

Design of a Case Management System for School Counselors

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Abstract: With the rise of non-contact services due to the COVID-19 pandemic, school counselors had to quickly adapt their practices in transitioning to a digital environment. The effectiveness of electronic medical records has been supported by numerous studies as it provides improved long-term care management and access to healthcare information and assessments. However, persistent issues on privacy and security of the storage of digital medical information on database servers have an impact on the acceptance of the digitization of sensitive patient data. Studies show that employing data encryption and user validation and authentication techniques ensure data privacy and security. Thus, this study developed a design for the implementation of a Case Management System (CMS) to streamline the post-documentation processes and manage a student's case information for school counselors, while ensuring the security and confidentiality of data with an appropriate encryption algorithm.

Key Words: case notes; school counseling; encryption; electronic medical records

1. INTRODUCTION

With the current COVID-19 pandemic, there is an increasing demand for non-contact medical services. Mental health professionals had to rapidly transition their practice to adapt to the online setting. The evolving technological advancements and software tools, designed to help improve patient care and engagement, have a great influence on ensuring the availability of mental health services. The pandemic enabled the utilization of digital tools for both providers and their clients. This showed acceptance of digital tools as a normal part of routine care practice (Torous et al., 2020). Thus, the rapid virtualization of these services aids to expand and effectively facilitate mental health care through various digital communication venues by providing a level of monitoring and assessing client's mental well-being virtually as effectively as the traditional face-to-face method.

The impact of Information and Communication

Technologies (ICT) in the healthcare industry has not only revolutionized how health services are delivered but also how it is now being integrated into assisting with the daily routine of clinical practice such as facilitating appointment management, patient billing, and clinical record management and storage. These tools allow the healthcare providers more time to spend on clinical practice, which helps in improving productivity and overall patient experience (Niemela et al., 2019).

The use of digital healthcare solutions can enhance patient care as well as case management in general. Case Management Systems (CMS) is a way of gaining a better understanding of a case's needs and behaviors to develop long-term business models. The system's objective is to earn enough information about a case that health providers can use to maximize the positive experience in terms of patients' quality of care. CMS may be a local or cloud-based application that monitors and manages patients' data. Through rapid

technological advancements, the practice of psychotherapy is expected to change significantly so that patients will be able to obtain care through mobile applications (Hariman et al., 2019).

Shifting their practice to adapt to an online setting and turning to various digital solutions for managing cases and case notes that contain confidential information, health privacy has become increasingly important for school counselors. A student's records are ideally kept in a folder and locked in a cabinet in the school counselor's office. As opposed to keeping records on paper, this poses issues about the protection of sensitive information being stored digitally, especially with the associated security and privacy risks in whether internal or external users attempt to directly breach an organization's data confidentiality regulations. According to the National Privacy Commission (2021), personal data that are stored digitally must be encrypted. Having multiple documents to monitor and track a student's counseling status, it is also difficult to manage and organize a student's data to enable a more effective assessment of mental health care. It's even more challenging when school counselors have to work from home and don't have easy access to their student records.

This study aims to design a web-based case management system in order to streamline the post-documentation processes of the counseling services of a school. It should also keep the electronic records encrypted and secured to ensure confidentiality. The system should be able to provide a digitalized method of case management for school counselors, that would keep the counseling services available even during the current pandemic situation.

2. CASE MANAGEMENT

Case management refers to the method or process of service delivery and roles shouldered by service providers. It is a method of helping people in assessing and identifying the areas where they need help and linking them to resources that will be able to help them (Frankel, et al., 2018). Applications that cater to mental health are also being used by certain healthcare providers to help with administrative areas of care delivery specifically for care management and case management. As a result, mental health applications fall on the said spectrum: some are used as a solution for in-person care, while others are used to assist in-person processes (Powell et al., 2020).

From a healthcare perspective, using a management system can expand the efficacy of

healthcare by improving services and workflows, offering decision-making guidance and clinical knowledge to medical practitioners, and improving the quality and effectiveness of patient care (Baashar et al., 2020).

