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Optimizing the Use of Online Systems in Health Care Facilities

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Optimizing the Use of Online Systems in Health Care Facilities

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Abstract. The use of web-based information technology or online services can accelerate service delivery. Digitalisation of online health services is one of the growing issues, along with the increasing need for access to health services globally. However, there are things that must be considered in implementing an online health service system so the utilisation can be optimal. This study examines the factors that can support the optimisation of online service systems in health facilities so that innovation can continue to grow and provide benefits in the future. The authors conducted a literature review, with PRISMA guidelines according to the PEO (*Population, Exposure, Outcome*) method with a population focus on health facilities that use online health registration and service systems, both applications and web, and the success factors of using existing online systems when applied to users. A total of 607 articles were searched, and after selection, 22 articles fulfilled the inclusion criteria and research objectives. Analysis of each article illustrated that optimising online systems in healthcare should be fully integrated into clinical workflows and add value to patient care while offering easier processes and facilitating communication between healthcare services. User and provider engagement is also important in the development of online healthcare systems. It also needs to be supported by various parties, from the government to the healthcare provider level. Ultimately, optimising online systems in healthcare is very useful in effectively cutting down service delivery time to improve the quality of healthcare and health status in the future.

Keywords: Online System; Healthcare Facility

Abstrak. Pemanfaatan teknologi informasi berbasis web atau layanan daring merupakan inovasi yang mampu mengakselerasi penyediaan layanan. Digitalisasi layanan kesehatan daring menjadi salah satu isu yang terus berkembang, seiring dengan meningkatnya kebutuhan akses layanan kesehatan secara global. Namun, ada beberapa hal yang harus diperhatikan dalam penerapan sistem layanan kesehatan daring agar pemanfaatannya dapat optimal. Penelitian ini mengkaji faktor-faktor yang dapat mendukung optimalisasi sistem layanan daring pada fasilitas kesehatan agar inovasi dapat terus berkembang dan memberikan manfaat di masa mendatang. Penulis melakukan studi pustaka secara sistematis, dengan pedoman PRISMA sesuai metode PEO (*Population, Exposure, Outcome*) dengan fokus populasi pada fasilitas kesehatan yang menggunakan sistem pendaftaran dan layanan kesehatan daring, baik aplikasi maupun web, serta melihat faktor keberhasilan penggunaan sistem daring yang ada saat diterapkan kepada pengguna. Dari penelusuran diperoleh total 607 artikel, dan setelah melalui seleksi dihasilkan 22 artikel yang memenuhi kriteria inklusi dan tujuan penelitian. Analisis setiap artikel menggambarkan pengoptimalan sistem daring dalam layanan kesehatan harus sepenuhnya terintegrasi ke dalam alur kerja klinis dan memberikan nilai tambah pada perawatan pasien sekaligus menawarkan proses yang lebih mudah dan memfasilitasi komunikasi antara layanan kesehatan. Keterlibatan pengguna dan penyedia juga penting dalam pengembangan sistem layanan kesehatan daring. Hal ini juga perlu didukung oleh berbagai pihak, mulai dari pemerintah hingga tingkat penyedia layanan kesehatan. Pada akhirnya, pengoptimalan sistem daring dalam layanan kesehatan sangat berguna dalam memangkas waktu pemberian layanan secara efektif untuk meningkatkan kualitas layanan kesehatan dan meningkatkan status kesehatan di masa mendatang.

Kata Kunci: Sistem Daring; Fasilitas Kesehatan

INTRODUCTION

The development of the digital world has made the internet increasingly widespread in all aspects of life. The use of web-based information technology or other online services is one of the innovations that has accelerated the provision of services that the wider community needs. Digitalization of health services has also become one of the growing issues along with the increasing need for access to health

services for people who are increasingly accelerated to advance after the COVID-19 pandemic that hit the world globally.(1,2)

In a fairly short period of time, the development of information technology in healthcare has grown rapidly in many countries, especially in Primary Health Care Centres. Every healthcare provider has been triggered to be able to provide online services,

both in terms of teleconsultation, scheduling, and registration to health services in order to manage the number of people who come to access services without having to create crowds.(3,4)

The Ministry of Health in Indonesia is intensifying transformation in health services. The health transformation proposed by the Minister of Health, Budi Gunadi Sadikin, is to improve the health benefits for the people as much as possible, especially to prepare Indonesia for the demographic bonus, which can be a stepping stone for Indonesia to change its status from a developing country to a developed country. However, the implementation of the use of existing information technology can still be said to be quite low. This may impact the sustainability of the use of online healthcare innovations.(5,6)

Based on the statement above, this study was conducted to provide input on important factors supporting the optimization of online service systems in health facilities. Thus, existing innovation efforts can continue to grow and deliver benefits to advance health services in the future.

