

Digital Health Literacy: A Concept Analysis

Reem Mohammed F ALJohani^{1*}, Hafizah Che Hassan²

¹School of Nursing & Applied Science, Lincoln University College, Malaysia

²School of Nursing & Applied Science, Lincoln University College, Malaysia

*Corresponding Author's E-mail: hayti-2011@hotmail.com

Abstract: *Digital health literacy has become central to contemporary health care because patients and professionals increasingly rely on patient portals, telehealth platforms, mobile applications, remote monitoring systems, and online information environments to access, interpret, and act on health information. Despite its widespread use, the concept remains inconsistently defined and is frequently conflated with digital literacy, health literacy, and the earlier notion of eHealth literacy. This paper therefore aimed to clarify the meaning, boundaries, antecedents, consequences, and empirical referents of digital health literacy through a concept analysis. Walker and Avant's method guided the analysis, supported by a structured search of recent peer-reviewed literature and selected foundational works. After verification of the final evidence base, 39 studies were retained for concept-analytic synthesis. The analysis indicates that digital health literacy is a multidimensional socio-technical capability involving access to digital tools, navigation of digital health resources, comprehension of health content, critical appraisal of credibility and relevance, communicative interaction within digital environments, and application of digital information to decision-making and self-management. Major antecedents include basic literacy, health literacy, internet access, digital readiness, trust, motivation, and supportive organizational or social conditions. Major consequences include stronger patient engagement, more effective use of digital services, improved self-management, and better informed decision-making, whereas low digital health literacy increases the risk of exclusion, disengagement, and exposure to misinformation. The concept should therefore be understood as more than technical competence. Clarifying digital health literacy can strengthen nursing theory, measurement, intervention design, and equitable digital health implementation.*

Keywords: Digital health literacy; eHealth literacy; concept analysis; health literacy; digital inclusion; nursing.

1. Introduction

The digitalisation of health care has altered how people seek information, communicate with providers, access services, and participate in health-related decisions. Patient portals, teleconsultation platforms, wearable devices, online appointment systems, and algorithmically curated information environments now form part of routine care rather than peripheral innovation. Under these conditions, the ability to engage competently with digital health resources is no longer optional; it has become increasingly important for safe, timely, and equitable participation in care (López et al., 2023). The intellectual lineage of the concept begins with eHealth literacy, originally defined as the ability to seek, find, understand, and appraise health information from electronic sources and apply that

knowledge to a health problem (Norman & Skinner, 2006). That formulation was foundational, but it emerged in an earlier internet environment dominated by information retrieval rather than by interactive platforms, apps, patient-generated data, messaging systems, and integrated service pathways. Recent work therefore argues that the older model no longer captures the full complexity of contemporary digital health participation, especially the interactive, platform-dependent, and socio-technical nature of digital care environments (Milanti et al., 2025).

Current scholarship increasingly uses the term digital health literacy to describe a broader capability that includes technical access, navigation, interpretation, critical evaluation, communication, and context-sensitive application. Ban et al. (2024) explicitly describe digital health literacy as an evolving concept, while van Kessel et al. (2022) position it as a super determinant of health because it mediates how people benefit from the broader digital transformation of health systems. This broader framing is also supported by evidence showing that digital health literacy is socially patterned by age, education, income, support networks, and digital access rather than determined by personal effort alone (Estrela et al., 2023). The problem is that the concept is still used inconsistently. In some studies it is treated as a synonym for digital literacy, in others as a direct extension of health literacy, and in others as a renamed version of eHealth literacy. That conceptual looseness weakens theoretical precision, complicates measurement, and creates poor alignment between interventions and the capability they are supposedly improving. A concept analysis is therefore warranted. The purpose of this paper is to clarify the meaning of digital health literacy, distinguish it from neighbouring constructs, identify its defining attributes, antecedents, consequences, and empirical referents, and strengthen its usefulness for nursing, research, education, and policy.

