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Review

Digital Health Technologies in Patient Experience Literature: A Scoping Review and Future Outlook for Sustainable Digital Health Interventions

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Abstract: The aim of this study is to address the issues identified in previous reviews and meta-analyses regarding the progress of patient experience literature and to highlight the most important concepts specifically related to digital health technologies. To do so, we have carried out a comprehensive analysis of the literature on patient experience in the category of health science services databases over the past decade and identified the tools related to digital health technologies within these studies. This is a bibliometric study based on data obtained from the Web of Science and Scopus between the years 2014 to and 2024 by using 11 search terms. In this review, a total of 21,392 publications from patient experience literature over the last decade were analyzed. Keywords were grouped by showing their co-occurrence using bibliometric and scientific mapping analyzing methods. The development of digitalization and digital tools has contributed to the advancement of theory in the field of digital health, eHealth, electronic health records, health information technology, the internet, mhealth, mobile applications, mobile health, patient portals, smartphones, social media, telemonitoring, web, artificial intelligence, machine learning, virtual reality, telehealth, telemedicine, telerehabilitation, and virtual care. These developments have provided sustainable digital health benefits in the development of patient experience theories. The findings of this study emphasize that digital health tools cover a wide area of research, and the application of information and communication technologies goes beyond the field of medicine and covers the broad field of healthcare.

Keywords: patient experience; digital health technology; sustainable digital health; health services; bibliometric

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1. Introduction

Patient experience encompasses all aspects of the healthcare system, including the treatment received from health plans, physicians, nurses, and other healthcare professionals at hospitals, doctors' offices, and other healthcare facilities. It incorporates the various elements of healthcare delivery that patients value during the process of seeking

and obtaining care. As a vital aspect of healthcare quality, the patient experience is a key area for improvement and optimization. In the global context, patient experience, clinical effectiveness, and patient safety are viewed as key aspects of healthcare quality [1]. Patient experience has evolved as a vital component of healthcare [2,3]. It is crucial for healthcare providers to comprehend the patient experience, as it has a substantial influence on multiple core aspects, including satisfaction, the perceived quality of healthcare, patient loyalty to physicians and providers, and patients' behavioral intentions [4–7]. Despite the growing significance of patient experiences in healthcare services, there is currently no consensus on a definition of this term [8]. Consequently, there is considerable variation in the interpretations of the concept held by patients, clinicians, policymakers, managers, and researchers. The most recent definition of patient experience is "the totality of patient encounters shaped by an organization's culture and affecting their opinions throughout the course of treatment can be considered a key factor in patient experience" [2]. A comprehensive understanding of patient experience is vital for the healthcare industry and society as a whole. It can inform health policies and drive sustainable improvements for the quality of medical care [9].

Considering patient experience as a source of information may be helpful, especially when figuring out the kind of problem and how technology affects a person's health and quality of life. A thorough account of the patient's life could be useful to add to the body of evidence to obtain a thorough understanding. The experience of looking for an intervention to treat or control the ailment and its different facets may be better understood as a result [10]. It is stated that for patient experiences to be accepted as evidence, structured or semi-structured interviews that enable the transfer of the multilateral experiences of patients, caregivers, and family members should be structured to focus on criteria related to the specific healthcare decision-making process [10] (p. 8). Patient experience data can be collected through a variety of methods, including surveys, telephone surveys, interviews, focus groups, or patient complaints or satisfaction [11].

The measurement of the various aspects of patients' experiences with healthcare services represents a significant challenge, even though the subject of patient experience literature is expanding rapidly. The use of patient feedback can be an effective approach for evaluating new medical technologies that lack robust clinical evidence to support their effectiveness. Service interventions that enhance the patient experience include reducing waiting times, improving communication with staff, digitizing services, and increasing the politeness of medical staff [12,13]. It seems fair to suggest that the usefulness and usability of technology interfaces, such as teleportals, healthcare websites, and information or communication technologies, may also have an impact on patients' experiences in the modern era [14]. Similarly, there is a growing recognition of the potential to improve the healthcare experience using other smart hospital applications, such as contactless and remote robot aid services, special entertainment, and creative technology [15–17].

The advent of digital health technologies has enabled patients to access their health information, monitor their progress, and manage their care remotely [18,19]. Patients can receive personalized attention, conveniently schedule appointments, engage in virtual telehealth consultations, and assume a more active role in their care, thereby empowering them to assume control of their health and enhance their quality of life [20,21]. As technology continues to exert a dominant influence on contemporary life, it is becoming increasingly crucial for healthcare professionals to embrace digital health applications as a means of enhancing the quality of care they provide to patients.

For patient experiences to be regarded as evidence, they must be recorded within a systematic methodological framework that has been specifically designed to satisfy the demands of the relevant health technology assessment process [22] (p. 8). The patient

experience literature is characterized by dense passages and gaps, and addressing these issues will offer numerous benefits. It is anticipated that this will be beneficial in meeting patient expectations, guiding decision-makers to enhance the quality of health services, and guiding researchers for future research. The initial impetus for this review was the dearth of research that had fully elucidated the existing gaps in patient experience literature. The current body of literature on patient experience is fragmented and in need of a comprehensive, holistic review. The objective of this bibliometric study is to address the challenges encountered in previous reviews and meta-analyses of patient experience literature development. This study, which reviews the patient experience literature from the last decade, aims to make a comprehensive analysis of the literature under the category of healthcare sciences services database. It reveals new research areas, develops and theoretically evolves healthcare theories, and analyzes the systematic analysis of patient experience literature integrated with the bibliometric method to conceptualize the accumulated literature. The research questions of this review are as follows:

(1) What are the prominent themes in patient experience and healthcare services in the last decade?
(2) What is the impact and role of a wide range of new digital tools on patient experiences in healthcare?
(3) What are the key themes of digitalization and digital health tools in relation to patient experiences?

