

The role of patient portals for cancer patients: a systematic review of benefits, challenges, and opportunities

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Responsible Editor: Praba Diyan Rachmawati

Received: 11 February 2025 ◦ Revised: 10 October 2025 ◦ Accepted: 22 November 2025

ABSTRACT

Introduction: Cancer patients have a complex journey. Technological developments offer convenience in communicating and accessing health information. Cancer patient portals were developed to coordinate and integrate care by overcoming existing barriers. This study aims to explain the benefits, challenges, and opportunities of using patient portals in oncology services.

Methods: The design of this study was a systematic review, with the source articles drawn from PubMed, ScienceDirect, ProQuest, EBSCOhost, and Scopus. Inclusion and exclusion criteria were used to screen articles with the PRISMA 2020 guidelines. A critical appraisal was conducted using the JBI Critical Appraisal Checklist 2020 and the MMAT 2018. Narrative descriptive approaches are used for data synthesis.

Results: We screened 3,301 articles using inclusion, exclusion, and duplication criteria, resulting in 10 articles for analysis. Communication and care coordination (n=4) were among the main benefits of using patient portals. Perceived obstacles such as limited resources (n=2), socio-demographic challenges (n=3), and limited information sources (n=2) are still found. On the other hand, the use of patient portals creates opportunities to address information needs and provide assistance (n=1), increase security and privacy (n=1), and improve service efficiency (n=2).

Conclusions: Patient portals play an essential role in improving coordination and engagement among cancer patients, despite ongoing challenges related to access and digital literacy. For nursing, these portals strengthen nurses' roles in education, coordination, and the use of evidence-based technology to improve the quality of care.

Keywords: cancer, digital health, health information system, health services, patient portals

Introduction

Cancer remains a major public health, social, and economic problem in the 21st century, accounting for nearly one in six deaths (16.8%) and one in four deaths (22.8%) from non-communicable diseases worldwide (Bray *et al.*, 2024). Data from 2022 reported by the International Agency for Research on Cancer revealed approximately twenty million new cancer cases and 9.7 million cancer deaths worldwide in 2022 (Globocan,

2022). The high incidence of cancer poses a significant burden and challenge for patients and healthcare systems worldwide, straining resources for diagnosis, treatment, and care (Ngalla *et al.*, 2024).

Technological advancements such as Patient Portals in healthcare play a crucial role in addressing these challenges and revolutionizing the collection, processing, and transmission of data, enabling automated, high-precision, and real-time diagnostics (Yucel *et al.*, 2025). The patient portal is a tool that provides patients with

access to their health records, laboratory test results, educational materials, secure messaging, appointment scheduling, reminders, remote monitoring, and telehealth visits, enabling patients to take an active role in their own (Vyas and Muzumdar, [2022](#); Johnson *et al.*, [2023](#); Milanfar *et al.*, [2024](#)). Patient portals for cancer care differ from those in non-cancer contexts because they offer specific tools for managing chronic, complex, and often unpredictable diseases. Cancer patients use portals more frequently to view clinical records and lab results, interact with their care team, manage side effects, and track treatments (Vyas and Muzumdar, [2022](#); Zaidi *et al.*, [2022](#)).

Patients who can access their health records through a Patient Portal integrated with Electronic Health Records (EHR) show better health outcomes by supporting information exchange for self-care, informed decision making, improving treatment adherence, and increasing trust between patients and healthcare providers (Vyas and Muzumdar, [2022](#); Zaidi *et al.*, [2022](#)). Through the patient portal, effective communication can be established, and care coordination improved to address complex barriers to cancer patients' care (Weis *et al.*, [2020](#)). Families can also play a role in accessing health information, helping to understand medical terms, assisting in decision-making with patients, and acting as patient representatives if the patient's condition makes it impossible for the patient to access their EHR (Weis *et al.*, [2020](#)). For healthcare professionals, patient portals can improve the quality of care by enabling efficient communication, as they can view a patient's medical and treatment history when determining a care plan (Upadhyay and Hu, [2022](#)).

Currently, the use of patient portals varies across the world due to differences in healthcare systems, national digital health policies, and user experiences. The implementation and use of patient portals across countries remain diverse: some countries have adopted patient portals with advanced features, while others are still in the development stage (Aval *et al.*, [2025](#)). In the meantime, although various studies have shown that patient portals can improve patient access to medical information, strengthen communication with healthcare professionals, and increase user satisfaction, most of these findings remain descriptive and limited to the general healthcare context (Coughlin, [2018](#)). Thus, the

exploration of the benefits, challenges, and opportunities of using patient portals for healthcare professionals, cancer patients, and care providers in oncology services remains limited. Therefore, this systematic review aims to provide a more comprehensive perspective on patient portals in the context of cancer care.

