Review

Associations of Health Literacy and eHealth Literacy With Patient Portal Access and Use: Systematic Review

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Abstract

Background: Effective patient portal access and use require both digital navigation and understanding of clinical information. Health literacy and eHealth literacy reflect these different demands. Although the 2 constructs overlap, prior research often treats them as interchangeable. It remains unclear whether health literacy and eHealth literacy are associated differently across stages of portal engagement and patterns of portal use. A systematic review is therefore needed to identify consistent patterns across studies.

Objective: This study aimed to synthesize associations of health literacy and eHealth literacy with patient portal access, general use, feature-specific use, and frequency of use.

Methods: We searched PubMed, Scopus, CINAHL, PsycINFO, Web of Science, and Embase from inception to March 2026 using keywords related to health literacy, eHealth literacy, patient portals, and portal access or use. We included English-language peer-reviewed articles and gray literature involving adults who used real-world patient portals, measured health literacy or eHealth literacy using validated instruments, and reported quantitative associations with portal access or use. Because studies differed substantially in literacy instruments, portal outcomes, and outcome measures, we used direction-based vote counting, complemented by narrative synthesis. Reporting followed the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) statement, whereas synthesis methods were guided by the Cochrane Handbook for synthesis without meta-analysis. For full-text, peer-reviewed journal articles, we assessed the risk of bias by using the Joanna Briggs Institute (JBI) critical appraisal tools.

Results: Among 1107 screened studies, 30 met the inclusion criteria. Of these, 17 examined health literacy only, 10 examined eHealth literacy only, and 3 examined both constructs in the same sample. Studies focused far more on portal use than on portal access and emphasized general portal use over feature-specific outcomes. Any use was assessed more often than frequency of use. Nine of 10 directionally codable eHealth literacy studies of general portal use showed lower use among individuals with lower eHealth literacy, whereas health literacy findings for general portal use were mixed. Lower health literacy showed a more consistent pattern of lower portal access and several feature-specific outcomes, although comparable eHealth literacy evidence for these outcomes was limited. Most studies met the majority of JBI criteria, although most measured portal use via self-report rather than objective system data.

Conclusions: Nearly every directionally codable eHealth literacy study reported lower portal use among patients with lower eHealth literacy. Lower health literacy showed similar patterns for portal access and several feature-specific outcomes. These consistent associations point to literacy-related disparities at multiple stages of portal engagement, although comparable

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within-sample evidence remains limited. Future studies should measure both constructs in the same sample, use comparable modeling approaches, use objective portal log data when possible, and distinguish access, any use, frequency, and feature-specific behaviors to identify where literacy-related disparities emerge.

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KEYWORDS

patient portals; health literacy; eHealth literacy; digital health; patient participation; systematic review

Introduction

A patient portal is a secure web or mobile interface linked to the electronic health record that provides patients with access to their health information, including laboratory results, visit summaries, immunization records, scheduling, and vital signs [1-3]. In 2024, about 77% of US adults reported being offered online access to their medical records, compared with 52% in 2017 [4]. Despite broader availability, access alone does not ensure meaningful ongoing portal use.

To benefit from a portal, patients must be able to register, log in, navigate relevant features, interpret clinical content, and act on what they read. These tasks involve both digital navigation and comprehension of complex health information [5]. When patients use portals effectively, benefits include better engagement in care, stronger communication with clinicians, and improved management of chronic and preventive care needs [2,6,7]. Yet, the most commonly reported barriers to portal use remain insufficient digital skills or difficulty understanding medical content [8], which indicates that barriers persist even after access is established.

Health literacy and eHealth literacy map directly onto these 2 barriers. Health literacy refers to the ability to obtain, process, and understand health information to make appropriate health-related decisions [9]. Low health literacy affects about one-third of US adults [10] and increases the risk of misunderstanding health information [11]. eHealth literacy was originally defined as the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to a health problem [12]. More recent work has expanded this concept to include the ability to engage with digital technologies in effective, safe, and helpful ways to achieve health goals [13]. eHealth literacy therefore extends beyond information seeking to include the skills needed to use digital health tools, such as patient portals [12].

Although health literacy and eHealth literacy overlap, the 2 are not identical [14]. The Centers for Disease Control and Prevention has cautioned against using them interchangeably [15]. Health literacy focuses primarily on understanding health information and how to act on it [16], whereas eHealth literacy adds the digital skills needed to work with online health information and digital health tools [12,13]. A recent systematic review and meta-analysis found only a weak positive correlation between the 2 constructs (r=0.29), suggesting they capture distinct skill domains rather than variations on a single construct [17]. In patient portal research, this distinction matters: some patients may struggle mainly with digital navigation, others with interpreting the clinical information they find inside the portal.

A second challenge is how portal engagement is measured. Prior research usually defines portal use as whether patients used the portal at all, with less attention to how often they returned [18]. Yet one-time use and sustained use reflect different levels of engagement [3,18]. A patient might register and log in once but never return. Studies focusing only on any use may therefore miss whether literacy-related barriers affect initial uptake, continued use, or both.

Existing reviews have focused mainly on health literacy, giving limited attention to eHealth literacy, and have not clearly separated gaining access to a portal from using it after access is established [3,19]. To our knowledge, no prior review has examined how health literacy and eHealth literacy together relate to portal access, any use, frequency of use, and feature-specific use. Given these gaps, a systematic review is needed to integrate the available evidence across studies and identify consistent patterns. This matters because patients with lower literacy skills may be using portals less, or not at all, while their providers and health systems assume otherwise. As a result, these patients may not recognize critical abnormal test results and clinical changes that require immediate follow-up, delaying diagnosis and treatment. The gap between portal access and meaningful engagement has also been documented among real-world portal users, who frequently encounter difficulty understanding the relevance and clinical significance of test results even after accessing the portal [20]. If health literacy and eHealth literacy relate differently to portal engagement, treating them as interchangeable could misdirect intervention efforts and result in medical errors, such as missed test results. For example, plain-language materials will not reach patients who cannot complete registration, while digital navigation support alone will not address the needs of patients who log in but cannot understand or act on the information they read.

The objective of this systematic review was to synthesize evidence on the associations of health literacy and eHealth literacy with patient portal access, general use, feature-specific use, and frequency of use. The goal of this work is to identify where literacy-related disparities emerge and where targeted support could reduce them.

Methods

Overview

This systematic review was reported in accordance with the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) statement [21]. The synthesis methods were guided by the Cochrane Handbook guidance for synthesis

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without meta-analysis [22]. A review protocol was not registered, as this review began as an exploratory assessment of how literacy and portal outcomes were measured.

Eligibility Criteria

We included peer-reviewed articles and gray literature, including conference abstracts and papers, as well as theses, to minimize publication bias. Eligible studies (1) involved adults aged 18 years or older from clinical, community, or online samples; (2) evaluated a real-world patient portal, defined as a portal implemented in routine health care and used by patients rather than a hypothetical or simulated portal; (3) measured health literacy or eHealth literacy using a validated instrument; (4) reported a quantitative association between health literacy or eHealth literacy and patient portal access or use; and (5) were published in English. We excluded studies that evaluated nonportal technologies, such as electronic health record access without a patient portal, or focused only on user perceptions or qualitative outcomes, such as satisfaction, usability, or ease of use.

