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Navigating online health information: Insights into consumer influence and decision-making strategies—An overview of reviews

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Abstract

Objective: Communities' use of technology and the internet for online health information (OHI) is increasing exponentially. An understanding of how and why individuals access OHI, and how this information influences decisions on health, medicines and self-care practices is critical. This review aims to: (1) identify the factors influencing OHI-seeking behaviour; (2) evaluate the evidence of OHI on self-care practices; and (3) outline strategies to improve online informed decision-making and assess the impact of these strategies on consumer outcomes.

Methods: A review of systematic reviews was conducted in November of 2023, following the *Cochrane Handbook* and PRISMA guidelines, and using PubMed, Scopus, Web of Science and EBSCOhost databases. The methodological quality of retrieved reviews was appraised using the AMSTAR 2 tool.

Results: The search retrieved 1725 records. Of these, 943 were screened, and 33 were included in the final analysis. The most frequently identified reasons for seeking OHI were to retrieve diagnostic and treatment information, and well-being and emotional support. Level of education and socio-economic status influenced OHI-seeking. OHI directly influenced self-care decision-making by individuals and their relationships and communication with healthcare providers. Overall, OHI-seeking (and interventions to promote the use of OHI) enhanced individuals' confidence, skills and knowledge.

Conclusions: The findings highlight the benefits of OHI-seeking and its potential influence on self-care decisions. Future research should focus on strategies that would promote the pursuit of high-quality, up-to-date OHI and on the development of interventions for healthcare professionals to improve patients' use of OHI in self-care and self-efficacy.

Keywords

Online health information, self-care, decision making, consumers, systematic review, information-seeking behaviour, internet < general, behaviour change, lifestyle

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Introduction

Consumer access to the internet has expanded due to increased availability of digital technology,[1] giving consumers greater access to online health information (OHI). OHI-seeking was reported to have increased during the COVID-19 pandemic for many reasons including limited access to healthcare providers.[2] OHI is available from many evidence-based and non-evidence-based sources including social media, health and government websites,

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and online forums.[3] However, policies and regulations that moderate OHI are lacking, compromising its veracity and reliability.[4–7]

OHI enables consumers to be better informed and more involved in health-related decisions, and this may result in better health outcomes.[8–10] OHI may help individuals to make many decisions, such as whether or not to undertake self-care, where to access health services for management of specific conditions and whether or not to adhere to medication regimens. OHI may also be misleading, incorrect or misinterpreted by consumers. If it is not used appropriately, OHI can lead to health and safety risks,[11,12] which will inevitably have an adverse effect on the use of health system resources.[13] Therefore, ensuring that consumers use reliable evidence-based OHI should be a priority.

The evolution and widespread adoption of OHI and technology in healthcare decision-making have prompted research into consumers' experiences and capacity to search and evaluate the validity and reliability of OHI.[14–18] However, the compilation and synthesis of information in this field pose challenges due to the diverse and extensive nature of available data. Recognising the necessity of consolidating relevant literature on OHI-seeking behaviour across time, an overview of reviews in this domain was deemed appropriate. A systematic review of systematic reviews investigating the characteristics and determinants of consumers' OHI-seeking behaviour is an excellent methodology for providing a large amount of information to effectively manage OHI, mitigate associated risks, and devise strategies to promote informed decision-making. Accordingly, this overview of systematic reviews aims to: (1) identify the factors influencing OHI-seeking behaviour; (2) evaluate the effects of OHI on self-care practices; and (3) identify and outline strategies to improve OHI-based decision-making; and (4) assess the impact of these strategies on consumer outcomes.

Methods

This overview of systematic reviews used methods set out in the *Cochrane Handbook*.[19] The results are reported as stipulated in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[20] The methodological quality of the retrieved reviews was appraised using the Assessment of Multiple Systematic Reviews version 2 (AMSTAR 2) methods.[21]

Search strategy

In a preliminary scoping search of databases, key papers and systematic reviews relating to the objectives were identified from PubMed, Scopus, Web of Science and EBSCOhost databases. Search strategies were tailored for each database (Table 1). The searches, which included English and Spanish language articles, were conducted in November 2023 and no time parameters were imposed. Reference lists of included systematic reviews and meta-analyses were reviewed by author CCG to identify any further reviews not previously identified. Results were managed in EndNote X9 and saved without duplication.

Screening

Author CCG screened articles by title and abstract, and authors SDG and SB subsequently reviewed all instances where there was uncertainty. Disagreement among reviewers was resolved by discussion and consensus, and all three authors agreed on the texts for further consideration. Full texts were then assessed for eligibility according to inclusion and exclusion criteria. Articles were included if they were systematic reviews and/or meta-analyses that:

- focused on consumers (all population groups, adults and children) OHI-seeking behaviours; and
- reported at least one of the following –
  - characteristics of OHI-seeking behaviour;
  - factors influencing OHI-seeking behaviour and impact on consumer self-care decision-making;
  - interventions to increase consumers' informed decision-making regarding OHI; and
  - outcomes of OHI-seeking.

Articles were excluded if they were:

- non-systematic literature reviews; or
- systematic reviews or meta-analyses –
  - focused on telehealth interventions and applications (i.e. healthcare services or interventions provided to patients through online platforms or applications);
  - focused on improving or evaluating the quality of specific online health interventions;
  - focused on OHI-seeking behaviour of other populations (e.g. healthcare professionals); or
  - where outcomes pertaining to consumer OHI-seeking could not be separated from other outcomes.

Data synthesis and extraction

In accordance with *Cochrane Handbook* guidance,[19] variables that were extracted from the articles included title, authors, number and type of primary studies included, information on factors influencing OHI-seeking, type of OHI accessed by consumers, influence of OHI on self-care decisions (e.g. to adhere to medication, or to seek care from a health provider) and interventions to improve OHI-seeking (e.g. type of intervention, objective, duration and outcomes).

Table 1. Search strategies.

