Master Thesis

EHealth literacy in emergency care:
a scoping review

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Julia Paller, BSc

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Priv.-Doz.^{in} Dr^{in} scient. med. BSc MSc Franziska Großschädl

Arvid Steinar Haugen

Graz, January 30, 2025

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Graz, January 30, 2025 *Julia Paller m.p.*

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Zusammenfassung

Hintergrund: Die Notaufnahme spielt eine wichtige Rolle im Gesundheitssystem. Die Zunahme nicht-dringender Fälle kann jedoch zu einer Überlastung führen, die sich negativ auf Patient*innenergebnisse, das Gesundheitspersonal und institutionelle Kosten auswirken kann. Gesundheitskompetenz korreliert mit vermeidbaren, nicht-dringenden Notaufnahmebesuchen. Mit der zunehmenden Nutzung von Technologie und digitalen Gesundheitsinformationen wird auch die digitale Gesundheitskompetenz immer wichtiger. Ziel dieser Arbeit ist es, einen Überblick über die digitale Gesundheitskompetenz im Kontext der Notfallversorgung zu geben.

Methode: Zur Beantwortung der Forschungsfrage wurde ein Scoping Review gemäß den Richtlinien des Joanne Briggs Institute (JBI) durchgeführt. Eine systematische Literaturrecherche erfolgte in den Datenbanken PubMed, CINAHL und Ovid und wurde durch eine Suche in Google Scholar, in den Referenzlisten und in weiteren Quellen der Bibliothek ergänzt. Ein- und Ausschlusskriterien wurden anhand des PCC-Schemas festgelegt. Nach der Studienauswahl wurden die eingeschlossenen Studien mithilfe der JBI-Checklisten bewertet. Die Daten wurden extrahiert und sowohl narrativ als auch tabellarisch dargestellt.

Ergebnisse: Neun Studien wurden in dieses Scoping Review eingeschlossen. Ergebnisse wurden basierend auf dem „e-health literacy framework“ in die Kategorien „Individuell“, „Interaktion“ und „System“ eingeordnet. Die primären Ziele der Studien waren es, die Merkmale der Internetnutzung vor Besuchen in der Notaufnahme sowie Korrelationen mit Angst und Cyberchondrie zu bestimmen. Insgesamt zeigten die Ergebnisse eine hohe Prävalenz der Internetnutzung für gesundheitsbezogene Informationen. Ein Großteil der Studien zeigte, dass Personen das Internet nicht nutzten, um zu entscheiden, ob sie eine Notaufnahme aufsuchen sollten. Des Weiteren haben einige Studien herausgefunden, dass verstärktes Internetsuchen positiv mit Angst und Cyberchondrie korreliert. Weitere Aspekte betrafen den Einfluss auf die Arzt/Ärztin-Patient*in-Beziehung sowie Probleme mit Vertrauen, Zugang und Verständlichkeit digitaler Informationen.

Schlussfolgerung: Die Nutzung digitaler Gesundheitsinformationen nimmt stetig zu. Nichtsdestotrotz ist die Forschung in diesem Bereich aktuell noch begrenzt. Forschungslücken, wie der Bedarf an Geräten, die an individuelle Bedürfnisse

angepasst sind, sowie die Korrelation zwischen digitaler Gesundheitskompetenz und demografischen Faktoren, sollten in zukünftigen Studien adressiert werden. Sowohl Patient*innen als auch das Gesundheitspersonal benötigen Schulungen und Fortbildungen zur Nutzung des Internets für gesundheitsbezogene Informationen. Zudem sollten staatliche Richtlinien und Unterstützungsprogramme implementiert werden, um Nutzer*innen dabei zu helfen, fundierte Gesundheitsentscheidungen zu treffen.

Abstract

Background: The emergency department (ED) plays a critical role in the healthcare system. However, the increase in non-urgent visits can contribute to overcrowding negatively impacting patient outcomes, healthcare professionals and institutional costs. According to state-of-the-art literature, health literacy is correlated with preventable, non-urgent ED visits. With the growing use of technology and online health information, eHealth literacy has become increasingly important. The aim of this thesis is to provide an overview of eHealth literacy in emergency care.

Method: To address the research question, a scoping review was conducted following the guidelines of the Joanna Briggs Institute (JBI). A systematic literature search was undertaken in the databases PubMed, CINAHL and Ovid, supplemented by Google Scholar, reference lists and library sources. Inclusion and exclusion criteria were defined based on the PCC mnemonic. After study selection, the included studies were critically appraised using JBI checklists. Data was extracted and presented both narratively and in tabular form.

Results: Nine studies were identified and evaluated in this scoping review. Results were categorized as “Individual”, “Interaction”, and “System” based on the e-health literacy framework. The primary study objectives were to determine the characteristics of internet use prior to the ED visits and the correlations with anxiety and cyberchondria. Overall, the results showed a high prevalence of internet use for health-related information. Most studies indicated that people did not use the internet to decide whether they should visit the ED. Furthermore, some studies have found that increased internet searching was positively correlated with anxiety and cyberchondria. Other aspects researched included the effect on the doctor-patient relationship, as well as issues related to trust, access and understandability of online information.

Conclusion: The use of online health information is increasing. However, research in this area remains limited. Research gaps, such as the need for devices tailored to individual needs and the correlation between eHealth literacy and demographic factors, should be addressed in future studies. Both patients and healthcare providers need education on using the internet for health-related information. Furthermore, government guidelines and support programs should be implemented to help users make informed health decisions.

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List of Abbreviations

CENTRAL	Cochrane Central Register of Controlled Trials
CINAHL	Cumulative Index to Nursing and Allied Health Literature
ED	Emergency Department
eHEALS	e-health literacy score
eHLF	e-health literacy framework
ISMII	Internet Search effect on Medical Interaction Index
JBI	Joanna Briggs Institute
MeSH	Medical Subject Headings
MH	Major Headings
OHI	Online health information
PubMed	Public Medical Literature Online
PCC mnemonic	Population, Concept and Context
WHO	World Health Organization

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1. Introduction

The Emergency Department (ED) plays a critical role in healthcare, providing efficient and urgent care and treatment to patients who are seriously injured or ill (American College of Emergency Physicians, 2016). This trend, however, has changed. More and more patients visit the ED, whether urgent or not (Salway et al., 2017). Several studies show that most emergency visits are less urgent or non-urgent than acute emergency cases (Alnasser et al., 2023, Bakarman and Njaifan, 2014). In their systematic review Uscher-Pines et al. (2013) described a range of 8%-62% regarding non-urgent ED visits. The authors described that the heterogeneity of the included studies as well as the lack of objectively defining a non-urgent case limits the validity of the results. Reasons for non-urgent visits range from poor access to healthcare outside the ED, to beliefs that the ED would provide better and less expensive care. Other factors include convenience and the self-estimation that the patient's condition is severe and has to be treated immediately (Uscher-Pines et al., 2013). Rising numbers of non-emergent visits can lead to overcrowding (Erenler et al., 2014, Sartini et al., 2022). Three aspects are associated with overcrowding: the input, throughput and output. The input represents patients visiting the ED, the throughput describes the time it takes to treat these patients and the number of patients leaving the ED is called output. Rising numbers in input and throughput, while decreasing the output can therefore lead to overcrowding (Badr et al., 2022).

ED overcrowding is a phenomenon that occurs worldwide. Approximately 90% of EDs report instances of overcrowding (American College of Emergency Physicians, 2016). Overcrowding leads to the inability to ensure adequate emergency care for patients due to the lack of hospital resources. Therefore, hospitals cannot meet their patients' needs (American College of Emergency Physicians, 2016, Salway et al., 2017).

Several reviews describe different consequences of overcrowding. Critically ill or severely injured patients, for example, have to wait longer to receive emergency care. Overcrowding can also reduce the quality of treatment, lengthen the hospital stay, and increase the number of medical errors and mortality. Furthermore, the increased waiting times lead to patients leaving before they have even seen a physician and returning when their symptoms are worsening. This waiting time also prolongs patient evaluation and drug administration. Overcrowding not only affects patient outcomes, but also impacts healthcare professionals, increasing stress and decreasing their job satisfaction. In addition, the financial consequences must be considered, as an increased length of hospital stay and poor patient outcomes raise the institution's costs (Pearce et al., 2023, Salway et al., 2017, Sartini et al., 2022). Table 1 summarizes the consequences of overcrowding in the ED.

Table 1: Consequences of overcrowding in the ED including their reference source(s) (Pearce et al., 2023, Salway et al., 2017, Sartini et al., 2022)

Consequences	**References**
Longer waiting time	Pearce et al. (2023), Salway et al. (2017) and Sartini et al. (2022)
Reduced treatment quality	Pearce et al. (2023), Salway et al. (2017) and Sartini et al. (2022)
Longer hospital stays	Pearce et al. (2023) and Salway et al. (2017)
Increased medical errors	Pearce et al. (2023), Salway et al. (2017) and Sartini et al. (2022)
Higher mortality	Pearce et al. (2023), Salway et al. (2017) and Sartini et al. (2022)
Higher number of patients returning to the ED	Pearce et al. (2023), Salway et al. (2017) and Sartini et al. (2022)
Prolonged patient evaluation	Salway et al. (2017)
Prolonged drug administration	Sartini et al. (2022)
Increased stress in healthcare providers	Sartini et al. (2022)
Reduced job satisfaction in health providers	Sartini et al. (2022)
Poorer patient outcomes	Salway et al. (2017) and Sartini et al. (2022)
Higher institutional costs	Pearce et al. (2023), Salway et al. (2017) and Sartini et al. (2022)

Alongside the lack of primary care services, nursing staff shortages, bed availability, and many more, non-urgent visits are a compelling reason for ED overcrowding (Sartini et al., 2022). Several studies indicate that health literacy is correlated with preventable and non-urgent ED visits. Balakrishnan et al. (2017) found that patients with high health literacy were 2.3 times less likely to present to the ED with a preventable case than patients with low health literacy. According to Shahid et al. (2022), patients with high health literacy were less likely to revisit the ED.

1.1. Health literacy

Health literacy was first introduced by Simonds (1974), who described it as health education, and it has since gained interest and importance in the healthcare culture. Consequently, the term has many definitions, varying across different populations and contexts. Generally, it is described as basic skills such as reading and writing in a healthcare context (Parnell, 2014). However, a more recent interpretation was given by Nutbeam (2000) who not only defined the term by including previous works but also conceptualized it. He divided the term into three groups: functional, interactive, and critical health literacy. Functional health literacy involves basic skills like reading and writing, whereas interactive health literacy includes more advanced skills necessary to participate in everyday life. Critical health literacy describes the ability to critically appraise information to gain control over one's life and health.

Health literacy has been associated with significant impacts on patients' individual health management as well as their overall health outcomes. Low health literacy can make it difficult for individuals to make health-related decisions, such as those related to nutrition, physical exercise, or medication adherence. This can lead to poorer health outcomes, reduced wellbeing and safety. People with inadequate health literacy are also more likely to be hospitalized (Australian Commission on Safety and Quality in Health Care, 2014). According to Shahid et al. (2022), low health literacy is correlated with an increase in ED revisits. A review by Andrus and Roth (2002) further adds that inadequate health literacy is associated with a lack of knowledge about diseases and conditions, underutilization of preventive services, poorer self-reported health, reduced treatment adherence, and higher healthcare costs.

The European Health Literacy Population Survey, conducted by the HLS19 Consortium of the WHO Action Network M-POHL (2021), compared general health literacy across 17 countries, including Austria, from 2019 to 2021. The survey indicated that approximately 42% of respondents had trouble understanding and evaluating the benefits and harms of different treatment options, 40% could not assess prevention information from the media, 36% were unable to find online mental health information, and 26% struggled to make decisions about improving their health.

These overall findings match the results observed by Griebler et al. (2021), specifically in Austria. To measure health literacy, the “HLS$_{19}$-Q12-AT”[1], consisting of 12 items was used (Griebler et al., 2021). According to Griebler et al. (2021), about 15% of the Austrian population had trouble answering health-literacy-related questions derived from the HLS$_{19}$-Q12[1]. Aspects such as assessing treatment options and finding useful information for mental health and prevention from media sources seemed particularly challenging. For example, 36.9% of respondents found it very difficult or difficult to assess the benefits and harms of treatment options. In comparison to the other countries included, Austria was in the middle range. The lowest score was measured in Slovenia with 25.6%, while the highest was reported for Germany with 71.2%. Further surveys showed that almost one-fourth of the Austrian population found it very difficult or difficult to evaluate whether they needed a second medical opinion (Griebler et al., 2021).

The health literacy score composes 12 items based on the model for health literacy. Topics include health care, disease prevention, and health promotion. Skills are categorized in accessing, understanding, appraising and applying health information (HLS19 Consortium of the WHO Action Network M-POHL, 2021). The mean health literacy score for Austria was 84.8 out of possible 100 points, with the lowest scores in prevention and the ability to assess health information. The mean health literacy score across all countries was 76. Furthermore, the survey demonstrated that navigation in the healthcare system and digital health literacy posed challenges for Austrians (Griebler et al., 2021, HLS19 Consortium of the WHO Action Network M-POHL, 2021).

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[1] an instrument to measure health literacy used in the Health Literacy Population Survey Project 2019-2021 (AT stands for the Austrian version) (Griebler et al., 2021)

1.2. eHealth literacy

As mentioned in chapter 1.1., health literacy describes the ability to access health information, critically appraise it, and use it in one's everyday life (Nutbeam, 2000). However, in modern times, as technology continuously advances, online resources are gaining more and more importance. Approximately 5.44 billion (67.1%) people worldwide are using the internet in 2024. Between April 2023 and April 2024, the number of internet users increased by 178 million users (Kemp, 2023). In 2023, 95% of Austria's population used the internet (Statistics Austria, 2023a). Even in the healthcare sector, internet usage is increasing. According to Eurostat (2021), more than half of EU citizens used the internet to search for health information in 2020, and the trend is rising. In Austria, 44% of the population used social media to research health-related topics, whereas 42% used digital health technologies like smartwatches (Griebler et al., 2021).

As mentioned in the previous chapter, the European Health Literacy Population Survey also measured digital health literacy also known as eHealth literacy. The most prevalent challenges across all countries were determining, if online information is reliable, identifying whether the offered information has a commercial background, and using health information to solve a health problem (HLS19 Consortium of the WHO Action Network M-POHL, 2021). Austrian results showed that nearly one-third of internet users seeking online health information (OHI) experienced difficulties with their digital health literacy. The most common challenges were similar to those observed across all countries studied. Approximately half of the participants had trouble determining whether online information has commercial interests and if the information is reliable. Additionally, 32% found it very difficult or difficult to use the information they find online for their health problems, and 30% had trouble determining if the information applied to them. Furthermore, difficulties were demonstrated, such as finding the information the user was searching for, understanding that information, searching multiple websites to evaluate its accuracy, and identifying adequate keywords for the search.

Austria had a mean digital health literacy score of 70.1 out of possible 100 points. The overall mean score across all countries was 62.5. Norway had the highest score with 78.7, whereas Germany had the lowest with 41.8 (Griebler et al., 2021, HLS19

Consortium of the WHO Action Network M-POHL, 2021). Figure 1 illustrates the challenges and difficulties of eHealth literacy in the Austrian population.

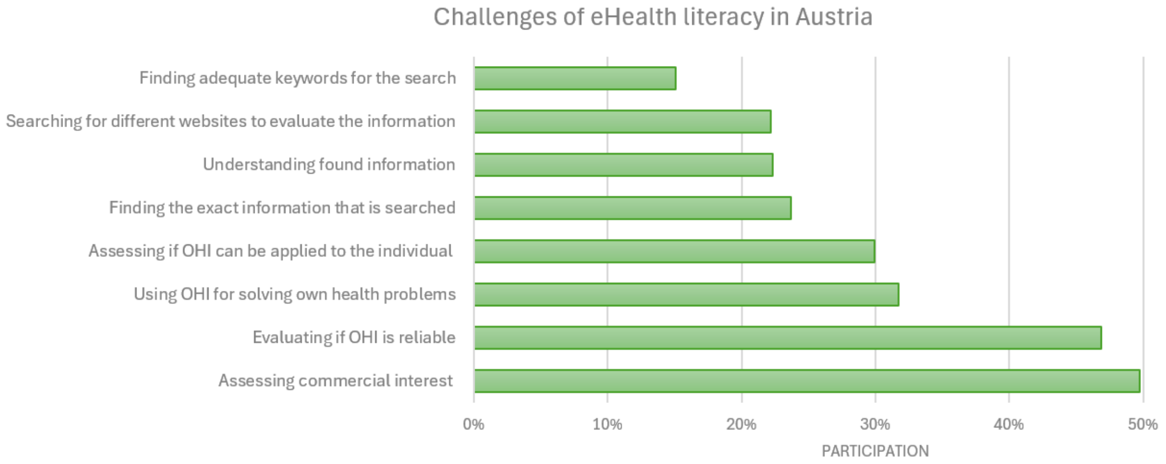


Figure 1: Challenges of eHealth literacy in the Austrian population between 2019 and 2021 (n= 2,967) (Griebler et al., 2021)

1.2.1. Barriers and facilitators of eHealth literacy

Having access to health information online has many positive effects. McLeod et al. (2017) found out that 74% of their studied population, which consisted of patients with gynecologic cancer, felt like internet resources are useful to help them understand their diagnosis. Online health information can empower patients and give them confidence about asking questions to physicians regarding their diagnosis. Seçkin et al. (2018) came to similar findings. Using the internet in health-related aspects can increase self-empowerment in coping with individuals' health conditions and improve quality of life as well as self-perceived health.