Considering that online platforms for different businesses and organizations are in widespread use today, most, if not all, of the data are stored digitally for easy and centralized access. Online databases and cloud storage are commonly used to store data for better accessibility and version control for data consistency.

3. SCHOOL COUNSELING

School counselors are individuals who are experienced in assisting students through group or individual counseling services (Supriyanto et al., 2020). School counseling services can assist students to improve their mental health and coping strategies, allowing them to still thrive academically, especially in the current pandemic scenario. School counselors are responsible for connecting students to many of the services that can alleviate student concerns such as in terms of academic or even personal issues. They have managed to continue to provide guidance in an online setting, focusing on emotional and academic guidance to students, and providing specific support to cater to individual struggles by utilizing virtual tools to engage with and track students and families since the outbreak of the pandemic (Strear and Sunde, 2021). Today, school counselors are even more relevant in assisting students with difficulties and improving their overall well-being by making counseling services available through digital media.

Triage systems in a medical environment refer to prioritizing patients depending on their level of medical severity and treating a considerable amount of patients as efficiently as possible without compromising the quality of services (Shaffer et al., 2017). In a school setting, a triage system in counseling can be applied to maximize the efficiency of the organization and help prevent a counselor from experiencing burnout due to the volume of students availing for counseling sessions. One model of a counseling triage system is through phone screening. The objective of the screening is for a counselor to discover the level of care needed for the student during that time, whether it is routine or urgent (Rockland-Miller & Eells, 2006).

The benefits of implementing technological tools used for school counseling are numerous. Tracking of students to determine who are veering off course or may require more attention can be possible. At Georgia

State University, the introduction of a chatbot to incoming students reduced summer attrition by 22% (Steele, Nuckols, & Stone, 2020). School counselors who utilize pre-existing technological tools and emerging ones may be able to aid them in properly managing their caseload and guide students in attaining their defined goals.

4. DATA ENCRYPTION

Data encryption has become a necessary process in securing sensitive data within large institutions. Even if attackers obtain access to a patient's records, it would be difficult or impossible for them to read patient information because of encryption. Specifically, even if an attacker gains access to a server containing encrypted data, the information on that server remains fully unreadable without the secret key to encrypt/decrypt data. A study by Smith (2016) shows that 70% of data breaches entail medical practitioners and that the incidents are mostly electronically stored. This raises a concern for the healthcare providers who use digital means for storing their data, since the confidentiality of patient records and other sensitive data may be compromised.

Confidentiality primarily pertains to the safeguarding of data, particularly sensitive healthcare-related information (Bani Issa et al., 2020). Confidentiality issues are critical since the patient might face significant issues if sensitive data is shared or accessed by unauthorized individuals. Encryption may be employed to add a layer of security to digital data. Through data encryption, sensitive data stored are encrypted into unreadable data upon storing, and only authorized users are allowed to decrypt the data back to a readable format (Saikumar, 2017). Confidentiality of data can be maintained through the implementation of data encryption and user authentication and verification.

5. ENCRYPTION

5.1 Symmetric Key Cryptography

Symmetric Cryptography uses only one secret key to both encrypt and decrypt data. It is commonly used to ensure the confidentiality of data stored in a database or database encryption. Some of the most widely used symmetric algorithms are Blowfish, Advanced Encryption Standard (AES), and Data Encryption Standard (DES). Because symmetric algorithms employ the same shared key and need fewer

computer resources than asymmetric algorithms, it gives a strong level of security at the same time being faster in terms of data encryption and decryption time for large volumes of data (Srilaya & Velampalli, 2018).

Figure 1 shows the Symmetric Encryption Flow using the Alice and Bob Scenario. Alice wants to use the AES algorithm to encrypt data and transfer it to Bob. Because AES is a symmetric block cipher, Alice and Bob will encrypt and decrypt data using the same secret key. AES will perform XORs using the shared secret key to encrypt the data and produce a ciphered text. Then Bob will also XOR the data with their (same) secret key to decipher the data Alice sent.