Information Sources and Search Strategy

We conducted a systematic search in PubMed, Scopus, CINAHL, PsycINFO, Web of Science, and Embase using database-specific free-text search strings related to health literacy, eHealth literacy, patient portals, and portal access or use, combined with Boolean operators. The search strategy was developed by the research team without support from a research librarian. Full search strings for each database are provided in Multimedia Appendix 1. No restrictions were applied to the publication date range. All searches were conducted on March 20, 2026.

Selection Process

All search results were imported into Covidence, where duplicates were identified and removed automatically or manually before title and abstract screening. Five reviewers (PH, MA, AP, AR, and SK) screened titles and abstracts in Covidence using predefined eligibility criteria, with each record assessed independently by 2 of them. Studies that passed the initial title and abstract screening advanced to full-text review, where the same 5 reviewers (PH, MA, AP, AR, and SK) applied the eligibility criteria, again with each article assessed independently by 2 of them. Any disagreements were resolved through discussion and consensus.

Interrater agreement for title and abstract screening, measured with Cohen's kappa (κ), ranged from κ=0.50 to κ=0.57, indicating moderate agreement [23]. The moderate kappa values likely reflect κ's prevalence sensitivity, since most title and abstract screening decisions were exclusions, which can lower kappa despite high observed agreement [24,25]. In contrast, proportion agreement for title and abstract screening ranged from 85% to 97%. Discrepancies arose from unclear abstracts, especially when studies did not clearly distinguish real-world patient portals from hypothetical portals or other digital technologies or did not clearly report quantitative outcomes of portal access or use. For full-text screening, agreement ranged from κ=0.79 to κ=1.00, indicating substantial or almost perfect agreement.

Data Collection Process and Data Items

For each study, we extracted data on key study characteristics, literacy measurement, and patient portal outcomes. Two of the 5 reviewers (PH, MA, AP, AR, and SK) independently extracted and compared data for each study, and any discrepancies were resolved by consensus. Interrater agreement for data extraction was substantial, with κ ranging from 0.76 to 0.80.

Outcome Classification

To support consistent synthesis across heterogeneous studies, we developed an outcome classification scheme during data extraction and applied it across all included studies. The framework and its definitions were derived inductively from the portal outcomes reported in the included studies, refined through reviewer discussion, and then applied consistently across studies. Specifically, we classified outcomes at 2 levels: outcome domain and portal outcome. The outcome domain referred to the broad stage of portal engagement, either portal access or portal use. We defined portal access as the early steps required to gain entry to the portal, and portal use as behaviors occurring after access had been established. The portal outcome referred to the specific action within each domain. This process yielded the following hierarchy:

1. Domain 1: portal access

- Account setup or activation: completion of portal registration, account creation, invitation acceptance, enrollment, or activation
- First portal login: first successful login to the portal after account setup or activation

2. Domain 2: portal use

- General portal use: any overall use of the patient portal after the first login, not tied to a specific feature
- Messaging: viewing, receiving, sending, or replying to portal messages
- Test results viewing: accessing laboratory or other health check results
- Vital sign monitoring: viewing, entering, or monitoring vital signs
- Note viewing: viewing physician or other clinical notes
- Appointments: viewing, scheduling, or managing appointments
- Medications and refills: viewing medications, managing prescriptions, or requesting refills
- Patient-reported outcome (PRO) measures: completing PRO measures, often before appointments
- Health education materials: viewing or accessing educational content in the portal

Following Beal et al [18] suggestions for quantifying portal use, we also classified portal use outcomes by outcome measure. Within the portal use domain, outcome measures were classified as (1) any use, defined as a binary indicator of whether a patient used the portal overall or a specific feature at least once, or (2) frequency of use, reflecting how often the patient used the portal or feature.

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Literacy Measurement and Harmonization

We first identified whether each study measured health literacy or eHealth literacy. Most health literacy studies used dichotomous categorical measures, though the labels varied across studies, for example, limited, low, problematic, inadequate, or no limitation. To improve comparability across studies, we harmonized all categorical classifications to a common lower versus higher health literacy framing. A few studies used 3 ordered categories, such as limited, marginal, and adequate health literacy. In those cases, we used the most extreme contrast, for example, limited versus adequate health literacy, to align results with the lower versus higher framing. The original comparison framing and specific thresholds used across studies are shown in Multimedia Appendix 2 for reference. Studies that treated health literacy as a continuous variable were also interpreted directionally, from lower to higher health literacy. We applied the same approach to eHealth literacy. Most eHealth literacy studies used continuous measures, which were interpreted directionally from lower to higher eHealth literacy, whereas categorical classifications were harmonized to the same lower versus higher framing.

Risk-of-Bias Assessment

To assess risk of bias, we used the Joanna Briggs Institute (JBI) critical appraisal tools matched to the study designs, including the analytical cross-sectional [26], the cohort [27], and the quasi-experimental checklists [28]. We restricted the appraisal to full-text, peer-reviewed journal articles. Each criterion was rated yes, no, or unclear. Two of the 5 reviewers (PH, MA, AP, AR, and SK) assessed each study independently and resolved disagreements through consensus discussion. Interrater agreement for risk-of-bias items yielded κ values ranging from 0.63 to 0.75, indicating substantial agreement.

Synthesis Methods

The synthesis first summarized study characteristics descriptively and quantified the number of studies that examined each portal outcome, outcome measure, and literacy type.

Because studies differed substantially in the literacy instruments, portal outcomes, and outcome measures, we judged a pooled quantitative synthesis inappropriate. Instead, we used direction-based vote counting to summarize the direction of associations between health literacy or eHealth literacy and patient portal outcomes, regardless of effect size magnitude and statistical significance [22].

To account for potential confounding, we prioritized fully adjusted estimates when multiple estimates were reported. Effects showing no difference were coded as “no association” and included as a separate category. Some studies reported only statistical significance without effect estimates, whereas others reported descriptive findings only. In these cases, effects were considered noncodable because no clear directional comparison could be derived from the reported results. Studies reporting partially tested findings without a clear direction, or descriptive findings only, were therefore excluded from direction-based coding and summarized using narrative synthesis [29]. Multimedia Appendix 3 presents the study-level effect estimates, directional classifications, and reasons for exclusion from directional coding.

For studies included in direction-based vote counting, we followed the recommended practice of displaying effect directions visually in an effect direction plot [30]. For visual display in the effect direction plot, we grouped studies into smaller (<500 participants) and larger (≥500 participants) samples to provide a simple visual indication of study size across a heterogeneous evidence base.