Materials and Methods

Research Design

The study employed a systematic review design, a research approach that gathers all empirical evidence within a specific area, critically appraises it, and synthesizes conclusions that summarize the findings. The literature search was conducted based on the research question: "*What are the benefits, challenges, and opportunities of using patient portals to improve the quality of oncology services?*" This study has been registered in PROSPERO with the registration number: CRD42025634559.

Search Strategies

The articles used in this study were obtained from four databases, namely PubMed, ScienceDirect, ProQuest, EBSCOhost, and Scopus. The keywords and research questions were developed from the Population, Concept, Context (PCC) framework (P: health workers, cancer patients, and caregivers who use patient portals in oncology services; C: focusing on the application of patient portals in the context of cancer care; C: the role of patient portals in supporting the oncology care process). The search strategy used a combination of keywords listed in Table 1, tailored to each database's characteristics. Included articles met the following inclusion criteria: published between 2020 and 2024, in English, open access, available in full text, original research, and explicitly discussing the use of patient portals in oncology services. Exclusion criteria included articles that discussed cancer services without mentioning the role of patient portals or digital technology, did not involve cancer patients, caregivers, or health workers as the research population, were theoretical without practical application, or were reviews or protocol studies. The screening process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines, a widely

Table 1. Keywords in search

Database	Keywords
PubMed	("Patient Portals"[Mesh] OR "Electronic Health Record" OR "Health Information Systems"[Mesh]) AND ("Oncology Care" OR "Cancer Care" OR "Cancer Treatment") AND ("Cancer Patients" OR "Neoplasms"[Mesh])
Science Direct	("patient portal" OR "electronic health record" OR "EHR") AND ("oncology care" OR "cancer care" OR "cancer treatment") AND ("cancer patient" OR "patients with cancer")
ProQuest	("patient portal") AND (cancer OR oncology OR neoplasm*) AND (benefit* OR challenge* OR opportunity*)
EBSCOhost	"patient portal" AND AB (cancer OR oncology) AND AB (benefit* OR challenge* OR opportunity*)
Scopus	("patient portal" AND (cancer OR oncology) AND (benefit* OR challenge* OR opportunity*))

recognized standard for reporting systematic reviews. The PRISMA process comprises four key stages: identification, screening, eligibility, and the final selection of articles by the researchers (Page *et al.*, 2021).

Article Selection

Databases used in the article search include PubMed, ScienceDirect, ProQuest, EBSCOhost, and Scopus using keywords based on the PCC framework. Subsequently, duplication checks and identification of articles according to the specified criteria were carried out using Rayyan, which facilitated the screening process and automatic detection of duplicate records across all searched databases (Rožanc and Mernik, 2021). Selected articles were further analyzed by five researchers (HZGP, ASN, BY, DPI, and DOD) through discussions to ensure data consistency in accordance with the objectives and research questions. The initial database search was conducted by HZGP and ASN, followed by a two-phase screening process consisting of title-abstract screening and full-text screening. All discrepancies were resolved through consensus among the five researchers. A collaborative approach was used to ensure clarity, accuracy, and minimize ambiguity in determining the final results of the study.

Quality Appraisal

The articles used in this study comprised five quantitative studies, four qualitative studies, and one mixed-methods study. To assess the quality of the articles used, three researchers identified based on eligibility criteria using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist 2020, for qualitative studies (Lockwood, Munn and Porritt, 2015), cohort studies, cross-sectional studies (Moola *et al.*, 2024), and the Mixed Methods Appraisal Tool (MMAT) 2018 (Hong *et al.*, 2018), in accordance with the study design of the selected articles. A thorough discussion with five researchers was conducted to resolve any disagreements. All included articles were of high quality and showed low bias. Decisions regarding the quality of reviewed articles are based on assessment results and discussions among researchers (JBI, 2025). Any disagreements between researchers during the quality assessment were resolved through in-depth discussions among all researchers.

Data Extraction

Data extracted from each selected article included the author, year, and country of publication, study design, research objectives, population, and study outcomes, with emphasis on the use of patient portals in oncology services (Phillips and Barker, 2021). The data were manually extracted by HZGP and DOD, and compiled into a summary table. The table was subsequently reviewed and cross-checked by all authors (HZGP, ASN, BY, DPI, and DOD) to minimize potential bias and extraction

errors. The systematic approach used ensured thorough and consistent data synthesis across all articles analyzed.

