

Implementation of Hospital Information System in Psychiatry

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Abstract: In light of the increasing awareness and acceptance of mental health, the COVID-19 pandemic has presented new opportunities for the integration of technology into the field of psychiatry. As hospital visits have been reduced and social distancing measures have become the norm, the implementation of a Hospital Information System (HIS) for secure and efficient data storage and transfer has become crucial across multiple hospital areas. However, mental health remains a taboo subject in developing countries such as Pakistan, necessitating the development of a HIS system for psychiatry with a strong emphasis on data security. Despite awareness of mental health in a developing country like Pakistan is niche, people who are aware of it find it troubling switching from one psychiatrist to another for a multitude of reasons. This article proposes a HIS system built for psychiatric clinics or therapy centers on a cloud-based platform to make it cost-effective for low-medium income countries like Pakistan for easy and secure transfer of data. A survey was conducted with the participation of 70 individuals through an online platform. The collected data were analyzed using SPSS v26.0, revealing that 81.4% of respondents expressed agreement with the implementation of HIS in psychiatric clinics, while 12.9% remained uncertain about its feasibility. Since, the majority of respondents agreed on the implementation of HIS in psychiatric practice this research paper proposes a centralized psychiatric system for the ease of sharing information amongst mental health clinics in Pakistan with optimum security.

Keywords: Hospital Information System, Psychiatry, Therapeutic centers, Mental Health, Pakistan, Hospital Management, Cloud Computing

1. Introduction

Advancements in information technology, the Internet of Things (IoT) and the digitalization of data have opened new areas of research that incorporate technology into healthcare. During the pandemic of COVID-19, people and organizations, with the drastic change in lifestyle, realized the

importance of data digitalization as human contact was limited and the work mode changed from standard offices/clinics to work from home, using tele-clinics and other areas of telemedicine [1] [2]. A hospital Information System (HIS) is a system that refers to the field of health informatics whose focus is mainly on the digital data requirements of the hospital, and they may be administrative needs, financial needs, clinical needs or special needs of a particular hospital. HIS helps professionals in the healthcare industry by providing the patient's medical history, previous tests, diagnosis, and many other information to coordinate care to the highest possible degree [3]. Many researchers believe that e-health will lead to major advancements in the development of healthcare systems worldwide as it is a massive industry capable of growing at a rate unimaginable for most others. However, there are multiple examples where healthcare systems have shown unsustainability, especially in low- and middle-income countries. With the current highly advanced and developed systems, implementation on a country-wide scale is only possible for well-developed or first-world countries [4].

To develop an HIS system in low-middle-income countries, the price is one of the main obstacles that must be solved. There are different kinds of HIS systems; some have adopted a cloud-based HIS system, while others have an on- Premise system. Since digitization has entered the field of healthcare, it has become an integral part of the industry, having the patient data be saved on the cloud where the medical staff, as well as the patient, can access it whenever it is required and from any location has brought many advantages and has raised many issues as well [5].

The implementation of a hospital information system (HIS) provides numerous benefits to an organization, including the ability to analyze various aspects of the hospital and proactively address potential challenges that may arise throughout the year. Additionally, HIS facilitates the accessibility of patient data, allowing doctors and patients to access information from different parts of the country or even the world [6] [7]. Although HIS offers several advantages, it is not without its limitations. For instance, accessing patient information remotely necessitates a reliable internet connection, particularly when dealing with data in audio or video format, as such medical data requires a strong and fast internet connection. Additionally, HIS may encounter interoperability issues when different institutes that share data have utilized varying technologies or standards, which could result in transfer failure from one cloud to another [8].

2. Background and Literature Review

Adapting to new technology is a complex process for individuals and countries alike, however, a system as complex and advanced as HIS, for the implementation of such a system to be done successfully, it is necessary to focus on the specific circumstances of the region where it is being implemented. The circumstances for implementing HIS are very different for developed and developing countries, it is an additional challenge to develop such a system in a country with cultural and environmental differences like Pakistan. Like many developing countries, Pakistan is struggling in many aspects of healthcare and psychiatry is no exception. For an estimated 15 million people who need psychological help and are suffering from mental illnesses, there are only 400 trained psychiatrists [9].

A study was carried out in two cities in Pakistan to identify factors that may hinder the adaptation of HIS in Pakistan. According to the findings, the main factors identified were; the influence of the top management, finances, system compatibility, complexity, and the pressure of the HIS adoption [10]. Another group of researchers analyzed the physician's stance on the matter, and the analysis was done on physicians who have experience with a HIS system and their level of acceptance was measured based on their educational and demographic background. According to the study, the approval of the HIS system mainly depended on their perception of its ease of use and benefit. To boost the acceptance rate of a HIS system, research was recommended to make the interface more user-friendly [11].