Database	Search Strategy
PubMed	("patient*" OR "consumer*" OR "older adults" OR "older people" OR "young people" OR "parent*" OR "adolescent*" OR "children*" OR "Humans" [MeSH Terms] OR "person*" OR "carer*" OR "patient activation") AND ("find*" OR "seek*" OR "navigation" OR "access" OR "search" OR "Seeking Behaviour*" OR "Seeking Behavior*" OR "Information Seeking Behavior*"[MeSH Terms]) AND ("health information") AND ("Internet" OR "online" OR "web" OR "mobile applications" OR "online content" OR "social media" OR "social network" OR "mass media") AND systematic [sb]
Scopus	TITLE-ABS ("patient*" OR "consumer*" OR "older adults" OR "older people" OR "young people" OR "parent*" OR "adolescent*" OR "children*" OR "carer*") AND TITLE-ABS (find* OR seek* OR "navigation" OR "search" OR "seeking behaviour*" OR "seeking behavior*") AND TITLE-ABS ("health information") AND TITLE ("Internet" OR "online" OR "web" OR "mobile applications" OR "online content" OR "social media" OR "social network" OR "mass media") AND (LIMIT-TO (DOCTYPE, "re")
Web of Science	TS = ("patient*" OR "consumer*" OR "older adults" OR "older people" OR "young people" OR "parent*" OR "adolescent*" OR "children*" OR "person*" OR "carer*" OR "patient activation") AND TS = (find* OR seek* OR "navigation" OR "search" OR "seeking behaviour*" OR "seeking behavior*") AND TS = ("health information") AND TI = ("Internet" OR "online" OR "web" OR "mobile applications" OR "online content" OR "social media" OR "social network" OR "mass media") and Review Articles (Document Types)
EBSCOhost databases • CINAHL Plus • Psychology and Behavioural Sciences Collection • Academic Search Complete • Education Research complete • Health Source: Consumer and Nursing/ academic edition • The Education Resource Information Center	AB ("patient*" OR "consumer*" OR "older adults" OR "older people" OR "young people" OR "parent*" OR "adolescent*" OR "children*" OR "Humans" OR "person*" OR "carer*" OR "patient activation") AND AB ("find*" OR "seek*" OR "navigate" OR "search" OR "seeking behaviour*" OR "seeking behavior*" OR "Information Seeking Behaviour") AND AB ("health information") AND TI ("Internet" OR "online" OR "web" OR "mobile applications" OR "online content" OR "social media" OR "social network" OR "mass media") *Filtered by review, systematic reviews and meta-analysis depending on the database.

Assessment of the quality of systematic review (risk of bias)

The AMSTAR 2 tool was selected as it provides an assessment of the quality of systematic reviews, including both randomised controlled trials (RCTs) and non-randomised studies.[21] AMSTAR 2 ranks the quality of a systematic review according to 16 predefined items without generating an overall score. Overall confidence in the results of the review is rated High if the review had non or only one non-critical weakness, Moderate (for, more than one non-critical weakness), Low (one critical flaw with or without non-critical weaknesses) and Critically Low (more than one critical flaw with or without non-critical weaknesses). Risk of bias was assessed in all articles by all authors independently, and any disagreements were discussed and resolved. No papers were excluded during the quality assessment process (Appendix 1 in the online supplemental materials).

Results

The search retrieved 1725 records from the following databases: PubMed ($n = 460$), Scopus ($n = 162$), Web of Science ($n = 142$) and EBSCOhost ($n = 961$). In all, 943 records were screened by title and abstract; 87 full-text articles were assessed for eligibility, and 30 fulfilled the inclusion criteria. Three additional articles were identified after reference review. Thus, a total of 33 reviews were included.[22–54] The selection process is depicted in the PRISMA diagram (Figure 1).

Description of included reviews

The included reviews were published between 2011[54] and 2023.[22–24] Of the 33 reviews, four were meta-analyses.[23,26,40,51] Furthermore, 27 reviews[22–25,27–38,41–49,52,53] included both qualitative and quantitative studies and 6 included quantitative studies only.[26,39,40,50,51,54] Several reviews were intervention focused,[26,30,34,39,40,50–54]

