

During 2010-2015, patient portals grew, not only without viewing records, but also by permitting patients to schedule appointments online, order and give prescriptions, as well as to exchange secure messages with medical professionals. At this period, healthcare organizations were also becoming aware of the importance of decreasing the administrative load and enhancing the convenience of patients. The management systems of appointments were able to reduce congestions at hospitals, shortened waiting time and enhanced doctor/patient cooperation. Simultaneously, the digital invoice and billing systems were implemented in order to solve common problems in billing mistakes, insufficient visibility, as well as payment delays.

Since 2016, the application of patient portals was further enhanced by the increasing rate of smartphone development and the use of mobile health (mHealth) applications. In the mobile devices, patients could make appointments, get reminders and view invoices at any time and any place. By merging secure payment gateways and digital invoices, financial transparency was enhanced, as well as the number of disputed transactions between patients and healthcare providers.

Patient portals gained significance even more in the COVID-19 pandemic (2020-2022). The lockdowns and social distancing measures made hospitals and clinics largely dependent on online services to schedule appointments and take payments without having to be physically present. The patient portals were also instrumental in the continuity of care as they allowed scheduling, virtual consultation and issuing of electronic invoices online. This time has increased the digital transformation in healthcare both in developed and developing nations.



Patient portals have undergone some changes in recent years (2023 and onwards) and have become a holistic healthcare management system. Improved services like automatic booking and billing reminders, instant generation of invoices, analytics and effective security systems are becoming commonplace. Governments and healthcare facilities are becoming more supportive of digital healthcare solutions to enhance the quality of services, satisfaction with the services, and the efficiency of the functioning.

A Patient Portal in the management of Doctor Appointments and Invoices is a viable solution to the contemporary healthcare issues in this regard. Such portals enable effective appointment scheduling, clear billing, and better communication between patients and the healthcare providers through offering a safe, easy to use and integrated platform. In this research paper, the researcher plans to research on the history, significance, and efficiency of patient portals in controlling doctor appointments and invoices in modern healthcare settings.

Review of literature:

Alturkistani et al. (2020) used a systematic review protocol to investigate the various functionality of the patient portals and their use in patients. The research reported major



portal features which included booking of appointments, medical records review, secure messaging and billing. The authors have indicated that accessibility, ease of use and awareness are significant in promoting patient portal uptake. The research found the issue of user-friendliness important to enhance the involvement of patients in digital health.

Alturkistani et al. (2020) maintained a review of patient portal features and their health outcomes effects in diabetic patients in another study. The results showed that frequent use of patient portals enhances patient engagement, self-management, and communication with care providers. Another advantage of patient portals that led to the worthiness of patient portals in controlling chronic diseases was also identified by the study as features such as appointment reminders and access to test results.

The systematic review of Dendere et al. (2019) is dedicated to the use of patient portals in the engagement of patients with inpatient electronic medical records. The research established that patient portals help to improve transparency and to empower patients through real-time access to health information. Nevertheless, privacy concerns, technical barriers, and different degrees of digital literacy were also named as the challenges that may restrict efficient usage of the portal by the authors.

In their study, Goldzweig et al. (2013) examined evidence pertinent to electronic patient portals and their effects in relation to health outcomes, efficacy, patient satisfaction, and attitudes. This research found that patient portals enhance health care efficiency through the minimization of the administrative load and enhanced communication. It was noted that attitudes toward the portal usage were positive (patients in general) and particularly toward booking the appointment and reading the bills, however, the study underlines that the high-level of data security is necessary.

Survey data and partial least squares analysis were used by Kinney and Sankaranarayanan (2021) to evaluate the correlation between patient portal use and patient satisfaction. The findings indicated a high positive correlative to the use of portal and patient satisfaction. The online appointment management and easy access to invoices, or even simple communication, helped greatly to enhance the general healthcare experience of patients.