Integration of private and public sectors is also a field of interest in all parts of the world. Globally, the integration of information and communication technology has brought significant changes and improvements in healthcare delivery. In a country like Pakistan, there are various types of health care provider, including the public sector, the private sector and various individual clinics. Integrating all these sectors could prove very useful in advancing the quality of healthcare provided; using enterprise application integration has been suggested for successfully integrating these separate sectors [12].

It is understood globally that with the growth of technology and advancements in the modern world, centralization of information is a key element to advance faster and have significant breakthroughs in various industries, especially healthcare [13]. One of the main areas of research right now is the implementation of HIS in psychiatry/psychology. A text-mining analysis was conducted to analyze the sentiment healthcare workers (nurses, physicians and psychologists) have towards integrating technology with psychiatry. This process was used to explore the views of healthcare workers about implementing technology. In texts about technology in the workplace, 69.4% were in a negative context [14].

A study was conducted in South West Nigeria to examine the effect of knowledge sharing between therapy teams from two psychiatric hospitals. The study monitored the teams' increased innovation and the improved quality of healthcare provided. The researchers found that collaborative technology was effective in increasing knowledge sharing between the two teams. As a result, their motivation levels increased, and they gained new insights, resulting in better responses to the questionnaire they received [15]. Several types of researches have been conducted to strengthen and improve current psychiatric systems and facilitate communication amongst healthcare providers in order to provide the necessary care to the patients [16].

3. Research Methodology

In order to ascertain the viability of a globalized psychiatric hospital information system in Pakistan, an online survey was conducted. The survey was designed to gather information from a diverse range of respondents, including psychiatrists, students, and employed individuals from the general public. These groups were included in order to provide a deeper insight into the potential implementation of such a system across various segments of society. The collection of data from these diverse occupational groups offers a deeper understanding of the feasibility and efficacy of a system of this nature in Pakistan.

A. Survey Aims

The primary objective of this survey was to gauge the perceived significance of a globalized psychiatric information system among the public, students, and medical professionals, and to elicit their perspectives on the potential advantages and drawbacks of its implementation. By gathering insights from these stakeholders, the survey aimed to identify potential obstacles and opportunities associated with the establishment of such a system. Ultimately, the data generated from this survey will be utilized to conduct a comprehensive analysis of the concerns expressed by participants and to develop potential solutions to address these concerns.

B. Survey Methodology

The survey was conducted through a Google Forms-based questionnaire distributed amongst acquaintances and the general public via social media platforms. Additionally, select psychiatrists based in Pakistan were identified through LinkedIn and invited to participate in the survey. Responses were collected over a duration of three weeks, following which the survey was closed for analysis. The gathered data was subjected to a rigorous analysis using IBM SPSS Statistics (version 26.0) to generate precise statistical measures and to identify potential correlations between

the views of medical professionals and the general public. Graphical representations of survey data were also obtained using the responses summary feature of Google Forms.

4. Results and Discussion

A. Role in Society

To gain a better understanding of how different segments of society perceive the potential implementation of an information system in psychiatric settings, the survey started by asking the respondents about their societal roles. The available options for selection were categorized into three distinct groups, namely, Students, Employed individuals, and Psychiatrists/Psychologists. This classification was implemented to facilitate an in-depth analysis of subsequent survey responses based on the viewpoints of different segments of society. Specifically, the objective was to identify any concerns or opinions about the idea of implementing an information system in psychiatric settings among individuals involved in our research topic.

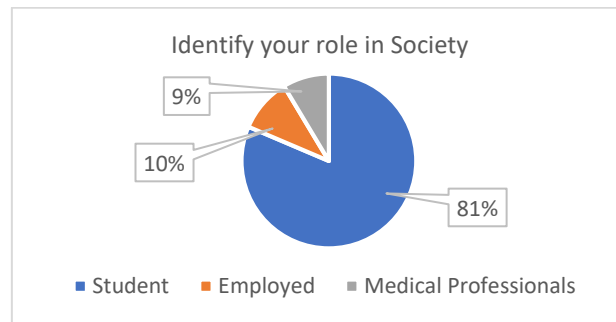


Fig. 1 - Pie Chart for roles in society of respondents

According to Figure 1, among the 70 respondents, 81.4% were students, 10% were employed, and 8.6% were medical professionals. Table 1 provides a numerical representation of these findings with students comprising of 57 participants, followed by employed individuals and psychiatrists/psychologists, with 7 and 6 participants, respectively.