While searching for online health information has positive effects, challenges and negative impacts must be considered. Although a study from Linn et al. (2019) showed no significant change in medication adherence at baseline and after six months of treatment between patients who had sought online health information and patients who had not, a significant difference after the treatment was found. Patients who did not use the internet after treatment were more adherent to medication than patients who did, suggesting that internet usage can negatively affect medication adherence. Additionally, patients who had sought information from the internet before their consultation showed higher concerns about medication.

Another important factor to consider is the prevalence of misinformation on the internet regarding health-related content. As technology continues to develop rapidly and more information becomes accessible online, the likelihood of encountering misleading pieces of information increases. This trend of misleading information is therefore also growing rapidly. Misinformation can have serious consequences, as people may make harmful decisions about their health based on information they find online (González-Fernández et al., 2021, U.S. Department of Health and Human Services, 2024). Several studies suggested that medical information available online can mislead patients. Poor-quality information has been found about crisis pregnancy centers (Bryant et al., 2014), the coronavirus disease (Cuan-Baltazar et al., 2020), and vaccinations (Wolfe et al., 2023). These findings demonstrated that misinformation on the internet is widespread and users have to be cautious when seeking health-related information online.

Moreover, cyberchondria is a recurring phenomenon. Cyberchondria is a term composed of “cyber” and “hypochondriasis” and refers to the behavior of excessive health-related internet searches, which increases anxiety as a result (Starcevic and Berle, 2013). Research about cyberchondria is limited, however, Mathes et al. (2018) suggested a correlation between cyberchondria and health anxiety. Nevertheless, cyberchondria and health anxiety are distinct constructs. The Anxiety & Depression Association of America (2023) defines health anxiety as a fear of developing an illness, where normal bodily sensations are perceived as dangerous. Muse et al. (2012) also examined the correlation between cyberchondria and health anxiety, finding that participants with a higher level of health anxiety spent more time searching online and experienced greater distress.

1.2.2. Definition of eHealth literacy

Norman and Skinner (2006b) proposed one of the first definitions of eHealth literacy: “*…eHealth literacy is defined as the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem* “ (Norman and Skinner, 2006b, no pagination). Considering this definition, a model for eHealth literacy was conceptualized.

1.2.3. The Lily model for eHealth literacy

The Lily model, as shown in Figure 2, was created to represent six categories that are combined into eHealth literacy: health, traditional, information, scientific, media, and computer literacy. EHealth literacy, in the context of the Lily model, describes the ability to engage in one's health by reading, understanding, and applying online health information (Norman and Skinner, 2006b). This version is similar to the definition of Nutbeam (2000), focusing on general health literacy instead of eHealth literacy. Adequate eHealth literacy skills require basic knowledge in health literacy. Health literacy comprises the ability to act independently in the healthcare system and use health information to solve personal health problems. Furthermore, additional skills, outlined in the other five categories, are important. Traditional literacy includes basic skills like the ability to read, write and understand health information. Information literacy goes one step further by describing one's capability to find and use information, as well as the knowledge of different resources and search strategies. Media literacy involves critical thinking and the evaluation of media content, while scientific literacy includes understanding aspects such as the nature, methods and aims of research and how research is conducted, which can pose challenges. Computer literacy involves both access to and the ability to use computers and software to solve specific problems. It extends beyond merely owning a computer; it also includes understanding how to use it effectively (Norman and Skinner, 2006b). According to Norman and Skinner (2006b), combining these six categories enables users to fully utilize the potential of eHealth literacy.

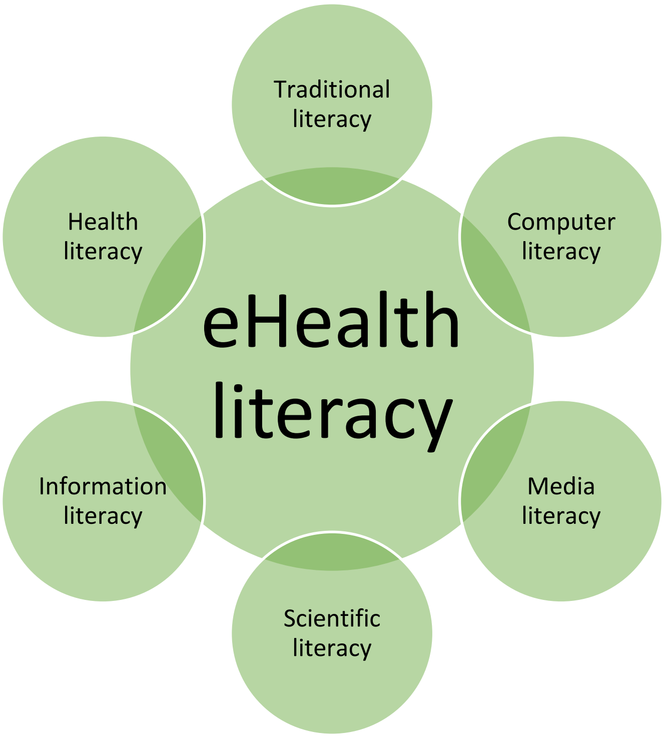


Figure 2: The Lily model derived by Norman and Skinner (2006b) including the six categories required for adequate eHealth literacy skills

1.2.4. E-health literacy framework (eHLF)

A more recent approach was undertaken by Norgaard et al. (2015). Using concept mapping, the authors constructed a modern version of a model, combining the opinions of patients, professionals in health, health informatics, computer scientists, and public researchers, called the e-health literacy framework (eHLF). The difference between the perspective of Norman and Skinner (2006b), Nutbeam (2000), and Norgaard et al. (2015) is that the eHLF comprises views and opinions of different individuals from various areas, making it applicable to a larger number of users. Furthermore, the model includes factors associated with the system itself, rather than the individuals' competences. All these continuing aspects describe the concept of eHealth literacy in its whole (Norgaard et al., 2015).

The eHLF consists of three large domains, which interact with one another: "Individual", "Interaction" and "System". These three domains are further divided into seven subgroups. Figure 3 shows the model including the interactions between the domains.

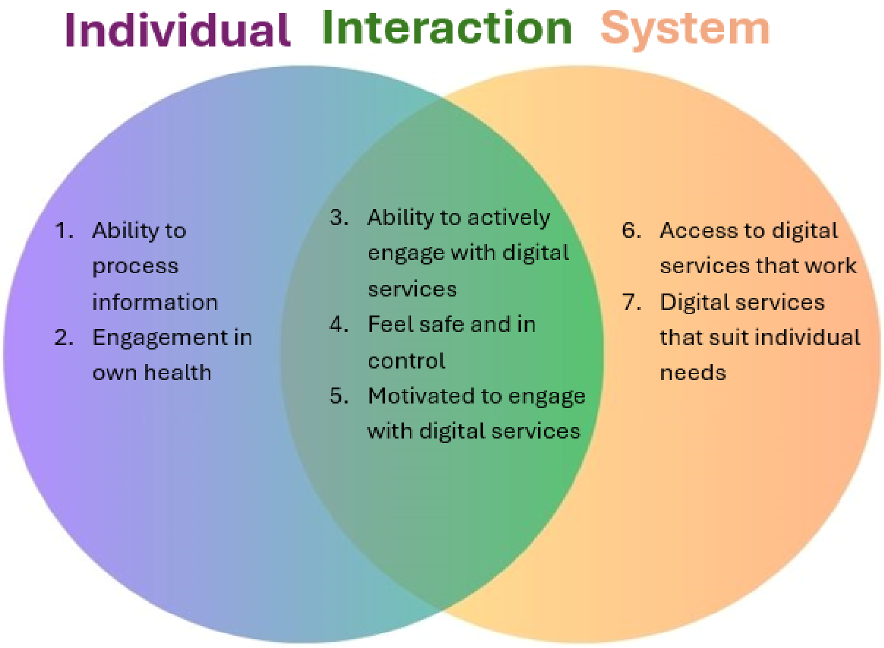


Figure 3: Graphic representation of the e-health literacy framework by Norgaard et al. (2015) including the three main domains and the seven sub-groups

The domain “ability to process information” (1) includes basic skills like reading, understanding, finding and applying information, as well as logical thinking and being able to mentally cope with the information found. “Engagement in own health” (2) is defined as being confident in knowing your own health conditions and taking care of them. This includes knowing basic facts about the navigation in the healthcare system and taking responsibility for your own health. The third domain is called “ability to actively engage with digital services” (3). It includes basics in using technology and digital devices, like knowing how to access systems in the context of healthcare. The next domain “feel safe and in control” (4) contains trust in technology, safe systems and data security along with trusting the source of the information. “Motivated to engage with digital services” (5) is defined as the competence to see benefits in the use of the internet. It is about being motivated to try new things when using technology and being curious and interested. The domain “access to digital services that work” (6) refers to systems, hardware, software and technologies like computers. It incorporates having access to technology and support systems that work and being able to interact with them. The systems should be easy to use and user-friendly. The last domain is called “digital services that suit individual needs” (7). It refers to an individual-based interface. The system and information that patients receive should be tailored to their needs and easy to understand.

These seven domains, summarized in three large groups, create the eHLF. Domains 1 and 2 refer to individual factors and competences, whereas domains 5 and 6 include aspects relating to the systems and technologies themselves. The link between individual characteristics and system factors creates the group “Interaction”. It involves being able to engage with digital services (domain 3), feeling safe (domain 4), and being motivated (domain 5) using them.

1.3. Relevance and research gap

Overcrowding in the ED is a prominent challenge in hospitals worldwide, leading to negative effects on the patient, staff, and institution (American College of Emergency Physicians, 2016, Pearce et al., 2023, Salway et al., 2017, Sartini et al., 2022). In 2022, Statistics Austria (2023b) showed 349,004 zero-night hospital stays in Austria, which means acute cases or emergencies, which were not admitted after emergency treatment. This is a plus of 2.6% compared to the acute cases in 2021

(Statistics Austria, 2023b). Research from various countries showed similar trends of overcrowding. The Canadian Institute for Health Information (2024) reported an increase in unscheduled ED visits, rising from 15.1 million between 2022 and 2023 to 15.5 million between 2023 and 2024. However, it is not only non-urgent visits that lead to overcrowding. A study by Ruxin et al. (2023) conducted in the United States demonstrated that, although non-urgent ED visits decreased from 1.1% in 2012 to 0.5% in 2022, overall visits increased from 12.5 million to 14.3 million, during the same period. This phenomenon is explained by the rising number of acute cases. Norway has also experienced a rise in ED visits, with 49,663 patient contacts in 2012 and 69,218 in 2021, based on data from two university hospitals (Nummedal et al., 2024). These examples highlight the importance of efficient management in emergency care.

Overcrowding has severe effects on not only the patient treated but also the entire healthcare system. Longer waiting times, reduced treatment quality, and increased mortality are only a few consequences of many, which also lead to more costs (Pearce et al., 2023, Salway et al., 2017, Sartini et al., 2022).

As mentioned above, overcrowding in the ED also affects healthcare professionals (Pearce et al., 2023). Nurses are the largest group of healthcare professionals in the ED (Saaiman et al., 2021) and play a critical role in addressing various health-related challenges (National Academies of Sciences et al., 2021). The work of an ED nurse is very versatile. They are, for example, involved in the care of critically injured or ill patients and play an important part in communication with other health professionals, patients, and relatives (Trisyani et al., 2023). Therefore, the findings of this master’s thesis will not only benefit emergency care in general but also be important for nurses, who represent a key group of healthcare professionals (Saaiman et al., 2021).

The importance of general health literacy, as well as eHealth literacy, is demonstrated by the European Health Literacy Population Survey from 2019 to 2021, which showed low scores across many European countries. The results indicated that health literacy is a crucial determinant of health outcomes, as it is associated with factors such as unhealthy lifestyles and reduced quality of life. The study, therefore, recommended interventions to improve health literacy. Additionally, digital health information should be accessible, understandable, and easy to use (HLS19 Consortium of the WHO Action Network M-POHL, 2021). A similar survey conducted in 2011 (Sørensen et al., 2015) revealed comparable results to the more recent study. Nevertheless, a positive trend towards better health literacy was observed in Austria. Following the 2011 survey, health literacy became one of Austria's ten health goals, leading to various interventions that aimed at achieving this goal. However, with the increasing digitalization, challenges have also grown. As the European Health Literacy Population Survey from 2019 to 2021 highlights particularly weak eHealth literacy, it is essential to update these goals to include a digital perspective (Griebler et al., 2021).

Although the relevance of the topic is visible, research in general and especially in nursing science is lacking. Health literacy in the context of the ED has been mildly studied. Studies suggest an association of health literacy with preventable and non-urgent emergency visits (Balakrishnan et al., 2017, Schumacher et al., 2013) and emergency outcomes (Herndon et al., 2011). Nevertheless, most of these studies are outdated and none explore eHealth literacy. Regarding the concept of eHealth literacy, studies cover measurement tools (Délétroz et al., 2022, Lee et al., 2021), a population of older adults (Rios, 2013) or students (Stellefson et al., 2011). To this date, there are no reviews exploring the components of eHealth literacy in the ED. Seeing as there is limited research in this field, this thesis provides an overview of existing literature, identifies research gaps and gives recommendations for research and practice.

1.4. Aim and research question

The aim of this thesis is to provide an overview of eHealth literacy in emergency care. Therefore, the following research question will be investigated:

How does eHealth literacy apply in the context of emergency care?

2. Method

The following chapter describes the methodological approach to answering the research question. First, the chosen design will be described. Then, the data collection, study selection, and data extraction and synthesis will be elaborated upon.

2.1. Study design

To answer the research question, a scoping review was undertaken. A scoping review is an evidence synthesis to identify and map the extent of existing literature on a topic or concept. It is particularly appropriate when literature is diverse, and the topic is emerging. Therefore, various study designs can be included. In contrast to systematic reviews, scoping reviews take a broader view of a topic leading to a broader research question (Munn et al., 2022). Since this master's thesis focuses on the concept of eHealth literacy in the context of emergency care and the literature on this is limited and heterogeneous, this type of review is well-suited.

The Joanna Briggs Institute (JBI) scoping review methodology outlines a systematic approach to planning and conducting a scoping review. The process comprises the following steps: title and research question (1); definition of inclusion criteria (2); search strategy (3); evidence screening and selection (4); data extraction (5); data analysis (6) and presentation of results (7) (Peters et al., 2020). Furthermore, this scoping review is based on the PRISMA Checklist, which can be obtained from the author (Tricco et al., 2018). Finally, a critical appraisal of the included studies was conducted.

2.2. Data collection

An initial data search was performed by the author in March 2024 to gauge the extent of existing literature. A systematic literature search was conducted to find suitable studies to answer the research question. This search was undertaken in May 2024 in the databases *Public Medical Literature Online (PubMed)*, *Cumulative Index to Nursing and Allied Health Literature (CINAHL)* and *Embase* and *Cochrane Central Register of Controlled Trials (CENTRAL)* via Ovid. Additionally, the first 100 studies from Google Scholar and individual library findings from the Medical University Graz were screened. After the full-text screening, reference lists from included studies were examined.

2.2.1. Inclusion and exclusion criteria

To conduct a systematic search to answer the research question, inclusion and exclusion criteria were established beforehand. Peters et al. (2020) recommend using the PCC (Population, Concept, Context) mnemonic to define a construct for the inclusion criteria. Table 2 shows the defined inclusion and exclusion criteria based on the PCC mnemonic.

