

Medical record information system of outpatient patients at harapan raya health service facilities

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ABSTRACT

One of the efforts to improve the quality of health care facilities is to improve the quality of medical record services including completeness, speed and accuracy in providing information for health services. This is certainly not complete if the recording is still using manual methods as happened at the Harapan Raya Health Center. Storage media still use shelves, making patient data search take a long time. Not to mention if the patient's outpatient card is lost, torn or damaged, of course this makes the patient's medical record data not recorded properly. Based on these problems, Harapan Raya Health Center needs an application, namely a medical record information system that is able to record patient medical record data properly and effectively in finding patient data and patient medical record data. This medical record information system uses java programming and uses the MySQL database as a data storage medium. This medical record information system is able to store patient data and patient medical records properly, as well as assist officers in finding data and presenting reports quickly.

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1. INTRODUCTION

Nowadays people are starting to realize the importance of health care. With this phenomenon, health service facilities must improve the quality of their services, both in the field of medical services and other services, including services for medical information needs. Health services have been studied by previous researchers. Evaluating pediatric advanced life support in emergency medical services with the performance and safety assessment tool researched by Bahr [1]. The impact of COVID-19 on orthopedic clinical services, education and research in university hospitals was investigated by Ong [2]. Development of a virtual benign hematology consulting service: results of a pilot project involving 5 medical centers researched by Pai [3]. Specialized social support services reduce neglect and treatment refusal in pediatric oncology: a seven-year experience of a non-profit referral oncology hospital (Tata Medical Center) in East India researched by Banerjee [4]. Effect of Korean Medical Service Quality and Satisfaction on United Arab Emirates Government Sponsored Patient Return Visit Intentions was investigated by Lee [5].

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Neurological complications of COVID19 during March 2020 at the LCMC medical university medical center: Dataset studied by Chachkhiani [36]. The process of receiving patient photographs in electronic medical records for confirmation of patient identification was investigated by Aseem [37]. Creating an inpatient diuresis dashboard for acute decompensated heart failure: a time-motion study using electronic medical records was investigated by Yang [38]. Hepatitis A virus immunity and vaccination among at-risk persons receiving HIV medical care was studied by DeGroote [39]. Chang Gung Research Database: A multi-agency database consisting of original medical records was studied by Tsai [40].

Medi-Block notes: Secure data sharing using blockchain technology researched by Singh [41]. The design of electronic health records for inclusion in sub-Saharan African medical record informatics was investigated by Adetoyi [42]. Vascular surgeons spent one-fifth of their time on after-hours electronic health records studied by Aziz [43]. The emergence of plant medicalization in Brazil: A temporal perspective on

vernacular names studied by Siqueira by Siqueira [44]. A feasibility study of a structured diagnostic method for functional dyspepsia in a Korean medicine clinic was investigated by Park [45].

Security and privacy of electronic health records: Concerns and challenges investigated by Keshta [46]. Early warning of nursing risks based on patient electronic medical record information was studied by Peng [47]. Implementation of Flowsheet in Electronic Medical Record (EMR) for Standardization of Chimeric Antigen Receptor T-Cell Toxicity Reporting (CAR T-cell) was investigated by Alencar [48]. Automatic address validation and review of health records to identify homeless Social Security disability applicants was studied by Erickson [49]. An automated approach to enriching databases using ontologies: Applications in the medical domain were researched by Nakhla [50].

Based on these problems, this paper contributes to presenting an outpatient medical record information system at the primary health care facility of the technical implementing unit (UPTD) of Harapan Raya Public Health Center. This information system is used for information on outpatients in health centers whose patient data is stored in the database server. So that this information system can be accessed from outside the health center.

2. METHODS

The research method for software design used with the following stages:

2.1. Entity Relationship Diagram

Entity relationship diagram (ERD) is a relationship between tables that are interconnected. The ERD form of the Outpatient Medical Record Information System at the Harapan Raya Health Center is shown in Figure 1. The figure shows the relationship between the tables in the outpatient medical record information system database.