Table 1 – Frequency of the roles of respondents in society

		Frequency	Valid %	Cumulative %
Valid	Employed	7	10.0	10.0
	Psychiatrist	6	8.6	18.6
	Student	57	81.4	100.0
	Total	70	100.0	

B. Consultation with a therapist, psychiatrist or psychologist

After analyzing the distribution of respondents across different societal roles, the survey asked whether participants or someone they knew had ever visited a psychiatric clinic or consulted with a psychologist. This question is of paramount significance, as it is vital in assessing potential concerns and problems that may arise with the implementation of a globalized psychiatric information system, as well as determining the level of interest among respondents.

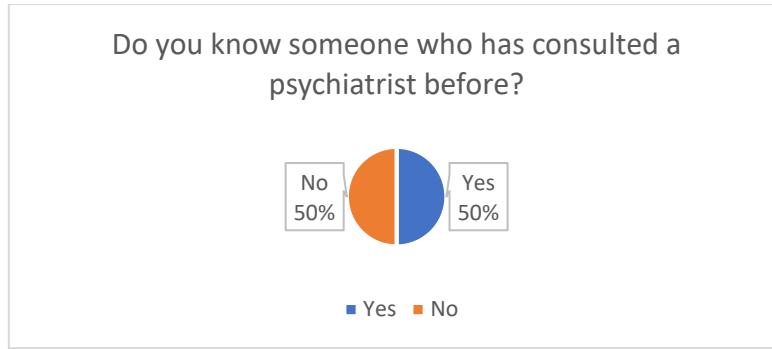


Fig. 2 - Pie Chart for consultation with a mental health specialist.

According to the results shown in Figure 2, out of the 70 survey respondents, 50% (35 participants) had either consulted a mental health specialist themselves or knew someone who had. The other half of the respondents had no experience with mental health specialists. These findings are crucial in gauging the level of interest and potential concerns surrounding the implementation of a globalized psychiatric information system

Table 2 – Cross tabular analysis of roles in society and therapist consultation

		Have you or someone you know consulted a therapist/psychiatrist		Total
		No	Yes	
Identify your role in the society	Employed	2	5	7
	Psychiatrist/ Psychologist	0	6	6
	Student	33	24	57
Total		35	35	70

Table 2 reveals that all psychiatrists/psychologists knew of someone who had consulted with a mental health specialist, while the ratio for employed personnel was 5:7. Of the 57 student respondents, only 24 had either consulted a mental health specialist or knew someone who had, while all psychiatrists/psychologists were aware of such cases. For employed individuals, the ratio was 5 out of 7.

C. Public view on trauma sharing

Repeating the traumatic events and reliving the experience each time one visits a psychiatrist or psychologist can have a significant impact on an individual's mental and physical well-being. To explore this issue, Figure 3 depicts the percentage of survey respondents who have experienced or anticipate difficulty with sharing their traumatic events repeatedly during consultations with mental health specialists.

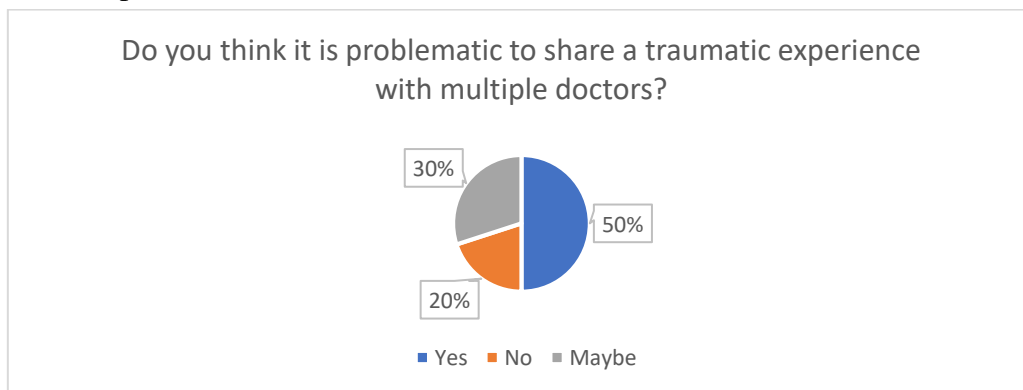


Fig. 3 - Figure 1- Pie Chart for it being problematic to share trauma

The chart, 20% of respondents did not find it problematic to share their experiences multiple times, while the majority (50%) considered it to be a significant problem, and 30% remained unsure about the matter.