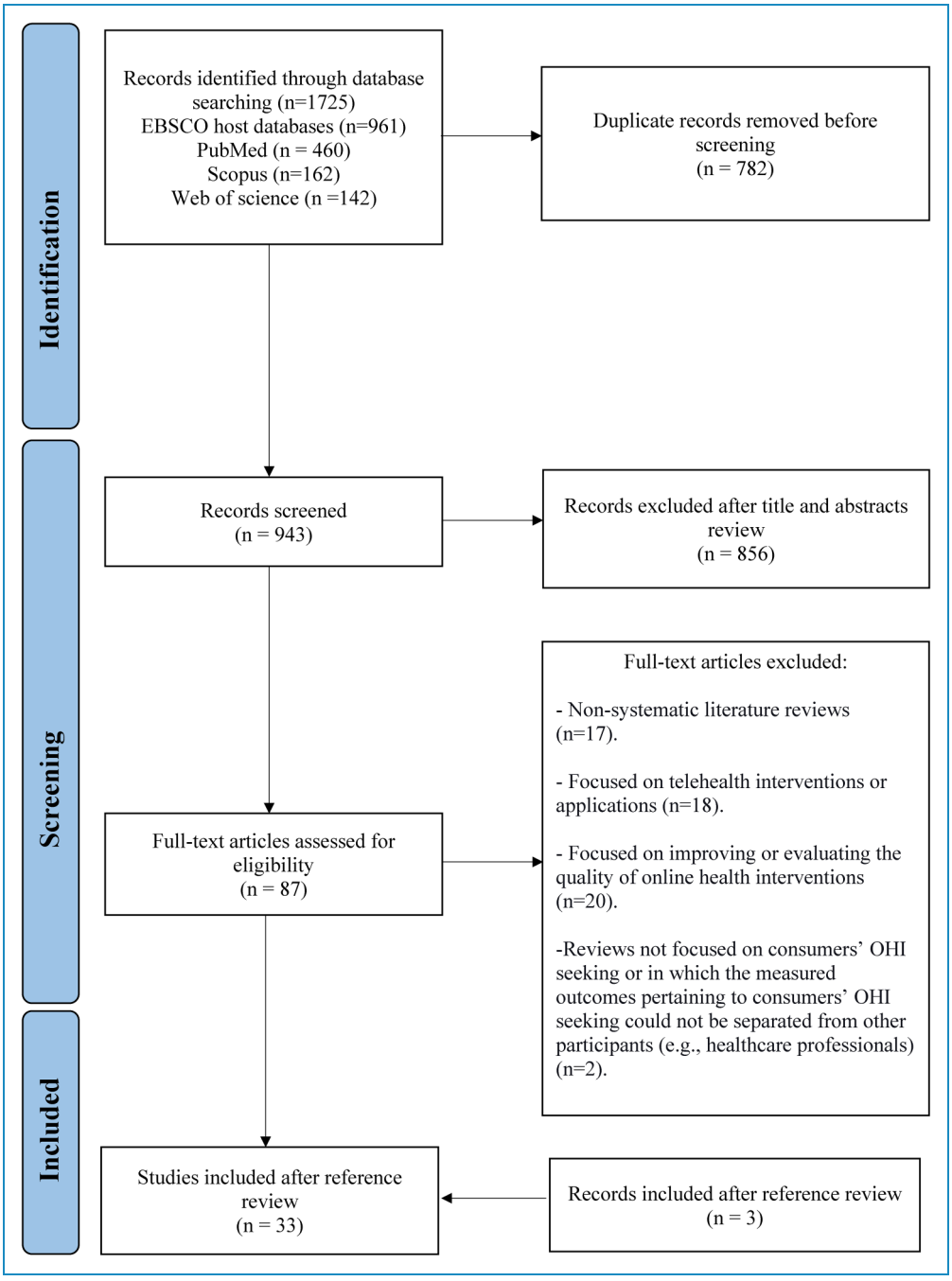

Figure 1. PRISMA flow diagram.

encompassing a range of study designs including randomised controlled trials, randomised factorial designs, pre-post intervention studies and uncontrolled single-group trials and cross-sectional studies, among others. Most reviews[22,23,25–28,30,33–41,43–47,49–55] were focused on OHI-seeking on the internet, while six reviews concentrated on social media.[24,29,31,32,42,48] The target populations of the reviews were varied, including patients or caregivers,[26–28,37,47,49] consumers,[41,48,52,54] patients with specific conditions,[22,23,29,42] older adults,[30,46,53] adolescents and children,[24,38,43,45] parents[25,32,39] and pregnant women.[44,50] Most studies were conducted in the United States. Due to the diversity of the target population and range of terms used to refer to them (e.g. proxy seekers, older adults, patients, consumers) in the included reviews, the term consumer, defined as any individual who accesses health information online, has been used throughout this manuscript. A full description of the characteristics of the included reviews is given in Appendix 2 in the online supplemental materials.

Online health information accessed by consumers

In 14 reviews, none of which were meta-analyses, described the types of OHI accessed by consumers and the online platforms used to find this information.[22,25,28,31–33,35,37,39,44–46,48,50] Two reviews[30,46] reported that older adults most commonly accessed the internet for information about their conditions, specific diseases, medications and treatments, nutrition, exercise and general health. Older adults also used the internet to find support groups.[30] The sources of OHI most frequently accessed by older adults most were websites (e.g. websites of educational, commercial, government and non-profit entities), social media, blogs, patient portals and mobile internet, and they tended to use general search engines (e.g. Google).[30] Two reviews, one focused on adults over 18 years old and other focused on proxy seekers (i.e. adults who seek information informally on behalf of others), reported that they sought OHI regarding specific conditions and prescribed medications, either for themselves or to support others with a health condition.[28,37] Adults over the age of 18 also accessed the internet to self-diagnose symptoms while maintaining online anonymity.[37] A review focused on children and adolescents reported they typically accessed OHI on physical, sexual and mental health, and on health issues with social, cultural and religious sensitivities.[45]

Five reviews reported OHI-seeking by parents,[32,39] expectant parents[25] and pregnant women.[44,50] In one review, parents usually accessed social media when they had specific health concerns related to their children, often to give health information and support and to find validation or reassurance. The social media platforms that parents mainly accessed were Facebook and Twitter. They also accessed Wikipedia, YouTube and online forums.[32] In other reviews of OHI-seeking by parents, the most common information topics searched for were specific diseases, treatment and diagnoses, and children's nutrition and development.[39] Three reviews reported that pregnant women (or expectant parents) frequently sought OHI on pregnancy and pregnancy complications, nutrition, exercise, medications, birth, and foetal and child development.[25,44,50] Overall the information most commonly accessed by consumers was on nutrition and exercise, specific diseases, medication, mental health, and sexual and reproductive health.[33]

Factors influencing OHI-seeking

The influence of sex and age on OHI seeking was explored widely in the articles. In several reviews, women were reported as being more likely than men to conduct OHI searches[28,33,43] and seek help online.[42,45,46] However, one systematic review of OHI-seeking by parents found no differences between men and women.[39] Indeed, a review focused on adults aged over 65 found that women were less likely to seek OHI.[46] Younger individuals were reported to be more likely to use the internet as their primary source of health information in several reviews,[27,45,49] but in contrast, three reviews found that age was not associated with OHI-seeking.[27,33,39]

Level of education and socio-economic status of consumers influenced OHI-seeking in nine reviews.[27,30,32,33,39,45,46,49,50] Six reviews variously covering patients, pregnant women, healthy individuals and older people found that those with higher education levels were more willing and likely to search OHI.[32,33,39,46,49,50] High-income individuals were also more likely to seek OHI due to greater access to the internet.[27,33,46,49] Adult patients and those over 18 years of age living in areas without publicly funded healthcare appeared to prefer to use OHI due to limited access to and costs associated with face-to-face consultations.[37,49]

