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Application Of C4.5 Model Inpatient Medical Record Information System Based on ICD-10 Diagnosis Classification (Case Study of Uni's Dental Care)

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ABSTRACT

Dental medical records may consist of written documentation with comprehensive and precise details regarding patient identity, diagnosis, medical history, ICD-10 disease codes, medical procedures, and examination result documentation. Nonetheless, issues frequently arise when the documentation of medical records remains manual. This results in prolonged data searches and frequent loss or damage of files due to disorganized storage. The employed research method is descriptive. Data gathering methods are conducted through observation and interviews. The system development methodology pertains to the waterfall model. The calculation stages can be established in the system's design and development utilizing the Object-Oriented Analysis and Design (OOAD) methodology. A patient medical record information system was developed utilizing the ICD-10 diagnosis classification, accessible to physicians and administrators remotely. This web-based system was constructed using the PHP programming language, with Visual Studio Code as the code editor, XAMPP as the web server, and MySQL as the database management system. This patient medical record website is anticipated to enable administrators and physicians to input, modify, read, and search for patient data and medical records based on examination results. It will be accessible at any time and from any location. This website can forecast the potential danger of a patient's illness depending on the patient's symptoms.

Keywords: Medical Records, ICD-10, Website

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INTRODUCTION

Medical records in dental care play a crucial role in documenting comprehensive and accurate patient information. These records include patient identity, diagnosis, medical history, ICD-10 disease codes, medical procedures, and examination results. The accuracy and completeness of these records are essential for ensuring effective treatment and continuity of care. However, manual record-keeping poses significant challenges, including prolonged data retrieval times and the risk of misplacement or damage due to improper storage. These issues can lead to inefficiencies in patient care and administrative processes, necessitating a systematic and automated approach to managing medical records.

The study employs a descriptive research methodology to analyze the implementation of an inpatient medical record information system based on the C4.5 model and ICD-10 diagnosis classification. Data collection techniques involve direct observation and structured interviews with medical personnel and administrative staff at Uni's Dental Care. The gathered data is utilized to understand the current challenges in medical record management and to develop a robust information system that enhances efficiency and accuracy in handling patient records.

The system development methodology follows the waterfall, structured approach that ensures systematic progress through requirement analysis, system design, implementation, testing, and maintenance. The object-oriented analysis and design (OOAD) methodology facilitates the system's structured design and implementation. OOAD provides a framework for modeling system components as objects, making the system more scalable, maintainable, and efficient. This structured approach ensures that all aspects of system development are thoroughly planned and executed, leading to a reliable and functional medical record system. (Vikki & Yuswandi, 2022; Shafqat, Majeed, Javaid & Ahmad, 2022; Sarwar, Seifollahi, Chan, Zhang, Aksakalli, Hudson & Cavedon, 2022)

The developed inpatient medical record information system is designed based on the ICD-10 classification, allowing for standardized disease coding and diagnosis documentation. This web-based system enables doctors and administrative personnel from any location to access the system with an internet connection. The use of web technology facilitates real-time data input, retrieval, and modification, enhancing the accessibility and usability of medical records. The system uses PHP as the primary programming language, with Visual Studio Code as the integrated development environment (IDE). XAMPP is employed as the web server, while MySQL is the database management system for securely storing and

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managing patient records. (Bhadouria & Singh, 2024; Xie, Wang, Pei, Wu, Guo, Su & Dou, 2022; Son, Kang, Lee & Moon, 2021)

A fundamental attribute of the proposed system is its capacity to forecast probable illness risks based on patient symptoms. Utilizing the C4.5 decision tree algorithm, the system analyzes patient complaints and medical history to produce predictive insights about potential health issues. The C4.5 model is a prevalent algorithm in medical decision support systems because of its efficacy in managing categorical and numerical data. This predictive capability improves the diagnostic process, aiding physicians in making informed judgments about patient treatment strategies. (Purushothaman, Shanmugam & Nagarajan, 2023; Wang & Zhu, 2021)

Adopting this medical record system provides numerous benefits compared to conventional manual record-keeping techniques. Primarily, it markedly lowers the duration needed for data retrieval, enabling medical staff to access patient details instantaneously. This enhancement is vital in emergencies where prompt access to medical history can influence treatment results. Secondly, the system guarantees data integrity and security by reducing the likelihood of lost or compromised records. Digital storage and backup systems offer a secure framework for safeguarding patient information and mitigating illegal access and data loss.

