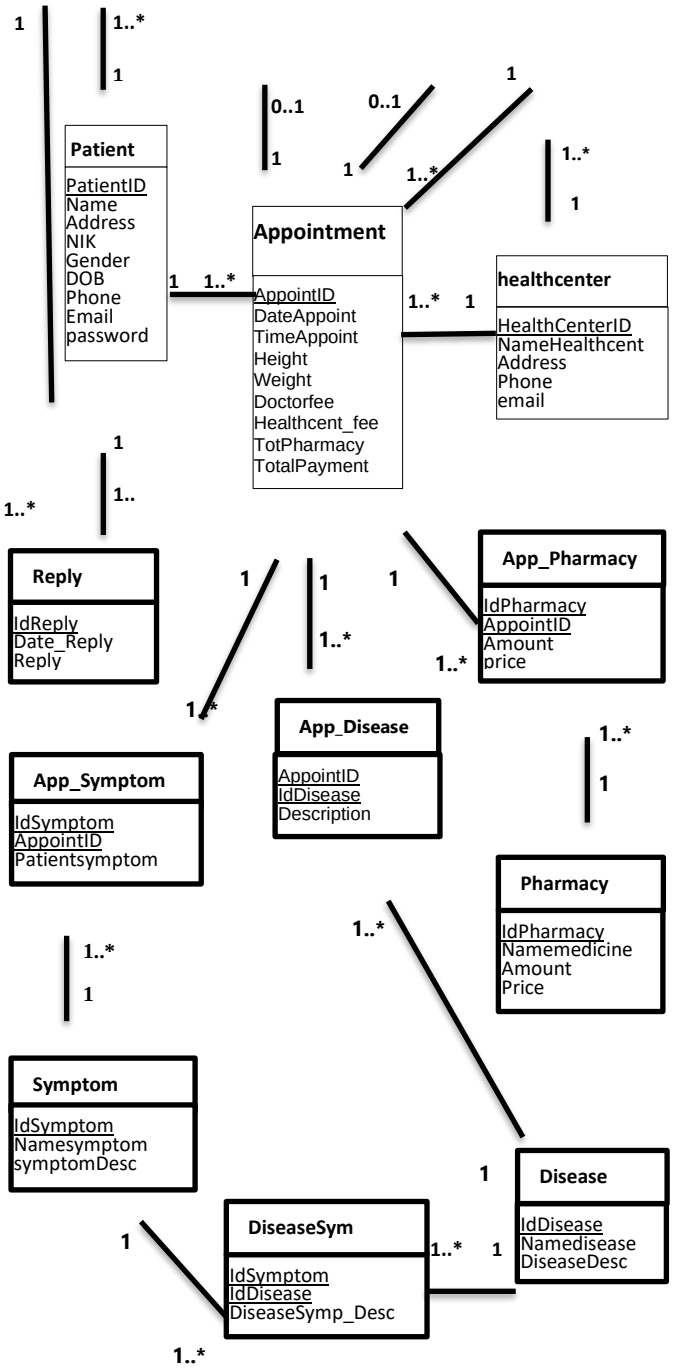


Fig. 2. Class diagram of Integration of patient medical record data between health centers

Figure 2 shows the class diagram model where there are 14 classes as 15 tables databases such as Patient, thread, reply, Appointment, Feedback, Rating, Doctor, Healthcenter, App_symptom, Symptom, App_Disease, App_pharmacy, Pharmacy, diseaseSym, and Disease. Six Classes such as patient, doctor, healthcenter, pharmacy, symptom, and disease are master tables which means that the records in the tables should be available first before the transaction, and other classes are transaction tables where the record content will be created in the transaction process.

As seen in figure 2, the underline attribute in each class is a primary key as a unique identification for each record. Some classes with double underline attributes, such as App_symptom, App_Pharmacy, and DiseaseSym, are recognized as composite or primary key content with two foreign keys. For example, class App_Symptom has composite key IdSymptom and AppointID, each as a foreign key. Meanwhile, foreign key as relation to other class wherein other class act as a primary key. For example, the foreign key AppointID in class App_Symptom is a primary key in class Appointment. Next, the detail for each class or table:

1. Class patient, this class or table contents with all the data belong to the patient when the patient does the registration to the system, and the data will include attributes such as name, address, NIK as Indonesian national citizen number or extension Nomor Induk Kependudukan in Bahasa. Moreover, the other attributes include gender, DOB (date of birth), phone, email, and password. This class has 1 to many associations to the class thread, which means that each patient can raise one or many threads in the forum. The class patient has 1 to many associations to class reply where which means that patient can give one or many replies from each thread in the forum. Lastly, the class patient has 1 to many associations to the class appointment, which means that patient can make 1 to many appointments to see a doctor.