Table 3 – Cross tabular analysis of therapist consultation and trauma sharing

		Do you think it is problematic to share a traumatic experience?			Total
		Maybe	No	Yes	
Have you or someone you know consulted a therapist psychiatrist	No	15	7	13	35
	Yes	6	7	22	35
Total		21	14	35	70

It can be observed from Table 3 that individuals who had previous experiences with mental health consultations agreed that it was problematic to share their traumatic experience multiple times. In fact, about 63% of those with prior experience indicated it to be problematic. Most of the respondents who selected ‘maybe’ were those without any experience with psychiatrists or psychologists.

D. Problems associated with sharing experiences

Survey respondents were asked to select all the potential issues they believed would arise from repeatedly discussing their traumatic experiences in order to identify the most critical problem areas and create a system to address them.

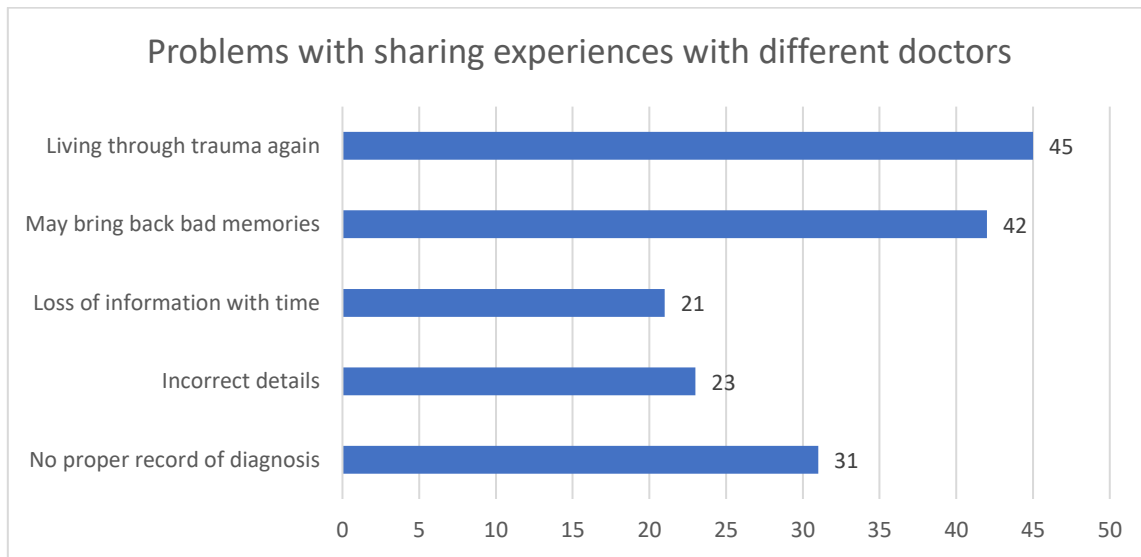


Fig. 4 - Pie Chart for it being problematic to share trauma.

Regarding the potential issues of repeatedly discussing their traumatic experiences, as shown in Figure 4, the majority of respondents cited the issue of having to relive their traumatic experiences from the beginning every time they switch to a new doctor, accounting for 64.5% of responses. The second most prominent issue mentioned by respondents was the possibility of relapsing into problematic behaviours associated with disturbing memories.

E. HIS in psychiatry

To ensure the usefulness of a Hospital Information System (HIS) in psychiatry, it is crucial to determine whether the intended users find such a system useful. Therefore, respondents were asked about their thoughts on the implementation of a globalized HIS in psychiatric clinics.

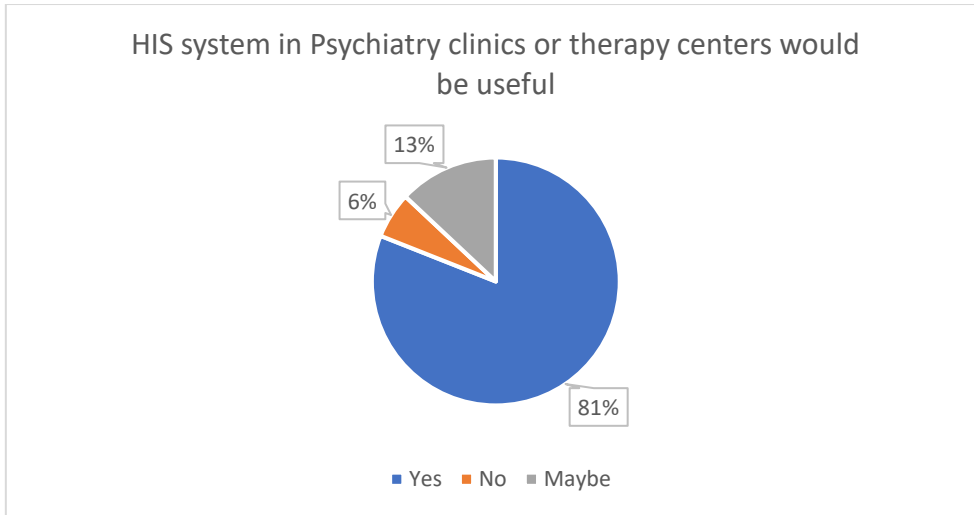


Fig. 5 - Pie Chart showing if HIS in psychiatry is preferred.