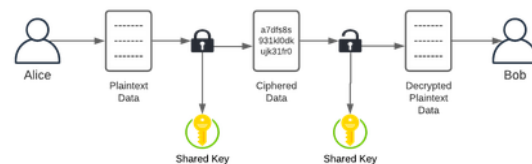


Fig. 1. Symmetric Encryption Flow

Symmetric encryption is more applicable for the proposed case management system since it uses a single key to encrypt and decrypt data and is more suitable when encrypting sensitive files prior to storing them in a database. In contrast with asymmetric encryption, this type of encryption is more suitable when there are a lot of end-users involved such as students to establish a secure connection in exchanging information.

5.2. Advanced Encryption Standard (AES)

To ensure data confidentiality and improve the protection of sensitive data, utilizing AES in securing digital data stored in the cloud has been utilized by several studies. Lee et al. (2018) successfully implemented a web application deployed in a Heroku cloud and successfully applied the AES algorithm to address the challenges of data security when it comes to cloud computing. The study emphasized the strength of AES such as its strong security and at the same time has great speed being one of the most efficient symmetric algorithms. Sivakumar et al. (2019) also dealt with the concern of cloud computing being able to handle cryptographic methods for data protection, developing a web application launched on Heroku, and implementing data security through AES cryptography. The results of the study preferred using the AES algorithm with Dual Cloud to improve data security and reduce time traffic in

encryption. Shakor and Surameery (2021) also utilized AES in order to protect the confidentiality of storing sensitive COVID-19 data being uploaded to cloud storage. Emphasized that encrypting data is important before storing it in the database to avoid data breaches by the cloud service provider and those responsible for managing it.

In cryptography, Rijndael, contemporarily known as Advanced Encryption Standard (AES), is an encryption algorithm used for encrypting and decrypting information. This algorithm is a symmetric block cipher that uses a single key to encrypt plaintext and decrypt ciphertext. AES utilizes cryptographic keys lengths of 128, 256, and 256 bits in encrypting and decrypting data of 128-bit blocks. The number of processes to be passed for encrypting and decrypting will be determined by the length of the data block and key size (Muttaqin & Rahmadoni, 2020). AES-256 was utilized in this study to secure the data in the system.

6. CASE MANAGEMENT SYSTEM (CMS)

The designed system is a web-based application that allows school counselors to manage and track the cases of their students even while working outside the confines of the school. The system should be able to help with the scheduling of the appointments. The system will be deployed using cloud storage. The goal of the system is to integrate into one application the components needed in counseling such as scheduling and case management to avoid juggling between different applications to utilize the different functionalities and to improve efficiency in workflow.

The system should be able to present two views, which are the administrator view and the counselor view. The administrator view allows administrators to manage the users, i.e. the school counselors. The administrator is provided with the following functionalities: creating, viewing, and disabling accounts as well as transferring cases from one counselor to another. The counselor view, on the other hand, should allow for the creation of new cases as well as viewing the list of cases assigned to them. Additionally, they will be able to track the progress of cases and schedule appointments. Scheduling will be done through Google Calendar and uploading of files is integrated with Google Drive. To access the case management system, the user will be required to input their login credentials for verification and authentication. Additionally, the user will be required to successfully pass the reCaptcha challenge. The

password of users is encrypted through the *bcrypt* module for NodeJS to prevent plaintext passwords saved in the cloud storage. This should protect the system from the abuse of automated bots. When accessing the system, the views page is dependent on the role assigned to the user account. Administrator roles can access admin features while counselor roles access the case management system.