Kruse et al. (2015) developed a systematic review to get an idea of the patient and provider attitude towards patient portals in the management of chronic diseases. The researchers concluded that portals provided by the study were perceived as helpful by both patients and medical providers to enhance care coordination and minimize administrative work. Nevertheless, the resistance to technology adoption and the fear of data privacy was found to be the significant obstacle to mass implementation.

Ryan et al. (2016) examined the views of patients and providers regarding the implementation and use of patient portals as detailed in a qualitative study. It was found that patient portal improves convenience and effectively delivery of messages although its successful introduction requires the appropriate training, technical assistance, and organizational preparedness. The researchers highlighted that healthcare providers should be the key agents in promoting the use of digital portals by patients.

Zhong et al. (2018) evaluated how the use of electronic patient portals influences the primary care usage and adherence to appointments. The researchers concluded that patients accessing portals had higher chances of attending scheduled visits and adherence to the care plans. Online appointment scheduling and reminder assisted in minimizing the missed appointment, and this is a pointer of increased efficiency in the health care service delivery.

In general, the literature reviewed shows that patient portals play a role in the efficient administration of appointments, a higher level of billing transparency, and increased patient satisfaction. Major obstacles like insecurity of information, digital divide, and integration have to be countered through, so as to maximize their utilization.

Objectives of the study:

- To examine the role of a patient portal in effectively managing doctor appointments.
- To study the usefulness of a patient portal in handling medical invoices and billing information.
- To analyze how a patient portal improves efficiency and convenience for patients and healthcare providers.

Research methodology:

The current research uses a descriptive and analytical approach to research to investigate the efficacy of an online patient portal to manage doctor visits and their bills. Such a method is appropriate to get the user experience, system performance, and the general effect of digital healthcare products.

Data used in the study uses both primary and secondary data. The primary data will be gathered using a structured questionnaire that will be distributed to patients, the administrative team of the hospital, and professionals with the experience of using the patient portal. The questionnaire will have close-ended questions, which will concern the time of the appointment booking, the accuracy of billings, ease of use, and user satisfaction. Hospital staff members also get interviewed in the simplest way to obtain the first-hand information on the topic of administrative efficiency and challenges.

The secondary data will be obtained through research journals, healthcare reports, books, websites and published articles on patient

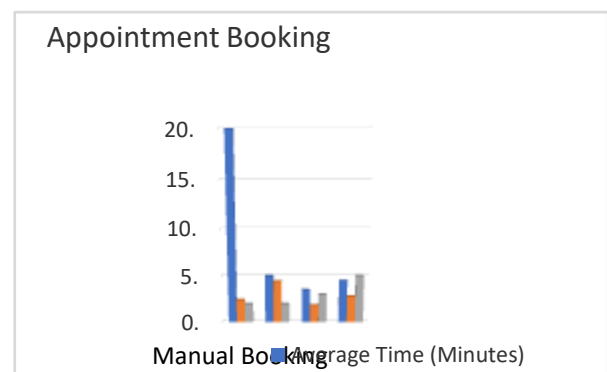
portals, healthcare information systems, and digital billing systems. Such data assists in interpreting the current research, gap determination as well as aiding the analysis.

The research study will have a population of 100 respondents which will be chosen through convenience sampling. Sensible statistical tools, like percentages, averages, and tables, are used to analyze the obtained data in order to present and interpret it. The results are displayed in the form of tables and interpretations to assess the efficiency of patient portal.

Therefore, the research methodology adopted offers a stable and acceptable framework on exploring the contribution of patient portals in enhanced management of appointment and payment of invoices in healthcare service delivery.