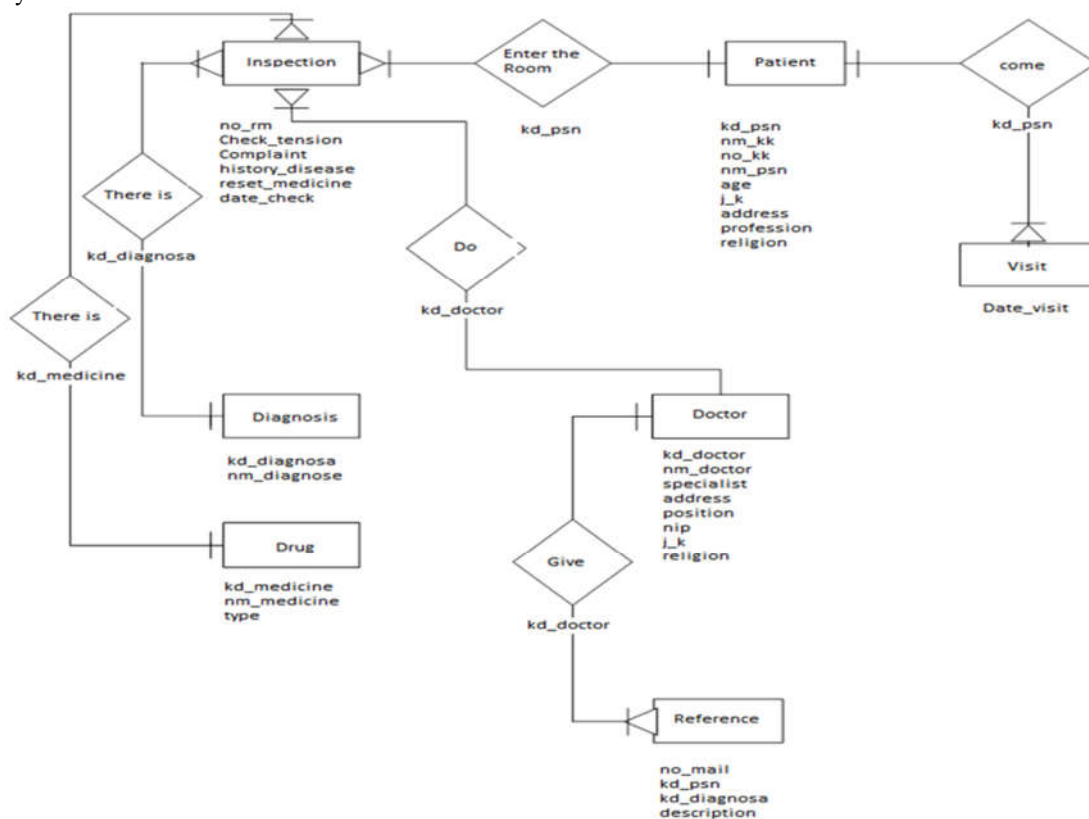


Fig. 1. Entity Relationship Diagram Display

2.2. Proposed Information System Flow

This is an overview of the proposed system for an outpatient medical record information system at the Harapan Raya Health Center as shown in Figure 2. The picture shows the process of the outpatient medical record information system. The process consists of the patient process, the administrative process, the doctor process and the coordination process.