2. Class Thread, this class with a class reply is used for the forum use case activity as seen in the use case diagram in figure 1. The class thread has attributes such as date_thread as the date when the forum thread is raised and the attribute thread that saved the comment. This class has relation many to one class patient where it means each one or many threads is raised by only one patient and primary key PatientID in the class patient will become foreign key in class Thread. Moreover, this class has a relation 1 to many with a class reply, which means that each thread can be replied to one or many replies, and the primary key Idthread will become a foreign key in class Reply.

3. Class Reply, this class with class thread is used for the forum use case activity and has attributes such as Date_reply as the date when the reply is raised. The attribute thread will be content with the patient's reply comment. Class reply has many to one associations to the class patient, which means that one or many replies are created from one patient, and primary key PatientID in the class patient will become foreign key in class Reply. Moreover, this class has many to one association with class thread which means one or many replies are for only one thread, and primary key Idthread will become foreign key in class Reply

4. Class Appointment, this class will record any appointment from a patient to have a consultation with the doctor in one specific healthcare place. The class appointment has attributes such as DateAppoint and TimeAppoint, which record the date and time when the appointment will be made. Moreover, attribute height and weight are used to record the patient's height and weight when seeing a doctor and will be assessed whenever making an appointment. Doctorfee attribute is a cost for a doctor's appointment, and the healthcent_fee is an attribute to save cost for the health care place, attribute TotPharmacy is total payment for all ordered pharmacies and attribute TotalPayment as total payment to three attributes such as Doctorfee, Healthcent_fee, and TotPharmacy. Class Appointment has a relation to the other eight classes such as patient, feedback, rating, doctor, healthcenter, App_pharmacy, App_symptom, and App_Disease. For classes such as patient, doctor, and healthcenter have relation

many to one association where each primary key in each class will move in this class become foreign key.

5. Meanwhile, classes such as feedback, rating, App_pharmacy, App_symptom, and App_disease have relation to many associations, and the primary key AppointID will move to each class as a foreign key. The class appointment has relation many to one with the class patient, which means one or many appointments can be created by only one patient and Primary key PatientID in class Patient will become foreign key in this class. Class Appointment has 1 to 0..1 to class feedback which means its appointment can have only one feedback or none, and primary key Idfeedback in class feedback will move to class appointment as a foreign key. Class Appointment has 1 to 0..1 to class rating, which means its appointment can have only one rating or none and primary key IdRating in class Rating will move to class appointment as a foreign key. Moreover, the class appointment has relation many to one with the class Doctor, which means only one doctor can handle one or many appointments, and Primary key DoktorID in class Doctor will become foreign key in this class. The class appointment has relation many to one with the class healthcenter, which means one or many appointments can be run in 1 healthcenter, and Primary key HealthcenterID in class healthcenter will become foreign key in this class.

6. Furthermore, class Appointment has 1 to many to class App_pharmacy, which means its appointment can have one or many bought pharmacy and primary key AppointID in class appointment move to class App_pharmacy and become foreign key. Class Appointment has 1 to many to class App_symptom, which means its appointment can have one or many symptoms and primary key AppointID in class appointment move to class App_symptom and become foreign key. The class appointment has relation one to many associations with the class App_Disease, which means each appointment can have 1 or many diseases, and the primary key AppointID will move to each class as a foreign key.

7. Class Feedback, a class that records the patient's feedback for each appointment transaction and attribute datefeedback, will record the date when the patient gives their feedback, and attribute feedback is the patient's feedback comment. Class feedback has 0..1 to 1 relation to the class appointment, which means each patient's feedback or none for one transaction in the class appointment, and primary key Idfeedback in class feedback will move to class appointment as the foreign key.

8. Class Rating, a class that records the patient's rating for each appointment transaction and attribute DateRate, will record the date when the patient gives their rating, and attribute score is the patient's rating score. Class Rating has 0..1 to 1 relation to the class appointment, which means each patient's rating or none for one transaction in the class appointment, and primary key IdRating in class Rating will move to class appointment as the foreign key.