The aim of these research questions is to identify the digital health tools that guide these studies by examining the patient experience literature in detail and comprehensively from past to present. Furthermore, the research seeks to demonstrate the most studied digital health concepts and themes. To respond to the research questions, the bibliometric technique of co-word analysis was employed to identify the various research themes that are related to patient experience. The digital health tools that were included in the extensive dataset, which were obtained from studies in the literature that were focused on patient experiences, were identified, and the contribution of these themes to the patient experience theory was explained.

2. Materials and Methods

For patient experiences to be regarded as evidence, they must be recorded within a systematic methodological framework that has been specifically designed to satisfy the demands of the relevant health technology assessment process [23] (p. 2567), [24]. The utilization of quantitative methodologies, such as bibliometric analysis (e.g., citation analysis), to examine bibliometric data (e.g., units of publication and citation), is defined as bibliometric [25]. Bibliometric analysis is a rigorous and comprehensive method for the extraction and analysis of substantial quantities of scientific data. This approach enables us to examine the evolutionary developments of a specific discipline in detail, while also providing insights into the emerging field of research [26]. This bibliometric study provides clarification regarding the methodology employed in the selection process, including the specific search and selection criteria utilized during this phase. It forms a component of a scoping literature review [27]. The findings and results are integrated and blended with the existing literature [27] (p. 18). The objective of the scoping literature reviews is to identify new insights through the critical analysis and synthesis of the field's literature. These reviews are based on a representative description of a topic. In accordance with Snyder's (2019) systematic review guidelines [28], this review was divided into three sections. Initially, the research questions were utilized as the primary instrument for defining the study topic and organizing the literature. This is a bibliometric study based on data obtained from the Web of Science and Scopus from 2014 to 2024. The

study aims to increase the reliability of research by using an integrative method and comprehensive perspectives.

When carrying out a systematic literature review, the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines help to illustrate the choices made in including and excluding articles to be searched and selected for review [29]. A bibliometric analysis was conducted using Bibliometrix R programming and VOSviewer. Web of Science (WoS) and Scopus are widely used authoritative databases of research publications and citations [30]. Using science mapping, this study reveals the structure and dynamics of scientific aspects in the literature on patient experience variables and healthcare services improvement. To analyze the data, bibliometric data must first be uploaded to biblioshiny. PRISMA steps were followed in the study regarding the inclusion criteria [29].

2.1. Data Collection

The search terms were designed to yield a wide range of literature and were not combined into a single search string to ascertain the quantity of results for each term separately. In Table 1, the criteria that were used for the selection of the included studies, as well as the search terms employed, are stated in a way that is both comprehensive and accessible. Initial literature searches yielded 24,553 publications as shown in Figure 1. We filter the publications to retain only the articles and reviews in English related to the fields of healthcare systems and services, which leaves us with 21,392 publications (see Figure 1).

Table 1. Search Criteria and Search Terms.

Database Search Criteria	
Database	WoS and Scopus
Language	English
Type	Articles, Reviews, Books, and Chapters
Index	SSCI-ESCI-SCI-E
The number of search terms	11
Inclusion criteria	Abstract, title, and keywords
Year	01-01-2014–31-10-2024.
Category	Healthcare Science Services
Search Terms and Keywords	Patient Experience; Health Experience; Patient Satisfaction; Patient Feedbacks; Patient Values; Patient Evaluations; Patient Complaints; Patient Experience Data; Health System Improvement; Health Systems and Service Improvement; Health System Quality

2.2. Bibliometric Analysis and Data Visualization

After merging all the files into a single file, we used the R tool, biblioshiny, and the VOSviewer (1.6.18) tool to analyze and extract the information. VOSviewer is a software tool that creates and displays bibliometric networks using a variety of data sources, such as citation, bibliographic coupling, co-citation, and co-authorship links. Journals, researchers, and individual papers can all be part of these networks. VOSviewer also offers text mining capabilities, which can be used to create and visualize data. This review includes the broad category of exploratory research, and it uses the bibliometric analysis and scientific mapping technique, which has grown in popularity in recent years, to examine academic

and scientific output in terms of quantity. The emphasis is on the amount, as examined by a statistical analysis of scientific articles using certain parameters.