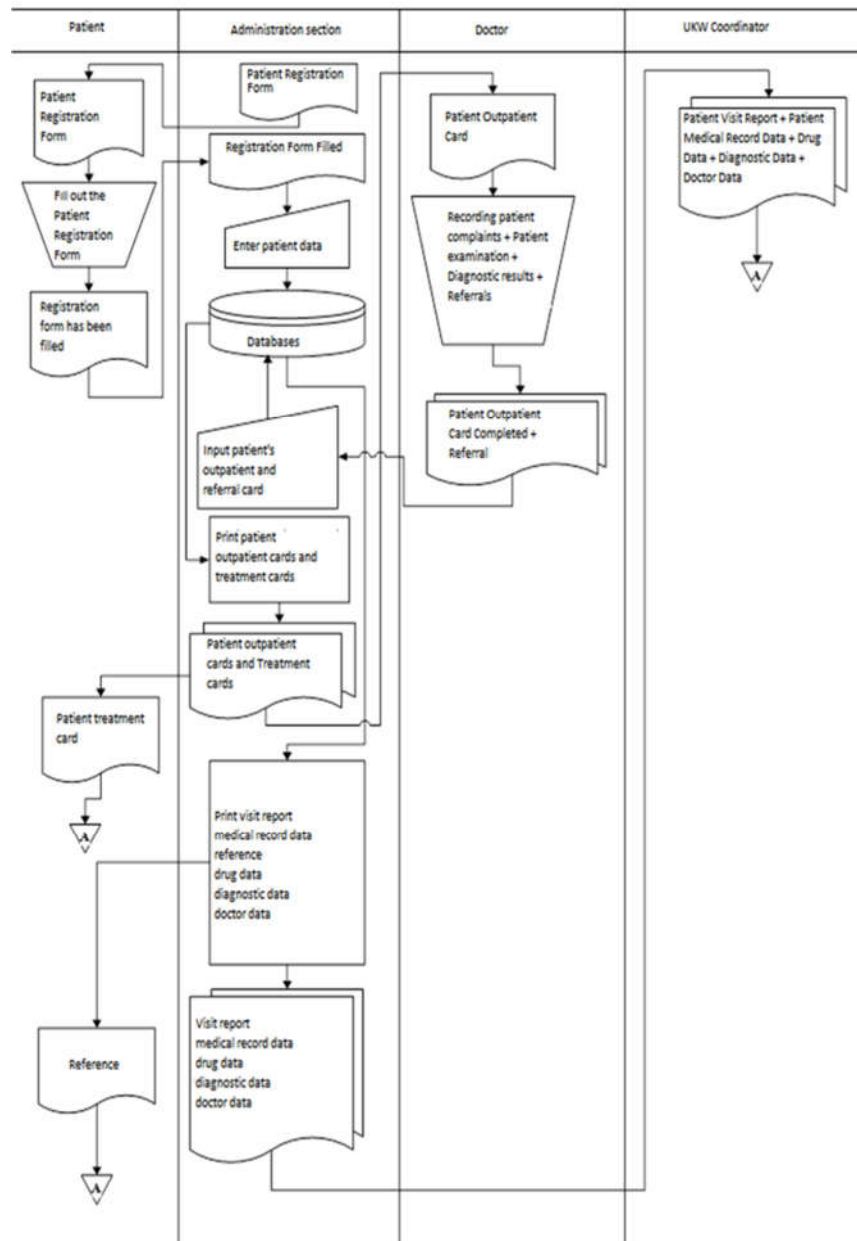


Fig. 2. Proposed Information System Flow

2.3. Context Diagram

Context diagrams are the stages of DFD that represent the entire software process as one environment with input and output data indicated by arrows entering or leaving one or more entities such as an individual object that represents a real one. In accordance with the problems discussed, this paper describes a context diagram for this system as shown in Figure 3. The figure shows that there are 4 important parts, namely Patients, Administration, Doctors, and UKW coordinator.

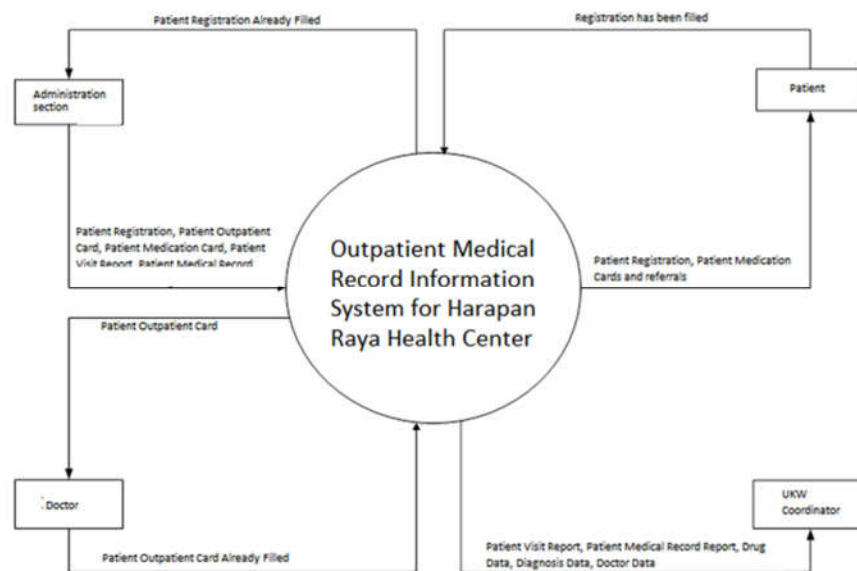


Fig. 3. Proposed System Context Diagram

2.4. System Interface Design

The main menu design in the outpatient medical record information system of Harapan Raya Pekanbaru Health Center to make it easier for users to choose the form displayed is shown in Figure 4. The picture shows that the main menu is made with a simple display and is not too complicated for users to understand, so it doesn't happen. error in running the program, following the design of the main menu display.

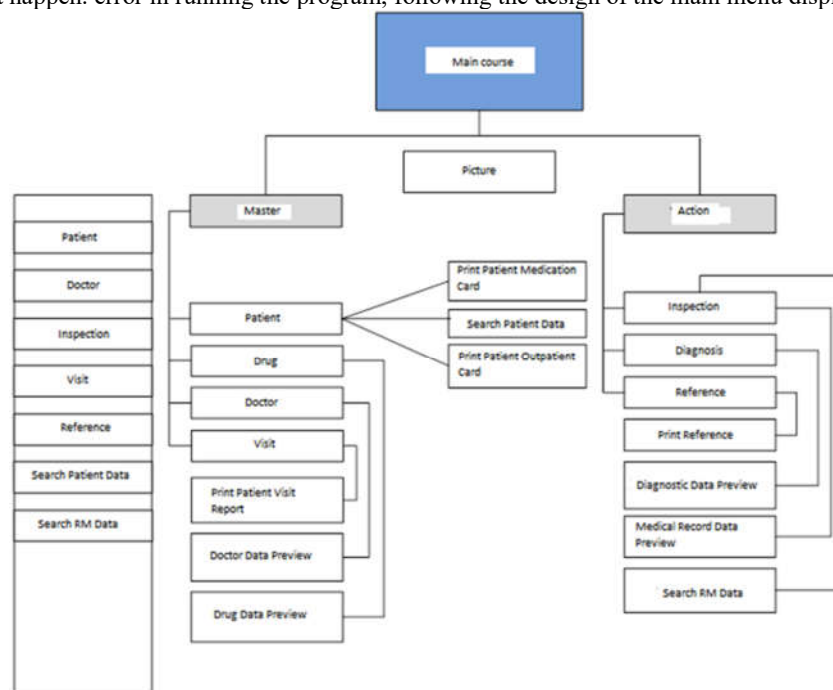


Fig. 4. Main Menu Design

3. RESULTS AND DISCUSSION

From the results of making a medical record information system for outpatients at Harapan Raya Health Center Pekanbaru. Then the resulting patient data processing process is faster, accurate and efficient, this is due to the availability of systems that support better data processing than before and also greatly saves time in a process that has been time consuming in its process. The following is a display of the outpatient medical record information system at the puskesmas.