As shown in Figure 5, the vast majority (81.4%) of respondents agreed that implementing such a system would be beneficial, while 12.9% responded with a "Maybe."

Table 4 – Cross tabular analysis of therapist consultation and HIS implementation

		Hospital Information System in psychiatry			Total
		Maybe	No	Yes	
Have you or someone you know consulted a therapist/psychiatrist	No	7	3	25	35
	Yes	2	1	32	35
Total		9	4	57	70

Examining the data further, Table 4 shows that individuals with prior experience in therapy or psychiatry overwhelmingly supported the implementation and centralization of HIS in psychiatric settings. Specifically, 32 out of 35 such respondents (91.4%) with such experience agreed with the proposal. Notably, even respondents without prior experience with mental health services acknowledged the importance of HIS in psychiatric settings, with 81.43% agreeing with the notion.

Table 5 – Cross tabular analysis of role in society and HIS implementation

		Hospital Information System in psychiatry			Total
		Maybe	No	Yes	
Identify your role in the society	Employed	1	0	6	7
	Psychiatrist/ Psychologist	0	0	6	6
	Student	8	4	45	57
Total		9	4	57	70

Cross-tabulating respondents' societal roles with their views on HIS implementation and centralization (Table 5) reveals a unanimous agreement among all psychiatrists, and an overwhelming majority of employed individuals in favour of HIS implementation. Conversely, the "No" responses were exclusively from students, with only one "Maybe" among employed individuals. Despite these reservations, a significant majority of students (45 out of 57) still expressed support for HIS implementation.

F. Problems HIS would solve in psychiatry

The respondents were asked to choose the potential benefits that the implementation/development of Hospital Information Systems (HIS) in psychiatry could address.

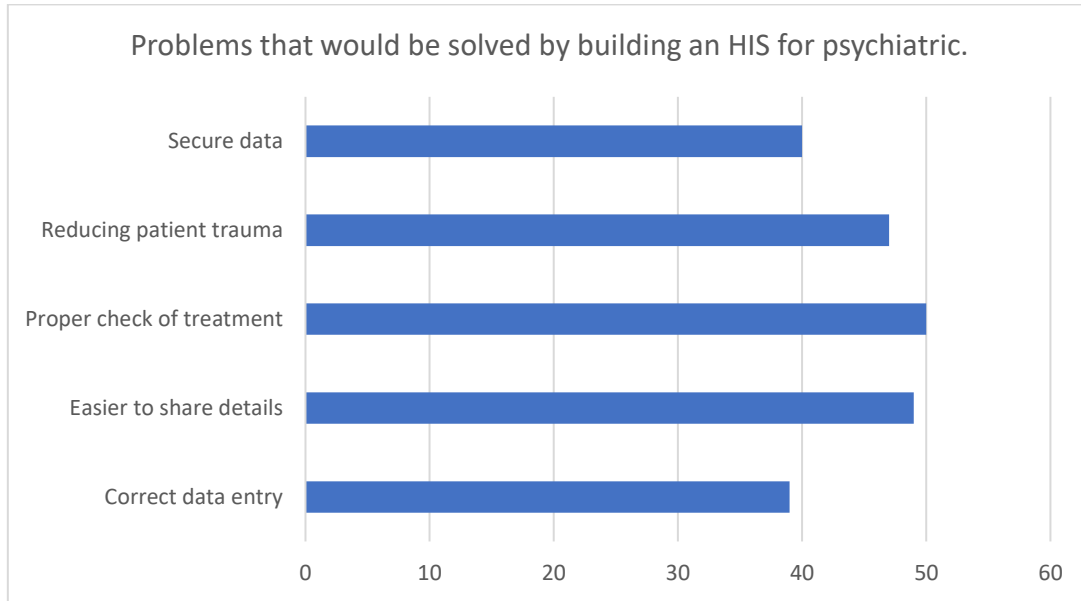


Fig. 6 - Bar graph showing the benefits of implementing HIS

As depicted in Figure 6, all listed advantages had a pick rate of over 50%. The majority of participants (71.4%) believed that HIS implementation could lead to proper verification of patient treatment and diagnosis. The second most selected benefit of HIS implementation was the more convenient transfer of patient data between different doctors, which is also associated with the third most selected benefit of avoiding repeated sharing of traumatic memories or behaviours.