2. Methodology

This paper used the Walker and Avant (2019) method of concept analysis. The framework was selected because it provides a structured process for clarifying conceptual meaning through the examination of uses, defining attributes, model and additional cases, antecedents, consequences, and empirical referents. The aim was conceptual clarification rather than effect estimation. Accordingly, the literature was used analytically to identify recurring elements, conceptual tensions, and operational patterns rather than to produce a pooled quantitative synthesis. A structured search of PubMed, Scopus, Web of Science, and Google Scholar was undertaken to identify literature on digital health literacy and closely related constructs. The search prioritised peer-reviewed studies published between January 2021 and January 2026 and used combinations of the terms digital health literacy, eHealth literacy, digital literacy and health, concept analysis, measurement, determinants, intervention, and digital inclusion. Selected foundational works were retained outside the date range where necessary to preserve conceptual lineage, particularly the original eHealth literacy model and the methodological source for concept analysis. Records were screened for direct relevance to the conceptualisation, measurement, determinants, antecedents, consequences, or applied use of digital health literacy. After verification of the final usable evidence base, 39 studies were retained for the concept-analytic synthesis represented in Figure 1 and Table 1.

The retained literature was compared iteratively to identify recurring conceptual components and to distinguish digital health literacy from adjacent constructs such as digital literacy, health literacy, and eHealth literacy. The analysis emphasised definitional clarity, conceptual boundaries, and applicability to contemporary digital health systems. Because this is a concept analysis, PRISMA-style screening is presented only to show the logic of literature identification and selection; the paper should not be read as a full systematic review.

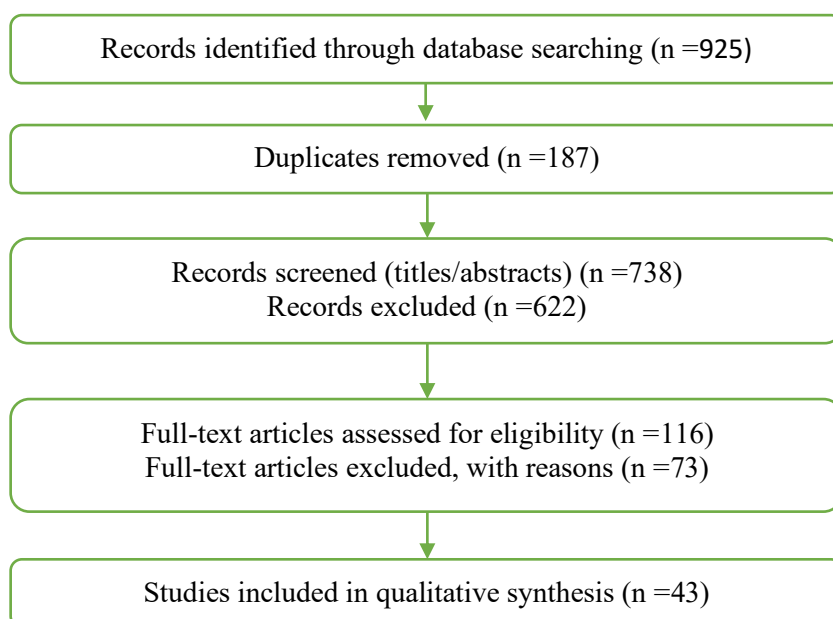


Figure 1. PRISMA-style flow of study selection for the concept analysis.

Table 1. Evidence base informing the concept analysis

No.	Source	Study type	Principal conceptual contribution
1	Ban et al. (2024)	Concept analysis	Clarified digital health literacy as an evolving multidimensional concept and identified core attributes, antecedents, and consequences.
2	López et al. (2023)	Scoping review	Positioned digital literacy as a determinant of health and linked digital disadvantage to unequal health opportunities.
3	Estrela et al. (2023)	Systematic review and meta-analysis	Showed that age, education, income, and social support are consistent determinants of digital health literacy.
4	Wang and Luan (2022)	Scoping review of older adults	Mapped key themes in digital health literacy research on older adults and emphasised structural and capability barriers.
5	Kim et al. (2025)	Scale development and validation	Operationalised digital health literacy as a multidimensional construct for older adults and strengthened its empirical referents.
6	Milanti et al. (2025)	Conceptual model update	Updated eHealth Literacy 3.0 and reinforced the need to treat digital health literacy as interactive and context dependent.
7	Kizilkilic et al. (2024)	Clinical participation study	Linked digital readiness, awareness, and health literacy to participation in digital rehabilitation contexts.
8	Lee et al. (2021)	Systematic review of instruments	Demonstrated major variation in measurement quality and underlined the need for stronger conceptual-operational alignment.
9	Crocker et al. (2023)	Systematic scoping review	Showed that performance-based measures capture different aspects of eHealth literacy than self-report tools.
10	Yang et al. (2022)	Bibliometric analysis	Mapped the rapid growth, fragmentation, and thematic diversity of the digital health literacy field.
11	Palumbo et al. (2022)	Literature review	Explained how health literacy must be reconceptualised within digital environments rather than simply translated online.
12	Kim et al. (2023)	Path analysis in older adults	Showed that technology readiness and eHealth literacy shape digital health technology use among older adults.