3.1. Display Login Menu

The login menu display is shown in Figure 5. From the figure it can be seen that the login menu form functions as the user's right to enter the main menu. Patients must enter with the login menu to be able to get access rights in treatment.

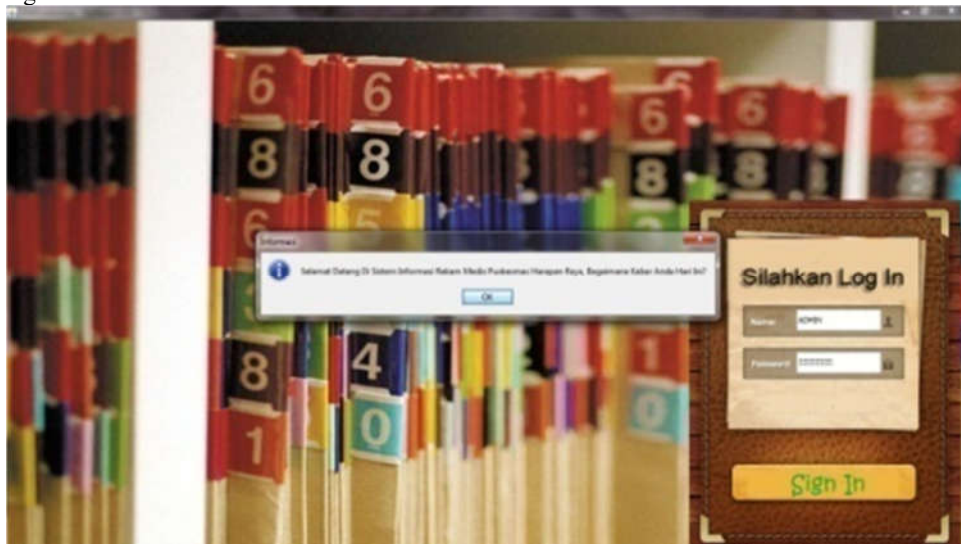


Fig. 5. Example of a figure caption. (figure caption)

3.2. Check Input Menu

The examination input menu shown in Figure 6 can be used by the patient after successfully logging in from the login menu. The picture shows that the examination input menu is a menu for inputting patient examination data, which is useful for recording the entire patient examination history.

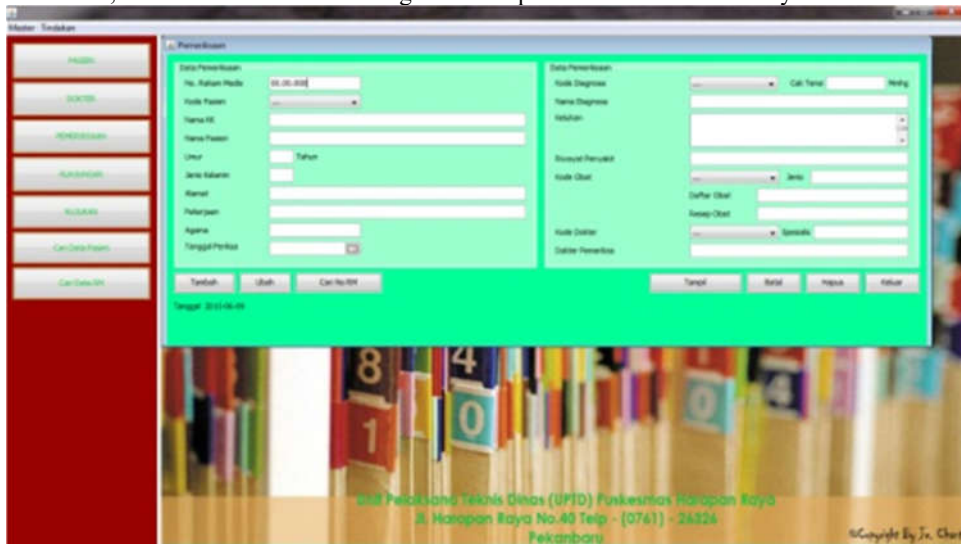


Fig. 6. Check Input Design

3.3. Output Medical Record Data

The output of the medical record data is a report on the results of the patient's examination shown in Figure 7. The picture shows that this report is useful for further examination purposes as a reference for viewing the patient's medical history.