Consumer needs also affected willingness to seek OHI. Parents with children below 18, pregnant women and adult patients sought OHI when their needs were not met by healthcare professionals for reasons such as insufficient time in consultations and difficulties with communication.[32,39,44,49] Six reviews, based on different target populations (e.g. parents, adolescents between 13 and 18 years old, patients), reported that these individuals tend to look for OHI before[32,37–39,47] and after[32,49] a GP consultation to be informed and to answer new questions following the consultation. The use of social media and online communities due to consumers' needs for emotional support and reassurance were described in five reviews.[25,39,45,48,49]

The characteristics of the online sources have been reported as a factor influencing consumers' use of OHI. Privacy and anonymity are features that made consumers feel safe and more willing to seek OHI.[25,32,33,38,45,49] Online communities have been found to be an accessible way of sharing experiences providing consumers with emotional and informational support.[25,32,33,37,44–46,48] Characteristics of the internet – easy access to health information at no cost,[32,33,37,38,44,46] currency of information with access to different points of view[32,33,38] and availability of sensitive information[33,45] – encouraged consumers to seek OHI. Conversely, some features of online sources – such as poor quality and reliability of the information,[30,32,33,37–39,45,48,49] the amount of information and complex medical terminology,[37–39,43] and lack of some health-related information and emotional guidance[33,45] – evidently discouraged consumers from finding OHI. Moreover, the amount of health information available online may overwhelm users and lead to catastrophising, anxiety and stress.[25,30,32,44] Table 2 lists the factors that influence OHI-seeking, and trends identified within included reviews.

A meta-analysis found that younger adults (aged 19–44 years) are significantly more likely to search for OHI when compared with older adults.[51] The same study also found that those individuals who were in a domestic partnership were more likely to access OHI than those not in such relationships.[51] Another meta-analysis found that self-efficacy,

Table 2. Factors influencing online health information seeking and trends within the included reviews.

Identified Factors		Number of Systematic Reviews Reporting This Factor by Year of Publication										Citations Supporting Trends
		2023 ($n=3$)	2022 ($n=6$)	2021 ($n=6$)	2020 ($n=4$)	2019 ($n=4$)	2018 ($n=2$)	2017 ($n=2$)	2016 ($n=2$)	2014 ($n=3$)	2011 ($n=1$)	
Individual factors	Sex	1[23]	0	1[33]	2[39,40]	1[42]	3[43,45,46]	1[47]	1[50]	1[51]	0	**1. Women** - More willing and likely to conduct OHI searches. [33,40,43,51] - More likely to search for information about specific medical issues (about their health or relatives), medication or processes, and depression, anxiety, stress and mental health. [42] - Women are more likely to seek help online. [42,45,46] - Women are less likely to seek OHI.[46] - First-time pregnant women more likely to access the internet. [50] - Women prefer to talk in person with someone than over the internet.[23] **2. Men** - Men are more likely to discuss OHI with their physician.[47] - Both men and women tend to find OHI useful.[51] **3. No differences in OHI seeking between sex**[39]
	Age	1	1[27]	2[32,33]	3[38–40]	1[45]	2[43,45]	0	2[49,50]	1[51]	0	**1. Young people** - Young people are more likely to use internet for less sensitive topics.[45] - Younger adolescents prioritised relevance of information over trustworthiness.[38] - Young consumers more likely to seek information on internet (primary source of information).[27,40,45,49] - Young male patients with psychiatric conditions more likely to discuss health information with their physicians.[27] - Adolescents more likely to notice if websites included specific domains (e.g. ".gov") and if they included information from health experts.[38] - Adolescents tend to rely on more on websites than in social media or social networking sites.[38] - OHI searching is not frequent in adolescents.[43] - Tend to access OHI more frequently through their phones.[43] - The veracity of the OHI is considered neither reliable or nor reliable by college students.[51] **2. Adults** - Adults between 19 and 44 years more like than older adults to seek OHI.[51] - Parents tend to examine the source, translating information, and assessing how information is presented to assess the quality of the social media platforms.[32] - Some consumers tend to ask healthcare professional about the veracity of the source.[32,33] - No differences found in OHI seeking depending on the age.[27,33,39]
	Ethnicity	0	0	2[33,40]	0	0	1[45]	0	0	0	0	- White people tend to search OHI more frequently than others race.[40,45] - Hispanic people are more likely to seek health information using a general search engine compared with other white populations.[33]

(continued)

Table 2. Continued.

Identified Factors	Number of Systematic Reviews Reporting This Factor by Year of Publication										Citations Supporting Trends
	2023 ($n=3$)	2022 ($n=6$)	2021 ($n=6$)	2020 ($n=4$)	2019 ($n=4$)	2018 ($n=2$)	2017 ($n=2$)	2016 ($n=2$)	2014 ($n=3$)	2011 ($n=1$)	
Culture	0	1[27]	3[33,39,40]	1[37]	0	0	1[47]	1[50]	1[51]	0	- Cultural environment of patients may also affect consumers' communication with physician (e.g. afraid to offend health professionals).[27,47] - Patients sometimes do not share OHI with their physicians because they are ashamed/afraid to be judged, or they do not want to interrupt the diagnosis process. [37,39,47] - Pregnant women tend to seek OHI but in many cases they do not share this information with their doctors.[50] - Marital status has been found both influencing and not influencing OHI. [33,50,51]. - Culture has not been found as a significant moderator of OHI seeking.[40]
Level of education	0	2[27,30]	4[32,33]	2[39,40]	0	2[45,46]	0	2[49,50]	0	0	**1. Consumers with high education level** - More willing and likely to use OHI.[33,40,46,49,50]. - Have fewer difficulties with OHI-seeking.[27,33] - Parents' level of education sometimes influences the use of social media and the internet as a source of health information for their kids.[32,39] - Parents sometimes prefer social media for health information, as they believe other parents are more educated in self-management strategies than health professionals.[32] **2. Consumers with low health literacy** - May not even realise their need to seek OHI.[33] - May have difficulties in understanding health information so they are less likely to ask questions.[27,30] **3. Consumers with eHealth literacy is associated with OHI seeking**[45]
Health status	1[23]	1[30]	1[32]	0	0	2[45,46]	0	0	1[51]	0	- Consumers with mental health conditions (e.g. anxiety and paranoia) tent to search the internet more frequently to reduce anxiety.[45] - Consumers with depression symptoms more likely to use the internet to find health information than people with other conditions.[23] - Parents tend to seek OHI with a predetermined health condition in mind.[32] - Consumers tend to search OHI after a confirmed diagnosis.[51] - Consumers with good health are more likely to look for OHI than those with poor health.[46] - Consumers with any functional decline tend to have more difficulties to access OHI.[30]

(continued)

Table 2. Continued.