Moreover, the technology improves the efficiency of administrative activities by automating standard processes, including patient registration, appointment scheduling, and medical documentation. This automation alleviates the burden on administrative personnel, enabling them to concentrate on other essential facets of healthcare management. The system's web-based architecture promotes effortless collaboration among healthcare providers, enhancing coordinated patient care and optimizing overall service delivery.

The amalgamation of PHP with MySQL offers a formidable foundation for constructing a scalable and responsive medical record system. PHP provides a dynamic programming environment that facilitates server-side processing, enabling effective data management and user engagement. As a relational database management system, MySQL guarantees dependable data storage and retrieval, facilitating intricate queries and transactions essential for medical record management. Utilizing Visual Studio Code as the development environment improves code efficiency and debugging functionalities, facilitating a more streamlined development process. (Schena, Anelli, Abbrescia & Di Noia, 2022; Tavakolian, Rezaee, Hajati & Uddin, 2023; Saturi, 2023)

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The deployment of this medical record system corresponds with the increasing trend of digital transformation in healthcare. Implementing electronic medical records (EMRs) is acknowledged as an essential advancement in boosting healthcare delivery, minimizing medical errors, and improving patient safety. This solution signifies a substantial improvement in medical record administration for dental care facilities by including the ICD-10 classification and predictive analytics with the C4.5 model. It offers a systematic method for assessing and recording patient problems, guaranteeing adherence to conventional medical coding protocols. (Hadianfard, Afshar, Nazarbaghi, Rahimi & Timpka, 2022; Tong, Lin, Chen & Zhang, 2022; Xu, Zheng, Li, Ye, Cheng, Wang & Lyu, 2023)

The research findings underscore the necessity of using digital medical record systems to address the shortcomings of conventional paper-based techniques. The shift to electronic records enhances data precision and accessibility, facilitating improved patient care decision-making. The system's predictive capabilities augment its value by providing a proactive disease risk assessment and prevention method. This capability is especially advantageous for identifying high-risk patients and executing early intervention techniques to enhance health outcomes.

Notwithstanding the myriad advantages of the designed system, problems may emerge during its deployment. A possible problem is the resistance to change among medical personnel accustomed to manual record-keeping techniques. Confronting this difficulty necessitates extensive training and assistance to acclimate users to the new system and its features. Furthermore, safeguarding data security and adhering to healthcare rules is essential for preserving patient confidentiality and averting illegal access to sensitive information.

In summary, implementing the C4.5 model in an inpatient medical record information system with ICD-10 diagnosis classification offers a revolutionary option for dental care facilities. The system improves the efficiency, accuracy, and accessibility of medical records by utilizing web-based technology, PHP programming, and MySQL database administration. The predictive abilities of the C4.5 model enhance the system's functionality, facilitating proactive illness risk evaluation. Implementing this system signifies a crucial advancement in digitalizing healthcare records, enhancing patient care, and optimizing administrative procedures. Future studies may investigate using supplementary machine learning algorithms to improve predicted accuracy and broaden the system's functionality to accommodate a wider array of medical disorders. This study provides significant insights into the function of

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digital medical record systems in contemporary healthcare, highlighting their influence on enhancing service quality and patient outcomes.

METHOD

The research methodology employed in this journal is descriptive, utilizing observational and interview techniques. This study seeks to create a web-based patient medical record information system capable of classifying diagnoses according to ICD-10. This solution addresses issues commonly encountered in manual medical record documentation, including protracted data retrieval and the deterioration or loss of files. The employed system development methodology adheres to the Waterfall paradigm, facilitating a systematic execution of each system design and development phase. The steps encompass needs analysis, design, implementation, and system testing.