Data synthesis was conducted at the level of one effect per study for each predefined portal outcome. A single study could contribute multiple effects if it reported different portal outcomes. To maintain a consistent orientation across studies, all effect estimates were standardized to the lower literacy perspective. For example, health literacy estimates originally reported for higher versus lower health literacy were inverted so that all coded effects reflected lower versus higher health literacy. The same approach was applied to eHealth literacy.

We decided not to assess the certainty of the evidence because the synthesis was based on direction-based vote counting rather than pooled effect estimates, which limits the assessment of certainty domains that rely on comparable effect estimates and CIs across studies.

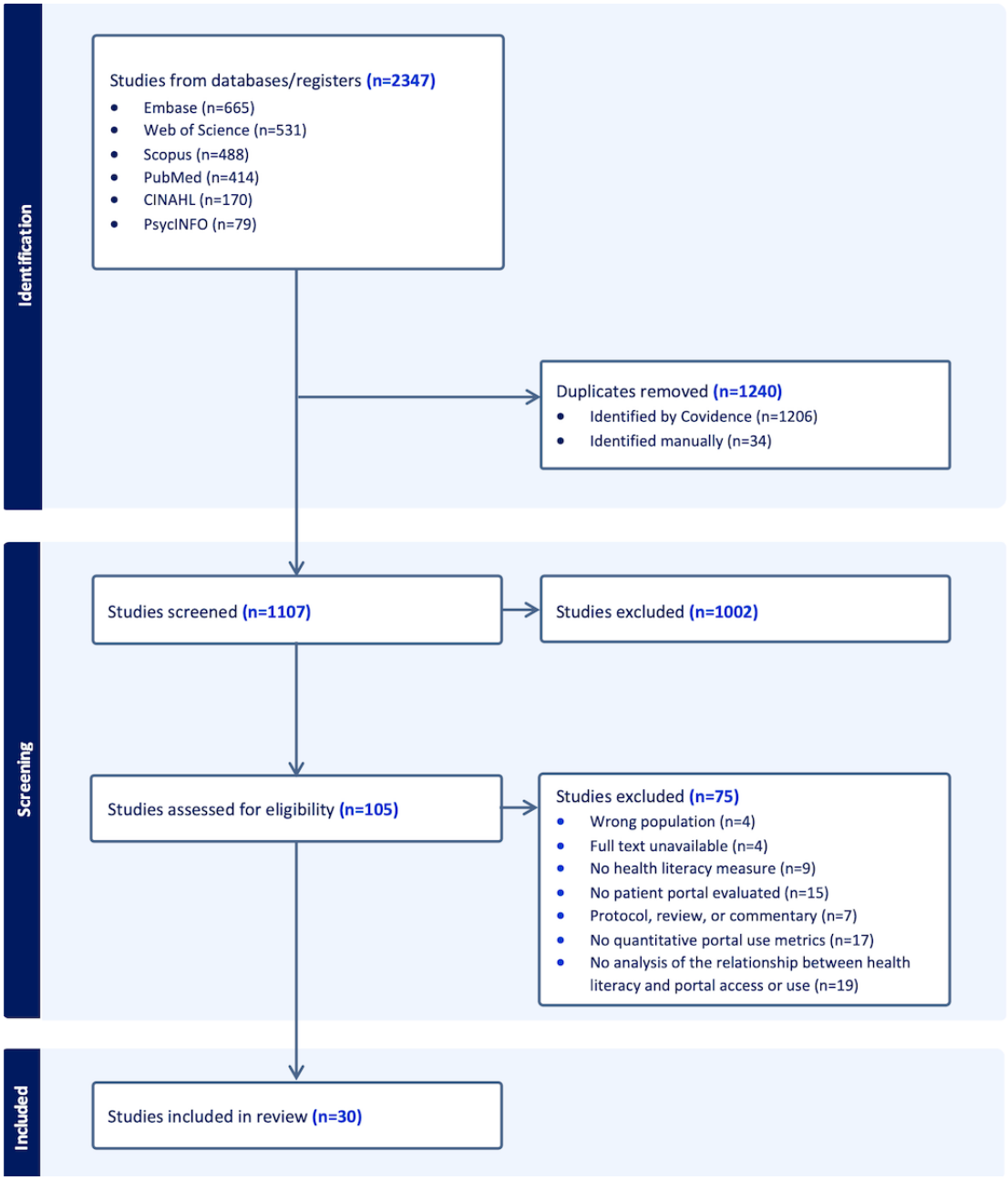
Results

Study Selection

A total of 2347 records were identified through database searches. After removal of 1240 duplicates, 1107 unique records remained for title and abstract screening. Of these, 105 records advanced to full-text review. After full-text assessment, 75 records were excluded, leaving 30 studies [31-60] for data extraction and synthesis. The full study selection process is shown in Figure 1.

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



Study Characteristics

Most included studies were journal articles (26/30, 87%) [33-39,41-45,47-60], while 2 were conference abstracts (2/30, 7%) [31,32], one was a conference paper (1/30, 3%) [40], and one was a thesis (1/30, 3%) [46]. Most studies were conducted in the United States (24/30, 80%) [32,34-43,46-50,52-57,59,60] and used a cross-sectional design (23/30, 77%) [31,34-37,39,41,43-51,53-59]. Sample sizes ranged from 18 to 60159, with most samples drawn from adult clinical populations (24/30, 80%) [31-33,35-47,50,52-57,60]. Survey self-report was the most common portal data source (21/30, 70%) [31,33-37,39,41,43-46,48-51,53-55,58,59], whereas portal log data were used in 8 studies (27%) [32,38,40,42,47,52,57,60] and administrative data in one study (3%) [56]. Health literacy alone was examined in 17 studies (57%) [32-34,36-40,42,47,49,52,55-58,60], eHealth literacy alone in 10 studies (33%) [41,44-46,48,50,51,53,54,59], and both literacy constructs in 3 studies (10%) [31,35,43]. The most common health literacy instruments were the Brief Health Literacy Screener (BHLS) [34,36-40,42,43,52,56] and the Newest Vital Sign (NVS) [35,47,49,55,57,60], whereas eHealth literacy was measured most often with the eHealth Literacy Scale (eHEALS) [35,41,43,45,46,48,50,51,53,54]. Health literacy was usually treated as a categorical variable, most often through dichotomous or ordinal groupings, although thresholds varied across studies and were not always reported. By contrast, most studies using eHEALS treated it as a continuous measure, while 2 studies applied dichotomous eHEALS cutoffs (Multimedia Appendix 2). Portal types included mainly institution-specific portals (25/30, 83%) [32-42,45-54,56,57,59,60], with the remainder using national patient portals (5/30, 17%) [31,43,44,55,58]. Table 1 summarizes the characteristics of all included studies.

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Table 1. Characteristics of included studies (N=30).