Table 2: Inclusion and exclusion criteria based on the PCC mnemonic

PCC mnemonic	**Inclusion criteria**	**Exclusion criteria**
Population	○ adults (older than 18) presenting to the ED	○ children/youth up to 18 ○ health professionals’ eHealth literacy and perspectives
Concept	○ eHealth literacy ○ patient’s interaction with online health information and consequences of use	○ quality assessment of online health information/websites ○ digital interventions
Context	○ general ED	○ psychiatric ED ○ pediatric ED ○ primary care

Children and adolescents are likely to search for health-related information on the internet (Park and Kwon, 2018). Statistics Austria (2023c) showed a strong correlation between age and digital skills, indicating that younger people are more likely to have digital skills. A review by Yuen et al. (2024) supported these findings, demonstrating that a younger age positively correlates with digital health literacy (Yuen et al., 2024). Nevertheless, to understand eHealth literacy skills across the broader population, further research on adults is needed. Accordingly, this master’s thesis will focus on describing eHealth literacy of adults.

Only studies involving adults over 18 years were included. There are many definitions of adulthood due to different cultures or legal factors. That being the case, there is no specific age limit for visiting an ED. Adulthood typically begins between the ages of 16 and 21 (Canêo and Neirotti, 2017), but most countries have set the age limit at the age of 18 (Cornell Law School-Legal Information Institute, 2021). Therefore, for this master’s thesis, an adult is considered to be 18 years or older. To answer the research question, only studies, including adults presenting to the ED were taken into account. Thus, health professionals' eHealth literacy and perspectives were not considered.

Since the main concept of this master's thesis is eHealth literacy, all studies screened regarding this concept were included. Norman and Skinner (2006b) define eHealth literacy as the ability to seek and find health information from electronic sources, and further, understand and apply this knowledge to solve a health problem. Therefore, in addition to the concept of eHealth literacy, all studies involving participants' interaction with online health information and the consequences of its use were included. Quality assessments of online health sources and websites, as well as the testing of digital health interventions, were excluded.

Another inclusion criterion is the context of a general ED, to ensure answering the research question in the previously defined scope. All other kinds of EDs, like psychiatric or pediatric facilities, were excluded.

Only studies in the languages English and German were included. There was no publication time limit set. Since the aim of this thesis is to provide an overview of existing literature, all study designs were included.

2.2.2. Search strategy

To identify suitable studies, individual search strategies were developed for each database. The search strategy comprises keywords, derived from the PCC mnemonic and their synonyms. Additionally, Medical Subject Headings (MeSH Terms) were used in PubMed, while Major Headings (MH) were utilized in CINAHL. To find all relevant studies, MeSH Terms, and MH were also searched as keywords. MeSH Terms and MH are used for cataloging and indexing health information and are recommended for a more effective search (EBSCO Connect, 2019, National Library of Medicine, 2024). However, MeSH Terms and MH could not be employed in Ovid and Google Scholar. The keywords, synonyms, MeSH Terms and MH were linked using the Boolean operators "AND" and "OR". To ensure that all relevant studies were going to be found, truncations (*) were utilized. In the databases, keywords regarding the concept had to be present in the title and/or abstract of the study. Table 3 shows the used keywords and MeSH Terms / MH based on the PCC mnemonic. The complete search strategies for each database can be found in the appendix.

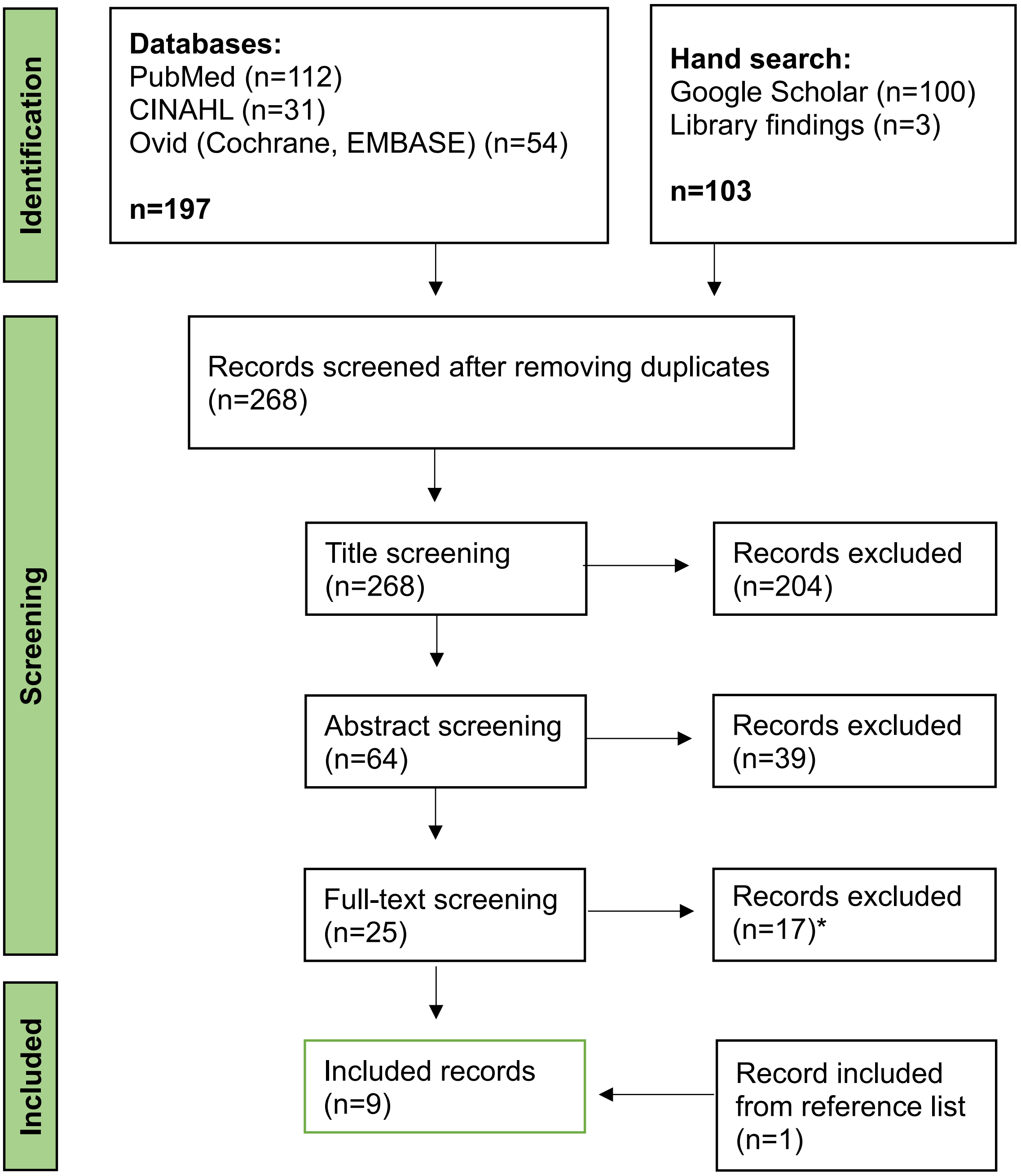
Table 3: Keywords based on the PCC mnemonic

PCC mnemonic	Keywords/Synonyms	MeSH Terms / MH
Population	adult	adult
Concept	eHealth literacy, electronic health literacy, mhealth literacy, online health literacy, digital health literacy, electronic health information, online health information, digital health information, ehealth literacy	-
Context	emergency department, emergency room, emergency unit, emergency care, emergency service, emergency treatment	emergency service, hospital; emergency treatment; emergency care

Additionally, a hand search was conducted in Google Scholar, screening the first ten pages. Individual library findings from the Medical University Graz were also included. At the end of the search, reference lists from the included studies were screened.

2.3. Study selection

A total of 300 studies were identified through database searches (n=197) and hand-searching (n=103). The results were exported into the reference management tool “Endnote 20”. All records were screened according to the inclusion and exclusion criteria shown in Table 2. Initially, 32 duplicates were removed, leaving 268 remaining studies. Subsequently, the titles of the identified records were screened, resulting in the exclusion of 204 records. The abstracts of the remaining 64 studies were then screened, excluding 39 records, and leaving 25 for full-text screening. Of these, 17 records were removed due to an unfitting setting (n=9) or population (n=1), studies regarding the evaluation of websites or interventions (n=3), and records researching general health literacy instead of eHealth literacy (n=4). After full-text screening, the reference lists of the eight included studies were screened, adding one more study to be included in this scoping review. The screening process and study selection are demonstrated in Figure 4.



* Reasons for exclusion: setting/context not fitting (n=9), evaluation of websites/interventions (n=3), population not fitting (n=1), general health literacy (n=4)

Figure 4: Flow chart demonstrating the screening process and study selection derived from Page et al. (2021)

2.4. Critical appraisal

To assess the methodological limitations and trustworthiness of the included studies, critical appraisal tools of the Joanna Briggs Institute (JBI) (JBI, 2020a, JBI, 2020b, JBI, 2023) were used. A variety of JBI instruments are freely available, evaluating qualitative as well as quantitative studies. Therefore, these tools are suitable when assessing different study designs (Barker et al., 2023). In this master thesis checklists for cross-sectional studies (JBI, 2020a), randomized controlled trials (JBI, 2023), and qualitative studies (JBI, 2020b) were used. Depending on the study design, the checklists consist of eight to 13 questions with the answer options “yes”, “no”, “unclear” and “not applicable”. To demonstrate the extent of existing literature, all studies, regardless of their quality, will be included.

The majority of the included studies (n=7) used a cross-sectional research design. Rutty (2023) employed a mixed-methods approach. The thesis included a questionnaire to address the quantitative aspects of the research question, whereas a semi-structured interview served as the qualitative measurement. Therefore, to critically appraise the study, the checklist for cross-sectional studies (JBI, 2020a) was used, as well as the checklist for qualitative studies (JBI, 2020b). Besides Rutty (2023), only McCarthy et al. (2017) used a qualitative approach. One study conducted a randomized controlled trial (Martin et al., 2019). The complete critical appraisal is available from the author of this thesis.

2.4.1. Cross-sectional studies

Most of the studies that used a cross-sectional approach described clear inclusion criteria for the study sample, the setting and the study subjects. The study of Malik et al. (2019) was the only one that left this important information out. The measurement of exposure was not described in any of the included studies, since exposure was not identifiable. Many of the studies did not state a condition, making this question in the checklist unanswerable. Nevertheless, three studies incorporated conditions, which were described objectively (Rutty, 2023, Scott et al., 2017, Yastik, 2017). Four studies identified confounding factors and described strategies to deal with them (Cocco et al., 2018, Rutty, 2023, Scott et al., 2017, Yastik, 2017). Asch et al. (2019), Malik et al. (2019) and Pourmand and Sikka (2011) did take confounding factors into account. It is unclear, if Asch et al. (2019) measured the outcomes validly and reliably, as this was not outlined thoroughly. All other included studies, except for Yastik (2017), who described the limitations of their measurement, measured the outcomes validly and reliably. Nevertheless, it has to be noted, that the Internet Search effect on Medical Interaction Index (ISMII) used in the study by Cocco et al. (2018) has not been validated to this date. However, the scale has acceptable internal consistency and face validity. The majority of the studies employed suitable statistical methods for analyses. The approach to the analysis was unclear in two studies (Malik et al., 2019, Pourmand and Sikka, 2011). In summary, the studies by Rutty (2023) and Scott et al. (2017) show very good quality. Due to poor quality, the results of Malik et al. (2019) have to be interpreted carefully.

2.4.2. Qualitative studies

McCarthy et al. (2017) used a qualitative approach, while Rutty (2023) carried out a mixed-methods study. The qualitative aspects of the mixed methods study will be evaluated in this chapter. Critical appraisal showed very good quality in the qualitative aspects of Rutty (2023). McCarthy et al. (2017) also demonstrated overall moderate quality, with some uncertainty regarding the philosophical perspective. Furthermore, information about the researcher is missing.

2.4.3. Randomized controlled trials

Only one randomized controlled trial was identified. Martin et al. (2019) showed moderate quality. Participants were randomly assigned to groups that were similar at baseline and treated identically. Outcome assessors were blinded to the assignment and outcomes were measured consistently across all groups. Two out of three outcomes were measured reliably, and an appropriate statistical analysis was used for every outcome. Moreover, the design was appropriate for the research question. However, it is unclear if the allocation to the groups was concealed and if all participants were analyzed in the group to which they were randomized. Participants were not blinded to treatment assignment, since they carried out the “treatment”, which was internet searching, by themselves.

2.5. Data extraction and synthesis

Data extraction methods were derived from the methodological guidance of the JBI (Peters et al., 2020). As recommended, a table of study characteristics was created. The following aspects are included: author(s) and year, location, objective(s), study design, sample size, outcomes and main results. This information can be found in Table 4. Within data analysis, all results relevant to this study's aim and research question were extracted narratively. Furthermore, all relevant demographic data were summarized. Subsequently, the results were categorized based on the eHLF (Norgaard et al., 2015).

3. Results

The following chapter describes the results of the included studies. First, the main characteristics will be described and presented. Furthermore, the results will be classified using the e-health literacy framework (Norgaard et al., 2015) and described both narratively and graphically. To begin with, all aspects regarding the domain "Individual" will be presented, followed by results referring to "Interaction", and lastly, the domain "System".

Nine studies were included in this master's thesis. Nearly all of them were conducted in the United States (U.S.) (Asch et al., 2019, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Scott et al., 2017, Yastik, 2017). The three remaining studies were carried out in Australia (Cocco et al., 2018), Pakistan (Malik et al., 2019) and Canada (Rutty, 2023). The samples in all the studies were patients in the ED. The main objectives were to determine the characteristics of internet searches (Asch et al., 2019, Cocco et al., 2018, Scott et al., 2017), the accuracy of internet searches (Martin et al., 2019, McCarthy et al., 2017), the impact of online health information to seek the ED (Pourmand and Sikka, 2011, Yastik, 2017) and the effect on cyberchondria and anxiety (Malik et al., 2019, Rutty, 2023). The smallest sample with 74 participants was identified in the cross-sectional study by Yastik (2017), while Scott et al. (2017) were able to recruit the biggest sample with 723 participants. The study characteristics are presented in Table 4.

Table 4: Study characteristics of the nine included studies

Author(s), year	Country	Objective(s)	Study design	Sample size (n)	Main outcome(s)	Main result(s)
Asch et al., 2019	United States	Testing patients' willingness to share Google search histories with their EMR[1] & exploring association between internet searches and clinical presentation	Cross-sectional	n=334 (willing to share EMR[1]) n=103 (final sample size)	• EMR[1] data • Google Searches	• 165 (49%) of patients who had a Google account were willing to share EMR[1] data. • Health-related internet searches doubled prior to the ED visit. • Over 50% of patients who made searches prior to their ED visit searched for information related to their chief complaint.
Cocco et al., 2018	Australia	Determination of prevalence, predictors and characteristics of internet searches, effect on doctor-patient relationship and treatment compliance	Multi-center, observational cross-sectional	n=400	• Prevalence, characteristics • Doctor-patient relationship • Treatment compliance • Predictors of searching • EHealth literacy	• Nearly half of the participants use the internet regularly to search for health-related information. • Internet searching is more prevalent with younger age. • Internet searching helps patients to communicate with health professionals. • 40% of participants feel like internet searching made them anxious.

[1] Electronic Medical Record

Author(s), year	Country	Objective(s)	Study design	Sample size (n)	Main outcome(s)	Main result(s)
Malik et al., 2019	Pakistan	Assessment of cyberchondria	Cross-sectional	n=304	• Prevalence of cyberchondria	• Internet searching about medical conditions often makes people panic. • Only 8.88% always trust their doctor more than online searching.
Martin et al., 2019	United States	Determining the accuracy of online searching and evaluating the impact on anxiety	RCT[1]	n=300 No Search: n=101 Google Search: n=100 HFD[2]: n=99	• Accuracy of patient generated differential by matching clinicians' differential (at least 2 out of 3) • Anxiety	• No significant difference in being more likely to match their differential diagnoses with the clinician's differential after online searching was found. • There was no significant difference in anxiety between groups.
McCarthy et al., 2017	United States	Characterizing internet searches evaluating the relationship to clinical diagnoses	Qualitative	n=170	• Search terms • Relationship between search term and final diagnosis	• Most patients searched for symptoms. • Only 29% of participants who searched for a specific diagnosis, received the same diagnosis.