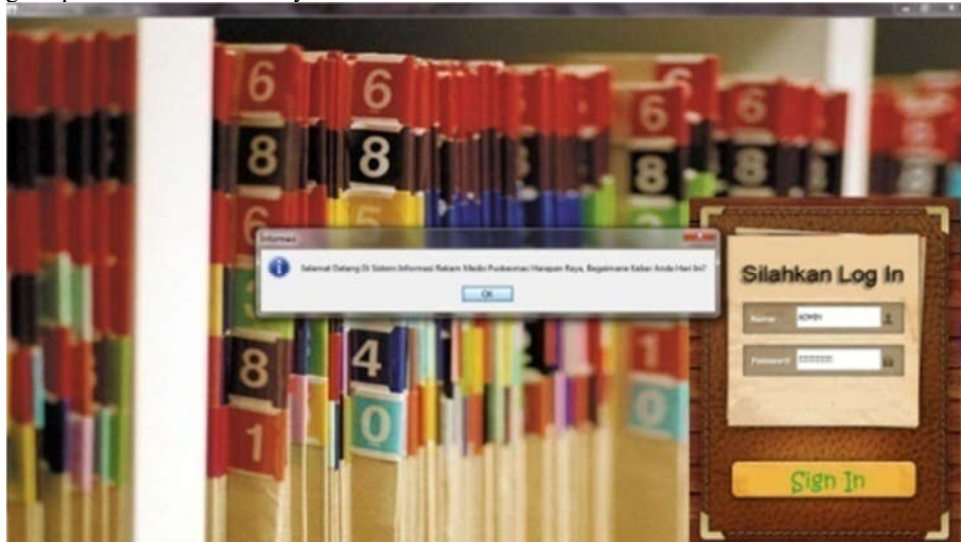


Fig. 7. Example of a figure caption. (figure caption)

3.4. Patient Medication Card Output

Output Patient treatment card is a card for patients containing patient data shown in Figure 8. The picture shows that this card is useful for patient requirements when going for treatment at the health center.



Fig. 8. Example of a figure caption. (figure caption)

3.5. Outpatient Card Output

The patient's outpatient card is a card that contains notes by a doctor about the results of the patient's diagnosis as shown in Figure 9. The image shows that this card is used for the condition that the patient is outpatient.

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KARTU RAWAT JALAN

No. KK : 01E200407000700
Nama KK : Tasya F. Sisy
Kode Pasien : PSH-0007
Nama Pasien : Tasya F. Sisy
Alamat : Jl. Medan Belantika No. 30 A Mangrove

Jenis Kelamin : L
Umur : 47
Pendidikan : SMP
Agama : Hindu

Tanggal	Penyakit / Diagnosis / Tgl. 1. Sisy	Parasetamol	Dokter Parasetamol	Paid

Fig. 9. Outpatient Card Output

3.6. Output of Visit Report

The visit report is a report containing records of patient visits every month at the Harapan Raya Health Center as shown in Figure 10. It can be seen that this report is used to find out how many patients are treated at the puskesmas.

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PEKANBARU

LAPORAN DATA KUNJUNGAN PASIEN - BULAN : 06

Tgl. Kunjungan	Kode Pasien	No. KK	Nama Pasien	Umur	JK	Alamat
2015-06-01	PSH-0008	01E200407000700	Tasya F. Sisy	36	P	Jl. Medan Belantika No. 30A Mangrove
2015-06-01	PSH-0007	01E200407000700	Tasya F. Sisy	47	L	Jl. Medan Belantika No. 30 A Mangrove
TOTAL						

01. Juni 2015
Rizki Adhikarini
Jabatan: Ketua

Fig. 10. Visit Report Output

3.7. Output Reference Data

The output of referral data is a report containing patient referrals that cannot be handled at the Harapan Raya Health Center as shown in Figure 11. The figure shows that the output of this referral data is used to refer hospitals in handling patients.

The screenshot shows a medical visit report form titled "SURAT KUNJUNG" (Visit Report) from the Dinas Kesehatan UPTD Puskesmas Harapan Raya Pekanbaru. The form is dated 2022-01-01 and is for a patient named "Tanjung". The form includes a table for medical history and a section for examination and diagnosis.

No	Gejala	Gejala	Gejala	Gejala	Gejala
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Fig. 11. Visit Report Output

3.8. PIECES Framework

This is the framework of the new pieces of the outpatient medical record information system at Harapan Raya Pekanbaru Health Center, which are as follows:

3.8.1. Performance (Performance)

The current updated medical record information system can provide fast, accurate and efficient performance. The processing system already uses an information system that utilizes optimal information technology, so that it can support accuracy and speed in presenting information.

3.8.2. Information

In processing medical record data, the updated system can run well and optimally. The information generated is fast, accurate and efficient, this can be seen from the results of the information generated by the new system.

3.8.3. Economy

After the medical record information system was updated, the use of costs in operating medical records has decreased, seen from the storage media that no longer uses books or conventional ones.

3.8.4. Control

With the outpatient medical record information system at the Harapan Raya Health Center, it can avoid data loss because the security system is already optimal with data security, or passwords.

3.8.5. Efficiency

From the creation of an outpatient information system at the Harapan Raya Pekanbaru Health Center, it provides efficiency in terms of time, cost, and has a good impact on the Harapan Raya Pekanbaru Health Center in terms of processing patient data which is always an obstacle in the process.

3.8.6. Services

Information and data services that are accurate, immediate in presentation are very much needed by information users and management in running the organization. There are often delays in running the existing system to find the desired information. After the existence of a medical record information system for outpatients at the Harapan Raya Health Center, the services provided were fast, accurate and efficient.