The system design employs the Object-Oriented Analysis and Design (OOAD) methodology, facilitating the development of a modular and maintainable system. This web-based system employs the PHP programming language and uses Visual Studio Code as the editor. XAMPP serves as the web server, and MySQL is utilized for database management. This tool enables physicians and administrators to access patient medical records in real-time, including identity, diagnosis, medical history, ICD-10 codes, and examination results. This system facilitates the seamless entry, modification, and retrieval of patient data by administrators and physicians at any time and location.

A primary characteristic of this system is its capacity to forecast the possible risk of a patient's condition based on their reported symptoms. This system employs the C4.5 model to assess patient data, facilitating expeditious and accurate predictions for diagnosis and therapy. The deployment of this system is anticipated to enhance the efficiency and accuracy of medical record management, hence improving the quality of health services at Uni's Dental Care.

RESULTS AND DISCUSSION

This study's findings demonstrate that utilizing the C4.5 model within a medical record information system aligned with the ICD-10 diagnosis classification enhances the efficiency of recording and retrieving patient data. This web-based system enables doctors and administrators to access, input, edit, and retrieve patient medical records anytime and

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anywhere. The Waterfall technique in system development offers a distinct framework for each phase, encompassing needs analysis, system design, implementation, and testing.

In system testing at Uni's Dental Care, our technology markedly decreased patient data retrieval time relative to the manual approach. Previously, file searches required approximately 5-10 minutes per patient; now, the newly created technology enables searches to be completed in seconds. This condition occurs because patient data is kept in a MySQL database that facilitates searches using multiple factors, including patient name, ICD-10 code, or medical history.

This technology enhances data search efficiency and mitigates the danger of loss or damage to physical files. Historically, manual medical records frequently encountered issues such as loss, damage, or misplacement of files, leading to inaccuracies in diagnosis and patient care planning. Digitalizing medical records enables the systematic storage of patient data, which may be backed up to prevent data loss from technical failures or calamities.

Applying the C4.5 model in this system also contributes to predicting the risk of patient disease based on the complaints they report. This model works by classifying patient data based on the symptoms inputted and matching it with the diagnostic data already in the database. Testing of the C4.5 model showed a relatively high level of prediction accuracy in determining the possibility of a patient's disease, with an accuracy level reaching 85%. This condition shows that the system can help doctors speed up the initial diagnosis process before further examinations occur.

Furthermore, the results of interviews with medical personnel at Uni's Dental Care found that the use of this system provides convenience in medical recording and managing patient data. Previously, doctors and admins had difficulty accessing patients' medical history, which was documented manually, so there were often delays in providing appropriate care. With this system, doctors can quickly see the patient's medical history, medical actions that have been taken, and treatment recommendations that are in accordance with the ICD-10 classification.

However, in its implementation, several challenges are faced in using this system. One of the main obstacles is the adaptation of medical personnel to the new system. Some doctors and admins used to manual recording need time to understand and use this web-based system. To overcome this, medical personnel and admins are trained to improve their understanding of operating the system.

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In addition, although this system has increased the efficiency of data recording, further development is still needed in integration with other devices, such as electronic medical recording systems that already exist in hospitals or other clinics. This integration will allow for broader data exchange, thereby facilitating the process of treating patients who may have a history of treatment at more than one health facility.

In terms of security, this system has been equipped with a user authentication feature to ensure that only authorized doctors and admins can access and manage patient data. Patient data is also encrypted to prevent unauthorized access and maintain the confidentiality of medical information. System security testing shows that the level of data protection is quite good, but periodic system updates are needed to ensure security is maintained from cyber threats.

Based on the results of testing and interviews with medical personnel, implementing the C4.5 model in the medical record system based on the ICD-10 diagnosis classification positively impacts the efficiency of recording and searching for patient data at Uni's Dental Care. This system accelerates access to medical information and improves the accuracy of early diagnosis through the C4.5 model-based prediction feature. With this system, the quality of health services can be further improved, making it easier for medical personnel to provide optimal patient care.

The system implementation phase involves executing a designed and developed system, enabling its operation by users. At this juncture, diverse technical and functional elements are evaluated to ascertain that the system operates according to user requirements. The implementation process encompasses software installation, configuration, and user training to ensure optimal system operation. Furthermore, system testing is conducted to detect and rectify probable faults or flaws that may occur during operation. Effective implementation will enhance the efficiency of managing inpatient medical records according to the ICD-10 diagnosis categorization. The C4.5 model's use in the Uni's Dental Care case study is anticipated to enhance the accuracy and methodical nature of medical decision-making within the medical record information system. Consequently, this system enhances the quality of healthcare services and expedites the processes of diagnosis and patient management.