Identified Factors		Number of Systematic Reviews Reporting This Factor by Year of Publication										Citations Supporting Trends
		2023 ($n=3$)	2022 ($n=6$)	2021 ($n=6$)	2020 ($n=4$)	2019 ($n=4$)	2018 ($n=2$)	2017 ($n=2$)	2016 ($n=2$)	2014 ($n=3$)	2011 ($n=1$)	
	Economic status	0	2[27,30]	2[32,33]	2[39,40]	0	1[46]	0	2[49,50]	0	0	**1. High-income consumers** - More likely to use OHI (e.g. more likely to own a personal computer).[27,33,40,46,49] - Consumers with smartphones more likely to look for OHI.[39] - Employed women tend to use the internet for OHI more frequently than unemployed women.[50] **2. Low-income consumers** - More likely to seek information using general search engines.[33] - Using social media for health information may be associated to living above poverty line, having lower income and having a government insurance policy.[32] - Not having access to a device with internet access.[30]
	Needs	0	2[25,28]	2[32,33]	4[37–40]	0	2[44,45]	2[47,48]	2[49,50]	0	0	- Consumers tend to use the internet to find OHI when their need is not met (e.g. lack of patient-provider communication or time).[32,39,44,49] - Consumers use the internet to be well informed before a consultation to be informed and bring OHI to the consultation.[32,37–39,47] - Consumers use of internet after new questions arises after visiting their healthcare providers.[32,49] - Consumers tend to use the internet to find emotional support, comfort and reassurance.[25,39,45,48,49] - Consumers finding OHI for specific diseases are more likely to find information that suits their needs for motivation.[40] - Consumers tend to use the internet for having further knowledge.[47,50] - Consumers sometimes prefer social media for health information, as they believed other people in their same situation are more educated in self-management strategies than health professionals because of the live experience.[32,48] - Caregivers tend to search OHI more than the public.[28,33] - Parents tend to use the internet to decide if their children need a doctor.[39] - Consumers tend to search in at least three different websites.[33]
	Internet skills and knowledge	1	1[30]	0	1[40]	0	2[43,46]	0	1[49]	0	0	- Issues in accessing information on the internet because of low self-efficacy.[30,49] - Lack of knowledge of relevant and useful websites.[43,46] - Self-efficacy does not have an influence on OHI seeking.[40]
External factors	Regional characteristics (i.e. characteristics of the area where consumers accessing OHI are located)	0	0	1[33]	2[37,40]	0	0	0	1[49]	0	0	**1. Consumers living in developed areas** - More online health information seekers in developed countries (or regions).[33] - People from developed countries search OHI more frequently.[33] **2. Consumers living in underdeveloped areas or more isolated areas** - Consumers living in areas with low Information communication technologies have lower trust in OHI. However, they are more likely to seek OHI if they believe the internet is a trustworthy source for health information or if they believe they can find the information they need online.[40] - Consumers living in areas where there is no publicly funded healthcare system prefer to access OHI due to the costs and limited access to healthcare professionals.[37,49]

(continued)

Table 2. Continued.

Identified Factors	Number of Systematic Reviews Reporting This Factor by Year of Publication										Citations Supporting Trends
	2023 ($n=3$)	2022 ($n=6$)	2021 ($n=6$)	2020 ($n=4$)	2019 ($n=4$)	2018 ($n=2$)	2017 ($n=2$)	2016 ($n=2$)	2014 ($n=3$)	2011 ($n=1$)	
Source characteristics (i.e. characteristics of the online platforms)	1[23]	2[25,30]	3[32,33,36]	3[37–39]	0	4[43–46]	1[48]	2[49,50]	0	0	**1. Positive features of OHI** - Anonymity and privacy features online make health information consumers feel safe to seek information.[25,32,33,38,45,49] - Online communities allow consumers to have a connection, share information and experiences with other consumers in online communities and talk about more sensitive topics.[23,25,32,33,37,44–46,48] - Accessibility and no cost.[32,33,37,38,44,46] - Currency of information and the ability to access information archived from multiple viewpoints.[32,33,38] - Websites using appropriate language and including references, logos or credentials from institutions provide higher trust in the reliability of the content.[38,46,50] - The information is useful.[50] - OHI is trusted for minor conditions but not for serious illnesses.[37,38] - Search sensitive information that are difficult to talk about and allow to define sexual orientation.[33,45] - Normalisation of common situations faced by other consumers.[32] **2. Negative features of OHI** - Poor quality and reliability of information (misinformation and lack of mechanisms to check information veracity) affect consumers' trust in OHI.[30,32,33,37–39,45,48,49] - Privacy concern.[45] - Some health-related information is still lacking (e.g. psychological and emotional guidance).[33,45] - Prevalence of unregulated content and possibility of encountering non-expert information which can lead to health decisions not evidence based.[25,38] - A lot of information and different language use make it difficult for consumers to find OHI.[37–39,43] - Some platforms have censorship of the content and identity (consumers cannot access or join some online health communities).[33] - Information overwhelming and catastrophising may produce anxiety.[25,30,32,44] - Time-consuming and physical effort for those with not much experience with technology.[37,46] - Slow websites and broken links made the search frustrating.[30,43]

perceived risk, affective responses to risk and anxiety were significantly related to OHI-seeking.[40] OHI quality and trustworthiness, gender, income, race, education and experience of consumers were also found to be significantly related to OHI-seeking.[40] Females, younger consumers and individuals with a higher income and education were more likely to seek OHI.[40]