Author (year)	Publication type	Country	Sample, setting	Clinical condition	Study design, data source	Patient portal	Literacy construct: instrument
Ahmed et al (2023) [34]	Journal article	United States	489 adults, online sample	General population	Cross-sectional, survey	Institutional portal	HL[a]: BHLS[b]
Arcury et al (2017) [35]	Journal article	United States	200 low-income older adults, 3 primary care clinics (urban and rural)	General population	Cross-sectional, survey	Institutional portal	eHL[c]: eHEALS[d] HL: NVS[e]
Bauer et al (2017) [36]	Journal article	United States	186 adults, 5 primary care clinics	General population	Cross-sectional, survey	Institutional portal	HL: BHLS
Cajita et al (2021) [37]	Journal article	United States	100 older adults, academic medical center	General population	Cross-sectional, survey	Institutional portal	HL: BHLS
Cemballi et al (2021) [38]	Journal article	United States	19921 adults, integrated health system	Diabetes	Retrospective longitudinal, portal logs	Kaiser Permanente Online (KP.org)	HL: BHLS
Clarke et al (2021) [39]	Journal article	United States	79 adults, academic medical center	Chronic cardiovascular disease	Cross-sectional, survey	MyChart	HL: BHLS
Davis et al (2015) [40]	Conference paper	United States	60159 adult inpatient admissions, hospital setting	General population	Retrospective, portal logs	My Health at Vanderbilt	HL: BHLS
Deshpande et al (2023) [41]	Journal article	United States	274 general medicine inpatients, academic medical center	General population	Cross-sectional, survey	Institutional portal	eHL: eHEALS
Di Tosto et al (2022) [42]	Journal article	United States	654 hospitalized adults, academic medical center	General population	Secondary analysis, trial portal logs	MyChart Bedside/MyChart	HL: BHLS
Haun et al (2015) [43]	Journal article	United States	819 veterans, 2 VA[f] medical centers	General population	Cross-sectional, survey	My HealtheVet (US VA, national)	eHL: eHEALS HL: BHLS
He et al (2016) [31]	Conference abstract	United Kingdom	175 adults, primary and secondary care clinics	Diabetes	Cross-sectional, survey	My Diabetes My Way (Scotland, national)	eHL: not specified HL: not specified
Holt et al (2019) [44]	Journal article	Denmark	246 adult outpatients, hospital outpatient clinic	General population	Cross-sectional, survey	sundhed.dk (Denmark, national)	eHL: eHLQ[g] & eHLA[h]
Hoogenbosch et al (2018) [45]	Journal article	Netherlands	439 adult outpatients, university hospital	General population	Cross-sectional, survey	Hospital portal	eHL: eHEALS
Kallmerten (2021) [46]	Thesis	United States	20 adults, 3 health care organizations	Heart failure	Cross-sectional, survey	Institutional portal	eHL: eHEALS
Kim et al (2018) [47]	Journal article	United States	18 low-income pregnant women, outpatient prenatal clinic	Pregnancy	Cross-sectional, portal logs and interviews	MyChart	HL: NVS
Lustria et al (2025) [48]	Journal article	United States	276 adults, community sample	At least 1 chronic condition	Cross-sectional, survey	Institutional portal	eHL: eHEALS
Mackert et al (2016) [49]	Journal article	United States	4974 adults, online research panel	General population	Cross-sectional, survey	Institutional portal	HL: NVS
Maroney et al (2021) [50]	Journal article	United States	288 transplant recipients, 2 academic transplant centers	Solid organ transplant	Cross-sectional, survey	Institutional portal	eHL: eHEALS
Neves et al (2021) [51]	Journal article	United Kingdom	1083 adults	General population	Cross-sectional, survey	CIE[i] (United Kingdom)	eHL: eHEALS
Nolla et al (2025) [52]	Journal article	United States	3457 oncology patients, 30 ambulatory oncology clinics	Cancer	Secondary analysis, trial portal logs	MyChart	HL: BHLS

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Author (year)	Publication type	Country	Sample, setting	Clinical condition	Study design, data source	Patient portal	Literacy construct: instrument
Philpot et al (2024) [53]	Journal article	United States	1850 adults, multistate multisite academic health system	General population	Cross-sectional, survey	MyChart	eHL: eHEALS
Price-Haywood et al (2017) [54]	Journal article	United States	247 older adults, integrated health system	Hypertension or diabetes	Cross-sectional, survey	MyChart	eHL: eHEALS
Ruiz et al (2016) [55]	Journal article	United States	600 outpatient veterans, VA medical center	General population	Cross-sectional, survey	My HealtheVet (US VA, national)	HL: NVS
Sarkar et al (2011) [56]	Journal article	United States	14102 adults, integrated health system	Diabetes	Cross-sectional, administrative data	Kaiser Permanente Online (KP.org)	HL: BHLS
Smith et al (2015) [57]	Journal article	United States	534 older adults, general internal medicine clinic	General population	Cross-sectional, portal logs	EpicCare portal	HL: NVS
Sundell et al (2022) [58]	Journal article	Sweden	416 adults	General population	Cross-sectional, survey	1177.se (Sweden, national)	HL: S – C & C HL[j] scales
Van der Vaart et al (2014) [33]	Journal article	Netherlands	214 adults, rheumatology center	Rheumatoid arthritis	Pretest-posttest, survey	Hospital portal	HL: FCCHL[k] scales
Wright et al (2022) [59]	Journal article	United States	340 emerging adults, 2 universities	General population	Cross-sectional, survey	Institutional portal	eHL: e-HLS[l]
Yanez et al (2024) [32]	Conference abstract	United States	3464 patients, oncology setting	Cancer	Prospective, portal logs	MyChart	HL: SILS[m]
Yoon et al (2024) [60]	Journal article	United States	536 middle-aged and older primary care patients, academic medical center	Chronic conditions	Retrospective longitudinal, portal logs and survey	MyChart	HL: NVS

[a]HL: health literacy.

[b]BHLS: Brief Health Literacy Screener.

[c]eHL: eHealth literacy.

[d]eHEALS: eHealth Literacy Scale.

[e]NVS: Newest Vital Sign.

[f]VA: Veterans Affairs.

[g]eHLQ: eHealth Literacy Questionnaire.

[h]eHLA: eHealth Literacy Assessment Toolkit.

[i]CIE: Care Information Exchange.

[j]S – C & C HL: Swedish Communicative and Critical Health Literacy.

[k]FCCHL: Functional, Communicative, and Critical Health Literacy.

[l]e-HLS: Electronic Health Literacy Scale.

[m]SILS: Single Item Literacy Screener.

Risk-of-Bias Assessment

Risk of bias was appraised for the 26 journal papers [33-39,41-45,47-60]. Across cross-sectional studies, most JBI criteria were met. The most common risk-of-bias concern was the measurement of patient portal use through self-report rather than objective system data, which affected the reliability of outcome measurement in the majority of studies.

Across cohort studies, most criteria were also met. The most common risk-of-bias concern was inadequate handling of follow-up.

The single quasi-experimental study had risk-of-bias concerns related to the absence of a control group, baseline differences between user groups, a single pre-post time point, incomplete follow-up, and ceiling effects on half of the outcome measures [33]. Risk-of-bias assessments for all criteria and each study are presented in Multimedia Appendix 4.