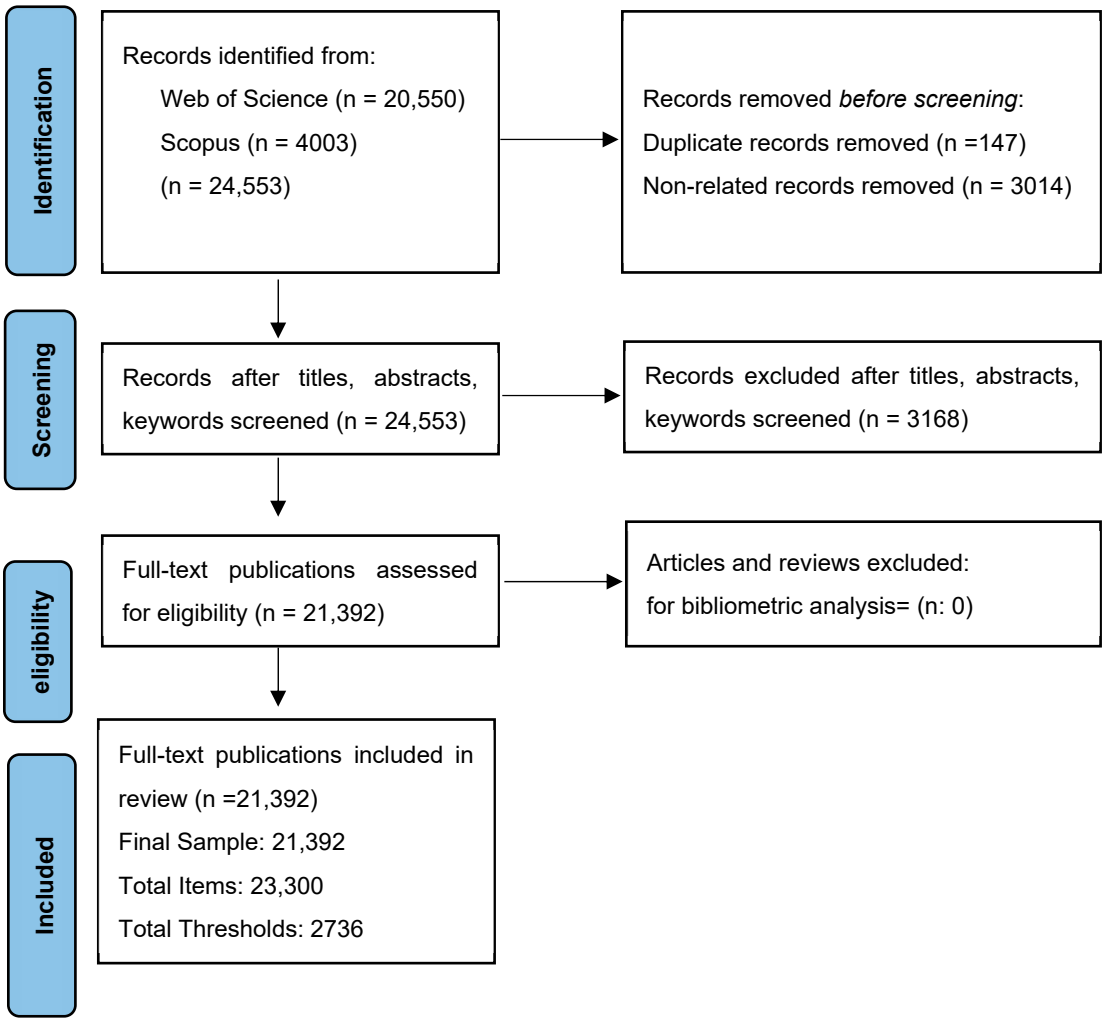

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

The study methodology is presented in Figure 1. In accordance with the aforementioned methodology, the research keywords were initially identified as a means of sourcing the patient experience literature dataset from the database. The total number of publications identified through the research criteria and keywords was 24,533. From the initial body of literature, those publications deemed appropriate for the study's scope were selected, resulting in the identification of 21,392 articles suitable for analysis. The analysis yielded a total of 23,300 items. The relevant items were collated, and a classification was made on 2736 items.

3. Bibliometric Findings

The study began by defining research words and analyzing their status in the literature. Research phrases are synonymous and strongly related to the patient experience subject in healthcare science services literature. Table 2 presents the main information gathered from the database using research terms.

Table 2. Main information.

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2014:2024
Documents	21,392
Annual growth rate %	−1.81
Document average age	4.2
Average citations per doc	11.34
DOCUMENT CONTENTS	
Author's Keywords (DE)	23,300
AUTHORS	
Authors	42,140
Authors of single-authored docs	246
AUTHORS COLLABORATION	
Single-authored docs	261
Co-Authors per doc	5.56
International co-authorships %	19.51
DOCUMENT TYPES	
Article	22,339
Review	2214
Review; early access	426

Table 1 presents the fundamental data pertaining to the research, including the annual growth rate in the field over the past decade and comprehensive information about the publications. The growth ratio of the documents due to the annual production rate decreased to −1.81%. In this analysis, as the authors of the studies, most of the research was carried out by more than one author. Co-authorship per document is 5.56 and the international co-authorship rate is 19.51%. The number of publications contributing to the literature on patient experience has declined in recent years.

The growth rate according to the years in the field is shown in Figure 2. According to Figure 2, the literature that was published prior to 2014 was eliminated from the review because the patient experience literature in digital health had not yet reached maturity by 2014. While it is plausible that antecedent publications existed, a substantial amount of material has been published since 2014. In 2019, a notable increase in the number of digital health-themed studies was observed within the field of patient experience literature. This trend continued until 2022, reaching its highest point in that year and a rapid growth has been observed in 2022. Since 2014, a sharp upward trend (cutting point, 2022) has been seen in the field of patient experience. According to Figure 2, the number of publications grows with each passing year. They have been observed to decline by 2023.

According to Figure 3 and Table 3, The ten most significant sources are presented in a list. The most publications on patient experiences within the healthcare services category have been published in *BMC Health Services Research*, throughout the past ten years. Articles on any topic related to the study of healthcare services are included. The second most published source is the open access, peer-reviewed *Journal of Patient Experience*, which focuses on showcasing innovations and technologies that influence patient experiences.

Presented in third position is *Supportive Care in Cancer*, which offers up-to-date scientific and clinical practice data on every facet of supportive care for cancer patients.