Influence of OHI-seeking on consumers' health-related attitudes and decisions

Four reviews reported that OHI-seeking had a positive influence on consumers' knowledge and awareness of their disease,[31,33,35,37] but the effect was not significant. One review reported that OHI use improved patients' perceptions of and satisfaction with medical services but noted that patients did not always share OHI with their physicians because of a fear of causing offence or embarrassment.[27] These findings were in line with those from another review examining the effects of self-diagnosis following use of OHI on the healthcare provider–patient relationship. This review reported that patients often do not share OHI with healthcare professionals to avoid pressuring or challenging them.[37] Other reasons for not sharing OHI were lack of trust of the online source and the time constraints during consultations. OHI also promoted decision-making on self-care initiatives,[27,37] such as taking action to achieve lifestyle changes,[27] while use of social media enhanced parents' perceptions of self-efficacy.[32]

Three reviews reported on the influence of OHI seeking on medication adherence.[26,27,35] No association between OHI-seeking and medication adherence was reported in two reviews[26,35] other than for HIV medications – an association that emerged in a subgroup analysis.[24] Another review found that online misinformation was associated with a decrease in patients' medication adherence.[27] Six reviews described the influence of OHI-seeking on consumers' psychological well-being, with five reviews reporting a beneficial effect.[27,31,32,35,44] Sharing life experiences and finding support from others in similar situations promoted parents' empowerment[32] but might also increase anxiety and distress.[39] Table 3 summarises the influence of OHI-seeking on health-related attitudes and decisions.

Interventions to improve OHI-seeking and their impact on outcomes

Five reviews identified interventions that enhance online informed decision-making.[30,34,52–54] Four reviews reported interventions designed for older adults and patients with specific diseases (e.g. HIV, cancer).[30,34,53,54] These interventions were developed based on several theories (e.g. the social cognitive theory, cognitive theory of multimedia learning, diffusion of innovation), models (e.g. the health belief model, persuasion knowledge model), and frameworks (e.g. transformative learning, e-health information literacy). The most common interventions identified were educational programmes[30,34,54] and workshops[30,34] aiming to improve health and computer literacy. These were delivered online or in person. Some more complex strategies such as algorithms,[34] interfaces[34] and online portals[52] to assess the credibility of the OHI were also reported. Table 4 lists the characteristics of strategies to enhance online informed decision-making.

Improvements in confidence and behaviour of adults over 18 and older adults over 60 years old towards finding OHI were reported in three reviews,[30,34,52] none of which were meta-analyses. Participants' confidence was also reported as significantly improved,[34] including older participants' confidence. Additionally, significant improvements in knowledge and health literacy were attributed to educational programs and workshops.[30] Digital literacy interventions for older adults also produced significant improvements, but the review reporting on them did not provide quantitative data.[53] Two reviews[30,34,52] highlighted improvements in computer skills, one as a result of an interactive workshop designed to help adults over 18 years old to find reliable OHI.[52] OHI evaluation skills were reported as improved in one review[34] and as significantly improved in another review.[30] Additional information regarding these interventions can be found in Appendix 3 in the online supplemental materials.

Assessment of risk of bias

The AMSTAR 2 assessments and overall quality ratings for the included reviews are given in Appendix 1 in the online supplemental materials. Six reviews (18%) received a High rating,[23,25,26,40,51,54] 21 reviews (64%)[22,24,27,29,31–39,41,43,45–47,50,52,53] were rated as Moderate and 6 reviews (18%)[28,33,42,44,48,49] were considered to be of Low quality.

Discussion

This overview of systematic reviews synthesised evidence from 33 systematic reviews and meta-analyses. It revealed the multiplicity of factors that affect the use and consequences of OHI, and the need to consider these factors in evaluating OHI, its utility and interventions to enhance its potential contribution to health, well-being and the delivery of health services. Specifically, the study explores the uptake of OHI among different demographic groups, the benefits of good computer and informational literacy among users, the utilisation of various types of online media, the positive and negative consequences of OHI use and types of interventions designed to improve access to it.

Regarding different demographic groups, the reviews assessed the apparent influence of several factors including age, sex, socio-economic status and education level on the use of OHI. Young people were the most frequent seekers of OHI, presumably reflecting their familiarity with

technology and devices since an early age.[56] Level of education was identified as one of the most influential factors in obtaining good-quality OHI; those with greater health literacy are likely to be more aware of reliable OHI sources.[57–59] Two studies based on nursing students and older adults found that those from high socio-economic groups sought and used OHI more frequently,[60] reflecting their greater access to resources and education.[61] With regard to the use of different types of online media, the internet, especially through general platforms, social media and online communities, was found to be a major source of OHI for consumers seeking reassurance and emotional support.

The reviews that examined the consequences of the availability of OHI covered the effects of OHI on users' health decision making behaviour and mental well-being, and the effects of having such accessible third-party information on patient–professional relationships. Seeking OHI strengthened consumers' capacity to make decisions about their health, but an increasing body of evidence is drawing attention to the link between the use of OHI and anxiety. The frequency of individuals' exposure to several social media sources of health information has been shown to influence their cognition and affective states, leading to information anxiety.[62] However, the causal sequence is not clear; health-related anxiety itself has been associated with OHI-seeking, and individuals who perceive their condition to be more severe tend to access OHI more frequently.[63,64] Overexposure to OHI can also lead to a phenomenon termed 'cyberchondria', described as 'excessive or repeated online health research that is linked to greater degrees of health anxiety or distress'.[63,65,66] Patient activation (i.e. an individual's knowledge, skills and confidence in managing their health and well-being[67]), social support (i.e. care and support of family members to use internet resources actively and participate in disease management) and self-efficacy were key factors supporting positive outcomes related to OHI-seeking.[68]

The effects of patients' use of OHI on their relationships with healthcare providers seemed to be positive, enhancing patients' understanding of their conditions and satisfaction with healthcare services.[31,33,35,37] However, it was of interest that some awkwardness arose in these relationships as a consequence of using OHI, and some patients avoided talking to their healthcare providers about their OHI use.[27] One review reported that OHI use improved patients' perceptions of and satisfaction with medical services but noted that patients did not always share OHI with their physicians because of a fear of causing offence or embarrassment.