Results of Synthesis

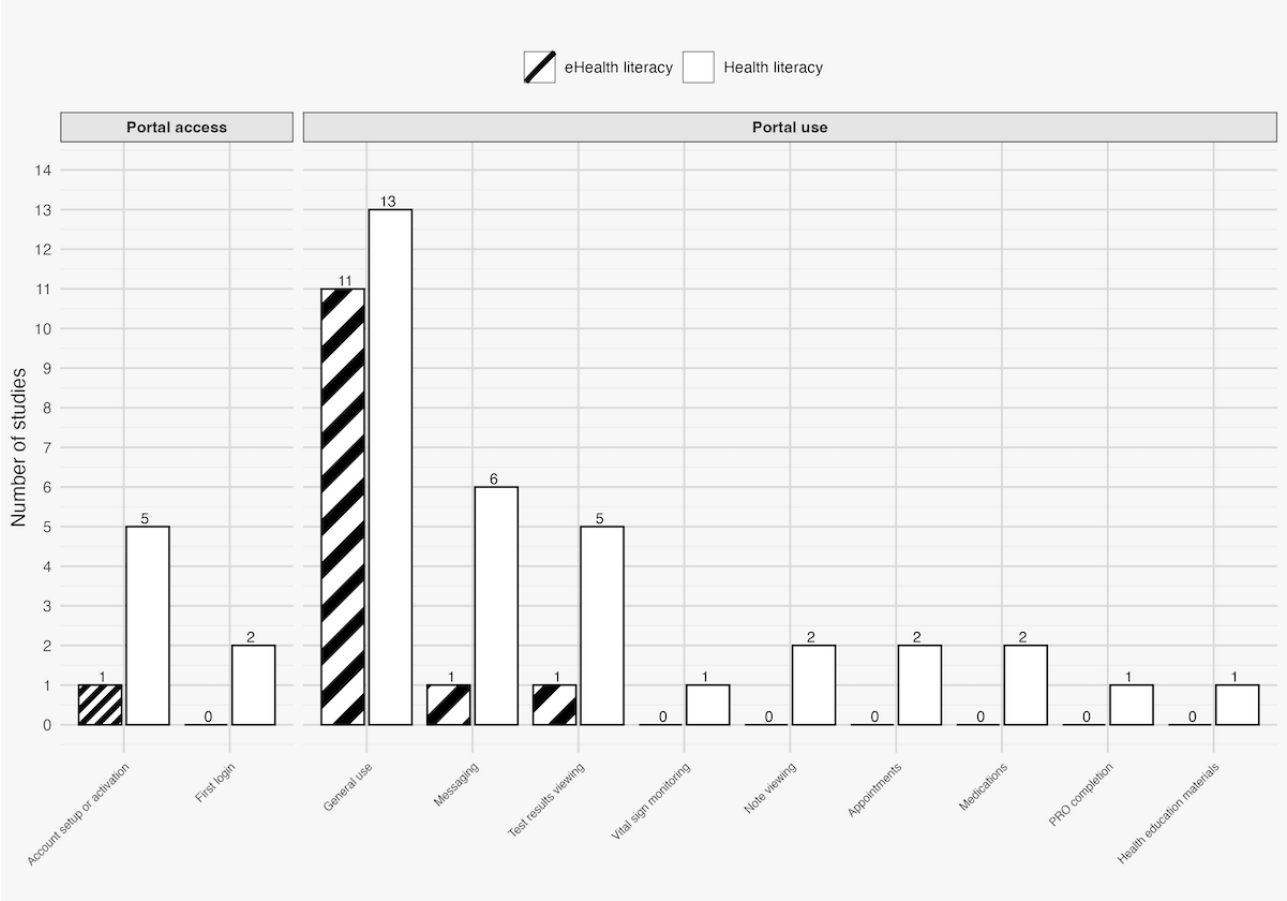
Distribution of Studies Across Portal Outcomes and Literacy Types

Figure 2 shows that the included studies focused far more on portal use than on portal access. Access-related outcomes, such as account setup or registration and first login, were rarely studied. Only 6 studies (20%) [40,47,53,55-57] examined account setup or activation, and 2 studies (7%) [33,56] assessed first login. Most portal features also received limited attention. Across both eHealth literacy and health literacy, general portal

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use was the most examined outcome, assessed in 21 unique studies (70%) [31,34-37,39-47,49-51,54,58-60]. Three of these studies assessed both literacy types within the same sample [31,35,43]. Across all outcomes, health literacy was studied much more often than eHealth literacy.

Figure 2. Study counts by portal outcome and literacy type. Studies that assessed both health literacy and eHealth literacy within the same sample were counted once for each literacy type. PRO: patient-reported outcome.



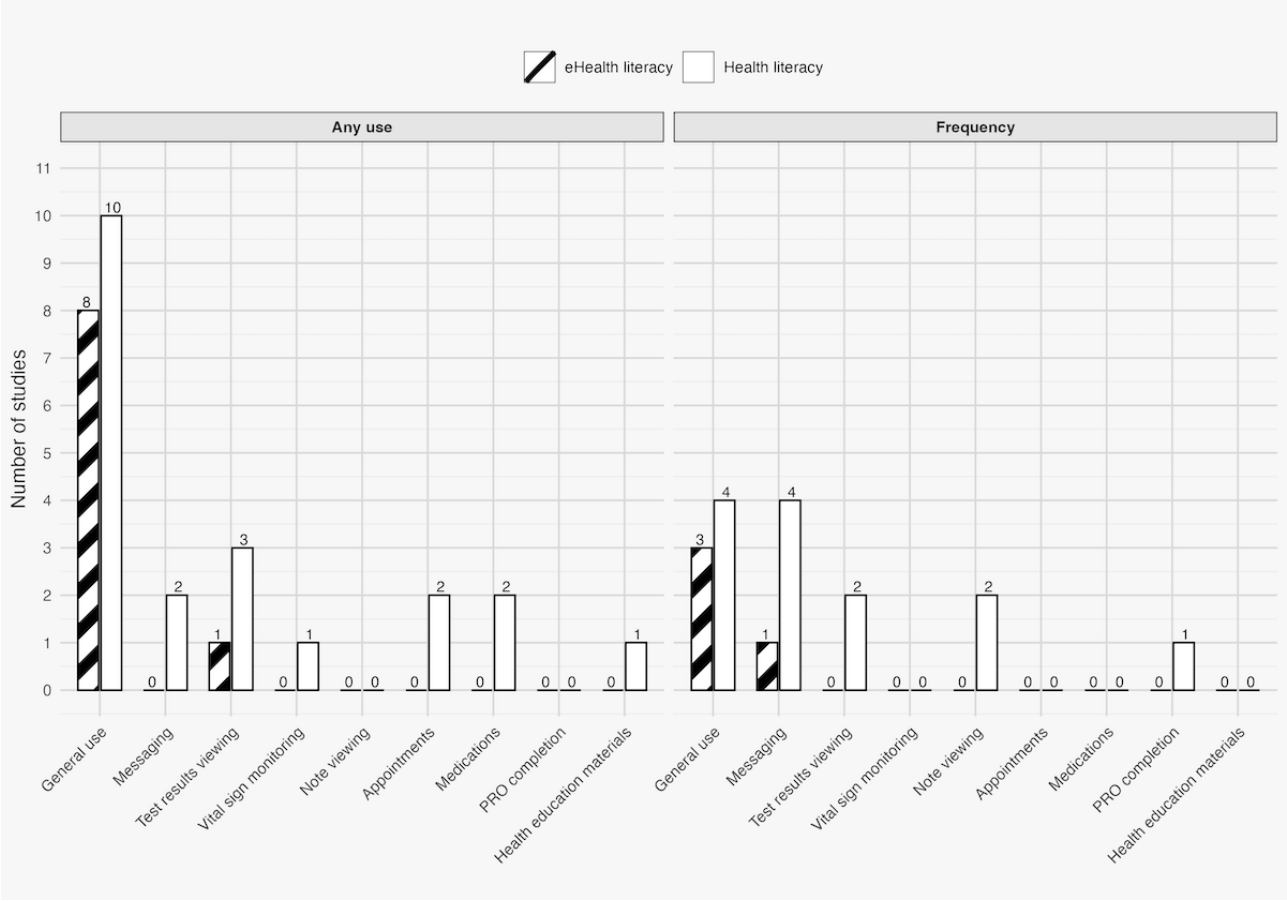
Distribution of Studies Across Outcome Measures and Literacy Types