No.	Source	Study type	Principal conceptual contribution
13	Xiong et al. (2023)	Review of digital interventions in LMIC primary care	Provided applied evidence that digital engagement capability affects implementation and uptake in resource-constrained settings.
14	Anrijs et al. (2023)	Technology and society study	Illustrated how digital exclusion is patterned by socioeconomic resources and internet resources.
15	Seifert et al. (2021)	Older adults and exclusion study	Connected digital exclusion with broader social exclusion, showing the compounding risks of low digital capability.
16	Alkureishi et al. (2021)	Qualitative study	Captured patient perspectives on the digital divide and highlighted usability, trust, and support barriers.
17	Philpot et al. (2024)	Cross-sectional portal-use study	Linked digital health literacy to actual use of patient portals in a linguistically diverse population.
18	Rangnow et al. (2024)	Quantitative study	Extended digital health literacy research beyond patients and showed its relevance in professional education settings.
19	Tran et al. (2024)	Cross-sectional study	Identified determinants of digital health literacy among community-dwelling older adults and reinforced the role of social context.
20	Zhao et al. (2024)	Cross-sectional study	Provided population-level evidence on associated factors, including education, digital access, and information behaviour.
21	Moretti et al. (2023)	Pre-post intervention study	Showed that targeted training can improve digital health literacy, especially the appraisal of misinformation.
22	Mukhtar et al. (2025)	Systematic review of interventions	Demonstrated that digital health literacy interventions can improve access, service use, and patient capability.
23	Barbati et al. (2025)	Systematic review and meta-analysis	Synthesised experimental evidence on the effectiveness of eHealth literacy interventions.
24	Thorup et al. (2025)	Mixed methods study	Compared measurement tools and reinforced that instrument choice affects what counts as digital health literacy.
25	Wiener and Abuhalimeh (2025)	Systematic review	Confirmed that adult digital health literacy evidence remains heterogeneous across populations and methods.
26	Qiu et al. (2025)	International cross-sectional study	Identified common determinants of digital health literacy across settings, including education, access, and confidence.
27	Yoon et al. (2025)	National survey study	Provided general-population evidence that digital health literacy is unevenly distributed and policy relevant.
28	Stauch et al. (2025)	Representative study	Extended the concept to children and adolescents and highlighted early-life social patterning.
29	Shao et al. (2025)	Qualitative study	Explained how chronic disease, ageing, support, and perceived utility influence digital health literacy.
30	Xie et al. (2025)	Longitudinal study	Showed that multi-level influences shape eHealth literacy over time among older adults.
31	Shi et al. (2024)	Scoping review	Summarised factors influencing digital health literacy in older adults and reinforced the role of barriers beyond skills.
32	Hwang et al. (2025)	Cross-sectional study	Linked digital health literacy with loneliness and social isolation, highlighting psychosocial consequences.
33	Oh et al. (2025)	Caregiver study	Showed that digital health literacy is associated with self-efficacy in using digital health resources.
34	Smith et al. (2025)	Umbrella review	Refined the broader health literacy dimensions that remain relevant when health activity becomes digitally mediated.
35	Zaghloul et al. (2025)	Systematic review and meta-analysis	Synthesised digital health literacy evidence in chronic disease populations and highlighted clinical relevance.

No.	Source	Study type	Principal conceptual contribution
36	Zhang et al. (2025a)	Cross-sectional study	Estimated prevalence and predictors of digital health literacy among older adults in China.
37	Zhang et al. (2025b)	Systematic literature review	Showed a reciprocal relationship between social media use and eHealth literacy in older adults.
38	Patel et al. (2024)	Comparative cross-sectional study	Demonstrated rural-urban differences in digital health literacy among ageing populations.
39	van Kessel et al. (2022)	Conceptual commentary	Argued that digital health literacy functions as a super determinant of health in digital systems.