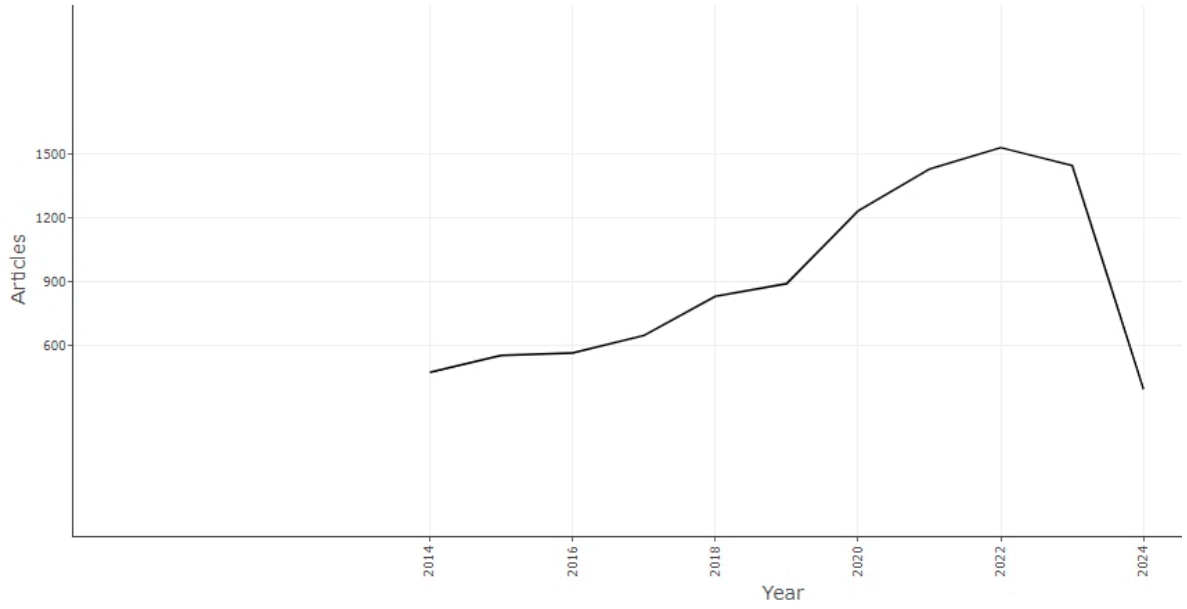

Figure 2. Annual scientific production.

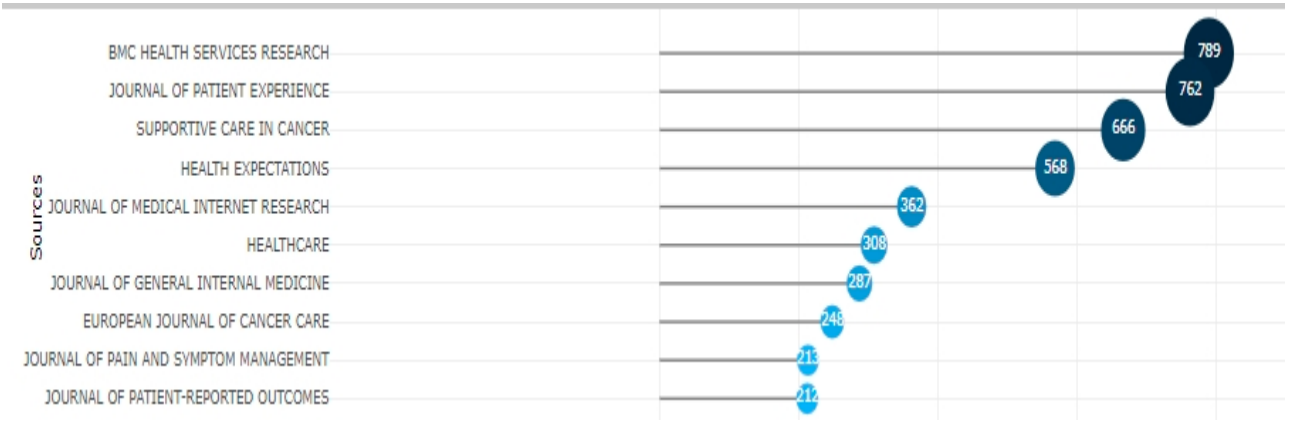

Figure 3. Most relevant sources.

Table 3. Top 10 most relevant sources.

No	Sources	Articles
1	*BMC Health Services Research*	789
2	*Journal of Patient Experience*	762
3	*Supportive Care in Cancer*	666
4	*Health Expectations*	568
5	*Journal of Medical Internet Research*	362
6	*Healthcare*	308
7	*Journal of General Internal Medicine*	287
8	*European Journal of Cancer Care*	248
9	*Journal of Pain and Symptom Management*	213
10	*Journal of Patient-Reported Outcomes*	212

3.1. Word Cloud Analysis

As illustrated in Figure 4, the word cloud generated by R's analysis of the Bibliometrix package offers a visual representation of the data.



Figure 4. WordCloud.

As demonstrated in Figure 4, the objective of employing a word cloud in research contexts is to facilitate the identification of terms that are most frequently utilized. This approach suggests that most of the analysis is conducted within these specific areas. The process of converting text input into single-word identifiers, commonly referred to as a "word cloud" or "tag cloud", involves the utilization of color to denote the relative importance of each word [31]. In the context of textual analysis, the size and the positioning of words are of critical importance. The greater the size of a term, the more pronounced the concentration of labor in these regions. The focus of our work is primarily on care, healthcare, management, impact, satisfaction, experience, quality of life, communication, and cancer. The printing of words in small letters indicates potential work directions [32]. The smaller terms are patient, depression, breast cancer, palliative care, diagnosis, prevalence, therapy, and physicians. WordCloud is a tool that can not only describe the highest frequency terms but also explain the relationship between them [33].

The most frequently occurring words are presented in Table 4. Although word clouds permit the visualization of words according to their density, they do not permit the sorting of words according to frequency. Consequently, presenting the top ten rankings of words with the highest frequency may facilitate comprehension of the conceptualizations presented in the literature.

Table 4. Most frequent words.

Terms	Frequency
care	1430
impact	834
health	771
quality-of-life	766
health-care	678
outcomes	641
quality	633
management	607
satisfaction	575
experiences	552

3.2. Co-Occurrences of Research Themes and Keywords

Co-occurrence analysis is a bibliometric technique that has been used for the past 10 years to map the field of study. This analysis involves the aggregation of matched data, with a focus on co-occurrence. The resulting data are frequently presented in a matrix style, with row and column titles denoting frequent intersections of rows and columns. As is evidenced by the numerous publications on the subject, the most frequently utilized keywords have been identified in many articles, and these keywords describe the most researched topics. Word analysis and common themes were used to identify the main topics covered in the articles. The minimum required number of occurrences for a keyword is five. Out of the 23,300 keywords, only 2736 meet this threshold, resulting in six clusters. All data were subjected to two phases of analysis. Initially, this review was conducted on patient experiences found in the healthcare sciences services category of WoS and Scopus databases. This analysis provides a comprehensive perspective on all patient experience literature without bias, identifying patient experiences that have been studied or given significant attention thus far and the healthcare science that is still lacking across all categories. In the second phase, the patient experience literature's most often discussed and examined concepts and themes were examined. The purpose of this analysis is to reveal concepts in the healthcare science field that are associated with patient evaluations and experiences. It is aimed to reveal directives for future research by revealing concepts and terms that are emerging or have not yet accumulated sufficiently in the literature on patient experience.