As shown in Figure 3, studies more often assessed any use than frequency of use. Across both outcome measures, the evidence remained centered on general portal use. Sixteen studies [31,34-37,39-41,44,45,47,49,51,54,58,59] assessed general portal use as any use, and 6 studies [42,43,46,47,50,60] assessed it as frequency of use. Two studies [31,35] in the any-use group and one study [43] in the frequency group contributed both a health literacy and an eHealth literacy analysis.

Among feature-specific outcomes, messaging was the only portal function more often examined using frequency-based measures. Most other specific features were rare or absent in both any-use and frequency analyses. This lack of evidence was even more pronounced among eHealth literacy studies.

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Figure 3. Study counts by portal outcome, outcome measure, and literacy type. Studies that assessed both health literacy and eHealth literacy within the same sample were counted once for each literacy type and outcome measure combination. PRO: patient-reported outcome.

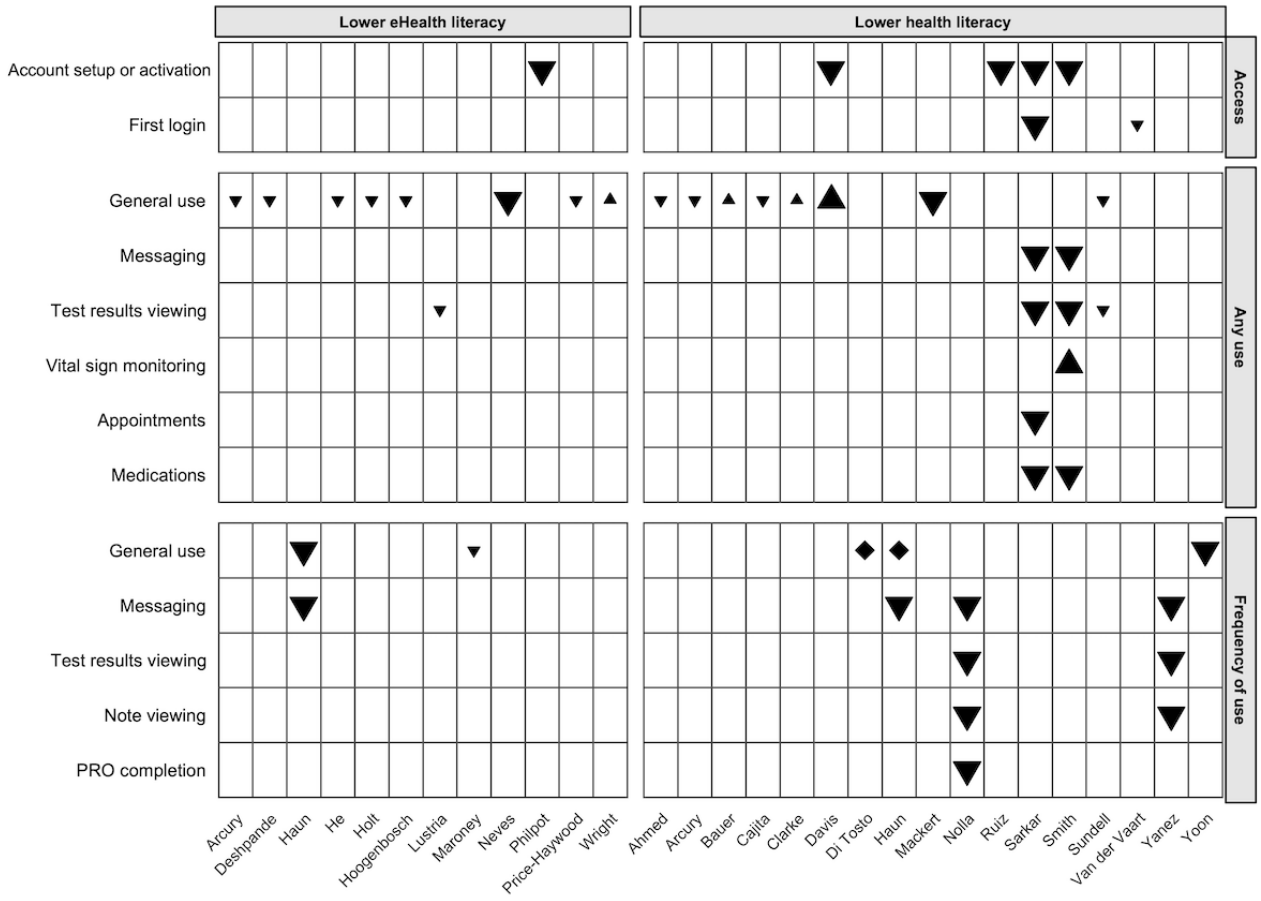


Evidence of Associations Between Lower Health Literacy, Lower eHealth Literacy, and Portal Outcomes and Outcome Measures

Twenty-seven individual studies (90%) [31-37,39-45,48-60] were included in direction-based vote counting. The remaining 3 studies [38,46,47] contributed only to narrative synthesis, and 2 additional studies [31,40] included some findings that could not be directionally coded. Figure 4 [31-37,39-45,48-60] summarizes all identified associations of lower health literacy or eHealth literacy across portal outcomes and outcome measures.

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Figure 4. Associations of lower literacy by portal outcome and outcome measure. Direction is coded regardless of statistical significance. Effect direction: upward arrow ▲, higher portal access or use among individuals with lower literacy; downward arrow ▼, lower portal access or use among individuals with lower literacy; diamond ◆, no association. Included sample size: large symbol ≥500 participants; small symbol <500 participants. PRO: patient-reported outcome.