Data Synthesis

A narrative-descriptive approach is used to integrate research findings from systematic synthesis to identify patterns and provide a comprehensive understanding of the analysis results in the field of research (Phillips and Barker, 2021). Based on the data extraction carried out, five researchers grouped the findings from all the articles reviewed in the initial identification tables to check and establish links between findings (Brown, Harry and Mahoney, 2018). The conclusions were carefully researched, reviewed, and defined until agreement was reached. Using analysis, the data were grouped into three main findings.

Results

Search Results

The results of the article screening process are summarized in the following scheme (Figure 1):

Based on searches across five databases using predetermined keywords, researchers identified 3,301 articles. Researchers then checked for duplicate articles between databases using Rayyan and excluded 508 articles. Screening continued by checking the suitability of articles against predetermined PCC, inclusion, and exclusion criteria. Based on this, 213 articles were also excluded, leaving 2,580 articles for further analysis. The remaining articles were screened again, excluding articles that discussed oncology services without explaining the role of patient portals (n= 2,316), leaving 264 articles. The next step was to exclude articles that did not involve health facilities, cancer patients, and direct caregivers in the study (n= 219), leaving 45 articles for

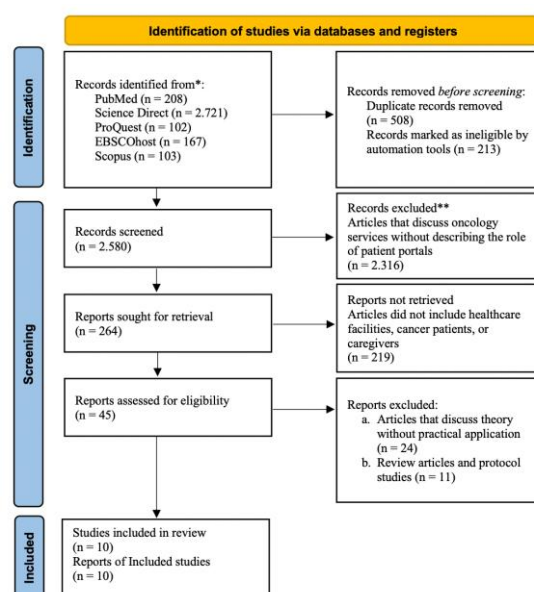


Figure 1. Flow diagram according to the PRISMA 2020 statement (Page *et al.*, 2021)

Table 2. Critical Appraisal Results

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No	Studies	Cohort Study Appraisal Checklist											Overall
		1	2	3	4	5	6	7	8	9	10	11	
1.	Luoh et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100% Low risk
2.	Emamekhoo et al. (2023)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	No	No	Yes	72,7% Low risk
3.	Griffin et al. (2024)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	No	No	Yes	72,7% Low risk
4.	Alexander & Beatty (2024)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100% Low risk
		Qualitative Study Appraisal Checklist											
		1	2	3	4	5	6	7	8	9	10		
1.	Santos et al. (2021)	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes	80% Low risk
2.	Petrovic et al. (2022)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	90% Low risk
3.	Sisk et al. (2023)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	90% Low risk
4.	Weis et al. (2020)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100% Low risk
		Cross-sectional Study Appraisal Checklist											
		1	2	3	4	5	6	7	8				
1.	Liu et al. (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100% Low risk
		Mixed-method Study Appraisal Checklist											
		1	2	3	4	5							
1.	Pollard et al. (2023)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	80% Low risk

further analysis. The final screening excluded articles that discussed theory only (n= 24) and review articles and protocol studies (n= 11). Ten articles were obtained for review.

Critical Appraisal of Included Studies

Based on quality assessment using JBI and MMAT, all articles in this study demonstrated good methodological quality with scores of 70%–100%, as indicated by a predominance of “Yes” answers reflecting low risk of bias and strengthening the validity of the findings (Melo *et al.*, 2018). However, two cohort studies (Emamekhoo *et al.*, 2023; Griffin *et al.*, 2024) received an “unclear” rating on question six because they did not report the initial status of participants. Three qualitative studies (Petrovic *et al.*, 2022; Santos *et al.*, 2021; Sisk *et al.*, 2023) were also rated “unclear” regarding researcher positionality because they did not explain the researchers' positions within cultural or theoretical perspectives. Additionally, one

mixed-method study (Pollard *et al.* (2023), received an “unclear” rating on question number four because it did not elaborate on how the discrepancies between quantitative and qualitative findings were analyzed or interpreted.