G. Obstacles in implementation of HIS psychiatry

For this study, respondents were asked to select from multiple options the obstacles they believed would arise when constructing a centralized system for psychiatry.

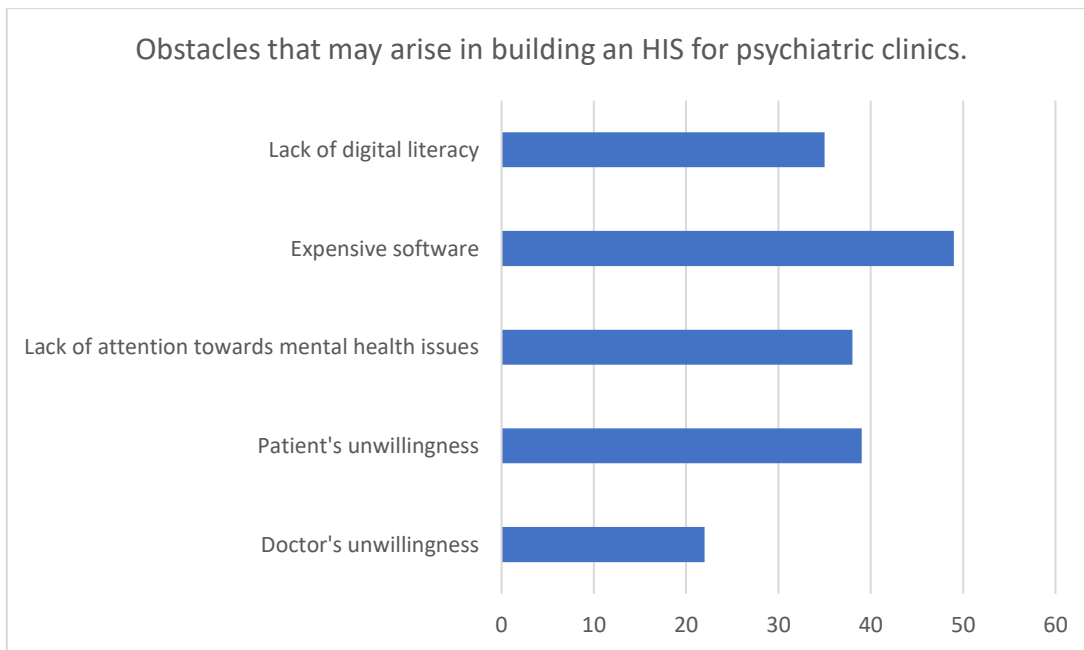


Fig. 7 - Bar graph showing the obstacles in implementing HIS

Figure 7 presents a bar graph of the percentage chosen for each option. The primary obstacle identified by the respondents was the cost of building such a system, with 70% (49 respondents) selecting this option. The other options had responses around the 50% mark, with the least chosen option being 'Doctors' unwillingness to record data electronically,' selected by only 31.4% of respondents. It is reasonable to expect that the concern about doctors' reluctance to record data electronically may diminish over time, as new doctors with computer literacy skills emerge and start treating patients.

5. Proposed System

In light of the potential challenges identified by various stakeholder groups regarding the implementation of a centralized system for psychiatry, including concerns around the cost of establishing such a system across multiple cities and the lack of digital literacy among older-generation psychiatrists, there is also some apprehension around data security and the potential risks associated with internet accessibility. This research article presents a proposed solution that provides both healthcare institutions and patients with administrative authority over their data.