As illustrated in Figure 5, the concepts and theories with the highest average formation are observed in patient experience-oriented studies accumulated in the healthcare sciences services database. It may be reasonably assumed that the terms that have received the greatest attention and have been the subject of the most extensive investigation in the existing literature are those that occur with the greatest frequency. A comprehensive analysis of the patient experience literature reveals a multitude of interrelated topics. The most common themes are identified as "patient satisfaction", "patient safety", "primary care", "patient engagement", "COVID-19", "cancer", "depression", and "patient-centered care". It is observed that the terms "telehealth", "telemedicine", and "ehealth", which are the subject of this review and have a significant density in the entire dataset, are grouped separately in the literature with the highest frequency.

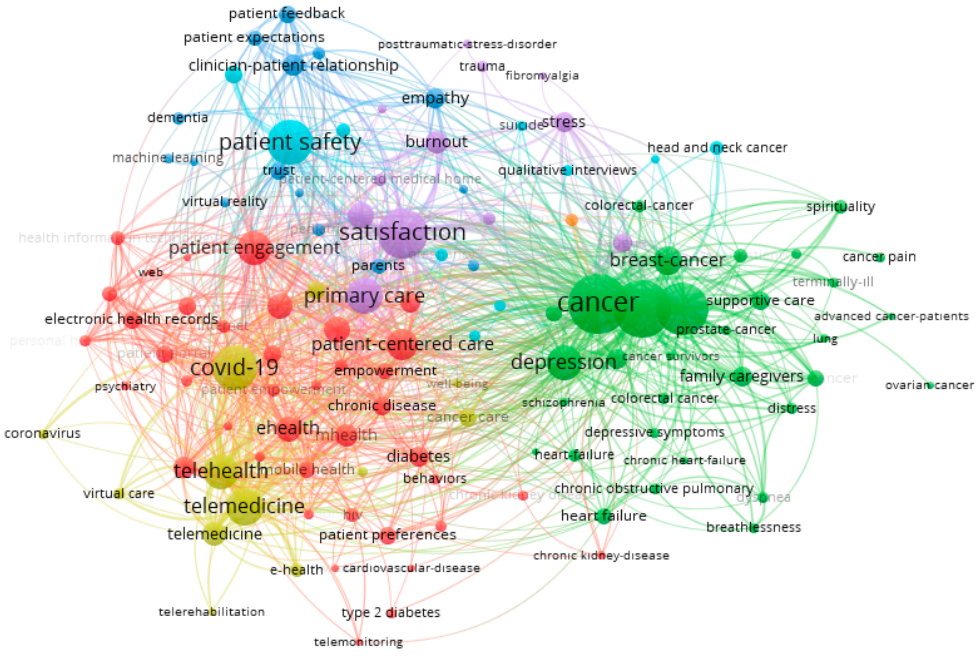

Figure 5. Keywords co-occurrence clustering map of patient experience literature.

Based on the co-occurrence analysis presented in Figure 5, a synthesis of keywords was conducted to enhance the understanding of all data. In Figure 6, the digitalization and digital health tools usage themes relevant to the patient experiences are depicted.

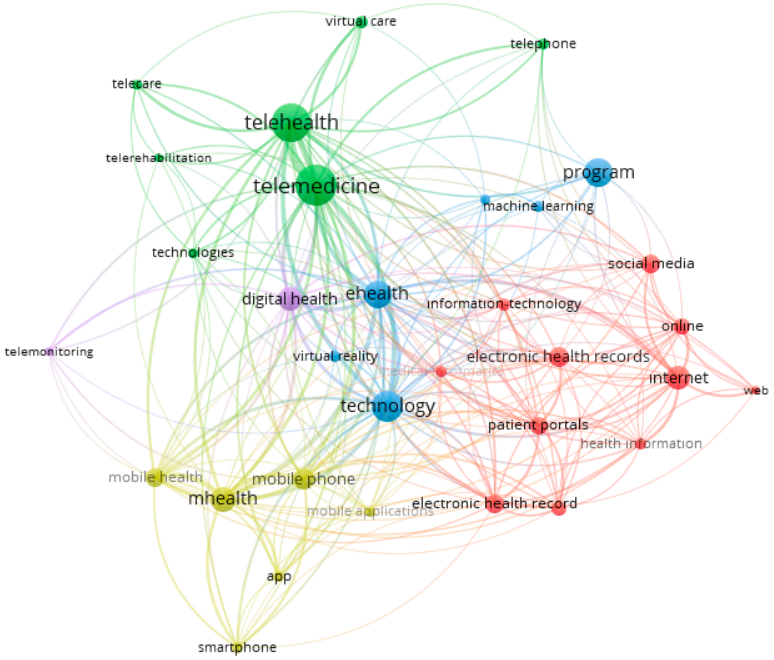

Figure 6. Keywords co-occurrence clustering map of digital health technology tools.

According to Table 5 and Figure 6, research questions on the conceptual classification of patient experience literature highlight the digitalization and digital health tools usage themes relevant to the patient experiences.

Table 5. The digitalization and digital health tools usage themes in patient experience literature.

Category	Items
Digitalization and digital health tools	App, Digital Health, eHealth, Electronic Health Records, Health Information Technology, Internet, Mhealth, Mobile Applications, Mobile Health, Patient Portals, Smartphone, Social Media, Telemonitoring, Web, Artificial Intelligence, Machine Learning, Virtual Reality, Telehealth, Telemedicine, Telerehabilitation, Virtual Care.