Study Characteristics

Participants

Ten studies reported varying numbers of patients, ranging from 11 to 28,942. In terms of gender, the proportion of female patients was higher than that of male patients, as in the study by Luoh *et al.* (2021), which involved 3,185 women and 2,765 men over the age of 18, and in Griffin *et al.* (2024), which involved 17,503 women and 11,439 men. The Alexander & Beatty (2024) study also reported 10,962 female patients, 14,389 male patients, and 16 patients in other categories. The majority of patients were over 18 years of age, and several studies

Table 4. Finding the benefits, challenges, and opportunities

Categories	Findings of Each Category
Benefits (n= 9)	1. Cancer diagnosis (Luoh <i>et al.</i>, 2021; Alexander and Beatty, 2024) 2. Health management (Santos <i>et al.</i>, 2021; Liu, Zhao and Ye, 2022) 3. Communication and coordination of care (Weis <i>et al.</i>, 2020; Petrovic <i>et al.</i>, 2022; Pollard <i>et al.</i>, 2023; Sisk <i>et al.</i>, 2023) 4. Increasing trust (Sisk <i>et al.</i>, 2023) 5. Informative (Weis <i>et al.</i>, 2020; Pollard <i>et al.</i>, 2023)
Challenges (n= 7)	1. Socio-demographics (Luoh <i>et al.</i>, 2021; Pollard <i>et al.</i>, 2023; Alexander and Beatty, 2024) 2. Portal usage (Santos <i>et al.</i>, 2021) 3. Health insurance (Luoh <i>et al.</i>, 2021) 4. Time of use (Luoh <i>et al.</i>, 2021; Petrovic <i>et al.</i>, 2022) 5. How to access the portal (Luoh <i>et al.</i>, 2021) 6. Information sources (Santos <i>et al.</i>, 2021; Sisk <i>et al.</i>, 2023) 7. Resource limitations (Petrovic <i>et al.</i>, 2022; Sisk <i>et al.</i>, 2023) 8. User coordination (Weis <i>et al.</i>, 2020)
Opportunities (n= 5)	1. Information needs and assistance (Santos <i>et al.</i>, 2021) 2. Security and privacy (Santos <i>et al.</i>, 2021) 3. Service efficiency (Luoh <i>et al.</i>, 2021; Sisk <i>et al.</i>, 2023) 4. Recommendations for using the portal (Weis <i>et al.</i>, 2020; Pollard <i>et al.</i>, 2023)

noted that younger patients under 40 were more active in using patient portals. The most commonly studied types of cancer were breast, lung, colorectal, and prostate cancer.

Countries

Most of the articles (n=5) originated from the United States (Luoh *et al.*, 2021; Emamekhoo *et al.*, 2023; Sisk *et al.*, 2023; Alexander and Beatty, 2024; Griffin *et al.*, 2024). Three articles originated from Canada (Santos *et al.*, 2021; Petrovic *et al.*, 2022; Pollard *et al.*, 2023). One article originated from Macau (Liu, Zhao and Ye, 2022), and one article originated from Germany (Weis *et al.*, 2020).

Methods

Most of the articles included in this study used a retrospective cohort study design (n=4) (Luoh *et al.*, 2021; Emamekhoo *et al.*, 2023; Alexander and Beatty, 2024; Griffin *et al.*, 2024) and qualitative approaches (n=4) (Weis *et al.*, 2020; Santos *et al.*, 2021; Petrovic *et al.*, 2022; Sisk *et al.*, 2023). In addition, there are cross-sectional studies by Field Liu *et al.* (2022) and a mixed-methods study by Pollard *et al.* (2023).

Main Objectives of the Study

Based on a review of ten articles, three main objectives were identified as the focus of the study, namely: (1) identification of factors related to improving communication between patients, caregivers, and health workers (Weis *et al.*, 2020; Santos *et al.*, 2021; Liu, Zhao and Ye, 2022; Petrovic *et al.*, 2022; Pollard *et al.*, 2023; Sisk *et al.*, 2023). (2) evaluation of technology access in the use of patient portals, including factors that influence their use such as age, location, and socioeconomic status (Luoh *et al.*, 2021; Emamekhoo *et al.*, 2023; Alexander and Beatty, 2024; Griffin *et al.*, 2024) and (3) exploration of patient experiences in using electronic patient portals, in terms of ease of access, perceived benefits, and challenges encountered during use (Weis *et al.*, 2020; Santos *et al.*, 2021; Liu, Zhao and Ye, 2022; Pollard *et al.*, 2023; Sisk *et al.*, 2023).