METHOD

This study used a *literature review* method, which was carried out with PRISMA guidelines. The search for literature sources was carried out based on the PEO (Population, Exposure, and Outcome) method. The focus of the Population in this study is Health Service Facilities that use online registration systems and health services both application and web-based, and look at the success factors of using existing online systems when applied to users. The keywords used during the literature search were: *Health Care Provider AND Online Registered System OR; Online Registration System OR; Appointment Scheduling System OR; and Online System.*

Searches were conducted on several databases, namely Proquest, Science Direct, Scopus, Cochrane and Sage Journals. Articles included in the inclusion criteria are accessible in full text and published between 2014 and 2024 in English and have a relationship with the topic and purpose of the study after going through the results of title searches, abstracts, and reading the entire article of the article obtained. The search results obtained 22 articles that fit the inclusion criteria and the research objectives from a total of 607 articles. The flow of searches in selecting articles can be described in the following diagram. The flow of searches in selecting articles can be described in the following diagram.

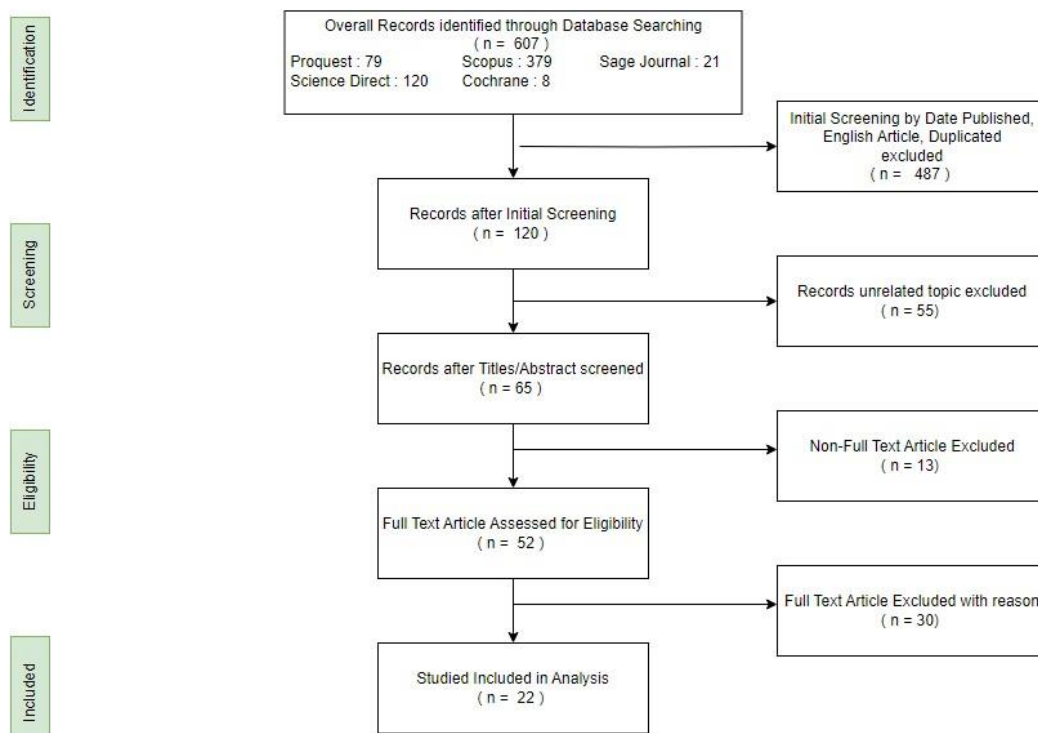


Figure 1. Article Search Based on Inclusion and Exclusion Criteria

RESULTS

The results of the article search can be seen in Table 1, which lists the author's name, year of

publication, methods used, and research results. These results will then be further researched by the author.