[1] Randomized controlled trial

[2] Google Search with health-related features disabled

Author(s), year	Country	Objective(s)	Study design	Sample size (n)	Main outcome(s)	Main result(s)
Pourmand & Sikka, 2011	United States	Impact of online searching on decision to seek the ED	Cross-sectional	n=489	• Prevalence of online searching • Impact to seek the ED	• 37% of participants with internet access used it to find online health information. • 17% changed their decision if they should visit the ED.
Rutty, 2023	Canada	Evaluating attitude towards OHI[1], prevalence of cyberchondria and health anxiety	Mixed-methods	Quantitative n=128 Qualitative n=101 (n=9 interviews)	• Characteristics of internet use • Anxiety • Cyberchondria • EHealth literacy • Experiences • Correlations	• Nearly all participants looked up OHI[1] in the last 12 months. • 45.3% use the internet as primary source for health information. • Over half of the participants searched online for symptoms before visiting the ED. • 17.9% had high or extremely high levels of anxiety. • Participants seeking symptoms prior to their ED visit had higher levels of anxiety, cyberchondria and reassurance seeking. • EHealth literacy was positively correlated to cyberchondria.

[1] Online health information

Author(s), year	Country	Objective(s)	Study design	Sample size (n)	Main outcome(s)	Main result(s)
Scott et al., 2015	United States	Analyzing OHI[1] utilization across age groups	Cross-sectional	n=723	• Access • Understanding • Trust • Characteristics of internet use • Impact to seek the ED	• Searching for health information online was prevalent in all age groups. • Younger participants were more likely to search for health information online and found information from the internet more accessible than older participants. • All age groups found information from their doctor more trustworthy and easier to understand. • Internet searching was overall not likely to impact the decision to visit the ED.
Yastik, 2017	United States	Describing OHI[1] seeking and the impact on decision to visit ED by non-urgent patients	Descriptive/correlational	n=74	• Characteristics of internet use • Impact to seek the ED	• 73% of participants used the internet as a general health information source. • Over half of the participants did not use OHI[1] to decide if they should go to the ED.

[1] Online health information

3.1. Individual

In this chapter, all results regarding individual aspects will be presented. Norgaard et al. (2015) further divided this domain into two subgroups: “the ability to process information” (1) and the “engagement in own health” (2).

3.1.1. Ability to process information

The “ability to process information” (1) describes basic skills like reading and writing, but also the ability to cope with the vast amount of information that one gets (Norgaard et al., 2015). The following evidence suggests an increase in cyberchondria and/or anxiety due to internet searching. Cyberchondria can be defined as excessive online searching for health information, which can lead to high anxiety levels. Excessiveness can be interpreted as recurrent or frequent searching as well as a large amount of information being accessed (Starcevic and Berle, 2013). Four studies examined the effect of searching online for health information on anxiety and cyberchondria.

According to Cocco et al. (2018), less than half of their sample (39.9%) agreed or strongly agreed that searching for OHI made them anxious or worried (95% CI, 33-47%). Martin et al. (2019) found similar results. The randomized controlled trial compared three groups: no searching before the ED visit, Google searching with health-related features and Google searching with health-related features disabled (HFD). Health-related features included a symptom search tool, guiding participants to accurate information, proofed by a physician. One outcome of the study was anxiety, measured with a visual analogue scale ranging from 0 to 30, where a higher score indicates more anxiety. The anxiety score after the ED visit was significantly lower in the no-search ($p<0.001$) and Google search groups ($p<0.001$). The group searching with disabled health-related features showed no significant change in anxiety ($p=0.18$). However, Malik et al. (2019) described that more than two-thirds (80.26%) panicked when finding out their condition is rare or serious while online searching. Furthermore, 70.38% often or always felt anxious after researching symptoms and 33.88% had often trouble getting to sleep after searching online for health information.

Rutty (2023) measured anxiety using the Short Health Anxiety Inventory (SHAI). An increased score on the SHAI indicates a higher level of anxiety, with possible scores ranging from 0 to 42. The mean score in the sample was measured to be 12.0 (SD=5.9), with 20 defining the threshold for a higher degree of anxiety. 13.3% had a score above 20, meaning that they showed high levels of anxiety. Moreover, a statistically significant correlation between age and anxiety was found, describing that younger participants were more anxious than those over 50 years old (p=0.008, 95% CI [1.10,9.99]) and those over 65 years old (p<0.001, 95% CI [2.30, 11.4]). Participants who searched for OHI before visiting the ED also showed higher levels of anxiety (p=0.004).

Besides anxiety, cyberchondria was also examined. The mean cyberchondria score was 65.6 (SD=20.9), measured with the Cyberchondria Severity Scale (CSS-30). The CSS-30 includes the subscales compulsion, distress, excessiveness, and reassurance seeking. The subscale “compulsion” describes the extent to which internet searching interrupts daily activities. The subscale “distress” refers to the emotional impact of internet searching on individuals. The third subscale, “excessiveness” relates to how frequently and how long people search online. The fourth subscale “reassurance seeking” reflects on the need to obtain reassurance from a health professional. Almost one-third (29.7%) of the participants had a higher level of cyberchondria. Furthermore, younger participants had a higher mean distress than older age groups (p=0.007, 95% CI [1.2,9.9]). Table 5 shows which factors contributed significantly to higher cyberchondria and anxiety. For example, searching for symptoms online and consulting a health professional following online searching resulted in participants having higher cyberchondria and anxiety scores (Rutty, 2023).

Table 5: Factors contributing to higher cyberchondria/anxiety scores (significant positive correlations) (Rutty, 2023)

higher cyberchondria scores	higher anxiety scores
when participants…	
…searched for symptoms online (p=0.001)[1,2]	…searched for symptoms online (p=0.004)
…consulted a health professional because of online health information (p<0.001)[2]	…consulted a health professional because of online health information (p<0.001)
…used the internet as primary information source (p=0.026)	not given/not significant
…received an online recommendation to visit the ED (p<0.001)[1,2]	not given/not significant
…who searched for OHI visited the ED the same day (p=0.006)[1,2]	not given/not significant
…who searched for OHI visited the ED the next day (p=0.019)[1]	not given/not significant
…searched for OHI on a weekly basis (p=0.02)	not given/not significant
…searched for OHI for 11 hours or more (p=0.044)	not given/not significant

[1] including higher scores for excessiveness subscale

[2] including higher scores for reassurance seeking subscale

[3] including higher scores for excessiveness subscale

Moreover, using the Pearson's correlational analyses the following positive correlations were found:

- eHealth literacy and cyberchondria (excessiveness and reassurance seeking subscales) (p=0.048)
- health anxiety and cyberchondria (p<0.001)
- health anxiety and compulsion (p<0.001), distress (p<0.001), excessiveness (p<0.001), and reassurance seeking (p=0.010)

- hours a week spent searching for OHI and health anxiety (p=0.001), cyberchondria (p<0.001), excessiveness (p<0.001), and compulsion (p<0.001)
- frequency of OHI use and eHealth literacy (p=0.007), distress (p=0.1), health anxiety (p=0.009), cyberchondria (p<0.001), compulsion (p=0.02), reassurance seeking (p<0.001) and excessiveness (p<0.001)
- frequency of online symptom searching in the last twelve months and eHealth literacy (p=0.003), compulsion (p<0.001), health anxiety (p<0.001), cyberchondria (p<0.001), excessiveness (p<0.001), reassurance seeking (p<0.001)
- time spent searching for symptoms before ED and health anxiety (p<0.001), cyberchondria (p<0.001), reassurance (p<0.001), and excessiveness (p<0.001)

No correlation between eHealth literacy and health anxiety was found (Rutty, 2023).

The qualitative part of the study also suggested a correlation between OHI searching and anxiety as well as cyberchondria. With interviews, experiences and opinions were investigated. Most participants stated feeling worse after online searching and increased time searching worsened anxiety. They felt overwhelmed, paranoid and panicked and needed support from family and friends to calm down (Rutty, 2023).

3.1.2. Engagement in own health

The subgroup “engagement in own health” (2) includes the feeling of being able to cope with one’s own health. It involves understanding and managing your condition and taking responsibility. Furthermore, this subgroup refers to the ability to understand and navigate through the healthcare system (Norgaard et al., 2015). Four studies examined whether online searching before the ED visit influenced the decision-making process of attending an ED (Pourmand and Sikka, 2011, Rutty, 2023, Scott et al., 2017, Yastik, 2017).

Scott et al. (2017) suggested that most online symptom searchers did not use the internet to determine whether they should visit the ED. Participants were more likely to ask a health professional (p=0.080) than to rely on the internet (p<0.001). Two additional studies demonstrated similar findings. Only 22.9% (Pourmand and Sikka, 2011) or 37.8% (Yastik, 2017) used the internet to determine whether they should visit the ED, whereas 17% (Pourmand and Sikka, 2011) or 43.2% (Yastik, 2017) changed their decision due to OHI. However, the results by Rutty (2023) imply that internet searching can impact the decision-making process of visiting the ED. Over half of their sample received recommendations from online sources as well as telehealth services to visit the ED. 50.6% visited the ED the same day and 24.7% went the next day. Qualitative results also showed that the internet can be seen as an alternative in the healthcare system, acting as a first step in the process.

3.2. Interaction

The domain "Interaction" includes the subgroups "ability to actively engage with digital services" (3), "feel safe and in control" (4) and "motivated to engage with digital services" (5) (Norgaard et al., 2015). As most of the included studies examined factors regarding interaction, this domain is the largest.

3.2.1. Ability to actively engage with digital services

The subgroup "ability to actively engage with digital services" (3) includes the basics of using digital services and technology. It involves the readiness to use such systems as well as critical and logical thinking (Norgaard et al., 2015). This chapter will include all results referring to the characteristics of internet usage in addition to the ability to use digital services. It will give insight into the following questions:

- Who is searching for OHI?
- When are they searching?
- What are they searching for?
- How long are they searching?
- Where are they searching?
- Why are they searching?
- Do search terms align with the final diagnosis given in the ED?

First, the general characteristics of internet usage will be outlined, as all included studies examined these factors. Figure 5 summarizes the main results.

Nearly all studies described general characteristics of internet use. In the study by Asch et al. (2019) 591,421 unique terms were searched, of which 6% were health-related. McCarthy et al. (2017) identified 243 search terms, with 32% using more than one term. The prevalence of general internet use for health information varied. Pourmand and Sikka (2011) found that 37.2% used the internet to find health information. Cocco et al. (2018) and Yastik (2017) discovered that 49% (95% CI, 44.1%-53.9%) and 73%, respectively, regularly searched for OHI. According to Rutty (2023), 93.8% have used OHI in the last 12 months. Further results showed that 35.9% searched for OHI a few times a year, 39.8% occasionally appraised their symptoms online and 45.3% used the internet as the primary source for health information (Rutty, 2023). The general study population primarily consisted of younger adults (Asch et al., 2019, Martin et al., 2019, Pourmand and Sikka, 2011, Rutty, 2023) and were predominantly female (Asch et al., 2019, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Rutty, 2023, Scott et al., 2017, Yastik, 2017). Only Cocco et al. (2018) included a study population with a slightly higher proportion of men. Participants were primarily African American or Caucasian (Asch et al., 2019, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Rutty, 2023, Scott et al., 2017, Yastik, 2017). Education levels, however, varied. While one study included participants who had not completed year 12 (Cocco et al., 2018), others included populations where most had completed high school (Martin et al., 2019), college (McCarthy et al., 2017, Scott et al., 2017, Yastik, 2017), or a bachelor's degree (Pourmand and Sikka, 2011, Rutty, 2023). In the studies by Cocco et al. (2018) and Yastik (2017), younger participants were more likely to use the internet to search for OHI than older adults. Specifically, 90.3% of individuals aged 18-39 searched for OHI in contrast to 50.7% of adults older than 75 ($p<0.001$) (Scott et al., 2017) and respectively 58% of individuals aged 18-29 in contrast to 14% of those over 60 ($p<0.001$) (Cocco et al., 2018).

Six studies examined at what point in their treatment process participants searched for OHI. The prevalence ranged from 15%-63.3% of those who searched for online health information prior to their ED visit (Asch et al., 2019, Martin et al., 2019, McCarthy et al., 2017, Rutty, 2023). In the study by Yastik (2017), 31.1% looked up their symptoms more than 24 hours after experiencing them. A different study showed that 62.17% began searching when feeling an unexplained bodily sensation (Malik et al., 2019).

Next, the content of the searches will be described. The most prevalent search terms referred to participants' chief complaints/problems (Asch et al., 2019, Cocco et al., 2018) and symptoms (Cocco et al., 2018, McCarthy et al., 2017). 51% searched for treatment options (Cocco et al., 2018) followed by 31.7% (McCarthy et al., 2017) who looked up diagnoses. Asch et al. (2019) found out, that 15% of their participants looked up information about the ED like directions or logistics.

Four studies took a closer look at search times. Cocco et al. (2018) determined a median search time of 20 minutes (10-60 min) with search time increasing, the closer it got to the ED visit. Martin et al. (2019) found out that patients searched in average 3.82 (2.53-5.72 min) minutes while in the waiting room at the ED. In the study by Rutty (2023), only 29.7% searched for 30 minutes or less prior to their ED visit. The majority (62.5%) searched for one to five hours. Time spent searching was positively correlated with health anxiety and cyberchondria. Longer searching therefore increased health anxiety and cyberchondria ($p<0.001$). Most participants in the study by Yastik (2017) searched for 24 hours or more after experiencing their first symptoms (31.1%) followed by 21.6% who searched between one and three hours after symptom onset.

The following chapter answers the question where participants searched for OHI. 57.8% and 74.3% of the participants in the study by Rutty (2023) and Yastik (2017), respectively, started their online search with a search engine. Two studies found out that the most used search engine was Google (94% (Cocco et al., 2018); 92.7% (Martin et al., 2019)). Interestingly, in the study by Yastik (2017), only 10.8% used Google, with the majority using WebMD. Nevertheless, nearly three quarters of the participants started their search with a search engine (Yastik, 2017). WebMD was also mentioned by McCarthy et al. (2017) with 58% of their participants using it. Additional sought-after websites were hospital websites (Cocco et al., 2018, McCarthy et al., 2017) and online encyclopedias (Cocco et al., 2018). Most trusted websites were hospital and university sites, and the most used device was the smartphone (Cocco et al., 2018).

Qualitative methods are required to explore why participants searched for OHI. Using a qualitative approach, Rutty (2023) found different reasons why participants chose to turn to the internet when facing health-related questions. Firstly, the internet was seen as a tool for education. Participants were curious about their own and their family's health conditions, symptoms, and treatment. Using the internet also gave participants a feeling of understanding. They could use the terms they searched for in conversations with their health providers. Furthermore, they felt more in control and could actively engage in their health situations. Solving health concerns was particularly motivating for people who worked in research fields. However, individual aspects were not the only reasons for using the internet. The internet's efficiency, speed, and ease of use were also factors contributing to participants using it. They even described it as being easier than going to see a health professional. Moreover, since participants were not satisfied with the healthcare system, the healthcare services and due to a lack of trust in health professionals, the internet became an alternative. Subsequently, the internet is used as a first assessment to determine the urgency of the symptoms (Rutty, 2023).

One way to determine, if participants are able to use digital services to search for OHI is to examine if their search terms align with the final diagnoses from the ED. Martin et al. (2019) compared three groups: those searching with health-related features, those searching with health-related features disabled (HFD) and those not searching online at all. The group searching on Google for health-related features used an online tool that led them to knowledge cards with information provided by health professionals. These features were disabled for the second group. Participants were instructed to search for a possible diagnosis they had. The third group did not search online. After comparing the groups, about one-fourth of each group matched at least two out of three of the diagnoses with no significant difference. Furthermore, no statistically significant differences were found by participants matching at least one out of three of the diagnoses and all three diagnoses. In summary, online searching had no effect on diagnosis matching (Martin et al., 2019).

McCarthy et al. (2017) also examined the relationship between searches and diagnoses. Participants stated their search terms, which were then categorized based on their content. Discharge diagnoses were also categorized as either symptom-based (e.g., abdominal pain) or formal diagnoses (e.g., gastritis). Search terms regarding symptoms and diagnoses were then compared to participants' final discharge diagnoses. Four categories were investigated: "flat trajectory-symptoms" (1), "flat trajectory-diagnosis" (2), "general-to-specific trajectory" (3) and "specific-to-general trajectory" (4). "Flat trajectory-symptoms" (1) included participants who searched for a symptom and received a symptom-based diagnosis. If participants searched for a diagnosis and got discharged with a diagnosis they fell into the category "flat trajectory-diagnosis" (2). "General-to-specific trajectory" (3) describes participants who searched for a symptom but were given a diagnosis, whereas participants in the category "specific-to-general trajectory" (4) searched for a formal diagnosis but received a symptom-based diagnosis (McCarthy et al., 2017). A summary of the four categories can be found in Table 6.