In the data-level security, an encryption algorithm was utilized using the NodeJs crypto module to ensure that the sensitive data stored in the database is not readable and will ensure confidentiality from unauthorized database access. In addition to the encryption algorithm, other security measures—such as authentication strategies and a strong password validator—were implemented to further increase the system's security. User inputs are also sanitized to catch potentially harmful characters and to ensure that the data was in the appropriate format. This would safeguard the application against code injections like SQL injection and Cross-Site Scripting.

7. RESEARCH METHODOLOGY

Data collection for the study was primarily done by interviewing school counselors from De La Salle University and other institutions. Interview questions consist of processes and tools being used as well as the basic client information during the initial consultation phase. The collected data aided in creating templates of forms, designing user interfaces, and identifying and creating user stories for the web application. In identifying the data encryption algorithm for the study, different encryption algorithms were evaluated and compared through literature reviews. Existing practice management web applications were also compared and contrasted to view the similarities in functionality. This was conducted to give an overview of the functionalities that are vital in case management, specifically in the post-documentation process.

In the development of the case management system, Agile Software Development Life Cycle, or Agile, was adapted in the study. Agile is done through short development cycles that offer deliverables of software to the client for review and feedback. The deliverable per development cycle will consist of the sprint product or a tangible product of the system, which will be used for getting the feedback of the client. This iterative approach offers flexibility that allows changes to be made at any given time in the software development, which makes it less prone to error in the final product (Islam & Storer, 2020).

8. RESULTS AND OBSERVATIONS

The usability of the designed case management system was measured by conducting User Acceptance Testing (UAT). Participants for UAT were chosen by contacting counselors of the Office of Counseling Counseling and Career Services (OCCS) of De La Salle University. Four (4) participants were available with the given schedule for the testing. The testing was done online via Zoom, and each tester was asked to share their screens while accomplishing 35 test cases. The test cases were developed to test out the different features of the designed case management system, and at the same time, validate the end-to-end flow of the management system.

The UAT findings showed that 33 out of 35 test cases had passed. Two (2) of the test cases that failed were because of a parse error in the system—an error that occurs when a user names a file, and some of the letters or symbols used in the naming of the file interfere with the implemented algorithm—which was resolved after the testing. The participants expressed user satisfaction and acceptance of how the system is timely and would be useful especially in this online setting after the testing session. They commended how they were able to easily track the progress of a student, case notes organization, being able to schedule appointments using Google Calendar, and report generation. Suggestions obtained during UAT were related to adding Zoom meetings for scheduling, time-automated deletion of data in the system, adding the 'Others' option in case type, viewing of archived records, and editable automated email template. From the UAT, suggestions from the participants with regard to the improvement of existing features in the web application were implemented.

9. CONCLUSION

The designed web-based Case Management System (CMS) is a tool to help school counselors in digitizing information from their counseling services. The rise of non-contact services due to the height of the COVID-19 pandemic laid the foundation for the proposed case management system. The design implementation of this system aims to aid the post-documentation processing of school counselors by integrating multiple functions—such as case management and scheduling—into a single application. The system utilizes AES-256 as the encryption algorithm to keep data secure in cloud storage and aid in

improving data confidentiality. Furthermore, an encryption algorithm was incorporated into the system to prevent unauthorized users from accessing sensitive information, especially the personal and case notes data of the clients. A User Acceptance Test (UAT) was done to validate the web application's functions. According to the results and observations of the UAT, 33 out of 35 test cases passed. Overall, the UAT findings revealed that the participants were able to perform the majority of the web application's functionalities. Additionally, the suggestions and observations acquired during the UAT were also reflected to further improve the web application.

With the integration of Google API in the system, other commonly used applications that have APIs—such as Zoom Meetings—can also be added to further improve the scheduling system of the web application. Moreover, given that data security is important in handling confidential information, improvement in the implementation of the encryption algorithm is recommended—such as using a hybrid algorithm, specifically public-key cryptography in securing the shared secret key—for added security and to further encrypt sensitive data. Adding other security measures—such as two-factor authentication—is recommended for future studies.

10. REFERENCES

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