Table 1. Summary of Article Search Results Related to the Success Factors of Online Registration Systems in Health Facilities

No	Title	Author and Year	Method	Results
1	<i>A Systematic Review of Health Management Mobile Applications in COVID-19 Pandemic: Features, Advantages, and Disadvantages (4)</i>	Garavand A, et al (2024)	Systematic review	In creating and developing applications, it is necessary to consider the ease of use of the application, security and ethics, protection of personal information, and user privacy.
2	<i>A Review of Optimisation Studies for System Appointment Scheduling (7)</i>	Niu T, et al (2023)	A literature bibliometric analysis	(1) Optimization methods in patient scheduling mostly involve the application of genetic algorithms and simulation optimization algorithms; (2) Web networking and deep learning methods on the system are core technologies in healthcare management optimization; (3) Bibliometric analysis reveals high interest in optimization technology of patient scheduling system in China compared with other countries; and (4) Technological progress is of great significance in comprehensive optimization of a system, exploration of practical use scenarios, and application of advanced simulation and modelling techniques.
3.	<i>Features of Online Hospital Appointment Systems in Taiwan: A Nationwide Survey (8)</i>	Yang PC, et al (2019)	Survey	More than half of the hospitals in Taiwan already operate an online scheduling system. However, this existing system only replaces the registration process, and is not further streamlined by incorporating information related to medical history or reasons for online appointments.
4	<i>Hurdles to developing and scaling remote patients' health management tools and systems: a scoping review (9)</i>	Ruyobeza B, et al (2022)	Scoping literature review	Most systems are targeted and focussed on a single disease, not involving patients and clinicians in their initial planning and design phases, not designed for disease management settings. This may discourage potential patients to physicians from using the systems offered, leading to low system utilisation.
5	<i>Indian Model of Integrated Healthcare (IMIHC): a conceptual framework for a coordinated referral system in resource-constrained settings (10)</i>	Mirza M, et al (2024)	Mix method	The Indian Integrated Healthcare Model (IMIHC) proposes three levels of integration: Macro, Meso, and Micro levels, using existing Information Systems. Its core components including a Central Control Room, using existing digital platforms at the macro level, <i>bucket overflow model</i> at the meso level, as well as a Triple Layered Concentric Circle outpatient department design, with a three-door outpatient concept at the micro level.
6	<i>Health informatics publication trends in Saudi Arabia: a bibliometric analysis over the last twenty-four years (11)</i>	Binkheder S, et al (2021)	Scoping literature review	The Ministry of Health's initiative in developing the <i>E-Health system</i> simultaneously triggered research in the development of health technology, both in data exchange, <i>Artificial intelligence</i> , and other health technologies.
7	<i>Patient, staff, and clinician perspectives on implementing electronic communications in an interdisciplinary rural family health practice. (12)</i>	Chang F, et al (2017)	Qualitative method	Patients stated they would use email to communicate with doctors to request prescriptions (65% of respondents), make appointments (63%), obtain lab results (60%), and educational information (50%). Clinic staff expressed concerns about patient confidentiality and data security, timeliness, complexity and consistency of responses, and increased workload. Thus, clear technical guidance is needed in implementing the online system.
8	<i>Impact of an Open Access Appointment Scheduling System on No-Show Rates in an Urban Federally Qualified Health Centre (13)</i>	Ward R (2024)	Mix method	Open access scheduling can significantly reduce patient no-show rates in resource-constrained health centres. Open access allows more flexibility in scheduling and allows facilities to offer scheduling methods that prioritise health check-ups and follow-up visits (in chronic care) with urgent visits.
9	<i>Use of a primary care online consultation system, by whom, when and why: evaluation of a pilot observational study in 36 general practices in South West England (14)</i>	Edwards HB, et al (2017)	Observational study	Use of online consultation systems is very low at weekends. If consultations are increased, the impact is that staff workload increases, healthcare costs increase and patient waiting times may lengthen. If an online consultation system is to be developed, it must be useful to improve efficiency for staff and patients.