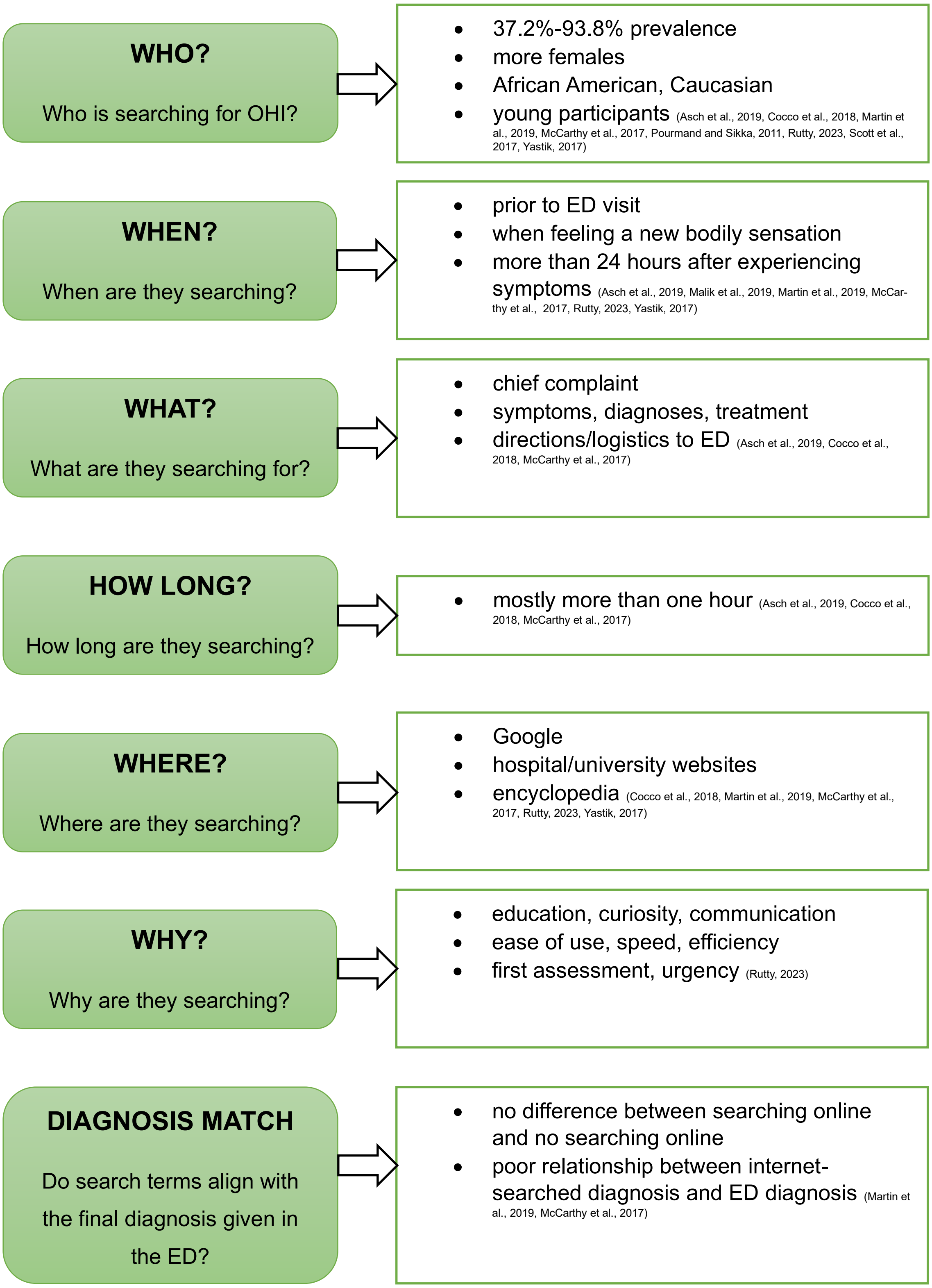
Table 6: Categories of search behaviors in the study population by McCarthy et al., 2017

Category	**Search term**	**Final diagnosis**	**Example**
Flat trajectory-symptoms (1)	Symptom	Symptom-based diagnosis	abdominal pain → abdominal pain
Flat trajectory-Diagnosis (2)	Diagnosis	Formal diagnosis	gastritis → gastritis
General-to-specific trajectory (3)	Symptom	Formal diagnosis	abdominal pain → gastritis
Specific-to-general trajectory (4)	Diagnosis	Symptom-based diagnosis	gastritis → abdominal pain

Results showed that most participants were categorized in the *flat trajectory-symptoms* category, which means they searched for a symptom and received a symptom-based diagnosis (34%, 95% CI [27%-41%]). 22% fell into the category *general to specific trajectory* (95% CI [16%-28%]). 13% had complete accuracy and were included in the category *flat-trajectory-diagnosis* (95% CI [8%-18%]). These participants searched for a diagnosis and received the exact same discharge diagnosis. Only 10% (95% CI [5%-15%]) fell into the category *specific-to-general trajectory* (McCarthy et al., 2017).

Furthermore, the relationship between the chief complaint and the final diagnosis was examined. About two-thirds of the cases showed near or complete concordance. Only 11.8% showed no concordance between a chief complaint and the final diagnosis. Nevertheless, only about one-tenth of the participants were completely accurate in their searches, searching for and obtaining a formal diagnosis.

Therefore, the relationship between internet-searched diagnosis and final diagnosis was poor (McCarthy et al., 2017).



WHO?

Who is searching for OHI?

- 37.2%-93.8% prevalence
- more females
- African American, Caucasian
- young participants (Asch et al., 2019, Cocco et al., 2018, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Rutty, 2023, Scott et al., 2017, Yastik, 2017)

WHEN?

When are they searching?

- prior to ED visit
- when feeling a new bodily sensation
- more than 24 hours after experiencing symptoms (Asch et al., 2019, Malik et al., 2019, Martin et al., 2019, McCarthy et al., 2017, Rutty, 2023, Yastik, 2017)

WHAT?

What are they searching for?

- chief complaint
- symptoms, diagnoses, treatment
- directions/logistics to ED (Asch et al., 2019, Cocco et al., 2018, McCarthy et al., 2017)

HOW LONG?

How long are they searching?

- mostly more than one hour (Asch et al., 2019, Cocco et al., 2018, McCarthy et al., 2017)

WHERE?

Where are they searching?

- Google
- hospital/university websites
- encyclopedia (Cocco et al., 2018, Martin et al., 2019, McCarthy et al., 2017, Rutty, 2023, Yastik, 2017)

WHY?

Why are they searching?

- education, curiosity, communication
- ease of use, speed, efficiency
- first assessment, urgency (Rutty, 2023)

DIAGNOSIS MATCH

Do search terms align with the final diagnosis given in the ED?

- no difference between searching online and no searching online
- poor relationship between internet-searched diagnosis and ED diagnosis (Martin et al., 2019, McCarthy et al., 2017)

Figure 5: Summary of the results regarding the ability to actively engage with digital services

To demonstrate the full extent of the results and to conclude this chapter, the e-health literacy score has to be mentioned (eHEALS). This score measures the ability to understand and use health information from electronic devices. The higher the score, the better the eHealth literacy skills. Scores range from 8 to 40 (Norman and Skinner, 2006a). Nevertheless, only two studies examined eHEALS. Mean eHEALS were calculated to be 28.3 and 29.7, respectively, indicating that participants had average eHealth literacy skills (Cocco et al., 2018, Rutty, 2023).

3.2.2. Feel safe and in control

The subgroup “feel safe and in control” (4) pertains to the general trust in technology. It includes people’s perceptions of the system they are using as the source of information. Moreover, it includes their feelings of safety in terms of data security (Norgaard et al., 2015).

Four studies examined if participants trusted the internet over their general practitioners and found similar results. In all studies, participants tended to trust their physicians more than the internet. More precisely, nearly two-thirds (63.48%) of the participants in the study by Malik et al. (2019) often or always trusted their general practitioner over the internet or their own health-related online search. Furthermore, 42.43% often or always trusted the diagnosis received by a physician over their online-searched diagnosis. Only 3.01% never trusted a physician over the internet. About half of the participants (47.69%) often or always visited trustworthy websites and user forums. Rutty (2023) described about one-third of the participants as having ultimate trust in health professionals and therefore did not mention an online search beforehand, so as not to influence the physician. According to Scott et al. (2017), all age groups found information from a physician more understandable and trustworthy than information derived from the internet. Cocco et al. (2018) reported that only 5% often or always doubted their clinical diagnosis or treatment when they found different information on the internet. Additionally, 91% would never or rarely change the treatment given to them by a health professional due to conflicting results found online. Moreover, one study examined how participants felt about data security. Nearly half of the participants (49%) agreed to share their Google searches as well as their electronic medical records and consented to them being linked. Summarizing participants’ trust in the internet, most preferred seeing a physician rather than searching for information on the internet, and the feeling of safety regarding data security was limited.

3.2.3. Motivated to engage with digital services

The next subgroup describes people’s motivation to use digital services. It is about being curious when using the internet and the motivation to use the information gathered online. This group highlights the benefits users have when searching for health information online (Norgaard et al., 2015). Therefore, in this chapter, results regarding the search effect on the doctor-patient relationship will be summarized. It will include a patient’s motivation to discuss online findings with health professionals, how patients deal with OHI and which benefits it has. Four studies examined the search effect on the doctor-patient relationship.

Cocco et al. (2018) obtained information regarding the doctor-patient relationship using the Internet Search effect on Medical Interaction Index (ISMII). The ISMII is a Likert scale, with scores above 27 reflecting a positive impact on the doctor-patient relationship. The participants’ mean ISMII score was 30.3 (7-41, 95% CI [29.6-31.0]). Searching had no effect on 7.1% of the participants. 77.3% (95% CI [70.9%-82.7%]) reported a positive influence on the doctor-patient relationship. Participants agreed or strongly agreed that searching for information helped them communicate with health providers (68.4%, 95% CI [61.5%-74.5]), better understand doctors during the visit (79.5%, CI [73.7%-84.9%]) and allowed them to ask more informed questions (80.7%, CI [74.6%-85.7%]). Half of the participants (51.4%) agreed or strongly agreed, that searching for health-related information made them feel empowered, whereas only 2% strongly disagreed. 42% agreed or strongly agreed that they received more attention during the consultation since they searched beforehand. A similar percentage (40.2%) agreed or strongly agreed that they received more information during their doctor’s visit. Participants were neutral about whether interactions with health professionals were more respectful after online searching, as 5.2% strongly disagreed and strongly agreed, respectively. Furthermore, a correlation between the eHEALS and the ISMII score was identified. The ISMII score increased significantly by 0.4 points for each point increase in the eHEALS (Cocco et al., 2018).

Contrary to the results in the study by Cocco et al. (2018), Martin et al. (2019) found, that no significant differences were found in communication, shared-decision making, and overall aspects of the patient-doctor relationship. All groups, regardless of whether they searched online beforehand, had good communication (p=0.71) and felt connected to their doctor (p=0.92). In a study by Yastik (2017), only 44.6% of the participants talked to someone about the information they had found on the internet. These are similar to the results of another study, stating that 53.28% often or always discussed their findings with a general practitioner. Additionally, 54.92% felt reassured, when discussing online findings with their doctor (Malik et al., 2019).

3.3. System

The last main group of the eHLF includes all aspects regarding the systems. This means access to systems, but also hardware, software, and technology in general, and incorporates a user-friendly interface. This domain consists of the subgroups “access to digital services that work” (6) and “digital services that suit individual needs” (7) (Norgaard et al., 2015).

3.3.1. Access to digital services that work

The subgroup “access to digital services that work” (6) includes general aspects of technology. To use the internet for health information, people need devices like a smartphone or a computer. However, access to equipment is not the only important factor. Users must be able to use the right software and hardware to conduct a search. Furthermore, the systems have to be easy to use, understandable, work together, and have support systems (Norgaard et al., 2015). Three studies investigated access to technology.

Martin et al. (2019) investigated, whether participants had equipment or devices to search for OHI. Nearly all participants (98.3%) owned a smartphone, with about one-third (33.3%) owning an Apple device and nearly two-thirds (65.0%) owning an Android device. Pourmand and Sikka (2011) asked participants more specifically and found that 92% had access to the internet, and 94.5% stated that they had access to e-mail. Another study confirmed widespread access to devices with internet functionality. Nearly all participants in the study by Scott et al. (2017) had internet-capable equipment. Nevertheless, access was more prevalent in the age group 18-30 years (98.1%, p<0.001). However, nearly three-fourths (72.3%) of those over 75-years-old also had access to internet-capable devices.

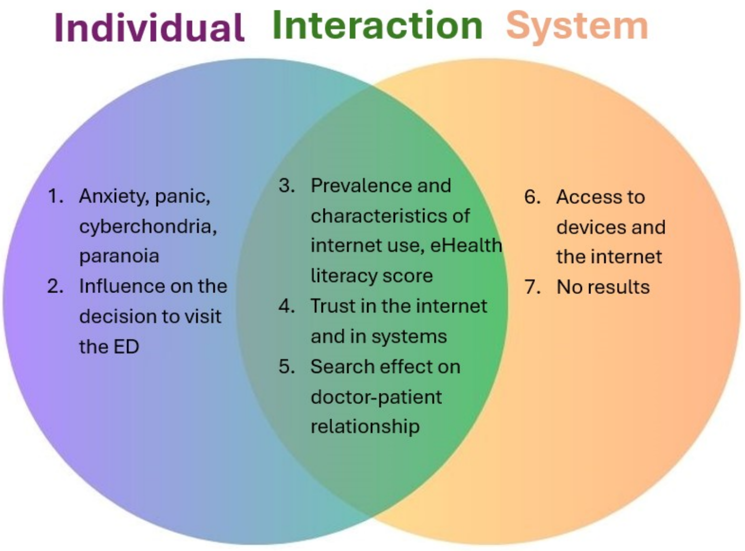
Two studies also examined access and understanding of systems. Younger participants perceived health information as more accessible from the internet, whereas older participants found health information provided by a health professional more accessible. However, all age groups found health information from a doctor easier to understand (p=0.511) and more trustworthy (p=0.061) (Scott et al., 2017). In the study by Pourmand and Sikka (2011), 58.7% of the participants found that OHI was easy to locate and 49.7% found it easy to understand.

3.3.2. Digital services that suit individual needs

The last domain "digital services that suit individual needs" (7) focuses on a user-based individual interface. The system should match the user and be adaptable to their needs. This can include an interface in a different language, tailored messages, and adaptations for disabilities. Furthermore, systems should be easy to use, and medical information clearly described without using technical jargon (Norgaard et al., 2015).

Thus far, no literature has been identified examining digital services that suit individual needs in the context of the ED.

Figure 6 summarizes the main findings and research areas in each domain, based on the e-health literacy framework (Norgaard et al., 2015).



1. Ability to process information
2. Engagement in own health
3. Ability to actively engage with digital services
4. Feel safe and in control
5. Motivated to engage with digital services
6. Access to digital services that work
7. Digital services that suit individual needs

Figure 6: Findings of this review based on the e-health literacy framework by Norgaard et al. (2015): identified topics in each category derived from the included studies as well as the original eHLF sub-groups

4. Discussion

This scoping review aimed to provide an overview of eHealth literacy in emergency care. To achieve this, evidence was screened, and the results of nine included studies were outlined narratively and graphically. The concept of eHealth literacy refers to the use, understandability, and application of information from electronic sources to address a health problem (Norman and Skinner, 2006b). This ability can be measured using the eHEALS. However, only two studies examined the eHEALS in patients visiting the ED (Cocco et al., 2018, Rutty, 2023). Given this finding, all results from the included studies were categorized using the eHLF. This framework provides an extended insight into the concept of eHealth literacy by combining individual and interactive aspects, as well as factors related to the system.

To address the research question, *"How does eHealth literacy apply in the context of emergency care?"* most findings fell into the category of “Interaction.” The objectives primarily focused on exploring the characteristics of internet usage (Asch et al., 2019, Cocco et al., 2018, Malik et al., 2019, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Rutty, 2023, Scott et al., 2017, Yastik, 2017), the correlation between internet searching, cyberchondria, and anxiety (Cocco et al., 2018, Malik et al., 2019, Martin et al., 2019, Rutty, 2023), as well as the effects of internet use on the doctor-patient relationship (Cocco et al., 2018, Malik et al., 2019, Martin et al., 2019, Rutty, 2023).

4.1. Discussion of results

First, results regarding the demographic factors as well as those associated with them will be discussed. Since technology is constantly changing and improving, the participants’ age is an important factor to consider. With a mean age ranging from 33 to 42.89 years, the population of the studies included in this master’s thesis was relatively young (Cocco et al., 2018, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Yastik, 2017). For example, the participants in one study were between 26.2 and 45.9 years old (Martin et al., 2019). Asch et al. (2019) included only 5% of participants older than 40, whereas only 28.1% of the sample in the study by Rutty (2023) were over 50, and 3.9% of participants in the study by Pourmand and Sikka (2011) were over 60. The only study that stratified its results by age and oversampled to obtain generalizable data was conducted by Scott et al.