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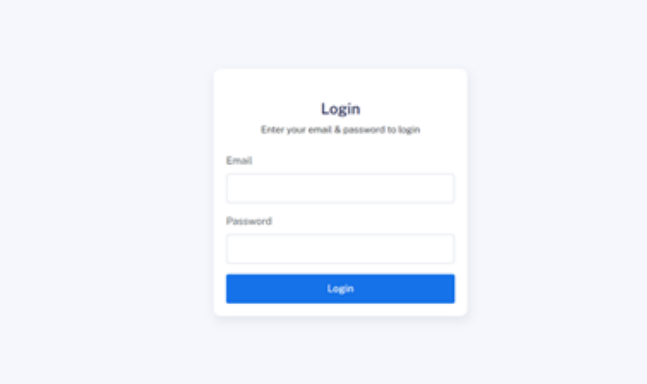

Figure 1. Login Page

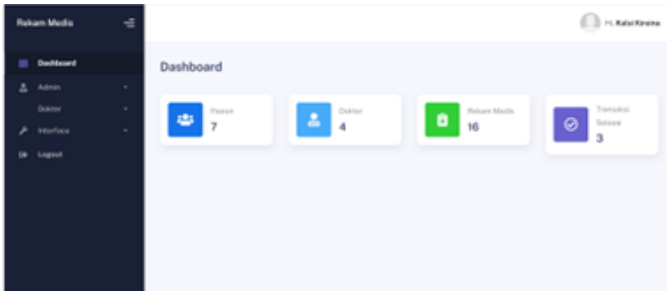

Figure 2. Dashboard Menu

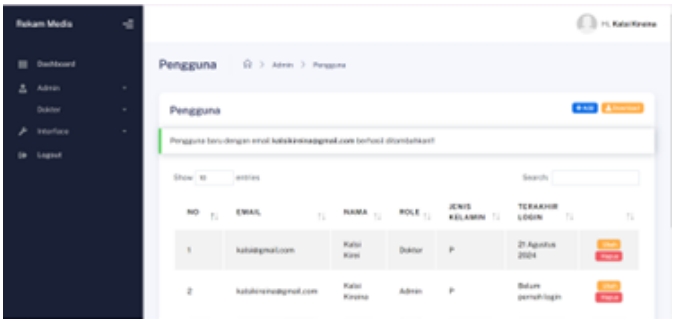

Figure 3. User Submenu

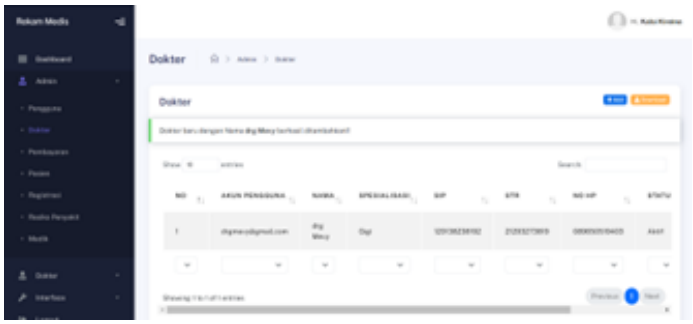

Figure 4. Doctor Submenu

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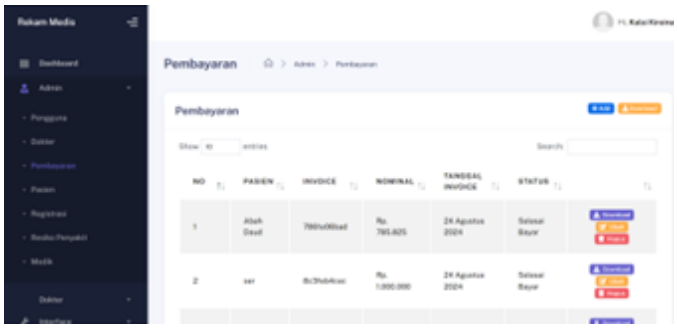