4. CONCLUSION

From the results of the research that has been carried out, the authors can draw conclusions and suggestions as follows, namely the Outpatient Medical Record Information system at the Harapan Raya Health Center, very helpful for officers in finding patient data quickly, accurately and efficiently. With the Medical Record Information System, it can assist officers in making visit reports and patient medical records. Patient data storage is better because it uses a database, so that data redundancies, damaged and lost data are no longer found. For the progress and goodness of a system in the agency, the author provides constructive suggestions for now and in the future as follows, namely in operating this system, it is hoped that the management of the Harapan Raya Health Center can provide tools and tools that can be used to run this

system according to the specifications that the author has described in previous chapter. This system should be maintained to be better, because no system is perfect, if an error occurs, it can be resolved by calling the programmer to resolve errors that occur due to the user's ignorance of the use of this system.

DECLARATION

Author Contribution

create an information system for outpatient medical records at Harapan Raya health service facilities.

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Conflict of Interest

Declare conflicts of interest or state "The authors declare no conflict of interest."

REFERENCES

- [1] N. Bahr, G. Meckler, M. Hansen, and J.-M. Guise, "Evaluating pediatric advanced life support in emergency medical services with a performance and safety scoring tool," *Am. J. Emerg. Med.*, vol. 48, pp. 301–306, Oct. 2021.
- [2] M. T.-Y. Ong et al., "Impact of COVID-19 on orthopaedic clinical service, education and research in a university hospital," *J. Orthop. Transl.*, vol. 25, no. July, pp. 125–127, Nov. 2020.
- [3] A. Pai, D. Kotak, N. Facher, K. Reader, K. Kong, and T. Kolevska, "Development of a virtual benign hematology consultation service: results of a pilot project involving 5 medical centers," *Blood*, vol. 133, no. 9, pp. 993–995, Feb. 2019.
- [4] P. Banerjee, P. Das, A. Das SucharitaTuladhar, NiharenduGhara, R. KS, and A. Bhattacharyya, "Dedicated social support services reduce abandonment and treatment-refusal in pediatric oncology: seven years' experience from a not-for-profit, referral oncology hospital (Tata Medical Center) in Eastern India," *Pediatr. Hematol. Oncol. J.*, vol. 3, no. 3, p. S10, 2018.
- [5] S. Lee and E.-K. Kim, "The Effects of Korean Medical Service Quality and Satisfaction on Revisit Intention of the United Arab Emirates Government Sponsored Patients," *Asian Nurs. Res. (Korean. Soc. Nurs. Sci.)*, vol. 11, no. 2, pp. 142–149, Jun. 2017.
- [6] K. Ishikura et al., "The Evaluation of Helicopter Emergency Medical Services With a Physician for Acute Myocardial Infarction in Japan: A Registry-Based Study of Prognosis and Time Reduction," *Air Med. J.*, vol. 000, pp. 1–5, Sep. 2021.
- [7] P. Naoum, K. Athanasakis, A. Skroumpelos, and J. Kyriopoulos, "Idiopathic Pulmonary Fibrosis: Utilization of Health Services and Out-Of-Pocket Health Expenditures in Greece," *Value Heal. Reg. Issues*, vol. 22, pp. 44–48, Sep. 2020.
- [8] F. M. Ssewamala, O. Sensoy Bahar, K. J. Johnson, and R. G. N. Katumba, "Suubi4Cancer: A protocol for an innovative combination intervention to improve access to pediatric cancer services and treatment adherence among children living with HIV/AIDS in Uganda," *Contemp. Clin. Trials Commun.*, vol. 16, p. 100459, Dec. 2019.
- [9] M. Stafford, C. von Wagner, S. Perman, J. Taylor, D. Kuh, and J. Sheringham, "Social connectedness and engagement in preventive health services: an analysis of data from a prospective cohort study," *Lancet Public Heal.*, vol. 3, no. 9, pp. e438–e446, Sep. 2018.
- [10] J. L. Alvarez and R. Jimenez, "Ten Years of Experience in the Non-Intensive Treatment of Acute Leukemias in Elderly Patients of the Hematology Service of the National Medical Center November 20 , ISSSTE," *Blood*, vol. 130, p. 5053, 2017.
- [11] L. M. Sørensen, L. Rognås, and K. Alstrup, "Trauma Versus Nontrauma Patients Treated by the Danish Helicopter Emergency Medical Service: A Register-Based Study of Patient Characteristics, Hospitalization, and Mortality," *Air Med. J.*, vol. 40, no. 5, pp. 325–330, Sep. 2021.
- [12] N. Bhan, L. McDougal, A. Singh, Y. Atmavilas, and A. Raj, "Access to women physicians and uptake of reproductive, maternal and child health services in India," *EClinicalMedicine*, vol. 20, p. 100309, Mar. 2020.
- [13] J. McDowall and A. E. Laher, "Cross-sectional survey on occupational needle stick injuries amongst prehospital emergency medical service personnel in Johannesburg," *African J. Emerg. Med.*, vol. 9, no. 4, pp. 197–201, Dec. 2019.
- [14] J. S. Hwang, S. H. Kim, and C. Van Dillen, "Unnecessary Emergency Medical Services Transports of Geriatric Patients in a Tertiary Hospital in South Korea," *Int. J. Gerontol.*, vol. 12, no. 3, pp. 222–226, Sep. 2018.