9. Class Doctor is a class like the master table content with any doctor information similar to a class patient. This class has attributes such as name, address, NIK, Indonesian national citizen number, gender, Date of Birth, phone, email, and password. This class has relation 1 to many associations with the class appointment, which means that each doctor can handle 1 or many appointments, and primary key DoktorID will move to class appointment as the foreign key. Meanwhile, the class doctor has a relation many to one association with class healthcenter, which means each doctor should belong to

healthcenter and primary key healthcenterID in class healthcenter will move to the class doctor as the foreign key.

10. Class Healthcenter, a class that likes the master table, contains attributes like namehealthcent, address, phone, and email. This class has relation 1 to many associations to a class appointment, which means that each health center can handle 1 or many appointments, and primary key HealthCenterID will move to class appointment as the foreign key. Meanwhile, the class healthcenter has a relation to one to many associations with class Doctors which means each health center can have one to many doctors, and primary key healthcenterID will move to the class doctor as the foreign key.

11. Class App_symptom is a class that records patients' symptoms related to the class symptom, and this class has relation many to one association to the class appointment, which means each symptom belongs to one appointment and primary key AppointID in class appointment will move here as a foreign key. Meanwhile, this class has a relation many to one association to the class symptom, which means each symptom comes from a class symptom as a master table database, and primary key IdSymptom in class symptom will move here as the foreign key. Both foreign keys, AppointID and IdSymptom, are primary keys recognized as composite keys.

12. Class Symptom is the master table that records any symptom used when treating each patient's appointment. This class has attributes such as Namesympton and symptomDesc, which record the name of the symptom and the detail. This class relates one to many associations to class App_Symptom, which means each symptom can be applied to one or many patients' appointments. This class also has relation to many associations to class DiseaseSym, which means each symptom can be applied to one or many diseases. The relation to many associations makes the primary key IdSymptom move to classes App_Symptom and DiseaseSym as the foreign key.

13. Class App_pharmacy, a class that records the patient's medicine related to class pharmacy. This class has attributes such as amount and price that record the amount of medicine for a patient's appointment and the price of the medicine. This class has relation many to one association to the class appointment, which means each assigned medicine belongs to one appointment and primary key AppointID in class appointment will move here as a foreign key. Meanwhile, this class has a relation many to one association to the class pharmacy, which means each assigned medicine comes from a class pharmacy as a master table database, and primary key IdPharmacy in class pharmacy moved here as the foreign key. Both foreign keys AppointID and IdPharmacy, are primary keys recognized as composite key.

14. Class Pharmacy is the master table that records any medicine used when treating each patient's appointment. This class has attributes such as Namemedicine, amount, and price, which record the name of the medicine, the unit, and the medicine's price. This class has relation one to many associations to class App_Pharmacy, which means each medicine can be applied to one or many patient's appointments, and the primary key IdPharmacy move to class App_Pharmacy as the foreign key.

15. Class Diseasesym is a class that records the symptoms for each disease, and this class has the attribute DiseaseSymp_Desc which records the information regarding the symptom of the disease. This class has a relation many to one association to the class symptom, which means each designed symptom

of disease belongs to one symptom and primary key IDSymptom in class Symptom moved here as a foreign key. Meanwhile, this class also has a relation many to one association to the class Disease, which means each designed disease symptom comes from a class Disease as a master table database, and primary key IdDisease in class Disease moved here as the foreign key. Both foreign keys IdSymptom and IdDisease as primary key are recognized as composite keys.

16. Class App_Disease, is a class that records the patient's diseases related to class Disease and this class has attributes description which records the information regarding diagnosed diseases. This class has relation many to one association to the class appointment, which means each diagnosed disease belongs to one appointment and primary key AppointID in class appointment will move here as a foreign key. Meanwhile, this class also has a relation many to one association to the class Disease, which means each diagnosed disease comes from a class Disease as a master table database, and primary key IdDisease in class Disease moved here as the foreign key. Both foreign keys AppointID and IdDisease as primary key recognized as composite keys.

17. Class Disease is the master table that records any diseases diagnosed when treating each patient's appointment. This class has attributes such as Namedisease and diseaseDesc, which record the name of the disease and the detail of the disease. This class has relation one to many associations to class App_Disease, which means each disease can be diagnosed to one or many patient's appointments. This class also has relation one to many associations to class DiseaseSym, which means each disease can be applied to one or many symptoms. The relation one to many associations makes the primary key IdDisese move to classes App_Disease and DiseaseSym as the foreign key.