Table 1: Appointment Booking Time Before and After Patient Portal

Method of Appointment	Average Time (Minutes)
Manual Booking	20
Patient Portal	5



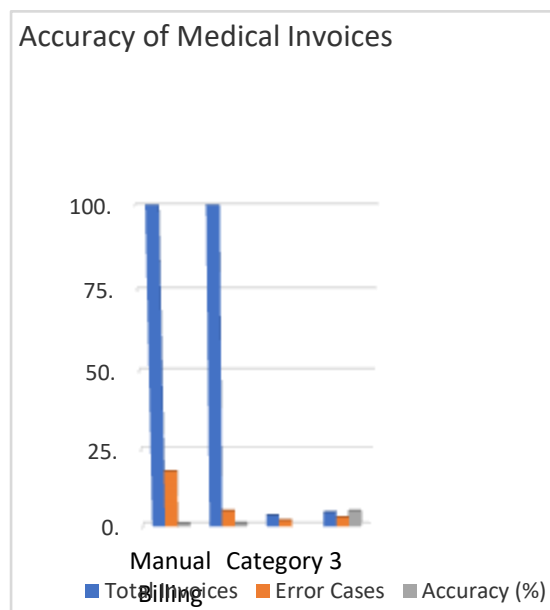
Interpretation

Table 1 indicates that there is a major difference between the time taken to reserve doctor appointments through manual systems and patient portal. Booking an appointment manually will take an average of 20 minutes compared to booking an appointment taking

the patient portal which takes only 5 minutes. The computation will show that booking time was cut by 75 percent by introducing the patient portal. Such a decrease underlines the effectiveness of online appointment schedulers. The patient portal leads to the rejection of physical visits, long queues, and repeated contacts with the hospital staff. Consequently, patients will make appointments in very quick and convenient ways and healthcare providers will be able to maintain schedules more efficiently. In general, as shown in the table, patient portal is essential in conserving time and enhancing the efficiency of operations in healthcare facilities.

Table 2: Accuracy of Medical Invoices Before and After Portal Implementation

Billing Method	Total Invoices	Error Cases	Accuracy (%)
Manual Billing	100	18	82%
Digital Invoice (Portal)	100	5	95%

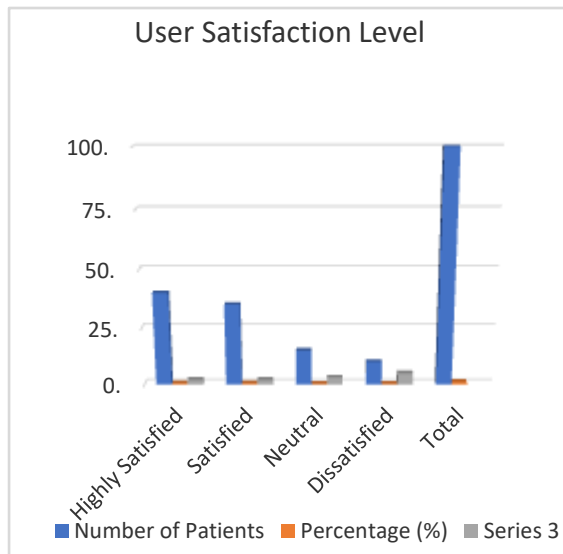


Interpretation

Table 2 details a comparison of the accuracy of billing in the manual billing systems and bills handling with the help of patient portal. According to the numbers, only the manual billing has a 82 percent rate of accuracy as 18 errors were observed in 100 invoices. Compared to it, patient portal system has a significantly higher accuracy rate of 95 of which 5 errors were reported. This enhancement shows that the process of generating invoices by use of software minimizes human-made errors usually faced with manual billing procedures like errors in calculations, data entry, among others. The higher level of accuracy makes medical billing more transparent, and creates trust between practitioners and patients. Thus, Table 2 proves the positive effect of the patient portal on the reliability and efficiency of healthcare services in invoice management.