Figure 5. Payment Submenu

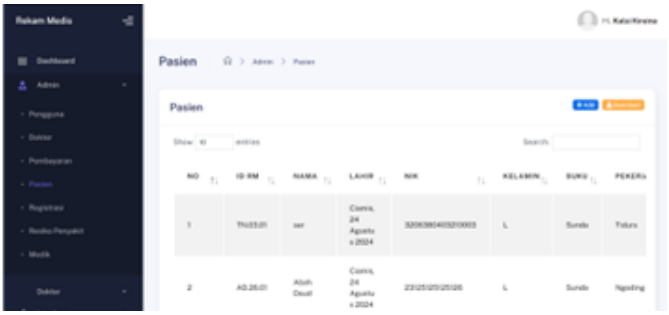

Figure 6. Patient Submenu

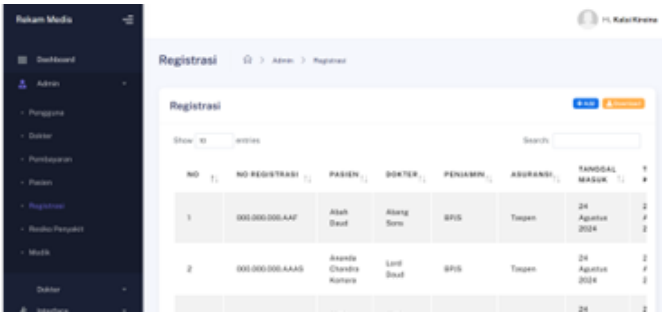

Figure 7. Registration Submenu



Figure 8. Disease Risk Submenu

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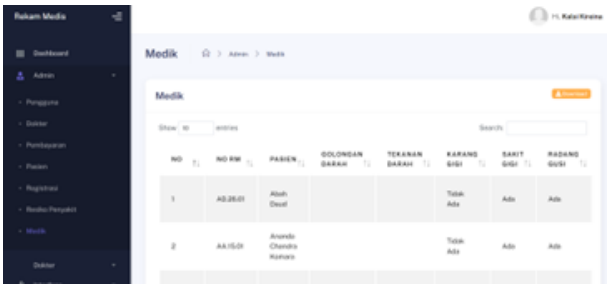