Main Findings

This section presents the main findings, which are then grouped into themes identified throughout the study. These themes are divided into three categories: benefits, challenges, and opportunities. The themes are supplemented with findings on factors that may influence them.

Benefits

Various studies show that patient portals provide significant benefits for cancer patients and caregivers. Portals have been shown to improve the efficiency of the diagnostic process (Pollard *et al.*, 2023), and strengthen patients' ability to manage their health during and after therapy (Santos *et al.*, 2021; Liu, Zhao and Ye, 2022). The

main benefits arise through improved coordination and communication between patients and healthcare providers (Weis *et al.*, 2020; Petrovic *et al.*, 2022; Pollard *et al.*, 2023; Sisk *et al.*, 2023). Although conducted in diverse contexts and populations, consistent findings show that the availability of relevant and timely clinical information increases patient trust in healthcare services (Sisk *et al.*, 2023) and facilitates access to health information (Weis *et al.*, 2020; Pollard *et al.*, 2023). In summary, access to information, effective communication, and increased trust mutually support patient self-management.

Challenges

The challenges of patient portals are complex and include socio-demographic factors such as age, education, income level, and digital literacy that affect the accessibility and usability of portals (Luoh *et al.*, 2021; Pollard *et al.*, 2023; Alexander and Beatty, 2024). This pattern emerges consistently across countries, suggesting that the digital divide is a structural challenge. Research across various contexts also shows that portal use tends to decline over time, especially after the initial diagnosis phase (Luoh *et al.*, 2021; Petrovic *et al.*, 2022). This indicates a mismatch between portal design and patients' long-term needs. The relevance and clarity of information are essential factors that influence user comfort and trust levels (Santos *et al.*, 2021; Sisk *et al.*, 2023). Technical challenges also arise, including resource limitations and barriers to data integration across portals and healthcare systems (Petrovic *et al.*, 2022; Sisk *et al.*, 2023). These obstacles impact service flow and the quality of coordination between service providers (Weis *et al.*, 2020). Analytically, many challenges directly limit the realization of benefits. For example, low digital literacy reduces patients' ability to access information, ultimately hindering improved communication and the trust that should be established.

Opportunities

Despite various challenges, patient portals offer significant opportunities to improve the quality of care for cancer patients, particularly by meeting information needs and providing data security and privacy (Santos *et al.*, 2021). These opportunities also strengthen trust and improve service efficiency by reducing administrative burdens and simplifying communication (Sisk *et al.*, 2023). Other studies also show that portals have the potential to develop into long-term, personalized, and responsive cancer service platforms, which need to be tailored to the needs of patients, caregivers, and healthcare professionals to support symptom monitoring, counseling, and survivorship planning (Weis *et al.*, 2020; Pollard *et al.*, 2023). These opportunities also serve as a bridge between benefits and challenges, for example, through interface simplification and improved digital literacy, which can reduce barriers to use. Thus,

optimizing these opportunities requires a strategic approach that aligns portal design with user capacity, system integration, and long-term care goals.

Discussions

This discussion section outlines the main findings of this systematic review, grouped into three aspects: benefits, challenges, and opportunities of patient portal use in cancer care.

Benefits

The patient portal enables quick, web-based access to medical information for cancer patients, thereby accelerating the flow of information and facilitating discussions among patients, caregivers, and healthcare professionals regarding diagnosis and treatment plans (Zaidi *et al.*, 2022). Patient portals play an essential role in supporting the cancer diagnosis process by providing fast, accurate, and easily accessible information Alexander & Beatty (2024) and Luoh *et al.* (2021). Direct patient involvement through portals also increases control and transparency of medical information in decision-making (Josfeld *et al.*, 2021). In addition, patient portals have been shown to improve the quality of communication between patients and healthcare professionals, which ultimately supports better care coordination. These findings are in line with the results of Petrovic *et al.* (2022), Pollard *et al.* (2023), Sisk *et al.* (2023), and Weis *et al.* (2020), which confirm that patient portals strengthen communication and care coordination between patients, families, and healthcare professionals.