No	Title	Author and Year	Method	Results
10	<i>Enhanced Primary Health Care Intervention: Perceived Sustainability and Challenges Among Implementers (15)</i>	Perialathan K, et al. (2021)	Mix method	Improving Health Services in Primary Health Care, needs to be supported by improving Human Resources facilities, Infrastructure, Information Technology Systems, and others.
11	<i>Minimal Human Interaction in Hospitals: Effective Online Registration System Design (16)</i>	Lin CF, et al (2022)	Mix method	Adding a right-click function to the registration tab by department or symptom and providing instant messaging to outpatients to check the progress of their clinic appointment number are important features to improve user satisfaction. Providing instant messaging to outpatients to check the progress of clinic appointment numbers are important features to improve system user satisfaction.
12	<i>MyHealthPortal - A web-based e-Healthcare web portal for out-of-hospital patient care (17)</i>	Tanbeer et al (2021)	Mix method	<i>MyHealthPortal</i> can assist home care and clinic-based health services along with existing portal benefits (example: scheduling, monitoring and information sharing). <i>MyHealthPortal</i> is secure, robust, flexible and easy to use.
13	<i>Adapting non-medical applications for medical use: Ethical limits, coverage, and validation (18)</i>	Giordano V, et al (2021)	Literature review	Adapting non-medical applications and devices for medical use presents limitations, barriers and potential risks. Privacy and security are fundamental aspects of ethical healthcare behaviour, but there are currently no standardised recommendations for all regions or countries. Despite the absence of universally accepted recommendations, there are benefits to using non-medical instant messaging, communication tools and devices with medical purposes in practice. However, despite the potential use and validation for expanding health outreach and patient support, it should be assumed that no non-medical application is 100% safe, so their use should always balance risks and benefits to minimise potential ethical issues.
14	<i>Digital transformation at Hall Green Health - A model for modern general practice (19)</i>	Nazir A et al (2023)	Literature review	In the HGH system, we need to be able to rely on an integrated platform of digital. Digital telephony, websites, messaging services, telecommunication links, mobile phones, computers, printers and telemedicine machines are provided to us in standardised form, but can be configured according to our local needs. This means we can rely on safe, secure, easily accessible digital solutions and solutions that are constantly monitored, updated as needed and continue to operate at a high level of performance. Employee productivity will increase in the end.
15	<i>Health digital state and Smart HER systems (2020) (20)</i>	Serbanati LD (2020)	Quantitative method	For each individual, the <i>Smart EHR</i> uses the <i>Virtual Health Record (VHR)</i> to generate an intelligent agent that acts as an avatar for the individual's health. These agents interact with the healthcare professionals, provide information on aspects of the individual's health, proactively offer solutions, and help them diagnose and decide on appropriate treatment.
16	<i>Industry 4.0 in Healthcare: A systematic review (21)</i>	Ahsan MM, et al (2022)	Systematic review	During COVID-19, healthcare and Industry4.0 are converging and evolving together, addressing issues including data security, resource allocation and data transparency. <i>Industry 4.0 in Health Care (IHC)</i> enables various technologies, including the <i>internet of things (IoT)</i> , blockchains, big data, cloud computing, machine learning, and information and communication technology (ICT), to track patient records and contribute to the reduction of social transmission of COVID-19.
17	<i>Managing appointment-based services with electronic visits (22)</i>	Cai Y, et al (2024)	Numerical study	How providers can use appointment scheduling as passive when patients have full access to E-visit channels, to better utilise resources and reduce waiting times. In particular, multimodality still applies to models with E-visits, although their waiting costs are usually non-linear. Furthermore, we analyse how providers can "actively" control the arrival of e-visits by scheduling their time windows. By examining the optimal combined schedule structure of appointments and E-visit time windows, and reformulating the problem into a two stage programme, an <i>Accelerated Cut Generation Algorithm</i> was designed, which proved to be efficient.

No	Title	Author and Year	Method	Results
18	<i>Modelling the utilisation of cloud health information systems in the Iraqi public healthcare sector (23)</i>	Meri A, et al (2019)	Quantitative method	The effects of system compatibility, system complexity, security, and privacy on physician confirmation and behavioural control were statistically significant. Both confirmation and behavioural control had a positive effect on physician use of technology in hospitals.
19	<i>Preference based scheduling in a healthcare provider network (24)</i>	Agrawal D, et al (2023)	Literature review	We propose a preference-based "nested" network model that comprises the most practical operational constraints. Our model considers patients with varying priorities who can visit their preferred clinic locations and providers, and request their preferred appointment days and times. Common constraints such as patient no-shows, cancellations, and uncertainty of doctor availability are also taken into account. We propose a dynamic programming approach to provide a robust scheduling policy.
20	<i>The regional and referral compliance of online healthcare systems by the Indonesia National Health Insurance agency and health-seeking behaviour in Indonesia (5)</i>	Handayani PW, et al (2021)	Quantitative method	The tendency for alternative medicine to increase health-seeking behaviour, and the tendency to seek health information on social media increases the frequency of health-seeking. Referral to higher services should be followed by proper diagnosis coding in the system.
21	<i>Analysis of hospital management information system satisfaction using the end-user computing satisfaction method: A cross-sectional study (25)</i>	Meiyana NS, et al (2023)	Quantitative method	The <i>end-user computing satisfaction</i> (EUCS) method is important to improve <i>hospital management information systems</i> (HMIS) satisfaction. Therefore, training and socialisation of EUCS should be increased to maintain the ease of use of computers to improve management system satisfaction in hospitals.
22	<i>Patients' choices regarding online access to laboratory, radiology and pathology tests results on a hospital patient portal (26)</i>	Hulter P, et al (2023)	Mixed method	Most patients favour transparency in health-related information and want their test results disclosed as soon as possible