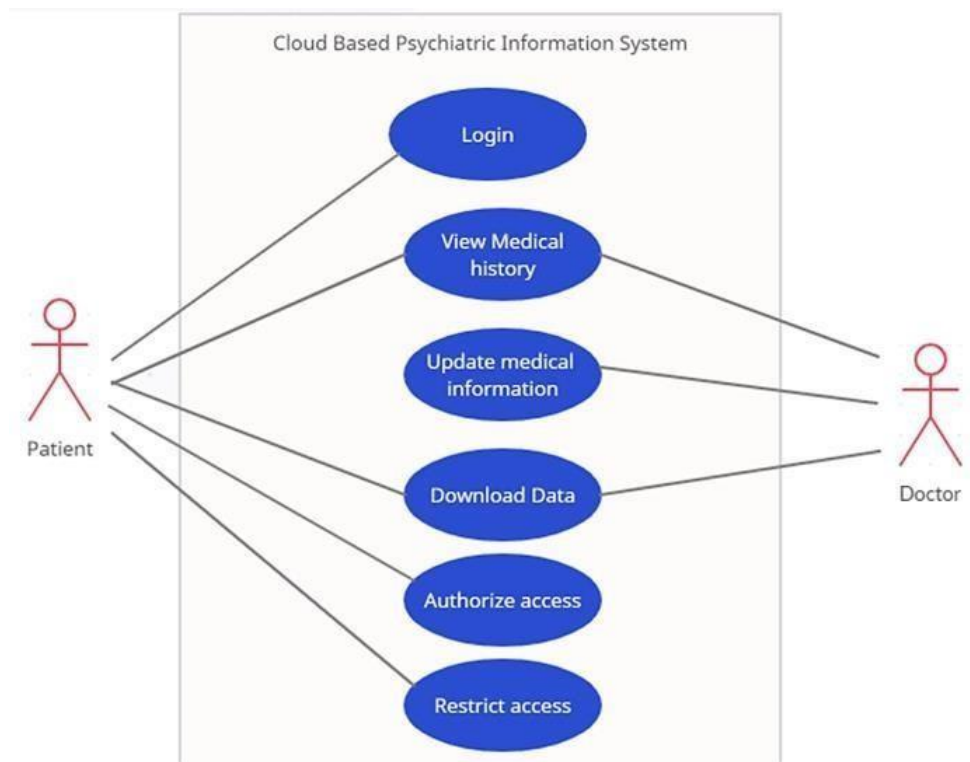


Fig. 8 - UML: Use case diagram for proposed system

Figure 8 outlines a proposed use case diagram for a cloud-based Hospital Information System (HIS) for psychiatry that can address the issue of unauthorized access. It clearly shows the roles of the doctor and patient, with the patient able to log in to their account, access their medical history, and grant or revoke access to the doctor. This functionality is crucial, as it allows patients to restrict access to their information when they change doctors or are referred to another healthcare provider.

Building on the proposed solution discussed in the previous section, this paragraph presents additional features and benefits of a cloud-based Hospital Information System (HIS) for psychiatry. If a patient is unable to manage their account due to mental incapacity, their authorized personnel will be granted access to the account to maintain the patient's information.

This ensures that the data is updated and only authorized personnel have access to it. In

addition, this proposed system is designed to be a cloud application, taking advantage of the safety, security, and ample storage space offered by various cloud systems and IoT-based systems, systems such as NextGen can be utilized to create a similar system tailed just for psychiatry. A cloud-based HIS system for psychiatry would significantly reduce the cost of system development, addressing the primary concern of cost among respondents (70%) [17] [18].