3.3. Digitalization and Digital Health Technologies in Patient Experience Literature

The subject of digitalization and digital health tools is the most frequently addressed theme in the literature on patient experience. The healthcare industry is currently experiencing a period of rapid digital transformation, with conventional services undergoing a progressive process of digitalization. While offline services remain important in attracting patients, digitalized services can improve patient experience and retention. In this review, the bibliometric findings of the study are discussed in order of their importance and position in the literature, as shown in Table 5. Firstly, the concept of digital health is notable as an umbrella concept. Digital health can be defined as the field of digital health technologies that are based on evidence, and which are used to measure or intervene in healthcare with the objective of supporting the overall practice of medicine. Digital health is a comprehensive term encompassing a wide range of categories, including health information technology, wearable devices, telehealth and telemedicine, and personalized medicine [34,35]. The rapid evolution of digital health technology has markedly enhanced individuals' capacity to assume control of their own health. The solutions and innovations

of the global digital health market are based on new technologies that adopt artificial intelligence and machine learning for various chronic disease patients, especially in hard-to-reach regions. The technologies and offerings that are generating the most interest include mHealth (or mobile health), telemedicine, telehealth, telecare, personalized medicine, and wearable devices.

In this instance, an app has the potential to completely transform how patients obtain medical care. With a few clicks, patients can check costs, schedule appointments, monitor their progress, and access their medical data at any time [18]. Such applications permit users to obtain personalized health advice, consult their doctor via chat or video call, and even upload images of their condition. Additionally, an app can provide a seamless experience by integrating with partner pharmacies to enable easy prescription fulfillment. Patients can also use the app to rate their experience and provide feedback; this can help medical practices improve their services. Most phones come pre-programmed with health-focused apps, such as Apple Health, Samsung health, etc. The mPower investigation constitutes an illustration of the application of the Apple Research Kit in the context of a mobile health study centered on Parkinson's disease. The objective of this study is to achieve the registration of 20,000 participants through the utilization of a mobile electronic consent process, as outlined in the study's protocol [36]. The research indicates that many digital tools are website/web-based platforms, with only a small proportion being smartphone applications [37]. One of the key challenges in studies conducted using social media platforms, mobile applications, or other forms of remote participation is the difficulty in organizing the complex concepts of digital data collection or technology-enabled intervention in a way that participants can comprehend [38].

The integration of digital health with patient-centered care has resulted in the emergence of digital systems for health parameter monitoring and mobile applications developed for specific pathological conditions. These enable the collection of personalized data on the health status of each patient [39]. Technological innovations have facilitated and supported research on patient experience, thereby enabling patient-centered design and processes to improve the patient experience by prioritizing the individual patient's needs. Bibliometric research methods, research design techniques, and mobile technology are utilized in this field, with the objective of patient experience research being driven by empathy and in-the-moment data. Thanks to the advent of telemedicine and digital health, there are now additional aspects to the patient experience. The increase in engagement points has been driven by patients' convenience in scheduling visits and even receiving online consultations. But this broader digital environment also brings risks and barriers that can leave patients dissatisfied with their healthcare. A patient-centered approach is one that some healthcare systems strive to maintain, while others succeed in providing an exceptional patient experience. Resolving any gaps in patient experience is critical as it can lead to decreased patient retention rates. Contextualized and actionable insights for healthcare professionals and decision-makers are the goal of patient experience research.

It is anticipated that emerging technologies, including new artificial intelligence applications for diagnostic purposes, robotic medical assistants, virtual reality medical visualization systems, and a range of similar products, will also be included [40]. The implementation of digital health represents a significant opportunity to reduce healthcare expenses while enhancing patient access to affordable care [41]. As demonstrated in previous research, digital health has the capacity to facilitate preventive measures, consultative processes, treatment modalities, and the management of health [42]. The patient experience is becoming increasingly digital with the advent of electronic appointment scheduling and digital health components. Scientists are now using smartphone screen recording features to comprehensively understand the patient experience. In this way, patient interaction

with digital technologies and healthcare services can now be examined in more detail. Researchers can gain extremely useful information by observing the difficulties patients face when trying to schedule appointments or navigate digital health platforms. The utilization of mobile screenshots to investigate and evaluate the digital aspects of the patient experience constitutes a valuable resource.

The term "virtual care" is used interchangeably with other terms referring to the provision of health services at a distance. These include "virtual visits", "telehealth", "telemedicine", "e-health", and "telerehabilitation" [43]. Virtual care encompasses any remote interaction between the patient(s) and those in their care network that is facilitated using technology, including but not limited to video conferencing, email, and instant messaging [44]. In emergency situations, virtual care may have a pivotal role to play by virtue of the remote healthcare support that it is able to provide [45]. As posited by Lo et al. (2022) [43], digital health tools, encompassing virtual care and portals, have evolved into an indispensable cornerstone of contemporary medicine, serving as a pivotal medium for healthcare delivery. The utilization of patient portals has been identified as a pivotal mechanism in fostering continuity and accessibility to healthcare through the pandemic. Virtual care is further defined as any interaction between patients and members of the care community that occurs in a remote capacity. The efficacy and quality of such interactions can be enhanced using communication methodologies or information technology [46]. Virtual care enables patients to communicate with their doctors and receive care remotely, rather than in person.

Telemedicine services, which proved invaluable to many patients and healthcare providers during the pandemic, have become an integral component of the anticipated digital patient experience. The global pandemic has had a considerable impact on the uptake of digital technologies, with the adoption of the patient portal being a notable example ([47] (p. 5), [48]). Digital technology has the potential to empower patients by providing them with the information they need to take greater control of their healthcare. A healthcare patient portal is a secure website that gives patients convenient access to their personal health information, including details of recent doctor visits, medications, laboratory results, and the ability to securely communicate with healthcare providers, request prescriptions, and arrange appointments [49]. Digital technology has the potential to empower patients; however, it may also modify their overall experience [49].