- [15] K. Sasaki, Y. Aihara, and K. Yamasaki, "The effect of accessibility on aged people's use of long-term care service," *Transp. Res. Procedia*, vol. 25, pp. 4381–4391, 2017.
- [16] X. R. J. Moors et al., "A Nationwide Retrospective Analysis of Out-of-Hospital Pediatric Cardiopulmonary Resuscitation Treated by Helicopter Emergency Medical Service in the Netherlands," *Air Med. J.*, vol. 000, pp. 1–5, Sep. 2021.
- [17] S. Nageswaran, D. Easterling, C. W. Ingram, J. E. Skaar, A. Miller-Fitzwater, and E. H. Ip, "Randomized controlled trial evaluating a collaborative model of care for transitioning children with medical complexity from hospital to home healthcare: Study protocol," *Contemp. Clin. Trials Commun.*, vol. 20, p. 100652, Dec. 2020.
- [18] J. D. Roberts et al., "Statewide Intervention to Improve Medical Care Services Utilization Patterns of Adults Living with Sickle Cell Disease," *Blood*, vol. 134, no. Supplement 1, pp. 517–517, Nov. 2019.
- [19] H. Abed and A. Rahman, "Setting up dental sedation services for special care and medically compromised patients," *Saudi Dent. J.*, vol. 30, no. 2, pp. 105–106, Apr. 2018.
- [20] G. Sariyer, M. G. Ataman, S. Akay, T. Sofuoglu, and Z. Sofuoglu, "An analysis of Emergency Medical Services demand: Time of day, day of the week, and location in the city," *Turkish J. Emerg. Med.*, vol. 17, no. 2, pp. 42–47, Jun. 2017.
- [21] C.-Y. Wu, T.-F. Chan, H.-Y. Shi, and Y.-L. Kuo, "Psychiatric problems of anxiety and depression disorder are associated with medical service utilization and survival among patients with cervical cancer," *Taiwan. J. Obstet. Gynecol.*, vol. 60, no. 3, pp. 474–479, May 2021.
- [22] S. Oshabaheebwa, L. K. Namuli, M. S. Tusabe, J. Nantume, L. H. Ackers, and R. T. Ssekitoleko, "Enhancing skills to promote the utilization of medical laboratory equipment in low resource settings," *Heal. Policy Technol.*, vol. 9, no. 1, pp. 94–101, Mar. 2020.
- [23] G. Santoni, B. Meinow, A. Wimo, A. Marengoni, L. Fratiglioni, and A. Calderón-Larrañaga, "Using an Integrated Clinical and Functional Assessment Tool to Describe the Use of Social and Medical Care in an Urban Community-Dwelling Swedish Older Population," *J. Am. Med. Dir. Assoc.*, vol. 20, no. 8, pp. 988–994.e2, Aug. 2019.
- [24] H. Herwartz and K. Schley, "Improving health care service provision by adapting to regional diversity: An efficiency analysis for the case of Germany," *Health Policy (New York)*, vol. 122, no. 3, pp. 293–300, Mar. 2018.
- [25] K.-H. Chen, H.-M. Hsieh, C.-M. Chen, H.-C. Chiu, and I.-C. Lee, "The Long-Term Trends of the Association Between Falls Among the Elderly in Taiwan and their Utilization of Medical Facilities," *Int. J. Gerontol.*, vol. 11, no. 3, pp. 161–165, Sep. 2017.
- [26] Y.-A. Ko et al., "Developing a synthetic control group using electronic health records: Application to a single-arm lifestyle intervention study," *Prev. Med. Reports*, vol. 24, p. 101572, Dec. 2021.
- [27] H. Soni et al., "State of the art and a mixed-method personalized approach to assess patient perceptions on medical record sharing and sensitivity," *J. Biomed. Inform.*, vol. 101, no. July 2019, p. 103338, Jan. 2020.
- [28] D. I. Inan, K. T. Win, and R. Juita, "mHealth Medical Record to Contribute to NonCommunicable Diseases in Indonesia," *Procedia Comput. Sci.*, vol. 161, pp. 1283–1291, 2019.
- [29] R. Khajouei, S. Hajesmael Gohari, and M. Mirzaee, "Comparison of two heuristic evaluation methods for evaluating the usability of health information systems," *J. Biomed. Inform.*, vol. 80, no. February, pp. 37–42, Apr. 2018.
- [30] R. Wade, B. Korytowsky, P. Singh, P. Dev, S. Bobiak, and P. Cariola, "The Novel Generation And Validation of Survival Curves In Oncology Utilizing Electronic Medical Records Linked To Point of Service Claims Data," *Value Heal.*, vol. 20, no. 9, p. A421, Oct. 2017.
- [31] R. T. Merrell et al., "Standardizing Care of Neuro-oncology Patients Using a Customized Electronic Medical Record Toolkit," *Mayo Clin. Proc. Innov. Qual. Outcomes*, vol. 5, no. 3, pp. 625–634, Jun. 2021.
- [32] B. Ji et al., "Research on Chinese medical named entity recognition based on collaborative cooperation of multiple neural network models," *J. Biomed. Inform.*, vol. 104, no. July 2019, p. 103395, Apr. 2020.
- [33] L. Huang, A. L. Shea, H. Qian, A. Masurkar, H. Deng, and D. Liu, "Patient clustering improves efficiency of federated machine learning to predict mortality and hospital stay time using distributed electronic medical records," *J. Biomed. Inform.*, vol. 99, no. April, p. 103291, Nov. 2019.
- [34] Y. Chen et al., "Learning bundled care opportunities from electronic medical records," *J. Biomed. Inform.*, vol. 77, no. October 2017, pp. 1–10, Jan. 2018.
- [35] T. Pham, T. Tran, D. Phung, and S. Venkatesh, "Predicting healthcare trajectories from medical records: A deep learning approach," *J. Biomed. Inform.*, vol. 69, pp. 218–229, May 2017.
- [36] D. Chachkhiani et al., "Neurological complications of COVID19 during March 2020 at LCMC health university medical center: Dataset," *Data Br.*, vol. 35, p. 106944, Apr. 2021.
- [37] S. Aseem et al., "A Process of Acceptance of Patient Photographs in Electronic Medical Records to Confirm Patient Identification," *Mayo Clin. Proc. Innov. Qual. Outcomes*, vol. 4, no. 1, pp. 99–104, Feb. 2020.
- [38] W. E. Yang, R. Rouf, V. P. Gundareddy, R. S. Kauffman, and A. Knight, "CREATING AN INPATIENT DIURESIS DASHBOARD FOR ACUTE DECOMPENSATED HEART FAILURE: A TIME-MOTION STUDY OF ELECTRONIC MEDICAL RECORD USE," *J. Am. Coll. Cardiol.*, vol. 73, no. 9, p. 724, Mar. 2019.