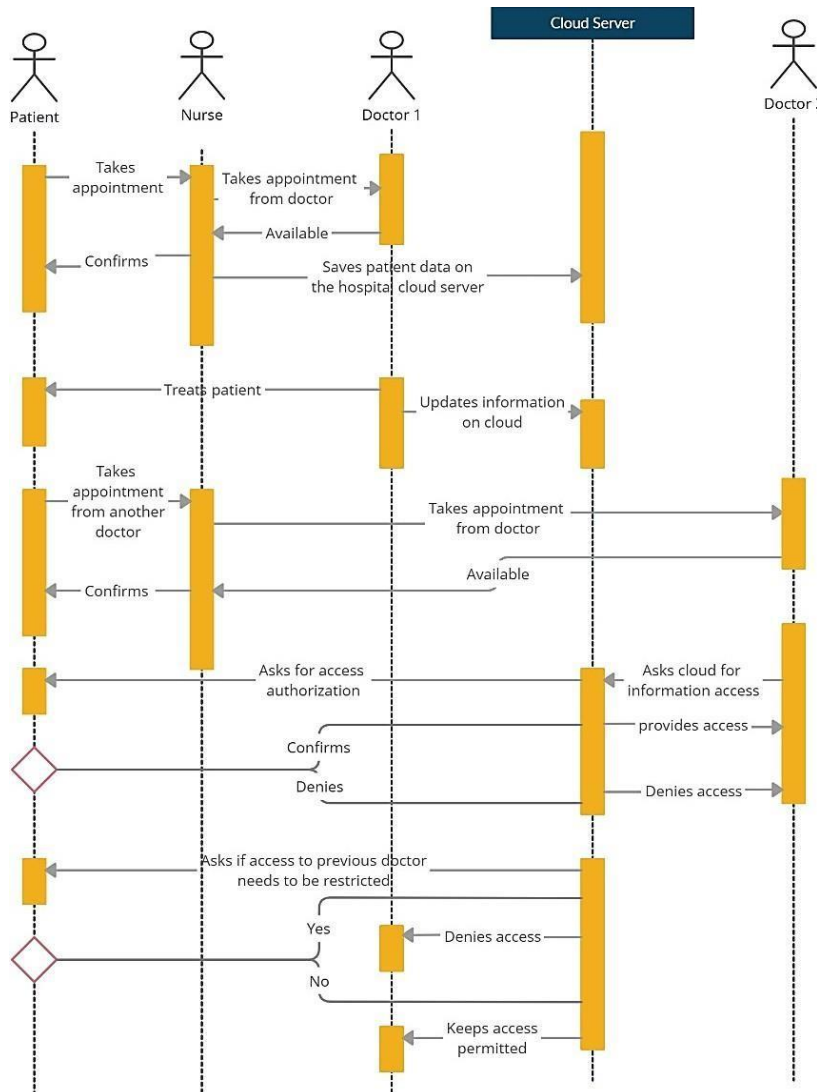


Fig. 9 - UML: Sequence diagram

The present research presents a sequence diagram in Figure 9 that outlines the proposed process of authorizing and restricting access in the cloud-based hospital information system for psychiatry. While the survey did not reveal a significant level of concern about patient data security, it remains a pressing issue in many countries, and the sequence diagram aims to address this concern. The diagram follows a standard hospital information system approach, wherein the patient requests an appointment with a doctor, and the nurse schedules the appointment after checking the doctor's availability.

Upon the patient's initial visit to the psychiatrist, their account is created on the cloud server, and the first doctor attending to the patient is automatically granted authorized access to their medical records, after which the patient's treatment commences. After the completion of treatment, if the patient seeks treatment from a different psychiatrist or is referred to another healthcare provider, the proposed cloud-based system will require patient authorization before granting access

to their information. This authorization process will ensure that unauthorized access is prevented, thereby providing enhanced security and privacy to the patient's information.

The patient will have the option to either grant or deny access to the new doctor. If access is granted, the new doctor will be able to view the patient's file, and if denied, the request will be blocked, and only the patient can unblock it if they choose to do so. Once the new doctor is granted access, the patient will be prompted to restrict access for the previous doctor, if the previous doctor still has access to their information. The patient may choose to not restrict access if they plan on seeing the previous doctor again, or if the two doctors need to collaborate. Alternatively, the patient may choose to remove the previous doctor's access.

The use-case and sequence diagrams have been developed to address the concerns identified during the survey, with other operations also included in the system. However, billing and other operations have been omitted from the diagrams to focus on addressing the identified concerns.

In conclusion, the proposed cloud-based HIS system for psychiatry provides a solution to address the challenges identified in this research, including cost, data security, and digital literacy. By implementing a permission-based system and utilizing encryption technology, patient data can be securely shared while ensuring only authorized personnel have access. Training programs can also improve the adoption of electronic medical records among older-generation psychiatrists. Overall, this system has the potential to improve patient care outcomes and provide a cost-effective solution for healthcare institutions.

6. Conclusion

The implementation of hospital information systems (HIS) has become a necessity due to changing work and healthcare dynamics. Implementing an HIS in psychiatry would result in better record-keeping of patient data, diagnosis, and treatment. A generalized HIS system would also provide clear statistics on mental health issues in Pakistan, leading to better recognition and understanding of these issues. Furthermore, HIS in psychiatry would be a significant step towards acknowledging and raising awareness of mental health in the country, where individuals are often unfamiliar with or have negative attitudes towards seeking psychiatric help.

The results obtained from the survey show that people and psychiatrists are in favor of building an HIS system for psychiatry. Psychiatrists have shown a 100% positive response towards building such a system, while 91.4% of people who have experience with therapy or a psychiatrist also agree that it would bring benefits. The main complaints observed were regarding the trauma of having to talk about traumatic events when changing doctors or being referred elsewhere. The cost of the system is the main obstacle identified for building an HIS system for psychiatry.

To address these issues, a cloud-based centralized HIS system for psychiatry has been proposed, which would not only solve the aforementioned problems but also be cheaper to build with the current technological boom. The proposed system includes a verification prompt that only grants access to individuals once the patient authorizes it, and the patient can restrict access whenever they choose. Additionally, with a cloud-based system, doctors can quickly and reliably access patient notes, diagnosis, and important details, eliminating the need for patients to repeat traumatic events. Overall, the proposed HIS system would be a significant step towards better mental health care in Pakistan.

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