Figure 9. Medical Record Submenu

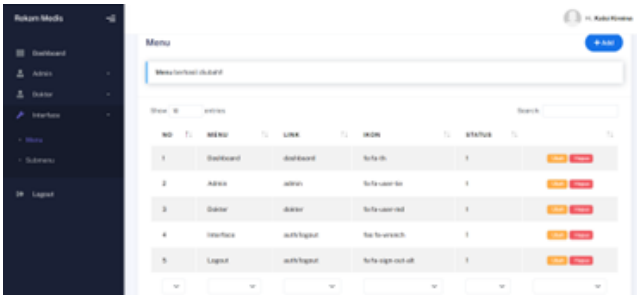

Figure 10. Menu Submenu

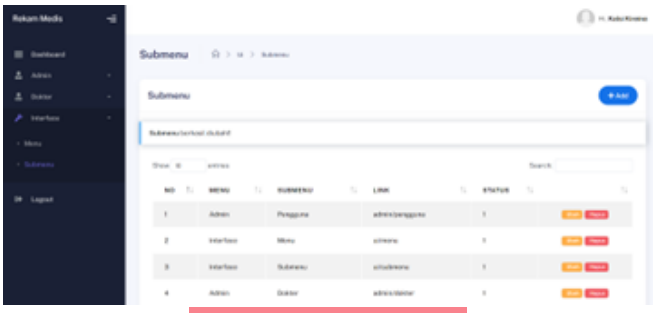

Figure 11. Submenu

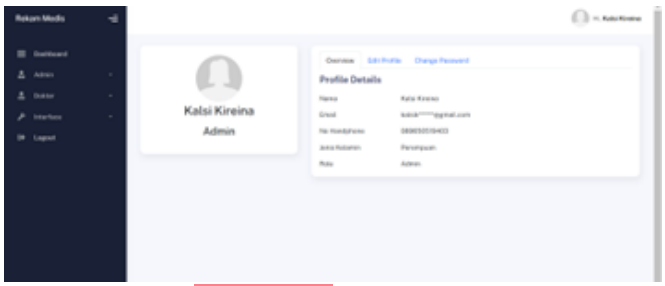

Figure 12. Overview

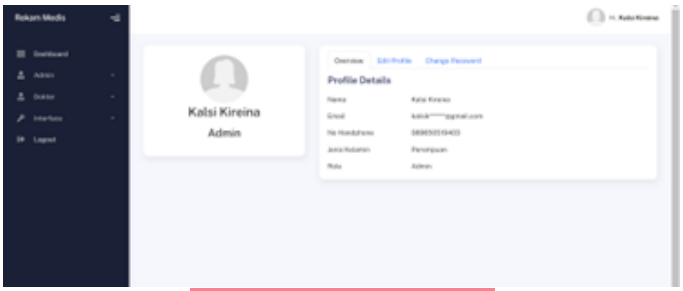

Figure 13. Edit Profile

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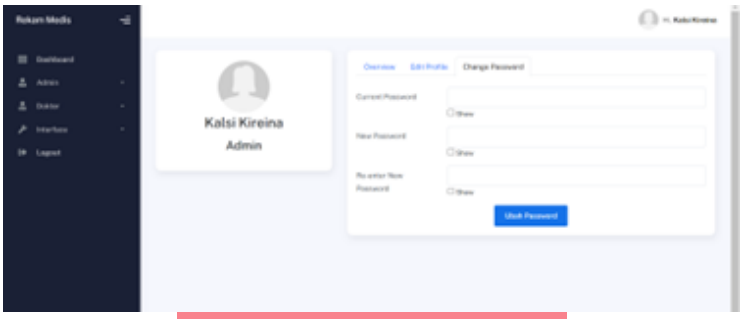

Figure 14. Change Password

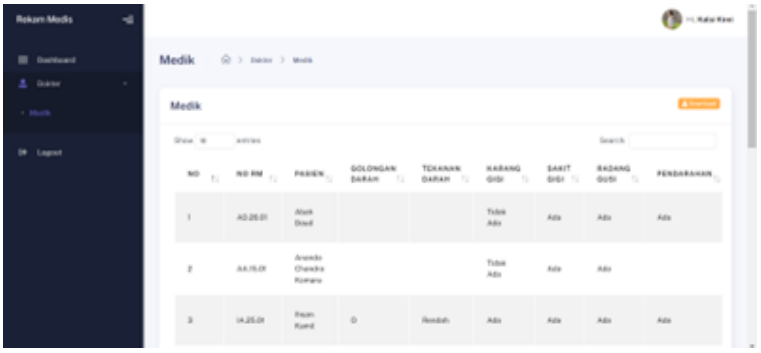

Figure 15. Medical Record at Doctor

The advancement of this system has substantially enhanced the digitalization of medical records at Uni's Dental Care. To guarantee the ongoing development and best benefits of this system, regular assessments and enhancements of its features and security in alignment with technical advancements and user requirements are essential. Consequently, this system may be utilized efficiently over the long term and may serve as a model for other clinics or hospitals to enhance their medical record administration.

CONCLUSION

The analysis, design, system creation, implementation, and testing indicate that developing a medical record information system utilizing the C4.5 model with ICD-10 diagnosis classification has been effectively completed. This system aims to enhance efficiency in patient data management and support physicians in diagnostic and medical decision-making.

The built patient medical record website enables administrators and physicians to input, modify, access, and search for patient information and medical examination results. A web-based system enables data access at any time and from any location, thereby enhancing flexibility and efficiency in medical information management. Furthermore, this technology facilitates a more organized and methodical management of patient data for physicians.

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The test results indicate that this website has functioned as anticipated. This system serves both as a repository for medical data and as a predictive tool for assessing patient illness risk based on reported symptoms. The C4.5 model enables the system to identify illnesses depending on the input data, providing doctors with more information to inform their medical decisions.