4. Discussion and Implications

In this review, a total of 21,392 publications from the patient experience literature over the last decade were analyzed. Keywords were grouped by showing common occurrence using bibliometric and scientific mapping analyzing methods. When common concepts are grouped, digitalization and digital health tools usage issues that are most frequently referenced in the literature are found. This review clarifies the existing literature on the digital patient experience and the formations that have emerged because of current technological developments and advancements. The development of digitalization and digital tools has contributed to the advancement of theory in the field of digital health, eHealth, electronic health records, health information technology, the internet, mhealth, mobile applications, mobile health, patient portals, smartphones, social media, telemonitoring, web, artificial intelligence, machine learning, virtual reality, telehealth, telemedicine, telerehabilitation, and other technology-based topics such as virtual care. To facilitate the advancement and dissemination of high-quality digital health research, the World Health Organization (WHO) mHealth Technical Evidence Review Group has published new guidelines [50] and a toolkit [51], with the objective of improving and standardizing mHealth research and reporting in the literature. The study by Labrique et al. (2018) [52] on

mHealth has demonstrated the significant role that digital health ecosystems have come to play in 2018, providing a comprehensive overview of their evolution. These developments have provided instrumental benefits in the development of patient experience theory. The benefits and effects of digitalization and health information technology tools have been extensively discussed in the literature regarding the development of the patient experience theory and the contribution to the theory. The contemporary healthcare landscape is replete with digital technologies, including electronic health records, electronic prescribing, and electronic medication administration records, as well as remote monitoring, telehealth, websites and applications for computers, tablets, and smartphones. Additionally, there is a vast array of educational video games, clinical decision support systems, barcoded medication administration, automated medication dispensers, and patient data management systems [53,54]. These tools can perform a variety of useful functions, including clinical diagnosis or decision-making support, patient compliance, or the provision of education [55]. Previous studies have demonstrated that the implementation of these technologies results in time savings, cost reductions, and improved patient health outcomes [56,57].

The most significant implication is the importance of the healthcare system utilizing providers who provide a positive patient experience. Positive results on patient experience measures are associated with positive healthcare outcomes. The second implication is that facilitating a comprehensive understanding of the patient experience would result in more effective dialog between doctors and patients. This, in turn, can empower patients to make more informed decisions about their treatment, leading to enhanced patient care. By elucidating patients' perceptions of the elements of a disease or treatment that they consider to have had the greatest impact on their lives, and by identifying previously overlooked symptoms through direct patient reporting, doctors can better tailor their approach to each patient's unique needs. This review argues that patient experience is a concept that requires further development and updating considering the constantly evolving and changing conditions that characterize the healthcare industry. The objective is to formulate sector-specific strategies that will achieve the common goal of excellent patient experience and satisfaction. The concept of patient experience, which has been the subject of considerable literature emphasizing the importance of patient-centered care, has become a highly significant approach in the contemporary healthcare environment. Patient-centered care necessitates a healthcare system where the patient's perspective is actively sought and integrated into all aspects of the healthcare system and related processes.

A significant benefit of sustainable digital health interventions is their capability to collect and process substantial quantities of data from numerous sources, including health information systems, medical devices, patients and their relatives, by leveraging the Internet of Things (IoT), social media platforms, applications, and telemedicine tools. The capacity to gather a substantial amount of data in a genuine context bolsters the efficacy and efficiency of pharmacological interventions by enhancing the probability of an accurate diagnosis, the likelihood of selecting efficacious treatments, and, more broadly, the capability of health systems to furnish optimal assistance [58,59]. Nevertheless, the digitalization of the health sector does have its drawbacks. The most significant challenge to the implementation of these technologies is the clinical environment, which is characterized by a complex, multi-stakeholder context with a highly fragmented decision-making process. This necessitates the satisfaction of a diverse array of needs and requirements, catering to the distinct requirements of various user groups and segments [60]. Furthermore, the restricted digitization of health information systems, coupled with the accelerated advancement of technologies utilized in the healthcare sector, represents a significant challenge. It is important to note that there are additional constraints relating to data security and privacy. It is worth considering that digital solutions frequently rely on

data extracted from databases originally designed for other purposes. This gives rise to several concerns, including the assurance of data sources, the accurate representation of the entire population, the quality of algorithms, and the validity and correct use of data. Patients often assume that certain personal information is not accessible to unauthorized individuals. However, this assumption is not always accurate. The growing accessibility and exchange of health information have the potential to advance both individual care and public health. However, it also provides opportunities for illicit, intrusive marketing practices and discrimination [50].

5. Future Directions for Sustainable Digital Health Interventions

This study looks at the identification and resolution of deficiencies in the delivery of care, with the objective of enhancing the clinical outcomes for all patients. In this context, digital health technologies constitute the second category that emerged in this study, as they positively impact the patient experience and patient–provider communication by accelerating the flow of accessible and timely information. Moreover, the progression of both the patient and the care provider's clinical experiences has underscored the requirement for innovations to enhance the digital patient experience. To accomplish this objective, it is crucial to consider population strategies that address healthcare culture, health literacy, and health behavior. This domain signifies a pivotal area for future exploration in the pursuit of a patient-centered healthcare model.

One issue with the existing literature on the implementation of eHealth is that it is dispersed across several different subspecialties. The plethora of reviews of the implementation of disparate eHealth technologies can render it challenging for clinicians, administrators, or policymakers to identify and apply evidence that is pertinent to their circumstances. It is understood that a variety of virtual models for the provision of virtual care have been developed, and this type of healthcare delivery has been shown to increase patient and caregiver satisfaction, as well as organizational benefits [47]. Furthermore, more than three-quarters of patients have expressed a desire to access virtual care [45].

The advent of emerging digital technologies has created unique opportunities to provide virtual care and enhance healthcare delivery within the global healthcare system [61]. Virtual care technologies are an indispensable tool for improving health outcomes at the individual and community levels. As healthcare systems evolve, there is a growing tendency for individuals to seek care in virtual care environments. From user-friendly mobile applications to cutting-edge medical devices, digital health technologies are transforming patient care and assisting in reducing disparities in healthcare access for underserved communities. eHealth is regarded as being pivotal in resolving the issues being faced by healthcare systems, particularly in light of an aging population, enhanced treatments, and scarce resources.