Figure 3 shows the registration menu, which is the view communication between the user and the systems, and in this registration menu, the user should enter their data such as name, address, NIK as national identification, date of birth, phone, email, and password. The data that should enter relates to the class user data on the class diagram in figure 2. Moreover, figure 4 shows the medical history menu, where health workers such as doctors and nurses can see the patient's medical history. There are a few attributes that are in the medical history class. The data is needed to know the medical history, such as the disease that happens, the medication consumed, and the transfer from where the patient was before.

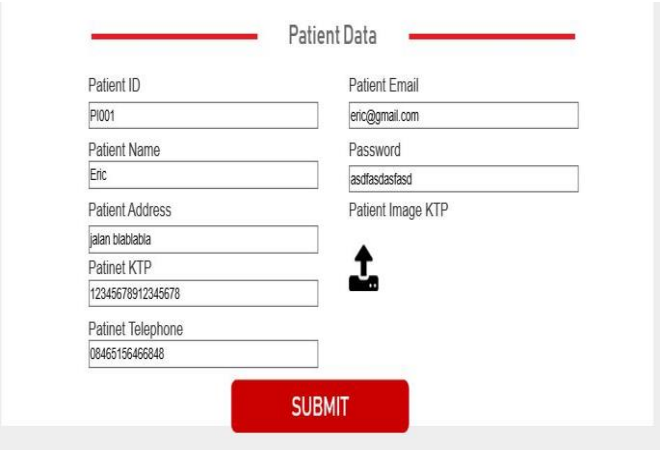
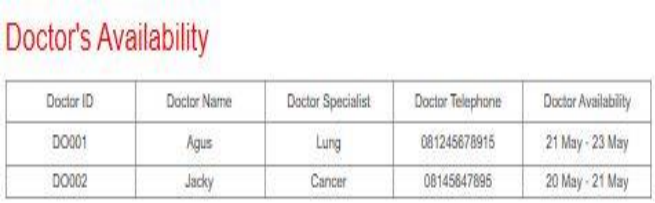


Fig. 3. Registration patient menu

Medical History ----------

Medical History ID	History Diseases	Medical Provider	Medications
ME001	Breast Cancer, Lounge problems	Husada	Hormon Stimulation
ME002	Tyfus, Final Stadium Cancer	Dharmais	Docetaxel, Eribulin

Fig. 4. Medical history menu



Doctor's Availability

Doctor ID	Doctor Name	Doctor Specialist	Doctor Telephone	Doctor Availability
DO001	Agus	Lung	081245678915	21 May - 23 May
DO002	Jacky	Cancer	08145647895	20 May - 21 May

Fig. 5. Doctor’s availability menu

Meanwhile, figure 5 shows the menu for the doctor’s availability where the patient can see the available doctor that they can see when making an appointment. Moreover, the health center can also see this doctor’s availability menu to check its availability, particularly in their health center. This interface will help the patient move to other hospitals with the doctor who already makes the appointment. It can make the doctor's schedule more structured, and the value of the doctor can be increased so the quality of health services can be improved.

CONCLUSION

Based on the explanation and understanding of previous studies, we created a model that will unify patient data for all residents of Jakarta. It is hoped that this data pooling can help the community and the government provide affordable and integrated health services. The proposed model was designed using Unified Modeling Language (UML) with the use case and class diagram where use case for promoting the business process for the proposed system while class diagram is designed for database model purposes.

Considering that public health treatment is essential for a country and is one of the barometers of measuring the level of welfare of its population, this data collection must be carried out. Considering that patient medical records are the private property of patients protected by law, this can be done by taking into account patients' wishes in determining whether their medical records can be shared among registered health institutions and recorded in this data unification system. For the time being, what is being done is still limited to a prototype. This research must be continued. It can be an opportunity for doctoral research topics to provide input to the Indonesian government, especially the Jakarta city government, to improve its public health management. In the future, it is hoped that this application can be run on a mobile phone, which makes it easier for the public to access it, and so that the handling of public health is more orderly, reducing queues to meet doctors who, as described above, are often spent with repeated questions such as asking previous diseases, possessed and drug allergies. In this case, it is confirmed that with this data pooling, it is hoped that health workers such as doctors will be beneficial and avoid malpractice in handling patients and help administer medicines that are following the condition and disease history of the patient.