General Portal Use

eHealth Literacy

Nearly all eHealth literacy studies reported lower general portal use, both for any use (7/8) [31,35,41,44,45,51,54] and for frequency of use (2/2) [43,50]. One study [59] found slightly higher any use among those with lower eHealth literacy. Kallmerten [46] was included only in the narrative synthesis and found no significant association between eHealth literacy and portal use frequency, although no effect direction was reported.

Health Literacy

The pattern for health literacy was more mixed. Among studies of any general portal use, 5 of 8 (63%) studies [34,35,37,49,58] reported lower use in groups with lower health literacy, and 3 of 8 (38%) studies [36,39,40] reported the opposite pattern. He et al [31] similarly found no significant association between health literacy and any portal use, although the direction was not reported. For frequency of general portal use, 1 of 3 (33%) studies found lower use among those with lower health literacy [60], whereas the remaining 2 (67%) studies found no association [42,43]. Kim et al [47] was included only in the narrative synthesis and described lower health literacy as a possible barrier to both any use and frequency of use but did not formally test the association.

Portal Access

eHealth Literacy

Only one eHealth literacy study examined access outcomes, finding that lower eHealth literacy was associated with lower account setup or activation [53].

Health Literacy

All studies that examined portal access outcomes, including account setup or activation and first login, found lower access among individuals with lower health literacy [33,40,55-57]. Kim et al [47], included only narratively, similarly suggested that registration may be a barrier for individuals with lower health literacy, although the study did not report a formal test.

Feature-Specific Outcomes

eHealth Literacy

Few eHealth literacy studies examined feature-specific outcomes. For any-use measures, one [48] study reported lower test results viewing among those with lower eHealth literacy. For frequency-based outcomes, another study found lower

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messaging frequency among individuals with lower eHealth literacy [43].

Health Literacy

Health literacy studies examined feature-specific outcomes more often and showed consistent negative associations. For any-use measures, lower health literacy was associated with lower messaging use (2/2) [56,57], lower test results viewing (3/3) [56-58], lower appointment use (1/1) [56], and lower medication feature use (2/2) [56,57]. The only exception was vital sign monitoring, for which 1 study reported higher use among those with lower health literacy [57]. Davis et al [40] reported a nonlinear, inverted-U relationship between health literacy and use of appointments and health education materials, so no clear directional interpretation was possible.

The consistency extended to frequency-based outcomes. Lower health literacy was associated with lower note viewing frequency in 2 of 2 studies [32,52], lower PRO measure completion in 1 of 1 study [52], lower messaging frequency in 3 of 3 studies [32,43,52], and lower test results viewing frequency in 2 of 2 studies [32,52]. Cemballi et al [38], included only in the narrative synthesis, also described lower cumulative secure messaging among patients with lower health literacy.

Studies Assessing Both Health Literacy and eHealth Literacy

The 3 studies that assessed both literacy constructs in the same sample allowed a more direct within-study comparison between health literacy and eHealth literacy. In Haun et al [43], lower eHealth literacy was associated with lower frequency of general portal use, whereas health literacy showed no clear directional association [43]. He et al [31] likewise found lower eHealth literacy to be associated with lower any portal use, while health literacy showed no significant association, although the direction of the health literacy effect was not reported. In contrast, Arcury et al [35] found a consistent pattern for both constructs, with portal users showing higher health literacy and higher eHealth literacy than nonusers. Yet, none of these studies simultaneously modeled both constructs in adjusted analyses.

Discussion

Principal Findings

The aim of this review was to synthesize associations of health literacy and eHealth literacy with patient portal access, general use, feature-specific use, and frequency of use. Several main findings were identified. In our review, the evidence base was uneven: health literacy was examined more often than eHealth literacy, included studies focused primarily on general portal use rather than portal access and specific features, and studies relied mainly on any-use measures rather than frequency of use. Despite these imbalances, health literacy and eHealth literacy may not function interchangeably as predictors of portal engagement. Nearly every directionally codable eHealth literacy study reported lower general portal use among patients with lower eHealth literacy. Health literacy showed a more mixed pattern for general use. The 3 studies that assessed both constructs within the same sample mostly supported this contrast, although they remain too few for firm comparative inference. In contrast, lower health literacy was more often associated with lower portal access and feature-specific use, but comparable eHealth literacy evidence for those outcomes remained sparse.

In our review, studies focused predominantly on general portal use, while early engagement stages, such as registration and first login, as well as specific portal features, received less attention. One possible explanation for this pattern is that many included studies recruited participants who were already registered portal users and therefore excluded the access stage from analysis. Another plausible explanation is that overall portal use is easier to measure than feature-specific behaviors, especially in cross-sectional surveys. Yet, treating portal use as a single outcome oversimplifies the staged nature of real-world portal engagement [61]. Access and subsequent portal use represent distinct stages at which disparities may emerge, and access alone does not necessarily translate into continued use [56,57,62]. Studies that measure only overall use may therefore miss whether literacy-related barriers arise during initial access, continued use, or both.

Across the included studies in our review, health literacy was examined more often than eHealth literacy. This imbalance likely reflects the longer history of health literacy as a field. Health literacy became central to health communication research [63] and was originally conceptualized in the context of paper-based health resources [12], well before digital health information became a major focus. Its recognition by the US Department of Health and Human Services further reflects its prominence at the policy level [64]. eHealth literacy, in contrast, was formally introduced only in 2006, as health information seeking increasingly moved into digital environments [12]. Prior digital health research appears to show a similar pattern, with greater emphasis on health literacy than on eHealth literacy [65]. This imbalance matters. Using health literacy as a proxy for eHealth literacy risks misclassifying digital navigation problems as comprehension problems, which may lead health systems to offer the wrong type of support.

A further pattern in our findings was the stronger emphasis on any use than frequency-based outcomes. This pattern is consistent with broader patient portal research, which often reports portal adoption or use without examining how frequently portals are used over time [18]. In our review, most studies relied on cross-sectional surveys to measure portal engagement. Although surveys are appropriate for capturing behavior at a single time point, they are less suited to assessing temporal patterns. Because these designs rely primarily on self-reported rather than objective data, they introduce recall bias [66,67] and provide limited information about when portal use occurred or how often it was repeated. Longitudinal designs using portal audit logs and defined follow-up periods are better suited to capturing repeated use over time [42]. As a result, the literacy evidence base reflects initial uptake more than sustained engagement and may underestimate barriers that emerge only with continued use.

Beyond outcome measurement, the choice of literacy constructs, instruments, and modeling approaches may have contributed to the observed patterns. One possible explanation is conceptual.