(2017). The age groups 18 to 39 years and over 75 years had nearly identical numbers, with 156 and 157 participants, respectively. Younger participants were more likely to use the internet for health information before their ED visit and found it more accessible than consulting a doctor (Scott et al., 2017). Cocco et al. (2018) found similar results as the likelihood of searching for OHI declined with increasing age. These findings are consistent with a study by Finney Rutten et al. (2019), which found that internet searchers for health information were more prevalent among younger age groups, particularly those under 50. Another cross-sectional study, which examined the characteristics of Egyptian adults searching for online health information, reached the same conclusion: younger participants were more likely to search online (Ghweeba et al., 2017). The lack of proper consideration of age in the included studies therefore weakens the generalizability of the results, as many studies show that the average age in the ED is patients over 75 (Fimognari et al., 2022, U.S. Department of Health and Human Services, 2022). For example, Malik et al. (2019) did not mention any demographics in their study. Therefore, the results should be interpreted with caution.

Nevertheless, internet use among the older generation is rising significantly. In 2013, 18% of individuals over 65 reported owning a smartphone, a figure that rose to 42% by 2017 (Anderson and Perrin, 2017). Additionally, Faverio (2022) observes that the disparity in internet usage between the youngest and oldest groups reduced from 56% in 2000 to 24% in 2021. As individuals over 75 represent the second-largest age group attending EDs, after infants, it is essential to focus specifically on this demographic (Yang, 2024). For example, in the U.S., adults aged 50 and older account for more than 40 million ED visits annually (Cutter et al., 2020). Ohaiba et al. (2024) found the highest prevalence in the age group 75 years and older, ranging from 24.4% to 32.5%. Given that most ED patients belong to the older generation, and internet use within this group is increasing, age-specific research is necessary.

Research shows that education is one of the most important predictors of general health literacy, suggesting that individuals with higher levels of education tend to have better health literacy (Jansen et al., 2018, Protheroe et al., 2017). Moreover, education is also a factor associated with eHealth literacy. A recent review including 44 studies shows that higher education increases eHealth literacy skills (Milanti et al., 2023). Seven studies included data on education. In all of these studies, more than half of the participants had at least completed high school, suggesting that they were more likely to have high eHealth literacy skills (Cocco et al., 2018, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Rutty, 2023, Scott et al., 2017, Yastik, 2017). Participants with a higher level of education were nearly twice as likely to search for health information online (Yastik, 2017). Interestingly, in contrast to the above mentioned studies, Rutty (2023) did not find a significant correlation between education and eHealth literacy. This lack of correlation may be due to the generally high educational level of the sample. The only connection mentioned was that participants who went directly to medical websites while searching had higher levels of cyberchondria.

However, a factor that has not been considered in any of the studies included is language. About 26 million people in the U.S. over the age of five have limited English proficiency, with more than half of them speaking Spanish (Gonzalez-Barrera et al., 2024). Six studies only included English-speaking patients or those who could understand and complete English surveys (Cocco et al., 2018, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Scott et al., 2017, Yastik, 2017). Rutty (2023) included patients with at least an 8th-grade comprehension of English or French, while Asch et al. (2019) and Malik et al. (2019) did not specify participants' language and possible barriers. As a result, a significant number of participants were excluded before any measurements. This poses a problem, as language is a well-documented barrier in emergency care, as suggested by many studies. Research shows that language barriers in emergency care can hinder communication (Bakhsh et al., 2024), increase resource use, and lead to patients returning to the ED unplanned since they do not understand treatment plans (Docrat, 2020). But language is not only important in the context of the ED but also poses a key role in general health literacy. A review by Singh et al. (2022) highlights nine studies that found a significant correlation between high language proficiency and high health literacy. People with limited language proficiency and low health literacy are more likely to experience worse health outcomes (Sentell and Braun, 2012). A Norwegian survey of immigrants found similar results: low language literacy was associated with poorer health outcomes and lower self-rated health (Kjøllesdal et al., 2023). Santos-Lozada and Martinez (2018) studied self-reported health in a Hispanic population. Their results suggested that individuals who completed the survey in Spanish were more likely to report poorer or fairer health status compared to those who responded in English, highlighting the importance of language in obtaining accurate answers (Santos-Lozada and Martinez, 2018). Immigrants, in particular, face a high risk of language barriers, which can lead to challenges in understanding health information (Kreps and Sparks, 2008). Due to these findings, it is possible that not all participants fully understood the surveys and questionnaires, and many ED patients were excluded, limiting the strength of the evidence.

Besides demographic factors, the prevalence of internet use for online health information will be discussed. Results show rates of internet use for OHI ranging from 37.2% (Pourmand and Sikka, 2011) to 93.8% (Rutty, 2023). According to EUROSTAT (2022), 52% of people in the EU used the internet to search for health-related information in 2022. Even greater is the number of US citizens in this regard since 58.8% of adults searched for health information only from July to December of the same year (Wang and Cohen, 2023). One reason for the lower prevalence in the study by Pourmand and Sikka (2011) could be the year it was conducted. General internet activity in the EU has risen dramatically over the past 15 years (EUROSTAT, 2024). The findings in this master's thesis align with this trend, as the prevalence in the more recent study by Rutty (2023) is more than twice as high.

4.2. Quality of the included studies

The quality and design of the included studies vary. Six cross-sectional studies (Asch et al., 2019, Cocco et al., 2018, Malik et al., 2019, Pourmand and Sikka, 2011, Scott et al., 2017, Yastik, 2017), one qualitative study (McCarthy et al., 2017), one randomized controlled trial (Martin et al., 2019) and one mixed-methods study (Rutty, 2023) were included. Study objectives ranged from determining the general prevalence of internet use for health-related information (Cocco et al., 2018) to more specific outcomes, such as the changes in anxiety scores after searching for OHI (Rutty, 2023). Due to the heterogeneity of the outcomes, the results are difficult to compare. However, this study aimed to provide an overview of existing literature. To achieve this, all relevant studies, regardless of their quality, were included. This chapter offers an overview of methodological flaws in the included studies.

Regarding the cross-sectional studies, the most significant gaps were identified in the measurement of exposure and condition. Since no clear exposure was measured, this question was not applicable. Similarly, the condition was also mostly not applicable. However, three studies appropriately measured a condition (e.g., cyberchondria) (Rutty, 2023, Scott et al., 2017, Yastik, 2017). In addition to the exposure and condition, confounding factors were generally poorly described. Three studies did not mention confounding factors or how they were addressed (Asch et al., 2019, Malik et al., 2019, Pourmand and Sikka, 2011). Demographic data can influence eHealth literacy (Estrela et al., 2023), so this missing data lowers the quality of these studies. For example, Scott et al. (2017) stratified their results by age. With a sample size of 723 participants, their study was large, which strengthens their findings. In contrast, Yastik (2017) included only 74 participants. Malik et al. (2019) demonstrated limited overall study quality, with poorly described inclusion criteria, study subjects, and the setting as well as unclear statistical analysis.

In the qualitative study by McCarthy et al. (2017), some unclear aspects were identified, including missing data about the researcher. However, the qualitative portion of the mixed-methods study by Rutty (2023) demonstrated good quality, with no missing aspects.

The randomized controlled trial by Martin et al. (2019) also met nearly all the requirements for a study with good methodological quality. However, participants could not be blinded due to the nature of the self-administered intervention – searching online for health-related information. It is also unclear whether patient allocation was concealed, whether all outcome measurements were reliable, and whether participants were analyzed in their randomized groups.

4.3. Strengths and limitations

The following chapter outlines the strengths and limitations of this scoping review. One key strength is the systematic approach used in developing this review. It is based on a clear research question and aim. Additionally, keywords were used to create a search string for several databases, followed by a hand search and a screening of reference lists. The included studies were evaluated using critical appraisal checklists by the Joanne Briggs Institute (JBI). Furthermore, to date, no overview of existing literature on eHealth literacy in the ED has been identified, making this review particularly significant. Another notable strength is the chosen study design. By conducting a scoping review, only a few limitations were imposed, allowing for the inclusion of all relevant evidence. Moreover, only recent literature was included, with the oldest study dating back to 2011. All identified results were summarized based on the e-health literacy framework (eHLF) by Norgaard et al. (2015), allowing for clear presentation of evidence and identification of gaps.

However, the review also has its limitations. Since only studies in English and German were included, relevant studies in other languages may have been excluded. Additionally, only three databases were searched, which may have led to the omission of relevant work. Furthermore, most of the included studies were conducted in the United States, limiting the generalizability of the results (Asch et al., 2019, Martin et al., 2019, McCarthy et al., 2017, Pourmand and Sikka, 2011, Scott et al., 2017, Yastik, 2017). No European studies were identified, making comparisons challenging due to the significant differences in healthcare systems (Ciulla et al., 2023). Regarding the methodological approach, it should be noted that having only one author conduct the search, study selection, and critical appraisal poses a risk of overlooking and excluding potential studies. Another limitation is the heterogeneity of the included studies. The aims, methods, and outcomes varied significantly, limiting the ability to compare studies effectively.

4.4. Implications for research

Using the e-health literacy framework (Norgaard et al., 2015) helped identify areas where research had already been conducted and highlights existing gaps. On one hand, aspects related to how people interact with digital services have been explored. This includes, for example, general internet use for health-related information, the consequences of its use, and the motivation behind it. On the other hand, the domain “System”, particularly the subgroup “digital services that suit individual needs” has yet to be examined in the context of emergency care, as no studies were identified in this area. Given the increasing use of technology for health-related information, it is essential to understand individual needs and develop systems that meet them to help users navigate and comprehend their symptoms or conditions. Therefore, further research is crucial.

Another implication for further research is the influence of demographic factors. As demonstrated in the earlier chapters, demographic variables can impact eHealth literacy (Estrela et al., 2023). Further studies should investigate specific demographic factors such as age or education, for example, by stratifying the population into different age groups or educational levels for comparison. Another approach to studying these demographic factors is to focus on a specific age group or educational level. For instance, by examining older adults, researchers can gain a better understanding of their internet usage, needs, and expectations.

Since language proficiency is also correlated with health literacy (Singh et al., 2022), this aspect must be taken into account. Conducting surveys in multiple languages is essential to ensure that individuals from various migration backgrounds can understand the questions. Language barriers can hinder effective communication and may distort responses. In addition to multilingual surveys, interpreters can be valuable in overcoming language barriers. Interpreters can facilitate both qualitative and quantitative surveys conducted in person, over the phone, or via video. However, family members should not be used as interpreters, as they could influence the answers (Squires et al., 2020). In conclusion, addressing language barriers is essential before beginning any research. Strategies to overcome these barriers should be established beforehand to ensure that participants can express themselves freely, understand the questions accurately, and be correctly understood.

As mentioned above, research can be conducted in person, over the phone, or via video. However, using online tools may introduce an early bias that can distort results. Participation in an online survey requires specific aspects, such as access to digital services, which may not be generally available. Additionally, it can be assumed that individuals with higher eHealth literacy are more likely to participate in online studies. Therefore, to obtain a realistic scope of the topic, research should ideally avoid relying solely on digital devices or technology.

Finally, nearly all included studies followed a cross-sectional approach, which cannot establish cause and effect. Therefore, randomized controlled trials are needed. The results show that anxiety and cyberchondria are prevalent conditions among internet searchers (Malik et al., 2019, Rutty, 2023). Thus far, ED patients have been poorly researched. To gain deeper insight into people's opinions and feelings, qualitative studies should also be conducted. Kobryn and Duplaga (2024) suggest, that cyberchondria leads to higher utilization of general health care services. Given the issue of overcrowding in EDs (American College of Emergency Physicians, 2016), a better understanding of this condition is necessary. Moreover, there is no research on what patients seeking emergency care need to conduct a beneficial health-related search. People require guidance when consuming health information online and these individual needs must be examined.

In conclusion, research is needed on both general aspects, such as systems, networks and devices, and specific factors, such as demographics and language. On one hand, study designs like randomized controlled trials are essential for establishing cause and effect. On the other hand, qualitative research is necessary to understand individuals' needs and experiences with eHealth literacy, as well as their specific needs in the context of the ED.

4.5. Implications for practice

This review demonstrates that internet searches influence patients' behaviors in the ED. These behaviors include the doctor-patient relationship, their decision to visit the ED as well as emotions such as anxiety or panic. Health providers need to recognize the fact that patients may have searched for information before their visit and to address this during their care. Nurses play an important role in communicating with patients and can thereby improve the overall quality of care (Fakhr-Movahedi et al., 2016). Therefore, nurses must acknowledge and understand that patients may have searched online beforehand. Technology should be emphasized in general and further in nursing education. For example, Whitt et al. (2024) already suggest the use of electronic health records in advanced nursing education. The use, consequences, and benefits of technology in healthcare should be considered in education, as this helps healthcare providers understand patients' motivations and address concerns that arise from their online searches.

Furthermore, since nurses play an important role in helping individuals find, understand, and apply health information (Wilandika et al., 2023), eHealth literacy should be emphasized in various training programs and continuing education. The use of technology is increasing across different nursing specialties. For example, community nurses use technology to enhance patient care, with health apps, wearable devices, and telehealth being commonly employed in this field (Subiyanto, 2024). Since the COVID-19 pandemic, the demand for digital solutions and technology use, such as telemedicine, has been rising in the healthcare sector, enabling patients and relatives to consult with healthcare professionals from home. However, using technology in healthcare also introduces new challenges. Insufficient focus on the older generation, as well as the need for an improved digital infrastructure, security, and data protection, are challenging aspects. To meet these demands, training focused on eHealth literacy is necessary (Booth et al., 2021, Negreiro, 2021).

This topic should also be addressed on a governmental level. The use of online health-related information has increased drastically over the past decade (Eurostat, 2021). Therefore, high-quality medical websites that are easy to understand and accessible are essential. Although there are various guidelines and criteria for developing good quality websites, there are no legal requirements (Devine et al., 2016, Winker et al., 2000). Standards are crucial to ensure patient privacy and to provide accurate information that helps individuals make informed health-related decisions.

Additionally, this field of research must be considered within the context of health politics. According to the results of the European health literacy survey (Sørensen et al., 2015), one of the ten health goals in Austria was dedicated to health literacy: to enhance the population's health literacy (Griebler et al., 2021). Actions such as, for example, creating a platform for health literacy, offering health literacy coaching, and improving migrants' health literacy were implemented (ÖPGK, n.d.). However, results from a more recent study indicated a particular lack of skills in digital health literacy (Griebler et al., 2021). Policymakers need to recognize the importance, challenges, and potential of eHealth literacy among the general population. It is therefore essential to modify or expand health goals to include a focus on digital aspects.

Modified actions could include digital or technology coaching for the entire population, with an emphasis on vulnerable groups such as older adults, migrants, or individuals with disabilities, as well as improving access to digital devices and technology. Furthermore, telehealth services and the integration of digital health literacy in education must be enhanced. Health policymakers should implement guidelines and actively participate in creating user-friendly, understandable, and accessible health websites. Additionally, research into eHealth literacy requires financial support. Another crucial factor is misinformation. Policymakers should work on restricting the spread of misinformation and promote evidence-based health websites.

Figure 7 summarizes possible actions by health politics to enhance the populations' eHealth literacy.