-
- [39] N. P. DeGroote, C. L. Mattson, Y. Tie, J. T. Brooks, S. Garg, and J. Weiser, "Hepatitis A virus immunity and vaccination among at-risk persons receiving HIV medical care," *Prev. Med. Reports*, vol. 11, no. May, pp. 139–144, Sep. 2018.
 - [40] M.-S. Tsai et al., "Chang Gung Research Database: A multi-institutional database consisting of original medical records," *Biomed. J.*, vol. 40, no. 5, pp. 263–269, Oct. 2017.
 - [41] C. Singh, D. Chauhan, S. A. Deshmukh, S. S. Vishnu, and R. Walia, "Medi-Block record: Secure data sharing using block chain technology," *Informatics Med. Unlocked*, vol. 24, no. June, p. 100624, 2021.
 - [42] O. E. Adetoyi and O. A. Raji, "Electronic health record design for inclusion in sub-Saharan Africa medical record informatics," *Sci. African*, vol. 7, p. e00304, Mar. 2020.
 - [43] F. Aziz, L. Talhelm, J. Keefer, and C. Krawiec, "Vascular surgery residents spend one fifth of their time on electronic health records after duty hours," *J. Vasc. Surg.*, vol. 69, no. 5, pp. 1574–1579, May 2019.
 - [44] B. V. L. Siqueira, C. M. Sakuragui, B. E. Soares, and D. R. de Oliveira, "The rise of medicalization of plants in Brazil: A temporal perspective on vernacular names," *J. Ethnopharmacol.*, vol. 224, no. May, pp. 535–540, Oct. 2018.
 - [45] J. H. Park, S. Kim, J.-W. Park, S.-J. Ko, and S. Lee, "Feasibility study of structured diagnosis methods for functional dyspepsia in Korean medicine clinics," *Integr. Med. Res.*, vol. 6, no. 4, pp. 443–451, Dec. 2017.
 - [46] I. Keshta and A. Odeh, "Security and privacy of electronic health records: Concerns and challenges," *Egypt. Informatics J.*, vol. 22, no. 2, pp. 177–183, Jul. 2021.
 - [47] Z. Peng et al., "Early warning of nursing risk based on patient electronic medical record information," *J. Infect. Public Health*, vol. 13, no. 10, pp. 1562–1566, Oct. 2020.
 - [48] M. C. Alencar et al., "Implementation of a Flowsheet in an Electronic Medical Record (EMR) to Standardize Chimeric Antigen Receptor T-Cell (CAR T-cell) Toxicity Reporting," *Biol. Blood Marrow Transplant.*, vol. 25, no. 3, pp. S98–S99, Mar. 2019.
 - [49] J. Erickson, K. Abbott, and L. Susienka, "Automatic address validation and health record review to identify homeless Social Security disability applicants," *J. Biomed. Inform.*, vol. 82, no. January, pp. 41–46, Jun. 2018.
 - [50] Z. Nakhla and K. Noura, "Automatic approach to enrich databases using ontology: Application in medical domain," *Procedia Comput. Sci.*, vol. 112, pp. 387–396, 2017.