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Health literacy and eHealth literacy instruments differ substantially in what demands within the portal experience they measure. Across included studies in this review, eHealth literacy was most often assessed with eHEALS, a self-report measure of perceived ability to find, appraise, and use online health information [68]. Health literacy was more often assessed with BHLS, which focuses on perceived difficulty with written clinical materials [69], or NVS, a performance-based test of functional comprehension and numeracy [70]. These differences suggest, but do not establish, that the 2 constructs may align with different aspects of portal engagement. For example, eHealth literacy may be more relevant during digital uptake and navigation, before patients reach portal content, whereas health literacy may become more relevant once patients must interpret and act on test results, clinical notes, or medication information. Our findings offer partial support for this interpretation, as lower health literacy showed more consistent associations with feature-specific portal outcomes than with general portal use. Comparable evidence for eHealth literacy at the feature level, however, remains too limited to allow a firm conclusion. At the same time, the observed difference may not be entirely conceptual and may instead reflect measurement choices. In our review, most studies modeled eHealth literacy as a continuous variable, while health literacy measures were often categorized. Because categorizing a continuous measure reduces information and statistical power [71,72], health literacy associations may have appeared weaker than the underlying relationship. This problem is further compounded by variations in the health literacy thresholds used across studies, with some studies not reporting thresholds at all. The 3 studies that assessed both literacy constructs within the same sample were broadly consistent with the overall pattern; however, they did not simultaneously model both in adjusted analyses. Given this limited within-sample evidence, it is unclear whether health literacy's weaker associations reflect true differences, confounding, measurement choices, or both.

Recommendations for Future Studies and Practical Implications

Given the uncertainty about whether the observed differences between health literacy and eHealth literacy are due to true construct differences, confounding, or both, future portal studies should measure both constructs simultaneously within the same sample using comparable approaches. Modeling both constructs continuously, where appropriate, would preserve statistical power and allow more direct comparison across portal outcomes. Studies should also distinguish portal access from portal use and separate any use from frequency-based outcomes to improve comparability across initial uptake and sustained engagement.

For clinicians and health systems, the choice of literacy measure can help identify the type of portal barrier a patient faces and guide more targeted intervention design. To improve registration, first login, or basic navigation, digital navigation barriers may warrant greater attention. If the goal is to improve understanding and use of portal content after login, health literacy-sensitive communication strategies may be more relevant. For health systems, portal equity assessment should extend beyond account creation or activation. Our findings suggest that literacy-related disparities may persist after access is established, especially for health literacy and feature-specific use, which could go undetected by systems that track only registration or activation. A patient may appear engaged in activation metrics yet never progress to viewing test results, managing medications, or messaging clinicians, the features through which portals affect care. These channels carry abnormal results, medication changes, and clinician messages about findings that change care. The 2 oncology studies in our sample found lower engagement in exactly these channels among patients with lower health literacy [32,52]. As measurement consistency improves, future studies should be better positioned to identify which literacy construct is most informative for specific portal barriers.

Limitations

This review has methodological limitations. First, we used direction-based vote counting. This approach ignores the magnitude of the effect size and gives equal weight to all studies regardless of study quality or risk of bias. Second, most comparisons between health literacy and eHealth literacy were indirect, because only 3 studies assessed both constructs in the same sample. Third, we harmonized heterogeneous literacy measures into a lower-versus-higher framing. This simplification may have obscured differences captured by 3-level categorical distinctions, such as limited, marginal, and adequate health literacy. Fourth, studies often modeled health literacy and eHealth literacy differently, with eHealth literacy typically treated as a continuous variable and health literacy often categorized, further limiting direct comparisons between the 2 constructs. Fifth, the outcome classification framework was developed inductively and was not prespecified, which may have introduced some subjectivity in how outcomes were grouped. Sixth, the review was limited to English-language studies, which may have introduced language bias. Seventh, a review protocol was not registered beforehand, which limits the transparency of the prespecified review methods. Eighth, searches relied on free-text terms and did not include database-specific vocabulary, such as MeSH terms and CINAHL subject headings, which could have decreased search sensitivity. Ninth, manual reference-list or citation searching was not conducted, which may have omitted relevant studies that were not identified through database searches. Finally, because no publication date restriction was applied, some older studies may have evaluated patient portals with different user interfaces and functionalities, which could have affected how directly their findings apply to contemporary portal use.

Limitations identified in the included literature should also be noted. Most studies were conducted in the United States, relied on clinical populations, and evaluated institution-specific portals, which limits generalizability to national portals and community populations. Differences in literacy measures, thresholds, and outcome measures (eg, self-reported use vs portal logs), as discussed above, further limit direct cross-study comparisons.

Conclusions

Current evidence points to a clear equity problem in patient portal engagement. Patient portals are now central to care, but research still relies on broad measures, most often general portal use or binary any-use outcome measures. This approach risks

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missing where literacy-related disparities emerge. Across the available evidence, lower eHealth literacy showed a more consistently negative cross-study pattern for general portal use, whereas lower health literacy more often showed negative associations with portal access and several feature-specific outcomes. Because only 3 studies assessed both constructs within the same sample, this contrast should be interpreted as a cross-study pattern rather than a direct comparative finding.

Future research should move beyond broad portal-use measures and examine where disparities occur across the full continuum of portal engagement. Studies should measure both health literacy and eHealth literacy in the same sample, use objective portal log data when possible, and distinguish access, any use, frequency, and feature-specific behaviors. This shift would help health systems identify which patients are left behind after portals become available and design support matched to the barrier: digital navigation, clinical comprehension, or both.

Data Availability

The search strategy, literacy measures, study-level effects, and risk-of-bias assessments used in this review can be found in Multimedia Appendices 1-4. No analytic code was used for this review.

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Generative AI Use

We used Claude Sonnet 4.6 to check for grammatical mistakes, punctuation errors, and incorrect spelling, and to improve readability after the manuscript was written. We critically reviewed and edited the content as needed and take full responsibility for the content of this work.

Authors' Contributions

Conceptualization: PH
Data curation: PH
Formal analysis: PH, MA, AP, AR, SK, CLR
Methodology: PH
Project administration: PH
Resources: PH
Supervision: MG
Visualization: MA, AP, AR, SK
Writing – original draft: PH
Writing – review & editing: MA, AP, AR, SK, CLR, MG

Conflicts of Interest

None declared.

Multimedia Appendix 1

Search strings.
[DOCX File , 21 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Literacy measures, comparison framing, and thresholds used.
[DOCX File , 26 KB-Multimedia Appendix 2]

Multimedia Appendix 3

Study-level effect estimates and directional coding.
[DOCX File , 34 KB-Multimedia Appendix 3]

Multimedia Appendix 4

Risk-of-bias assessment.
[DOCX File , 29 KB-Multimedia Appendix 4]

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Multimedia Appendix 5

PRISMA 2020 checklist.
[DOCX File , 269 KB-Multimedia Appendix 5]

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Abbreviations

BHLS: Brief Health Literacy Screener
eHEALS: eHealth Literacy Scale
eHL: eHealth literacy
HL: health literacy
JBI: Joanna Briggs Institute
NVS: Newest Vital Sign
PRISMA: Preferred Reporting Items for Systematic reviews and Meta-Analyses
PRO: patient-reported outcome

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