The impact of new technologies on the patient's digital experience is a crucial aspect to understand for several reasons. Firstly, the cost of healthcare in the United States is rising at an alarming rate; recent estimates predict it will grow from USD 3.5 trillion in 2017 to USD 6 trillion by 2027 [62]. It is emphasized that decision-makers in the health sector must facilitate the enhanced management of ICT platforms, with the goal of establishing a competence center in digital health services and creating a shared digital space among all actors within the ecosystem [39]. Allocating resources to support the development of sustainable digital health interventions provides a strategic plan. It provides the necessary support to persuade investors and risk-averse governments to invest in this solution area. It has been stated that it will continue the trend of planning and collaboration for experimentation, scale, and sustainability, further advancing the interdisciplinary meeting point between health systems strengthening and digital health [63].

Innovative technologies, including wearable devices, smartphone applications, internet-based self-help platforms, and health record databases, are capable of recording, storing, and presenting health-related data. Such data may subsequently be employed with greater regularity by patients, carers, or healthcare professionals to enhance comprehension, management, or the monitoring of medical conditions and streamline the process [64]. It is possible that the use of digital health tools could enhance efficiency, facilitate rapid scaling, enable the sharing of data almost immediately, and accelerate data collection and analysis. It is imperative to determine whether the insights gained from the integration of digital technologies during the pandemic can be maintained and replicated in subsequent contexts. The potential of these instruments to promote healthy living and well-being for all can be realized if the necessary resources are available. In the right context and with the help of dedicated users, digital tools have the capacity to improve health systems, ensure healthy lifestyles, and promote well-being. However, most of the research assessing the impact of digital technologies was undertaken on smaller projects or specific digital health applications [65].

The global pandemic has resulted in a regression concerning the Sustainable Development Goals [66]. However, it has also demonstrated both the worth and potential of digital health tools. The findings of this study are of significant value to policymakers, donors and non-governmental leaders in their efforts to gain insight into the most effective practices concerning the utilization of digital technologies. To ensure that digital health development is sustainable in the long term, it is imperative that research in this field in the future places significant emphasis on two key areas. Firstly, there is a need for comprehensive monitoring and detailed evaluation of tool utilization. Secondly, there is a need for the implementation of sustainable financing structures. The findings of research conducted during the recent pandemic, which have highlighted the value of the implementation of digital tools, if sustained and built upon, may prove pivotal in the future of digital health. The effective utilization of such tools has the potential to enhance access to healthcare while concomitantly improving its quality. Moreover, they have the capacity to complement primary healthcare systems and facilitate data-informed public health decision-making [67,68].

It is recommended that future evaluations of digital health technologies focus on the achievement of specific goals and outcomes, rather than solely on user satisfaction and compliance [63]. The future development of precision medicine is expected to be driven by the emergence of increasingly sophisticated algorithms capable of analyzing data from sensors or mobile applications. This is a field of medical research that aims to control all critical parameters for disease progression and to divide patients into homogeneous groups according to symptoms. The emergence of digital health and the prioritization of the patient can be seen as a crucial step towards the development of personalized medicine. Personalized medicine is a paradigm in which healthcare decisions, applications, and medical products are customized to the specific needs of each patient [39].

The advent of an innovative new generation of digital technology-driven healthcare solutions has generated significant optimism and anticipation surrounding the potential for radical transformation in healthcare delivery systems [69]. With respect to sustainable digital health interventions, the contribution that digital innovations can make to global healthcare, including in low- and middle-income countries, will increase with an understanding of the challenges that need to be overcome in scaling and sustaining such innovations [70–72].

The potential of digital health may be undermined by the unintended consequences of inadequate policies, infrastructures, or practices [73]. One potential issue with the implementation of new AI technologies in healthcare is the possibility of incompatibility with the detailed information management requirements that are necessary for effective patient data

access [74]. One of the most significant challenges to the sustainable adoption of digital health solutions in healthcare is the ability to adapt to new technologies. Furthermore, it prompts the question of whether the health policy is sufficiently responsive to the challenges of sustainable deployment of digital health solutions [63,75,76]. Despite abundant evidence of their benefits to patients, it has been emphasized that many innovative technologies and treatments were forgotten before they were widely disseminated or effectively used in healthcare [76].

6. Conclusions

In conclusion, the use of digital health technologies is on a rising trend, but research in this field is still in its infancy. The concept of patient experience has emerged as a fundamental component of healthcare. This review revealed that patient experience literature is a dominant feature of numerous disciplines and fields. Furthermore, it has demonstrated that patient experience studies offer numerous contributions and benefits in a variety of areas and serve a multitude of purposes. Although this study has only examined the literature under the healthcare management and services category, it represents the most comprehensive study to date in terms of the number of publications analyzed. The bibliometric findings examined the patient experience literature in a comprehensive and detailed manner in order to identify solutions to the research questions. Patient experience provides valuable insights into the nature of the problem and the impact of the technology under consideration on individuals' health and quality of life. e-Health, telehealth, telecare, virtual care, telemedicine, telerehabilitation, and mobile health (mhealth) comprise a vast scope of research and applications of information and communication technologies, extending beyond the domain of medicine to encompass the expansive field of healthcare. This encompasses not only traditional medical care but also encompasses home care and the provision of personalized health services.

7. Limitations

It should be noted that this study is subject to several limitations. There is a clear consensus on the importance of the patient experience in healthcare, yet there is a lack of consensus on what constitutes the patient experience. Although patient experience has been studied and measured, there is a notable discrepancy in the explicit definition of the concept in published literature. Furthermore, when definitions are provided, they are inconsistent. Consequently, given the extensive body of literature on patient experience, which has accumulated in a multitude of disciplines and scientific fields, it is not surprising that the WOS and Scopus database contains a vast quantity of literature on this subject, which is widely dispersed.

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