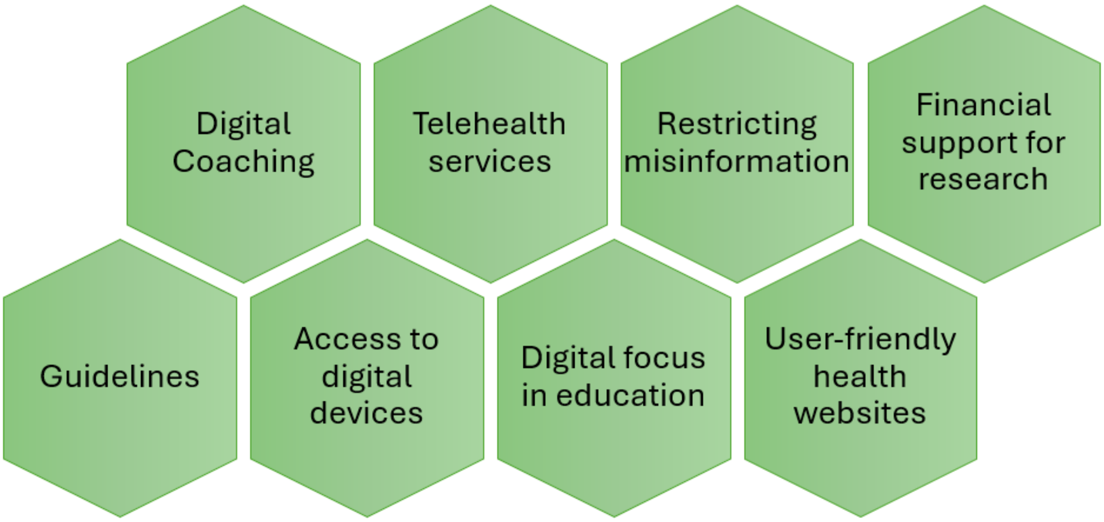


Figure 7: Different possible actions to implement by health politics to enhance eHealth literacy

Results from this review demonstrate high prevalences of internet use and, simultaneously, moderate to low eHealth literacy. Moreover, a correlation between internet searching and anxiety as well as cyberchondria was identified. This shows the importance of patient education. Interventions like courses or information events should be offered to teach individuals how to accurately search on the internet for health-related information. These courses should include teaching people which websites are trustworthy, how they can assess trustworthiness by themselves, and how to deal with information that you receive. Since demographic factors influence eHealth literacy it is important to offer courses for different age groups and different levels of knowledge.

5. Conclusion

The use of the internet to search for health-related information is increasing. However, internet use in the ED remains poorly researched. Therefore, the aim of this scoping review was to provide an overview of eHealth literacy in emergency care.

Based on the e-health literacy framework, literature across almost all domains was identified. This literature includes aspects such as the prevalence and characteristics of internet use for health-related information, its consequences, the effect on the doctor-patient relationship, and factors such as trust, understandability, and access. However, no studies were found examining digital services tailored to individual needs.

Nearly all nine included studies were conducted in the United States, which limits the generalizability of the results. Some findings suggest a correlation between OHI searches and cyberchondria, anxiety, and panic. Nevertheless, in two studies, fewer than half of the sample reported experiencing these feelings. The prevalence of internet use for health-related information ranges from 37.2%-93.8%. The most used search engine was Google. Most studies described that participants did not use the internet to determine whether they should visit the ED and participants tended to trust their healthcare practitioners more than the internet. Regarding the effects of searching for OHI, conflicting results were found. Access to devices and general OHI was widespread.

Due to the heterogeneity and lack of comparable results, further research in this area is needed. Furthermore, results suggest that demographic factors influence eHealth literacy, indicating the need for further research in these areas. Additionally, when conducting studies, language barriers have to be taken into account. Different study designs like randomized controlled trials and qualitative studies are necessary to gain insight into this topic. Healthcare providers must recognize that internet searching before ED visits is common and has to be educated to help the individuals to deal with challenges. Patients must be educated on how to use the internet appropriately for health information. Furthermore, legal standards for health-related websites are necessary to ensure the provision of adequate, evidence-based, easily understandable, and accessible information. Policymakers must understand the importance of eHealth literacy and modify health goals accordingly.

References

ALNASSER, S., ALHARBI, M., A.;, A., AAL IBRAHIM, A., KENTAB, O., ALASSAF, W. & ALJAHANY, M. 2023. Analysis of Emergency Department Use by Non-Urgent Patients and Their Visit Characteristics at an Academic Center. *Int J Gen Med,* 16**,** 221-232.

AMERICAN COLLEGE OF EMERGENCY PHYSICIANS 2016. Emergency department crowding: high-impact solutions. *ACEP task force report on boarding*.

ANDERSON, M. & PERRIN, A. 2017. *Tech Adoption Climbs Among Older Adults* [Online]. Available: https://www.pewresearch.org/internet/2017/05/17/tech-adoption-climbs-among-older-adults/ [Accessed 28.10. 2024].

ANDRUS, M. R. & ROTH, M. T. 2002. Health Literacy: A Review. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy,* 22**,** 282-302.

ANXIETY & DEPRESSION ASSOCIATION OF AMERICA. 2023. *Health Anxiety* [Online]. Available: https://adaa.org/understanding-anxiety/related-illnesses/health-anxiety [Accessed 29.08. 2024].

ASCH, J. M., ASCH, D. A., KLINGER, E. V., MARKS, J., SADEK, N. & MERCHANT, R. M. 2019. Google search histories of patients presenting to an emergency department: an observational study. *BMJ Open,* 9**,** e024791.

AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE 2014. Health literacy: A summary for Consumers.

BADR, S., NYCE, A., AWAN, T., CORTES, D., MOWDAWALLA, C. & RACHOIN, J. S. 2022. Measures of Emergency Department Crowding, a Systematic Review. How to Make Sense of a Long List. *Open Access Emerg Med,* 14**,** 5-14.

BAKARMAN, M. A. & NJAIFAN, N. K. 2014. Assessment of non-emergency cases attending emergency department at King Fahad General Hospital, Jeddah; pattern and outcomes. *Life Science Journal,* 11**,** 20-25.

BAKHSH, N. M., FATANI, O. A., MELYBARI, R. Z., ALABDULLAH, R., BAHAKEEM, R. F., ALSHARIF, S. H., ALHARBI, J. K. & FATANI, O. A. 2024. Language and Communication Barriers in Emergency Departments in Makkah: Physicians' Perspective. *Cureus,* 16**,** e58987.

BALAKRISHNAN, M. P., HERNDON, J. B., ZHANG, J., PAYTON, T., SHUSTER, J. & CARDEN, D. L. 2017. The Association of Health Literacy With Preventable Emergency Department Visits: A Cross-sectional Study. *Acad Emerg Med,* 24**,** 1042-1050.

BARKER, T. H., STONE, J. C., SEARS, K., KLUGAR, M., LEONARDI-BEE, J., TUFANARU, C., AROMATARIS, E. & MUNN, Z. 2023. Revising the JBI quantitative critical appraisal tools to improve their applicability: an overview of methods and the development process. *JBI Evidence Synthesis,* 21.

BOOTH, R. G., STRUDWICK, G., MCBRIDE, S., O'CONNOR, S. & SOLANO LÓPEZ, A. L. 2021. How the nursing profession should adapt for a digital future. *The BMJ,* 373.

BRYANT, A. G., NARASIMHAN, S., BRYANT-COMSTOCK, K. & LEVI, E. E. 2014. Crisis pregnancy center websites: Information, misinformation and disinformation. *Contraception,* 90**,** 601-605.

CANADIAN INSTITUTE FOR HEALTH INFORMATION. 2024. *NACRS emergency department visits and lengths of stay* [Online]. Available: https://www.cihi.ca/en/nacrs-emergency-department-visits-and-lengths-of-stay [Accessed 17.10. 2024].

CANÊO, L. F. & NEIROTTI, R. 2017. The Importance of the Proper Definition of Adulthood: What is and What is Not Included in a Scientific Publication. *Braz J Cardiovasc Surg,* 32**,** 60.

CIULLA, M., MARINELLI, L., DI BIASE, G., CACCIATORE, I., SANTOLERI, F., COSTANTINI, A., DIMMITO, M. P. & DI STEFANO, A. 2023. Healthcare Systems across Europe and the US: The Managed Entry Agreements Experience. *Healthcare (Basel),* 11.

COCCO, A. M., ZORDAN, R., TAYLOR, D. M., WEILAND, T. J., DILLEY, S. J., KANT, J., DOMBAGOLLA, M., HENDARTO, A., LAI, F. & HUTTON, J. 2018. Dr Google in the ED: searching for online health information by adult emergency department patients. *Med J Aust,* 209**,** 342-347.

CORNELL LAW SCHOOL-LEGAL INFORMATION INSTITUTE. 2021. *adult* [Online]. Available: https://www.law.cornell.edu/wex/adult [Accessed 28.05. 2024].

CUAN-BALTAZAR, J. Y., MUÑOZ-PEREZ, M. J., ROBLEDO-VEGA, C., PÉREZ-ZEPEDA, M. F. & SOTO-VEGA, E. 2020. Misinformation of COVID-19 on the Internet: Infodemiology Study. *JMIR Public Health Surveill,* 6**,** e18444.

CUTTER, C., LI, K., SOLNICK, R. & KOCHER, K. 2020. *Emergency Department Use Among Older Adults: Experiences & Perspectives* [Online]. Available: https://www.healthyagingpoll.org/reports-more/report/emergency-department-use-among-older-adults-experiences-perspectives [Accessed 28.10. 2024].

DÉLÉTROZ, C., ALLEN, M. C., SASSEVILLE, M., ROUQUETTE, A., BODENMANN, P. & GAGNON, M.-P. 2022. eHealth literacy measurement tools: a systematic review protocol. *Systematic Reviews,* 11**,** 205.

DEVINE, T., BRODERICK, J., HARRIS, L. M., WU, H. & HILFIKER, S. W. 2016. Making Quality Health Websites a National Public Health Priority: Toward Quality Standards. *J Med Internet Res,* 18**,** e211.

DOCRAT, N. 2020. *Language Barriers in the Emergency Centre (EC): A survey of secondary public hospital EC doctors on the perceived presence and impact of language barriers.*

EBSCO CONNECT. 2019. *Advanced Searching with CINAHL® Subject Headings* [Online]. Available: https://connect.ebsco.com/s/article/Advanced-Searching-with-CINAHL-Subject-Headings?language=en_US [Accessed 30.04. 2024].

ERENLER, A. K., AKBULUT, S., GUZEL, M., CETINKAYA, H., KARACA, A., TURKOZ, B. & BAYDIN, A. 2014. Reasons for Overcrowding in the Emergency Department: Experiences and Suggestions of an Education and Research Hospital. *Turk J Emerg Med,* 14**,** 59-63.

ESTRELA, M., SEMEDO, G., ROQUE, F., FERREIRA, P. L. & HERDEIRO, M. T. 2023. Sociodemographic determinants of digital health literacy: A systematic review and meta-analysis. *International Journal of Medical Informatics,* 177**,** 105124.

EUROSTAT. 2021. *One in two EU citizens look for health information online* [Online]. Available: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20210406-1 [Accessed 12.04. 2024].

EUROSTAT. 2022. *What did we use the internet for in 2022?* [Online]. Available: https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20221215-2#:~:text=At%20the%20EU%20level%2C%20in,website%20or%20app%20instead%20of [Accessed 26.08. 2024].

EUROSTAT. 2024. *Individuals - internet activities* [Online]. Available: https://ec.europa.eu/eurostat/databrowser/view/ISOC_CI_AC_I__custom_469754/bookmark/table?lang=en&bookmarkId=1cfc5098-5f1e-44c0-af52-f57202ab9c14 [Accessed 26.08. 2024].

FAKHR-MOVAHEDI, A., RAHNAVARD, Z., SALSALI, M. & NEGARANDEH, R. 2016. Exploring Nurse's Communicative Role in Nurse-Patient Relations: A Qualitative Study. *J Caring Sci,* 5**,** 267-276.

FAVERIO, M. 2022. *Share of those 65 and older who are tech users has grown in the past decade* [Online]. Available: https://www.pewresearch.org/short-reads/2022/01/13/share-of-those-65-and-older-who-are-tech-users-has-grown-in-the-past-decade/#:~:text=And%2096%25%20of%20those%2050,it%20now%20is%2024%20points. [Accessed 28.10. 2024].

FIMOGNARI, F. L., LELLI, D., LANDI, F. & ANTONELLI INCALZI, R. 2022. Association of age with emergency department visits and hospital admissions: A nationwide study. *Geriatr Gerontol Int,* 22**,** 917-923.

FINNEY RUTTEN, L. J., BLAKE, K. D., GREENBERG-WORISEK, A. J., ALLEN, S. V., MOSER, R. P. & HESSE, B. W. 2019. Online Health Information Seeking Among US Adults: Measuring Progress Toward a Healthy People 2020 Objective. *Public Health Rep,* 134**,** 617-625.

GHWEEBA, M., LINDENMEYER, A., SHISHI, S., ABBAS, M., WAHEED, A. & AMER, S. 2017. What Predicts Online Health Information-Seeking Behavior Among Egyptian Adults? A Cross-Sectional Study. *J Med Internet Res,* 19**,** e216.

GONZALEZ-BARRERA, A., HAMEL, L., ARTIGA, S. & PRESIADO, M. 2024. *Language Barriers in Health Care: Findings from the KFF Survey on Racism, Discrimination, and Health* [Online]. Available: https://www.kff.org/racial-equity-and-health-policy/poll-finding/language-barriers-in-health-care-findings-from-the-kff-survey-on-racism-discrimination-and-health/ [Accessed 24.08. 2024].

GONZÁLEZ-FERNÁNDEZ, C., FERNÁNDEZ-ISABEL, A., MARTÍN DE DIEGO, I., FERNÁNDEZ, R. R. & VISEU PINHEIRO, J. F. J. 2021. Experts perception-based system to detect misinformation in health websites. *Pattern Recognition Letters,* 152**,** 333-339.

GRIEBLER, R., STRAßMAYR, C., MIKŠOVÁ, D., LINK, T., NOWAK, P. & UND DIE ARBEITSGRUPPE GESUNDHEITSKOMPETENZ-MESSUNG DER ÖPGK 2021. Gesundheitskompetenz Österreich: Ergebnisse der österreichischen Gesundheitskompetenzerhebung HLS19-AT. Vienna.

HERNDON, J. B., CHANEY, M. & CARDEN, D. 2011. Health literacy and emergency department outcomes: a systematic review. *Ann Emerg Med,* 57**,** 334-45.

HLS19 CONSORTIUM OF THE WHO ACTION NETWORK M-POHL 2021. International Report on the Methodology, Results, and Recommendations of the European Health Literacy

Population Survey 2019-2021 (HLS19) of M-POHL. Vienna.

JANSEN, T., RADEMAKERS, J., WAVERIJN, G., VERHEIJ, R., OSBORNE, R. & HEIJMANS, M. 2018. The role of health literacy in explaining the association between educational attainment and the use of out-of-hours primary care services in chronically ill people: a survey study. *BMC Health Serv Res,* 18**,** 394.

JBI 2020a. Checklist for analytical cross sectional studies.

JBI 2020b. Checklist for qualitative research.

JBI 2023. JBI critical appraisal tool for assessment of risk of bias for randomized controlled trials.

KEMP, S. 2023. *Digital 2023: Global Overview Report* [Online]. Available: https://datareportal.com/reports/digital-2023-global-overview-report [Accessed 28.05. 2024].

KJØLLESDAL, M. K. R., GERWING, J. & INDSETH, T. 2023. Proficiency in the Norwegian language and self-reported health among 12 immigrant groups in Norway: A cross-sectional study. *Scand J Public Health,* 51**,** 363-370.

KOBRYN, M. & DUPLAGA, M. 2024. Cyberchondria severity and utilization of health services in Polish society: a cross-sectional study. *BMC Public Health,* 24**,** 902.

KREPS, G. L. & SPARKS, L. 2008. Meeting the health literacy needs of immigrant populations. *Patient Educ Couns,* 71**,** 328-32.

LEE, J., LEE, E. H. & CHAE, D. 2021. eHealth Literacy Instruments: Systematic Review of Measurement Properties. *J Med Internet Res,* 23**,** e30644.

LINN, A. J., VAN WEERT, J. C. M., GEBEYEHU, B. G., SANDERS, R., DIVIANI, N., SMIT, E. G. & VAN DIJK, L. 2019. Patients' Online Information-Seeking Behavior Throughout Treatment: The Impact on Medication Beliefs and Medication Adherence. *Health Commun,* 34**,** 1461-1468.

MALIK, M., MUSTAFA, M., YASEEN, M., GHAURI, S. K. & JAVAEED, A. 2019. Assessment of cyberchondria among patients presenting to the emergency department of a tertiary care hospital in Islamabad, Pakistan. *South Asian Journal of Emergency Medicine***,** 1.

MARTIN, S. S., QUAYE, E., SCHULTZ, S., FASHANU, O. E., WANG, J., SAHEED, M. O., PREM, R., DE FREITAS, H., RIBEIRO-NETO, B. & PARAKH, K. 2019. A randomized controlled trial of online symptom searching to inform patient generated differential diagnoses. *NPJ Digit Med,* 2**,** 110.

MATHES, B. M., NORR, A. M., ALLAN, N. P., ALBANESE, B. J. & SCHMIDT, N. B. 2018. Cyberchondria: Overlap with health anxiety and unique relations with impairment, quality of life, and service utilization. *Psychiatry Research,* 261**,** 204-211.

MCCARTHY, D. M., SCOTT, G. N., COURTNEY, D. M., CZERNIAK, A., ALDEEN, A. Z., GRAVENOR, S. & DRESDEN, S. M. 2017. What Did You Google? Describing Online Health Information Search

Patterns of ED patients and Their Relationship with Final Diagnoses. *West J Emerg Med,* 18**,** 928-936.