DISCUSSION

Health technology transformation is one of the pillars of health transformation, and it has triggered a significant development in the use of information technology in Indonesia.(5,6) Many challenges must be overcome to achieve the desired results in developing *mobile* health technology. The most common challenges for *mobile* health technology issues are acceptance and adoption by healthcare providers (health facilities) and healthcare recipients (patients).(18) The applications should be fully integrated into the clinical workflow, add value to patient care, and offer easier administration or usage processes. The implemented system should also facilitate communication between healthcare providers within the healthcare institution and between interrelated institutions. However, implementing each system must be accompanied by guarantees of personal information security and user privacy per applicable ethics.(4,6,8,12,17,18,22,23)

Online systems must be effectively implemented in health services. The integration created between one service and another, starting from registration, writing medical records, and submitting examination results to the patient's medical history, is expected to be easily accessible by both patients and health providers. Of course, the system model will require developing a layered service system

with its own level of security.(10) Technological advancements will be needed to optimize the online system comprehensively. The development of system scenarios that explore each part of the service in a practical way, as well as implementation through advanced modelling techniques is important. The development of information systems is also expected to continue to be improved, accompanied by improvements in infrastructure and the quality of human resources through various trainings, to trigger the birth of multiple innovations, including the development of online systems in health services.
(7,10,11,15,19,20,23–25)

Online system development also needs to pay attention to the involvement of service users, namely the patients themselves.(9,26) Patients are expected to be involved in providing evaluation and input on the needs that are deemed necessary when using online systems in health services. Transparency of data, clarity in using the system, to the ease of operating the existing system such as selecting service schedules, changing data and other things needed by patients, can ultimately increase patient satisfaction with the system used.(12,13,24,26) On the other hand, online systems also need to accommodate the needs of service providers, namely health facilities. Ease of access will increase the productivity of health services, and minimize the

occurrence of *fraud* or errors that may be made by health providers. All of these things will be very good if supported by standard rules set by the government to develop online systems in health services uniformly.(9,13,14,16,21,26)

Technological advances in health services need to be supported by various parties in supporting the needs of the online system facilities used. Preparation in using this system must not only be owned by system users, both patients and health facilities (both Community Health Centers or *Puskesmas*, Clinics, and Hospitals) but also the government in terms of making regulations to be able to equalize the quality of the system, create a good referral system between health services, and provide quality internet networks throughout the region.(5,10,11,15) Through the involvement of various parties, the use of online systems in health services can run in accordance with the original purpose of developing this system, namely increasing the utilisation and effectiveness of health services to improve health status in the future.(5,6)

CONCLUSION

Implementing online systems in health services can provide considerable benefits, especially in cutting service time. This condition is undoubtedly beneficial for Indonesia, amid the lack of available health facilities, compared to the number of people who must get services. Optimization of the use of online systems must begin to be carried out by the highest party, namely the government as a policy maker, to the lowest level, namely health facilities that provide direct services to the community. Information related to online systems must also be conveyed to service users. So that people can feel the impact of the benefits of implementing each online system without experiencing difficulties in using it. The use and development of innovation in online service systems are expected to continue over time, and service integration can be realized to increase the effectiveness of health service delivery. Ultimately, every effort to optimize online health services systems will improve the quality of health services and Indonesia's health status in the future.

RECOMMENDATIONS

The author in this study provides recommendations to the government to be able to create a standard for online service systems in the health sector that can be applied nationally. The hope of implementing this recommendation is that every health service in Indonesia can have the same standards and can be integrated with one another. This integration is expected to reduce obstacles related to health service data, to reduce the absence of online systems in some areas that still lack

innovation. The author also recommends that research on the use of online service systems can continue to be improved in order to create the latest innovations so that they can provide more benefits to users from all sides, including closing any obstacles that may arise, especially in terms of ethics.

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CONFLICT OF INTEREST

The author declares that there is no conflict of interest regarding the publication of this article.

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