Furthermore, patient portals enable caregivers to play an active role in managing care and gain a more comprehensive understanding of the patient's condition (Gleason *et al.*, 2023). Based on the results, patient portals improve the management of cancer patients, especially by enabling monitoring of treatment and follow-up care (Santos *et al.*, 2021; Liu, Zhao and Ye, 2022). Transparent information in the portal also plays a vital role in building trust between patients and healthcare providers (Brockhoven *et al.*, 2023; Elkefi and Asan, 2023), in line with the findings of (Sisk *et al.*, 2023), who identified that patient portals can increase trust in healthcare professionals through data transparency and two-way communication.

Patient portals are an effective medium for information and education Pollard *et al.* (2023) and Weis *et al.* (2020). A sound data security system has also been shown to increase user trust (Enaizan *et al.*, 2020; Keshta and Odeh, 2021). While the application of technologies such as blockchain ensures the integrity and security of patient data, thereby strengthening the portal's function as an integral component of digital-based cancer services (Sonkamble *et al.*, 2023; Liang *et al.*, 2024). In addition, patient portals serve as a means of social, emotional, and psychological support for patients and families,

delivering tailored, easy-to-understand information (Katsaros *et al.*, 2022; Colussi *et al.*, 2024; Song *et al.*, 2024). These portals facilitate access to test results, treatment history, appointment schedules, and health monitoring, helping patients become more independent in managing their care (Kondylakis *et al.*, 2020).

Challenges

Although patient portals offer numerous benefits, their use remains relatively low among the elderly, rural communities, male patients, and individuals without health insurance (Sadasivaiah *et al.*, 2019). This situation indicates that socio-demographic characteristics and insurance status play a significant role in affecting the adoption rate of patient portals (Luoh *et al.*, 2021; Pollard *et al.*, 2023; Alexander and Beatty, 2024; Griffin *et al.*, 2024). Additionally, socioeconomic factors limit patients' access to and ability to use the portal optimally, especially among resource-constrained groups (El-Toukhy *et al.*, 2020; Santos *et al.*, 2021).

Other obstacles include difficulties in the data verification process, claim rejections, and complex portal navigation, which reduce user interest, especially among those with limited digital literacy (Chivela, Burch and Asagbra, 2023). These barriers are commonly associated with access difficulties and inconsistent portal utilization patterns throughout the patient's care journey, suggesting that these challenges remain a recurring issue in health portal implementation (Luoh *et al.*, 2021; Petrovic *et al.*, 2022; Emamekhoo *et al.*, 2023; Griffin *et al.*, 2024). The inconsistent pattern of portal use, in which activity is higher in the early stages of diagnosis and decreases in subsequent phases, also reflects the challenges of sustaining use of this digital health system (Rexhepi, Moll and Huvila, 2020; Beal *et al.*, 2021).

In addition, there are still limitations in the presentation of structured information on the portal, such as the identification of parties involved in care and medical actions taken (Salmi *et al.*, 2024). The next challenge is the limited resources and coordination among users in supporting the effective implementation of patient portal-based services (Drennan and Ross, 2019; Holmér *et al.*, 2023). This suggests that resource availability and user coordination are essential elements to be considered for the optimal and sustainable implementation of a portal for cancer patients (Weis *et al.*, 2020; Petrovic *et al.*, 2022; Sisk *et al.*, 2023).

Opportunities

The need for information and assistance for patients is a significant opportunity in the development of cancer patient portals. The integration of patient portals with EHRs has strong potential to improve interoperability and service effectiveness by enabling more efficient, secure, and structured data exchange (Dendere *et al.*, 2019; Hefner *et al.*, 2019; Vyas and Muzumdar, 2022; Fennelly *et al.*, 2024). In this context, the patient portal

serves as an interface for patients and families to view information from the EHR system that was previously accessible only to healthcare professionals. Thus, the patient portal is not a separate system but an integrated part of the EHR that supports the continuity of clinical information and the coordination of care between service providers. The availability of clear, easy-to-access information and appropriate usage guidance is an essential factor for encouraging patient engagement and advancing digital transformation in the healthcare sector across various countries (Weis *et al.*, 2020; Santos *et al.*, 2021; Pollard *et al.*, 2023).

Data security and privacy are strategic dimensions in the development of patient portals, especially when integrated with EHR systems. The implementation of regulations such as the Health Insurance Portability and Accountability Act and the use of blockchain technology have been identified as essential mechanisms for maintaining the reliability and integrity of patient data (Sonkamble *et al.*, 2023; Tertulino, Ivaki and Morais, 2024). These policies not only strengthen the security of digital medical data but also support patients' rights to access and control their health information transparently.