It was suggested that the influence of patient activation, social support and self-efficacy should be considered when developing OHI interventions.[68] The interventions covered in the reviews, such as educational programmes and workshops, were associated with improvements in consumers' OHI-seeking, health information evaluation and computer skills. The findings on computer literacy outlined above suggest that it would be valuable to strengthen consumers' skills and knowledge in using online information devices and in seeking high-quality OHI. Evidence-based interventions promoting responsible use of the internet to obtain health information should be designed according to the characteristics and needs of target groups.

Individuals are encouraged to seek OHI and thus, there is a need to review the information provided for quality and reliability while maintaining users' confidentiality and privacy.[69] Safeguarding against the misuse, unauthorised access and breaches of consumers' health information online becomes paramount. Robust data protection protocols, adherence to legal mandates and ethical practices are reported by global literature as essential measures to protect consumers. These strategies are crucial for responsibly leveraging OHI and healthcare provision, ensuring consumers' data is handled securely and ethically.[70–72] Additionally, establishing support groups supervised or guided by health care professionals, peer support groups and organisations with protection of consumers' privacy and identity could enable life experiences to be shared and information and advice to be provided, enhancing participants' physiological well-being while promoting knowledge and skills.[73]

Overall, this overview of systematic reviews and meta-analyses shows that OHI is useful and informative as a component of healthcare, enhancing self-care and self-efficacy, and supporting contemporary policy initiatives to enhance self-care and health literacy. It seems inevitable that the use of OHI will increase as computer literacy becomes universal and as informational systems become increasingly sophisticated, notably through developments in artificial intelligence. Pending the spread of computer literacy and accessibility, it must be acknowledged that variability in access to OHI and in the use of OHI – often driven by socio-economic circumstances of individuals – introduced a dimension of inequity that must be overcome.

Further studies are likely to refine the uses of OHI, for example with respect to its value in different types of health conditions and for different types of health decisions. Users of OHI appear to feel empowered by the information and knowledge that they have acquired. The risk of health misinformation spreading due to readily available low-quality OHI should be considered, as limited fidelity of information, misinterpretation and failure of OHI providers to update websites may adversely influence consumers' self-management decisions.[74] Healthcare professionals can mitigate the risk by being aware of the content of OHI, assisting patients with the interpretation of OHI, and advising them on its application at the individual level.

Limitations

Since original articles included in the reviews were not assessed, we have relied on the information provided by the

Table 3. Influence of online health information seeking on health-related attitudes and decisions.

		Outcomes							
Authors	Population	Knowledge and Awareness of Illness	Communication	Physician-Patient Relationship	Decision-Making Ability (e.g. Treatment, Perceived Self-Efficacy)	Medication/ Treatment Adherence and Behaviour	Lifestyle Changes	Psychological Safety, Support and Well-being	Supporting Information
Lim et al.[26]	[a]Included population: Patients with HIV, cardiovascular diseases, diabetes mellitus, coronary artery disease, inflammatory bowel diseases, general chronic diseases, psychiatric diseases, glaucoma, and cancer.	Not reported (NR)	NR	NR	NR	±	NR	NR	Examples of p-values provided for reported outcomes: -Meta-analysis: "The pooled odds ratio for the association between OHIS and medication adherence was 1.356 (95% CI 0.793-2.322, p = 0.265) with high heterogeneity of 94%." -the subgroup analysis: - "A meta-analysis of five HIV-related studies showed a significant association between OHIS and medication adherence with a pooled odds ratio of 1.612 (95% CI 1.266–2.054, p < 0.001) with low heterogeneity of 22.6%."
Luo A et al.[27]	Patients	NR	±	+	±	−	+	+	Qualitative synthesis (no p-values provided)
Waterworth S and Honey M.[46]	Older adults	NR	NR	+	NR	NR	NR	NR	Qualitative synthesis (no p-values provided)
Farnood A et al.[37]	Adults	+	+	+	+	NR	NR	NR	Qualitative synthesis (no p-values provided)
Jia X et al.[33]	All	+	NR	NR	NR	NR	NR	NR	Qualitative synthesis (no p-values provided)
Chen J and Wang Y.[31]	Public	+	NR	NR	NR	NR	+	+	Concerns of social media information quality and impact of health outcomes. Qualitative synthesis (no p-values provided)
Thapa DK et al.[35]	All	+	NR	+	±	NS	+	+	Examples of p-values provided for reported outcomes: Lifestyle changes: - "Higher frequency of Internet use for health purposes was significantly associated with health decisions for physical activity (p = .009), making (p = .006) or cancelling (p < .001) the appointment, and resignation from planned tests or medicines used (p = .005)." Decision making: - "OHI search was positively correlated with changing health decisions (r = .40, p < .001)." Communication: "A positive correlation (r = .49, p < .001) between discussing online information with their provider and

(continued)

Table 3. Continued.

Authors	Population	Outcomes							Supporting Information
		Knowledge and Awareness of Illness	Communication	Physician–Patient Relationship	Decision-Making Ability (e.g. Treatment, Perceived Self-Efficacy)	Medication/ Treatment Adherence and Behaviour	Lifestyle Changes	Psychological Safety, Support and Well-being	
									using the information to make health decisions." Medication adherence: "Correlation between OHI seeking behaviour and medication adherence ($r = .013$, $p > .05$) was not significant."
Javanmardi M et al.[44]	Pregnant woman	NR	NR	NR	NR	NR	NR	+	Qualitative synthesis (no p-values provided)
Sayakhot P and Carolan-Olah M.[50]	Pregnant woman	NR	NR	NR	+	NR	+	NR	Examples of p-values provided for reported outcomes: - "This study also found that women's confidence levels significantly increased with respect to making decisions about their pregnancy after Internet usage ($p < 0.05$)"
Frey E et al.[32]	Parents	NR	NR	NR	+	NR	NR	+	Examples of p-values provided for reported outcomes: Physiological wellbeing: - "Engagement with social media for health information was associated with feelings of social support ($P < .001$) and empowerment ($P < .001$) in a study of pregnant women and mothers in the United States." Self-efficacy: - "Parents who engaged with social media in a meaningful way were found to have higher perceptions of self-efficacy ($P < .01$)"
Kubb C and Foran HM.[39]	Parents	NR	NR	NR	+	NR	NR	–	Qualitative synthesis (no p-values provided)

Note. NR: No reported; +: positive influence; –: negative influence; ±: mixed findings (positive and negative influence); NS: no significant.