In the future implementation, it is essential that mobile applications that are built can be equipped with Artificial Intelligence (AI) technology by applying the appropriate algorithms such as application recommender systems for the patient. This recommender system was used to assess their first health

condition before making an appointment to see a doctor, and also this recommender system can also apply to help the doctor treat their patient correctly. It is also possible to apply Dialogue systems or recognized as conversational agents, where the patient can be handled beforehand to assess their health condition.

REFERENCES

[1] Reeves, J. J., Hollandsworth, H. M., Torriani, F. J., Taplitz, R., Abeles, S., Tai-Seale, M., ... & Longhurst, C. A. (2020). Rapid response to COVID-19: health informatics support for outbreak management in an academic health system. Journal of the American Medical Informatics Association, 27(6), 853-859.

[2] Tartof, S. Y., Qian, L., Hong, V., Wei, R., Nadjafi, R. F., Fischer, H., ... & Saxena, T. (2020). Obesity and mortality among patients diagnosed with COVID-19: results from an integrated health care organization. Annals of internal medicine, 173(10), 773-781.

[3] de la Vega, P. B., Losi, S., Martinez, L. S., Bovell-Ammon, A., Garg, A., James, T., ... & Mishuris, R. G. (2019). Implementing an EHR-based screening and referral system to address social determinants of health in primary care. Medical Care, 57, S133-S139.

[4] National Academies of Sciences, Engineering, and Medicine. (2019). Integrating social care into the delivery of health care: moving upstream to improve the nation's health. National Academies Press.

[5] Myers, L. C., Parodi, S. M., Escobar, G. J., & Liu, V. X. (2020). Characteristics of hospitalized adults with COVID-19 in an integrated health care system in California. Jama.

[6] Yip, W., Fu, H., Chen, A. T., Zhai, T., Jian, W., Xu, R., ... & Mao, W. (2019). 10 years of health-care reform in China: progress and gaps in universal health coverage. The Lancet, 394(10204), 1192-1204.

[7] Schmidt, M., Schmidt, S. A. J., Adelborg, K., Sundbøll, J., Laugesen, K., Ehrenstein, V., & Sørensen, H. T. (2019). The Danish health care system and epidemiological research: from health care contacts to database records. Clinical epidemiology, 11, 563.

[8] Wahyudi, Y,P., & Nurfaidah, S. (2014). Pengelolaan Rujukan Kedaruratan Maternal di Rumah Sakit dengan Pelayanan PONEK,. Jurnal Kedokteran Brawijaya, 28, 84-88.

[9] Tate, L.M., Hopper, S., & Bergeron, S.P. (2018). Clinical and Economic Benefits of Involvement in a Community Hospital. Journal of Medical Care & Speciality Pharmacy, 24, 160-164.

[10] Jiang, H., Johnson, S.D., & Wong, H.W. (2008). An Integrated Software System for Analyzing ChIP-chip and ChIP-seq Data. Naturesearch Journal, 26, 1293-1300.

[11] Coulter, A. & Jenkinson, C. (2005). European patients' views on the responsiveness of health systems and healthcare providers. Eur J Public Health, 15, 35-37.

[12] Jagannatha, A., Liu, F., Liu, W., & Yu, H. (2019). Overview of the first natural language processing challenge for extracting medication, indication, and adverse drug events from electronic health record notes (MADE 1.0). Drug safety, 42(1), 99-111.

[13] Graber, M. L., Siegal, D., Riah, H., Johnston, D., & Kenyon, K. (2019). Electronic health record-related events in medical malpractice claims. Journal of patient safety, 15(2), 77.

[14] Rechel B., Wright S., Edwards N., Dowdeswell B., & McKee M. (2009). Investing in hospitals of the future. European Observatory on Health Systems and Policies, 13, 1201-1203.

[15] Kutney-Lee A., McHugh M.D., Sloane D.M., Cimiotti JP, Flynn F, & Neff D.F. (2009). Nursing: a key to patient satisfaction. Health Affair (Millwood), 28, 69-77.

[16] Lin, Y. K., Lin, M., & Chen, H. (2019). Do electronic health records affect quality of care? Evidence from the HITECH Act. Information Systems Research, 30(1), 306-318.

[17] Yuan, B., Balabanova, D., Gao, J., Tang, S., & Guo, Y. (2019). Strengthening public health services to achieve universal health coverage in China. BMJ, 365, l2358.

[18] Gottlieb, L. M., & Alderwick, H. (2019). Integrating social and medical care: could it worsen health and increase inequity?. The Annals of Family Medicine, 17(1), 77-81.