The predictive accuracy of this system indicates that employing the C4.5 algorithm for disease classification might effectively aid the medical diagnosis process. This system enhances the organization of medical record documentation, diminishes the likelihood of errors in manual entries, and accelerates the retrieval and analysis of patient information. The deployment of this medical record information system offers substantial advantages for Uni's Dental Care. This technology streamlines patient data management and enhances the quality of healthcare services by delivering more precise and organized information to medical staff. With additional research, this system can be combined with technologies such as artificial intelligence or machine learning to enhance medical prediction and diagnostic skills more effectively in the future.

REFERENCES

Bhadouria, A. S., & Singh, R. K. (2024). Machine learning model for healthcare investments predicting the length of stay in a hospital & mortality rate. *Multimedia Tools and Applications*, *83*(9), 27121-27191.

Hadianfard, Z., Afshar, H. L., Nazarbaghi, S., Rahimi, B., & Timpka, T. (2022). Predicting mortality in patients with stroke using data mining techniques. *Acta Informatica Pragensia*, *11*(1), 36-47.

Purushothaman, S., Shanmugam, G. S., & Nagarajan, S. (2023). Achieving Seamless Semantic Interoperability and Enhancing Text Embedding in Healthcare IoT: A Deep Learning Approach with Survey. *SN Computer Science*, *5*(1), 99.

Sarwar, T., Seifollahi, S., Chan, J., Zhang, X., Aksakalli, V., Hudson, I., ... & Cavedon, L. (2022). The secondary use of electronic health records for data mining: Data characteristics and challenges. *ACM Computing Surveys (CSUR)*, *55*(2), 1-40.

Saturi, S. (2023). Review on machine learning techniques for medical data classification and disease diagnosis. *Regenerative Engineering and Translational Medicine*, *9*(2), 141-164.

Schena, F. P., Anelli, V. W., Abbrescia, D. I., & Di Noia, T. (2022). Prediction of chronic kidney disease and its progression by artificial intelligence algorithms. *Journal of Nephrology*, *35*(8), 1953-1971.

Shafqat, S., Majeed, H., Javaid, Q., & Ahmad, H. F. (2022). Standard ner tagging scheme for big data healthcare analytics built on unified medical corpora. *Journal of Artificial Intelligence and Technology*, *2*(4), 152-157.

turnitin Page 15 of 16 - Integrity Submission Submission ID trn:oid:::9832:81137217

Electronic, Business, Management and Technology Journal
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E ISSN: 3025-8707, DOI:10.55208/ebmtj

Son, C. S., Kang, W. S., Lee, J. H., & Moon, K. J. (2021). Machine learning to identify psychomotor behaviors of delirium for patients in long-term care facility. *IEEE Journal of Biomedical and Health Informatics*, *26*(4), 1802-1814.

Tavakolian, A., Rezaee, A., Hajati, F., & Uddin, S. (2023). Hospital readmission and length-of-stay prediction using an optimized hybrid deep model. *Future Internet*, *15*(9), 304.

Tong, Y., Lin, B., Chen, G., & Zhang, Z. (2022). Predicting continuity of asthma care using a machine learning model: Retrospective cohort study. *International Journal of Environmental Research and Public Health*, *19*(3), 1237.

Vikki, Z., & Yuswandi, Y. (2022). Klasifikasi Tren Penyakit Pasien Bedasarkan Dianogsa Icd-10 Di Rumah Sakit Umum Cut Meutia Menggunakan Metode C4. 5. *Jurnal Tika*, *7*(3), 228-234.

Wang, S., & Zhu, X. (2021). Predictive modeling of hospital readmission: challenges and solutions. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, *19*(5), 2975-2995.

Xie, Q., Wang, X., Pei, J., Wu, Y., Guo, Q., Su, Y., ... & Dou, X. (2022). Machine learning–based prediction models for delirium: a systematic review and meta-analysis. *Journal of the American Medical Directors Association*, *23*(10), 1655-1668.

Xu, Y., Zheng, X., Li, Y., Ye, X., Cheng, H., Wang, H., & Lyu, J. (2023). Exploring patient medication adherence and data mining methods in clinical big data: A contemporary review. *Journal of Evidence-Based Medicine*, *16*(3), 342-375.