Table 3: User Satisfaction Level After Using Patient Portal

Response Category	Number of Patients	Percentage (%)
Highly Satisfied	40	40%
Satisfied	35	35%
Neutral	15	15%
Dissatisfied	10	10%
Total	100	100%



Interpretation

Table 3 indicates the level of patient satisfaction upon utilization of the patient portal in the management of doctor appointments and invoices. The findings indicate that 40 percent of the patients are very satisfied and 35 percent of the patients were satisfied with the system. This implies that 75% of the patients are satisfied with using the patient portal. It is only 15% of the patients who are neutral and 10% dissatisfied. The satisfaction rates are high, which means that the patients find the portal convenient, useful, and easy to use when it comes to managing healthcare services. The percentage of dissatisfaction is not that big, which does not mean that there are no small inconveniences, but perhaps they are connected to technical peculiarities or the absence of digital comfort. Altogether, Table 3 indicates that the patient portal is highly acceptable among the users and it leads to better patient experience and engagement.

Overall conclusion:

The paper notes that the patient portal of doctor appointment management and invoices is a promising and stable digital tool of the contemporary healthcare systems. The results obtained make it clear the portal will save a lot

of time when booking appointments, increase the quality of medical bills, and exceed patient satisfaction as a whole. The system will minimize human errors and administrative workload and increase operational efficiency by reducing the number of manual interventions.

The quality of user satisfaction was influenced by the fact that patients have the portal convenient, transparent, and easy to use. Online booking of appointments and invoicing save time, but also enhance the connection and relations between patients and health workers. In general, the patient portal may help in enhancing service delivery in the sphere of healthcare and sustain the surge in the imperative to entail technological-based, patient-centered healthcare administration.

References:

1. Alturkistani, A., Greenfield, G., Greaves, F., Aliabadi, S., & Jenkins, R. (2020). Patient portal functionalities and uptake: A systematic review protocol. *JMIR Research Protocols*, 9(7), e14975. <https://doi.org/10.2196/14975>
2. Alturkistani, A., Qavi, A., Anyanwu, P. E., Greenfield, G., & Greaves, F. (2020). Patient portal functionalities and patient outcomes among patients with diabetes: A systematic review. *Journal of Medical Internet Research*, 22(9), e18976. <https://doi.org/10.2196/18976>
3. Dendere, R., Slade, C., Burton-Jones, A., Sullivan, C., Staib, A., & Janda, M. (2019). Patient portals facilitating engagement with inpatient electronic medical records: A systematic review. *Journal of Medical Internet Research*, 21(4), e12779. <https://doi.org/10.2196/12779>
4. Goldzweig, C. L., Orshansky, G., Paige, N. M., Towfigh, A. A.,



- Haggstrom, D. A., & Miake-Lye, I. (2013). Electronic patient portals: Evidence on health outcomes, satisfaction, efficiency, and attitudes. *Annals of Internal Medicine*, *159*(10), 677–687.
<https://doi.org/10.7326/0003-4819-159-10-201311190-00006>
5. Kinney, A. P., & Sankaranarayanan, B. (2021). Effects of patient portal use on patient satisfaction: Survey and partial least squares analysis. *Journal of Medical Internet Research*, *23*(8), e19820. <https://doi.org/10.2196/19820>
6. Kruse, C. S., Argueta, D. A., Lopez, L., & Nair, A. (2015). Patient and provider attitudes toward the use of patient portals for the management of chronic disease: A systematic review. *Journal of Medical Internet Research*, *17*(2), e40.
<https://doi.org/10.2196/jmir.3703>
7. Ryan, B. L., Brown, J. B., Terry, A. L., Cejic, S., Stewart, M., & Thind, A. (2016). Implementing and using a patient portal: A qualitative exploration of patient and provider perspectives. *BMJ Health & Care Informatics*, *23*(2), 1–8.
<https://doi.org/10.14236/jhi.v23i2.844>
8. Zhong, X., Liang, M., Sanchez, R., Onukwugh, E., & O'Brien, E. C. (2018). The effect of electronic patient portals on primary care utilization and appointment adherence. *BMC Medical Informatics and Decision Making*, *18*, 84. <https://doi.org/10.1186/s12911-018-0669-8>