In addition, improving the efficiency of patient portals is a significant opportunity to support more responsive and integrated cancer services. A well-designed portal can accelerate information flow, reduce administrative burdens, and strengthen coordination between patients, caregivers, and healthcare professionals. Furthermore, future portal development can be expanded through the integration of artificial intelligence to support clinical decision-making, treatment monitoring, recurrence risk detection, and emergency message handling (Xu *et al.*, 2021; Ali *et al.*, 2023; Heudel, Crochet and Blay, 2024; Liang *et al.*, 2024; Shirazi *et al.*, 2024). This optimization will strengthen the efficiency of the portal while responding to the national digital health strategy of improving health literacy, expanding access to services, and encouraging active patient participation in their care.

Although this study provides a comprehensive overview of the benefits, challenges, and opportunities of using patient portals in cancer services, several limitations should be noted. The majority of studies come from countries with advanced digital infrastructure, so the findings may not be generalizable to developing countries with limited technology and resources. Variations in study design and population characteristics may also affect the consistency of results, particularly regarding digital literacy and healthcare worker readiness. Future research should evaluate the effectiveness of integrating patient portals with EHR systems across various contexts, including data security, user satisfaction, and clinical impact. In addition, exploring artificial intelligence and blockchain use

should be considered to improve efficiency, personalize services, and support the digital transformation of healthcare.

Conclusion

Patient portals play an essential role in improving communication, care coordination, and patient and caregiver engagement in cancer services, despite challenges such as sociodemographic inequalities, low digital literacy, and limited access. Integration with EHRs, the application of technologies such as AI and blockchain, and support for digital health policies can strengthen the system's security and effectiveness. For nursing, patient portals have important implications for improving nurses' roles as educators, coordinators, and patient advocates by increasing digital literacy, enabling care monitoring, and integrating technology into evidence-based nursing practice. Future researchers are advised to explore sustainable, user-centered implementation models for patient portals, including evaluating their impact on clinical outcomes and the psychosocial well-being of cancer patients.

Acknowledgments

The researcher would like to express their deepest gratitude to Universitas Gadjah Mada and other health colleagues who have provided support and input to ensure this article could be appropriately published.

Funding source

All research costs are shared fairly among all authors.

Availability of data and materials

All data relevant to the findings of this study are included in the article and supplementary materials. Additional supporting data underlying the research results can be accessed through the corresponding author upon reasonable request

Authors' contributions

In this systematic review, all researchers (HZGP, ASN, DOD, DPI, and BY) contributed to the article search and initial selection process. HZGP led the conceptualization, protocol development, search strategy, analysis, bias risk assessment, and initial draft writing and visualization. ASN supported the methodology, data curation, and manuscript review and editing. DOD was involved in study selection, data extraction with HZGP, validation of findings, and manuscript review. DPI handled study quality assessment, further analysis, and scientific supervision. Meanwhile, BY provided overall supervision, administration, and manuscript review and editing at the final stage.

Conflict of Interest

There is no conflict of interest in this research.

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How to cite this article: Puspitasari, H. Z. G., Nuzulullail, A. S., Deli, D. O., Irawan, D. P., and Yogatama, B. (2025) 'The Role of Patient Portals for Cancer Patients: A Systematic Review of Benefits, Challenges, and Opportunities', *Jurnal Ners*, 20(4), pp. 334-444. doi: <http://dx.doi.org/10.20473/jn.v20i4.69709>