MCLEOD, J., YU, I. & INGLEDEW, P. A. 2017. Peering into the Deep: Characterizing the Internet Search Patterns of Patients with Gynecologic Cancers. *J Cancer Educ,* 32**,** 85-90.

MILANTI, A., CHAN, D. N. S., PARUT, A. A. & SO, W. K. W. 2023. Determinants and outcomes of eHealth literacy in healthy adults: A systematic review. *PLoS One,* 18**,** e0291229.

MUNN, Z., POLLOCK, D., KHALIL, H., ALEXANDER, L., MCLNERNEY, P., GODFREY, C. M., PETERS, M. & TRICCO, A. C. 2022. What are scoping reviews? Providing a formal definition of scoping reviews as a type of evidence synthesis. *JBI Evidence Synthesis,* 20.

MUSE, K., MCMANUS, F., LEUNG, C., MEGHREBLIAN, B. & WILLIAMS, J. M. 2012. Cyberchondriasis: fact or fiction? A preliminary examination of the relationship between health anxiety and searching for health information on the Internet. *J Anxiety Disord,* 26**,** 189-96.

NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, MEDICINE, NATIONAL ACADEMY OF, MEDICINE & COMMITTEE ON THE FUTURE OF NURSING 2021. The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity. *In:* FLAUBERT, J. L., LE MENESTREL, S., WILLIAMS, D. R. & WAKEFIELD, M. K. (eds.). Washington (DC).

NATIONAL LIBRARY OF MEDICINE. 2024. *Welcome to Medical Subject Headings* [Online]. Available: https://www.nlm.nih.gov/mesh/meshhome.html [Accessed 30.04. 2024].

NEGREIRO, M. 2021. The rise of digital health technologies during the pandemic. European Parliamentary Research Service.

NORGAARD, O., FURSTRAND, D., KLOKKER, L., KARNOE KNUDSEN, A., BATTERHAM, R., KAYSER, L. & OSBORNE, R. 2015. The e-health literacy framework: A conceptual framework for characterizing e-health users and their interaction with e-health systems. *Knowledge Management and E-Learning,* 7**,** 522–40.

NORMAN, C. & SKINNER, H. 2006a. eHEALS: the ehealth literacy scale. *Journal of medical Internet research,* 8**,** e27.

NORMAN, C. & SKINNER, H. A. 2006b. eHealth Literacy: Essential Skills for Consumer Health in a Networked World. *J Med Internet Res,* 8**,** e9.

NUMMEDAL, M. A., MARKUSSEN, D. L., NÆSS, L. E., LAUGSAND, L. E. & BJØRNSEN, L. P. 2024. Patient influx to emergency departments at two Norwegian university hospitals from 2012-21. *Tidsskr Nor Laegeforen,* 144.

NUTBEAM, D. 2000. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International,* 15**,** 259-267.

OHAIBA, M. M., ANAMAZOBI, E. G., OKOBI, O. E., AGUDA, K. & CHUKWU, V. U. 2024. Trends and Patterns in Emergency Department Visits: A Comprehensive Analysis of Adult Data From the National Center for Health Statistics (NCHS) Database. *Cureus,* 16**,** e66059.

ÖPGK. n.d. *Gesundheitsziel 3* [Online]. Available: https://gesundheitsziele-oesterreich.at/gesundheitsziele-und-arbeitsgruppen/gesundheitsziel-3/ [Accessed 05.11. 2024].

PARK, E. & KWON, M. 2018. Health-Related Internet Use by Children and Adolescents: Systematic Review. *J Med Internet Res,* 20**,** e120.

PARNELL, T. A. 2014. Health Literacy: History, Definitions, and Models. New York: Springer Publishing Company.

PEARCE, S., MARCHAND, T., SHANNON, T., GANSHORN, H. & LANG, E. 2023. Emergency department crowding: an overview of reviews describing measures causes, and harms. *Internal and Emergency Medicine,* 18**,** 1137-1158.

PETERS, M. D. J., MARNIE, C., TRICCO, A. C., POLLOCK, D., MUNN, Z., ALEXANDER, L., MCINERNEY, P., GODFREY, C. M. & KHALIL, H. 2020. Updated methodological guidance for the conduct of scoping reviews. *JBI Evidence Synthesis,* 18.

POURMAND, A. & SIKKA, N. 2011. Online health information impacts patients' decisions to seek emergency department care. *West J Emerg Med,* 12**,** 174-7.

PROTHEROE, J., WHITTLE, R., BARTLAM, B., ESTACIO, E. V., CLARK, L. & KURTH, J. 2017. Health literacy, associated lifestyle and demographic factors in adult population of an English city: a cross-sectional survey. *Health Expect,* 20**,** 112-119.

RIOS, G. R. 2013. eHealth Literacy and Older Adults: A Review of Literature. *Topics in Geriatric Rehabilitation,* 29**,** 116-125.

RUTTY, D. P. 2023. *Investigating the Implications of Online Health Information Seeking and Prevalence of Cyberchondria Amongst Patients Visiting Emergency Departments.* MA, University of Ottawa.

RUXIN, T., FELDMEIER, M., ADDO, N. & HSIA, R. Y. 2023. Trends by Acuity for Emergency Department Visits and Hospital Admissions in California, 2012 to 2022. *JAMA Network Open,* 6**,** e2348053-e2348053.

SAAIMAN, T., FILMALTER, C. J. & HEYNS, T. 2021. Important factors for planning nurse staffing in the emergency department: A consensus study. *Int Emerg Nurs,* 56**,** 100979.

SALWAY, R. J., VALENZUELA, R., SHOENBERGER, J. M., MALLON, W. K. & VICCELLIO, A. 2017. Emergency Department (ED) overcrowding: evidence-based answers to frequently asked questions. *Revista Médica Clínica Las Condes,* 28**,** 213-219.

SANTOS-LOZADA, A. R. & MARTINEZ, M. J. 2018. How Have You Been? or ¿Como estás?: Does Language of Interview Influences Self-Rated Health Among Hispanic Subgroups? *J Immigr Minor Health,* 20**,** 766-775.

SARTINI, M., CARBONE, A., DEMARTINI, A., GIRIBONE, L., OLIVA, M., SPAGNOLO, A. M., CREMONESI, P., CANALE, F. & CRISTINA, M. L. 2022. Overcrowding in Emergency Department: Causes, Consequences, and Solutions-A Narrative Review. *Healthcare (Basel),* 10.

SCHUMACHER, J. R., HALL, A. G., DAVIS, T. C., ARNOLD, C. L., BENNETT, R. D., WOLF, M. S. & CARDEN, D. L. 2013. Potentially preventable use of emergency services: the role of low health literacy. *Med Care,* 51**,** 654-8.

SCOTT, G., MCCARTHY, D. M., ALDEEN, A. Z., CZERNIAK, A., COURTNEY, D. M. & DRESDEN, S. M. 2017. Use of Online Health Information by Geriatric and Adult Emergency Department Patients: Access, Understanding, and Trust. *Acad Emerg Med,* 24**,** 796-802.

SEÇKIN, G., HUGHES, S., HUDSON, C., LALJER, D. & YEATTS, D. 2018. Positive Impacts of Online Health Information Seeking on Health Perceptions and the Mediational Relationship with Health Communication and Sense of Empowerment. *In:* HALE, T. M., CHOU, W.-Y. S., COTTEN, S. R. & KHILNANI, A. (eds.) *eHealth: Current Evidence, Promises, Perils and Future Directions.* Emerald Publishing Limited.

SENTELL, T. & BRAUN, K. L. 2012. Low health literacy, limited English proficiency, and health status in Asians, Latinos, and other racial/ethnic groups in California. *J Health Commun,* 17 Suppl 3**,** 82-99.

SHAHID, R., SHOKER, M., CHU, L. M., FREHLICK, R., WARD, H. & PAHWA, P. 2022. Impact of low health literacy on patients' health outcomes: a multicenter cohort study. *BMC Health Services Research,* 22**,** 1148.

SIMONDS, S. K. 1974. Health Education as Social Policy. *Health Education Monographs,* 2**,** 1-10.

SINGH, H., KOLSCHEN, J., SAMKANGE-ZEEB, F., BRAND, T., ZEEB, H. & SCHÜZ, B. 2022. Modifiable predictors of health literacy in working-age adults - a rapid review and meta-analysis. *BMC Public Health,* 22**,** 1450.

SØRENSEN, K., PELIKAN, J. M., RÖTHLIN, F., GANAHL, K., SLONSKA, Z., DOYLE, G., FULLAM, J., KONDILIS, B., AGRAFIOTIS, D., UITERS, E., FALCON, M., MENSING, M., TCHAMOV, K., VAN DEN BROUCKE, S. & BRAND, H. 2015. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). *Eur J Public Health,* 25**,** 1053-8.

SQUIRES, A., SADARANGANI, T. & JONES, S. 2020. Strategies for overcoming language barriers in research. *J Adv Nurs,* 76**,** 706-714.

STARCEVIC, V. & BERLE, D. 2013. Cyberchondria: towards a better understanding of excessive health-related Internet use. *Expert Review of Neurotherapeutics,* 13**,** 205-213.

STATISTICS AUSTRIA. 2023a. *IKT-Einsatz in Haushalten* [Online]. Available: https://www.statistik.at/statistiken/forschung-innovation-digitalisierung/digitale-wirtschaft-und-gesellschaft/ikt-einsatz-in-haushalten [Accessed 28.05. 2024].

STATISTICS AUSTRIA. 2023b. *Inpatient health care: hospital discharges* [Online]. [Accessed 28.05. 2024].

STATISTICS AUSTRIA 2023c. More than 60% of the population have basic digital skills. Vienna.

STELLEFSON, M., HANIK, B., CHANEY, B., CHANEY, D., TENNANT, B. & CHAVARRIA, E. 2011. eHealth Literacy Among College Students: A Systematic Review With Implications for eHealth Education. *Journal of medical Internet research,* 13**,** e102.

SUBIYANTO, P. G., S.; SULIANTI, A.; SURYANINGSIH, C.; 2024. Community Nursing in the digital age, utilizing Technology to improve health Services. *Oshada,* 1**,** 73-82.

TRICCO, A. C., LILLIE, E., ZARIN, W., O'BRIEN, K. K., COLQUHOUN, H., LEVAC, D., MOHER, D., PETERS, M. D. J., HORSLEY, T., WEEKS, L., HEMPEL, S., AKL, E. A., CHANG, C., MCGOWAN, J., STEWART, L., HARTLING, L., ALDCROFT, A., WILSON, M. G., GARRITTY, C., LEWIN, S., GODFREY, C. M., MACDONALD, M. T., LANGLOIS, E. V., SOARES-WEISER, K., MORIARTY, J., CLIFFORD, T., TUNÇALP, Ö. & STRAUS, S. E. 2018. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med,* 169**,** 467-473.

TRISYANI, Y., EMALIYAWATI, E., PRAWESTI, A., MIRWANTI, R. & MEDIANI, H. S. 2023. Emergency Nurses' Competency in the Emergency Department Context: A Qualitative Study. *Open Access Emerg Med,* 15**,** 165-175.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. 2022. *QuickStats: Emergency Department Visit Rates by Age Group — United States, 2019–2020* [Online]. Available: https://www.cdc.gov/mmwr/volumes/71/wr/mm7142a5.htm#suggestedcitation [Accessed 24.08. 2024].

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. 2024. *Health Misinformation* [Online]. Available: https://www.hhs.gov/surgeongeneral/priorities/health-misinformation/index.html [Accessed 29.08. 2024].

USCHER-PINES, L., PINES, J., KELLERMANN, A., GILLEN, E. & MEHROTRA, A. 2013. Emergency department visits for nonurgent conditions: systematic literature review. *Am J Manag Care,* 19**,** 47-59.

WANG, X. & COHEN, R. A. 2023. Health information technology use among adults: United States, July–December 2022. *National Center for Health Statistics (U.S.)*.

WHITT, K. J., ALLEN, C. L., HOGG, C. W., PERICAK, A., BEEBE, S. L., BRAUNGART, C., KNESTRICK, J., HARROD, T. & MCNELIS, A. M. 2024. The use of electronic health records in advanced practice nursing education: a scoping review. *Journal of Professional Nursing,* 50**,** 83-94.

WILANDIKA, A., PANDIN, M. G. R. & YUSUF, A. 2023. The roles of nurses in supporting health literacy: a scoping review. *Front Public Health,* 11**,** 1022803.

WINKER, M. A., FLANAGIN, A., CHI-LUM, B., WHITE, J., ANDREWS, K., KENNETT, R. L., DEANGELIS, C. D. & MUSACCHIO, R. A. 2000. Guidelines for Medical and Health Information Sites on the InternetPrinciples Governing AMA Web Sites. *JAMA,* 283**,** 1600-1606.

WOLFE, C. R., EYLEM, A. A., DANDIGNAC, M., LOWE, S. R., WEBER, M. L., SCUDIERE, L. & REYNA, V. F. 2023. Understanding the landscape of web-based medical misinformation about vaccination. *Behavior Research Methods,* 55**,** 348-363.

YANG, J. 2024. *Number of emergency department visits per 100 people in the United States in 2022, by age group* [Online]. Available: https://www.statista.com/statistics/184432/us-population-with-emergency-room-visits-by-age/#statisticContainer [Accessed 28.10. 2024].

YASTIK, J. M. 2017. *Online Health Information Gathering And Health Service Utilization By Emergency Department Patients With Acute, Non-Urgent Illness Symptoms.* Doctor of Philosophy, Wayne State University.

YUEN, E., WINTER, N., SAVIRA, F., HUGGINS, C. E., NGUYEN, L., COOPER, P., PEETERS, A., ANDERSON, K., BHOYROO, R., CROWE, S. & UGALDE, A. 2024. Digital Health Literacy and Its Association

With Sociodemographic Characteristics, Health Resource Use, and Health Outcomes: Rapid Review. *Interact J Med Res,* 13**,** e46888.

Appendix

Search strings

PubMed

112 results

((("electronic health literacy"[Title/Abstract] OR "mhealth literacy"[Title/Abstract] OR "online health literacy"[Title/Abstract] OR "digital health literacy"[Title/Abstract] OR "electronic health information"[Title/Abstract] OR "online health information"[Title/Abstract] OR "internet usage"[Title/Abstract] OR "digital health information"[Title/Abstract] OR "ehealth literacy"[Title/Abstract]) AND (emergency department* OR emergency room* OR emergency unit* OR "emergency care" OR "ED" OR "ER" OR emergency service, hospital[MeSH Terms] OR (emergency room visits[MeSH Terms])) AND (adult[MeSH Terms] OR adult OR aged OR middle aged OR young adult)))

CINAHL

31 results

S1 TI "electronic health literacy" OR TI "mhealth literacy" OR TI "online health literacy" OR TI "digital health literacy" OR TI "electronic health information" OR TI "online health information" OR TI "digital health information" OR TI "ehealth literacy"

S2 AB "electronic health literacy" OR AB "mhealth literacy" OR AB "online health literacy" OR AB "digital health literacy" OR AB "electronic health information" OR AB "online health information" OR AB "digital health information" OR AB "ehealth literacy" OR AB

S3 S1 OR S2

S4 emergency department* OR emergency room* OR emergency unit* OR "emergency care" OR "ED" OR "ER" OR MH emergency service, hospital OR MH emergency treatment OR “emergency treatment” OR MH emergency care

S5 adult OR MH adult OR aged OR middle aged OR young adult

S6 S3 AND S4 AND S5

<u>Ovid (Embase, Cochrane)</u>

54 results

EBM Reviews - Cochrane Database of Systematic Reviews <2005 to April 22, 2024>

Embase <1974 to 2024 April 30>

1 ("electronic health literacy" or "mhealth literacy" or "online health literacy" or "digital health literacy" or "electronic health information" or "online health information" or "digital health information" or "ehealth literacy" or “internet usage”).ti.

2 ("electronic health literacy" or "mhealth literacy" or "online health literacy" or "digital health literacy" or "electronic health information" or "online health information" or "digital health information" or "ehealth literacy" or “internet usage”).ab.

3 1 or 2

4 (emergency department* or emergency room* or emergency unit* or "emergency care" or "ED" or "ER").af.

5 (adult or aged or middle aged or young adult).af.

6 3 and 4 and 5

<u>Google Scholar</u>

100 results

(electronic health literacy OR online health literacy OR digital health literacy OR online health information OR ehealth literacy) AND (emergency department* OR emergency room* OR emergency unit* OR emergency care) AND (adult)