[a]Results based on mixed-methods results (i.e. some results do not represent statistically significant results).

Table 4. Interventions to improve OHI-seeking.

Authors	Population	OHI Interventions and Impact Type of Interventions	Confidence/ Behaviour	Knowledge/ Health literacy	Computer Skills	Health Information Evaluation Skills	Self-Efficacy for OHI-seeking	Self-Efficacy for Disease Management	Comments
Zhao YC et al.[30]	Older adults	**1. Educational programs** - Partnering with Seniors for Better Health: Classes included two components (i.e. computer literacy and health information search strategies).	+	+	+	+	+	NR	Statistically significant improvements ($P < .001$) reported by the review authors for all the outcomes.
		2. Workshops	+	NR	+	NR	+	NR	
Watkins et al.[53]	Older adults	**1. eHealth literacy interventions/ workshops:** - Collaborative learning and tailored intervention content used. - Instructional materials developed by the National Institute on Aging (NIA) of the National Institutes of Health (NIH)	NR	+	+	NR	+	+	The review does not report p-values.
Song et al.[34]	HIV/AIDS Breast cancer General health Diet and physical activity Diabetes Children with medical conditions	**1. Educational programs** (i.e. workshops, web portals or eLearning programs)	+	NR	NR	+	+	NR	p-values provided: Significant improvements for confidence in judging OHI ($p < .0001$), and improvements in the evaluation skills ($p = 0.004$) were reported by the review authors.
	- Cancer - Depression - General health context	**2. Algorithms** (developing algorithms to automatically assess the credibility of OHI)	na	na	na	na	na	na	
	-General health	**3. Interfaces:** - An interactive scatter plot interface that characterises search results returned by MEDLINE - Visualisations (e.g. bar charts) to augment webpages and search results	na	na	na	na	na	na	

Table 4. Continued.

Authors	Population	OHI Interventions and Impact							
		Type of Interventions	Confidence/ Behaviour	Knowledge/ Health literacy	Computer Skills	Health Information Evaluation Skills	Self-Efficacy for OHI-seeking	Self-Efficacy for Disease Management	Comments
Lee K et al.[52]	All	**1. Interactive workshops:** - Didactic approach to teaching - Hands-on activities for participants to search for OHI - Presentation slides and list of credible websites provided - Group discussions	+	+	+	NR	+	NR	- Significantly greater self-efficacy for health information use compared to control group ($p < 0.05$). - Statistically significant improvement from pre-intervention to post-intervention in general computer/web knowledge and skills, and in eHealth literacy ($p < 0.001$) Reported by the review authors.
		2. Health literacy curriculum and community outreach implemented at schools and adult education program: - In the last session, participants shared what they have learnt with seniors in their community. - Checklist adapted from QUICK website for assessing websites credibility provided. - Search OHI targeted to disease types and populations.	+	+	NR	NR	NR	NR	Instruments not validated No statistical significance reported
		3. Online portal with support via videoconferencing three modules: - **Self-management** (participants had access to individualised care plans reviewed twice a week via videoconferencing with a telehealth nurse. During these videoconferences, participants had the opportunity to ask questions.)	NR	+	NR	NR	NR	+	- Non-validated questionnaire - Significant increase in participants reported knowledge of diabetes and adherence to diabetes management ($p < 0.05$) reported by the review authors.

Table 4. Continued.

Authors	Population	OHI Interventions and Impact Type of Interventions	Confidence/ Behaviour	Knowledge/ Health literacy	Computer Skills	Health Information Evaluation Skills	Self-Efficacy for OHI-seeking	Self-Efficacy for Disease Management	Comments
		- **Health education** (educational videos and links to health-related websites) - **Social networking** (participants interact with one another and shared preferred educational resources)							
Car et al.[54]	Healthy adults aged 60+ recruited via a local newsletter.	**1. Adult education internet classes: Classes included 'hands on practice' of skills.**	NR	NR	NR	NS (in comparison with the control group)	NS (in comparison with the control group)	NR	- The systematic review authors reported results of both studies were consistent, in that they favoured the intervention. However, they stated the quality of evidence must be downgraded by the fact that one of the studies was small and had methodological limits due to the non-randomised design. The risks of bias in the RCT were attributed by the authors to poor reporting rather than poor design. - RCT statistically significant positive effects Self-efficacy for health information seeking', 'health information evaluation skills' and the 'number of times the patient discussed online information with a health provider.
	People living with HIV/AIDS recruited via health and social services (350 (192 control/ 158intervention)	**2. Educational intervention:** Skills based, with aim of developing self-efficacy and skills for health information seeking based on principles from social-cognitive theory	NR	NR	NR	NS	+	NR	

review authors. As noted above, the methodological quality of some of the included reviews were rated as Low. This is likely to have been due, at least in part, to the variability in data definitions and designs of the primary studies among the articles. However, as our objective was to retrieve all available information in this area, consolidating and reporting the results of these reviews was considered important.

Conclusion

The extensive development and availability of OHI in recent years has changed the ways in which patients, carers and community members seek, access and use information to understand manage their health conditions and adapt their lifestyles. The value of OHI is inevitably dependent on the fidelity and currency of the information presented and the ability of users to retrieve and interpret it. Levels of digital literacy, socioeconomic circumstances and low levels of education mean that the existence of OHI inevitably influences health equity. This overview of systematic reviews showed that searching for information online appears to strengthen individuals' ability to make decisions about their health, but the findings also underline health professionals' critical input into advising individuals on their health status and healthcare. Moving forward, the results of this review may be used to shape an agenda for future researchers, healthcare providers, and policymakers, focusing on factors that need consideration to enhance consumers' experiences with online health information.

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