Table 3. Summary of the studies

Author, Year, and Country	Design	Aim	Population	Results
Luoh et al. (2021), USA	Retrospective cohort study	To determine whether cancer patients use health portals differently and understand how cancer patients use portals to help improve patient engagement in cancer care.	A total of 5950 patients included. Female (n = 3185) and male (n = 2765) with aged >18 years old	Benefits 1. Patients diagnosed with breast cancer, lung cancer, colon and rectal cancer, and prostate cancer are the most likely to use the patient portal. 2. Patient portal use is greater in the first year of diagnosis than afterward. 3. Patients use the patient portal via the web more often than via the mobile app. Challenges Most patient portal users are in urban areas. Opportunity Patients with private insurance are more likely to use the patient portal.
Santos et al. (2021), Canada	Qualitative	To explore experiences of oncology patients and their family caregivers in using electronic patient portals.	A total of 11 participants. Female (n= 8) and male (n= 3)	Benefits 1. Health information is needed by users to reduce uncertainty. 2. Users can exercise control in managing their health. 3. The use of the health portal can improve the security of medical data and accessibility. Challenges 1. There is limited information on the health portal. 2. The appearance of the portal makes it difficult for users. 3. Users have difficulty registering on the portal. 4. Users need help interpreting information on the portal. Opportunities 1. Information on the use of the health portal is obtained through the patient advisory committee. 2. Users need open access to information from health service providers.
Enamekhoo et al. (2023), USA	Retrospective cohort study	To evaluate the patterns of portal usage among cancer patients who regularly log in to portals.	A total of 2076 patients included. Female (n= 1,136) and male (n= 940).	Benefits 1. Most users accessed the portal more frequently via the web. 2. Most patients used the portal more frequently during their initial visit after diagnosis.
Petrovic et al. (2022), Canada	Qualitative	To evaluate and examine asynchronous web-based communication system “eOncoNote” for cancer care coordination between primary care and cancer specialists, to understand patients and healthcare provider perspectives.	A total of 32 participants. Total 18 patients, Female (n= 12), and male (n= 6). Total 14 health care providers (HCP). Female (n= 6), male (n= 5), not available (n= 3).	Benefit Use of eOncoNote improves care coordination. Challenge More primary care providers (PCPs) are needed to maximize the benefits of eOncoNote. Barrier Technical barriers remain in integrating EMRs with the eOncoNote system.
Griffin et al. (2024), USA	Retrospective cohort study	To analyze patient and structural factors that affect access to electronic health portal access among cancer patients.	A total of 28,942 patients. Female (n= 17,503) and male (n= 11,439)	Benefits The patient portal was accessed more by younger patients (<40 years). Opportunities 1. Fewer patients accessed the portal before the intervention 2. Patients with regular medical visits accessed the portal more often.
Sisk et al. (2023), USA	Qualitative	To identify benefits, problems and clinician accommodation related to using online patient portals for pediatric and adolescent oncology.	A total of 53 participants. Total 29 physicians, Female (n= 19), and male (n= 10). Total 24 advanced practice providers (APPs). Female (n= 24).	Benefits 1. The use of patient portals helps adolescent patients to be involved in their care. 2. Parents can be involved in monitoring the results and follow-up of care through the portal.

Author, Year, and Country	Design	Aim	Population	Results
				3. In adolescent patients, parents are given portal access to create transparency in communication. 4. Parents of adolescent patients participate in managing care through the portal. 5. Patient portals increase trust between the clinical team and the family. 6. The language in the patient portal is adjusted by the clinician to be easy for users to understand. Challenges 1. More staff are needed to reduce the increased workload of clinicians. 2. Delivering bad news through the patient portal can reduce the level of trust parents have in the medical team. Opportunity Clinicians should provide an explanation of how the patient portal helps provide information related to test results.
Pollard et al. (2023), Canada	Mixed Methods	To develop patient portals to improve family communication for patients undergoing hereditary cancer syndromes (HCS).	A total for quantitative 20 participants. Total 7 female patients and 13 clinicians. A total for qualitative 12 female participants from healthcare providers.	Benefits 1. Most patients and healthcare professionals recommend the use of patient portals. 2. Most users feel that the information presented on the patient portal is good. Challenge The main challenge that needs to be considered in patient portals is the complexity of the use of complicated language.
Alexander & Beatty (2024), USA	Retrospective cohort study	To investigate relationship between sent messages through patient portal and survival rates radiation oncology patients using real world data.	A total of 25,367 patients. Female (n= 10,962), male (n= 14,389), other (n = 16).	Challenges 1. Socioeconomic status, gender, health level, and language influence portal usage rates. 2. Patient age and diagnosis influence interactions in first-time portal use.
Liu et al. (2022), Macau	Cross-sectional study	To investigate effects use of patient accessible electronic health record (PAEHR) portals and to examine mediation pathways through patient centered communication (PCC).	A total of 626 respondents were diagnosed with cancer. Female (n = 370), male (n = 256)	Benefits 1. Implementation of PCC is increasingly beneficial with the use of Patient-Accessible Electronic Health Record (PAEHR). 2. Implementation of PCC improves the psychological health of patients.
Weis et al. (2020), Germany	Qualitative	To provide insight into patients and caregivers perspectives about roles in managing the patient portal an electronic personal health record (PHR).	A total of 31 participants. Female (n= 17)	Benefits 1. Caregivers help communicate with doctors in discussing therapy decisions. 2. Caregivers help manage and provide information to medical personnel. 3. Caregivers help patients access medical information through PEPA. Opportunities Caregivers who do not live with the patient suggest separate portal access. Challenges 1. There are still challenges in managing data in PEPA between caregivers and patients. 2. In accessing information and data through the portal, trust is needed between patients and caregivers.