3. Results

3.1 Conceptual uses and boundaries

Across the retained literature, digital health literacy is used to describe the capability required to engage effectively with digital health environments, not merely the ability to operate devices. Its practical use spans patient portals, online information seeking, telehealth, rehabilitation platforms, chronic disease management, health promotion, and digital self-care. The consistent theme is that the construct sits at the intersection of digital competence, health understanding, and health-related action in digitally mediated settings (Ban et al., 2024). Conceptual boundary work is essential because digital health literacy overlaps with, but is not reducible to, digital literacy, health literacy, and eHealth literacy. Digital literacy refers broadly to the ability to use digital technologies; health literacy concerns accessing, understanding, judging, and using health information; and eHealth literacy historically focused on electronic health information seeking. Digital health literacy incorporates elements of all three but extends further to include platform navigation, appraisal of credibility and risk, digitally mediated communication, and application to care decisions within complex service ecologies (Milanti et al., 2025).

This distinction matters because people may possess basic digital skills without being able to judge the quality of online health claims, interpret portal-based test results, or use app-generated information appropriately in self-management. Conversely, someone with adequate health literacy in face-to-face care may still struggle with authentication systems, portal navigation, privacy settings, or asynchronous messaging. The concept therefore refers to a situated capability that emerges only when digital and health-related competencies interact within a specific digital care context (Palumbo et al., 2022).

3.2 Defining attributes

Six defining attributes were repeatedly evident in the literature. First, digital health literacy requires access to, and workable familiarity with, digital devices, connectivity, and interfaces. Second, it requires the ability to locate and navigate digital health services and information resources. Third, it requires comprehension of digitally presented health content in relation to one's own needs. Fourth, it includes critical appraisal of quality, credibility, relevance, and risk. Fifth, it includes communication and interaction within digital care systems, such as portals, teleconsultations, or messaging platforms. Sixth, it requires the application of digital information or services to decision-making, self-management, and help-seeking (Kim et al., 2025).

These attributes show that digital health literacy is not a single skill but a capability chain. Access without comprehension is insufficient. Comprehension without appraisal leaves users vulnerable to misinformation. Appraisal without the ability to translate information into action has limited practical value. The construct is therefore best understood as an integrated performance capability in which technical, cognitive, evaluative, communicative, and behavioural elements are mutually reinforcing (Thorup et al., 2025).

Table 2. Analytic summary of the concept

Domain	Synthesis
Defining attributes	Access and operational familiarity; navigation and retrieval; comprehension; critical appraisal; digital communication and interaction; application to decisions and self-management.
Antecedents	Basic literacy, health literacy, internet and device access, digital readiness, motivation, trust, confidence, social support, organisational support, and user-centred service design.
Consequences	Better service access, stronger engagement, improved self-management, greater confidence, more informed decisions, and lower exclusion when adequately supported.
Risks when absent	Disengagement from digital services, misinformation exposure, weak portal uptake, dependence on others, inequitable participation, and digital exclusion.
Empirical referents	Self-report instruments, performance-based tasks, portal-use capability, communication tasks, comprehension exercises, and context-sensitive multidimensional measures.

3.3 Model, borderline, and contrary cases

A model case would be an adult with diabetes who can log into a patient portal, review laboratory results, interpret medication instructions, assess whether an online source is trustworthy, send a clarification message to a clinician, and use that information to adjust self-care or seek timely support. This case expresses all defining attributes because access, navigation, comprehension, appraisal, communication, and application are all present. A borderline case would be a person who can use a smartphone and join a teleconsultation link but cannot judge the credibility of conflicting online advice or translate portal information into appropriate action. This person demonstrates digital ability, and possibly partial eHealth engagement, but not full digital health literacy because appraisal and application are incomplete. A contrary case would be an individual who lacks device access, avoids digital services, cannot interpret online health information, and depends entirely on others to complete digital health tasks. That pattern represents digital exclusion rather than digital health literacy.

3.4 Antecedents

The most consistent antecedents of digital health literacy are basic literacy, health literacy, internet access, device availability, and a minimum level of digital readiness. However, the literature shows that these are necessary rather than sufficient conditions. Education, income, age, and social support strongly shape whether individuals can convert access into usable capability, which means digital health literacy is socially distributed rather than randomly distributed (Estrela et al., 2023). Motivation, confidence, and perceived usefulness also matter. Older adults and people living with chronic conditions are more likely to engage with digital systems when technologies are understandable, relevant, and backed by practical support. Where systems are poorly designed or require hidden digital assumptions, initial access does not become meaningful use (Shi et al., 2024).

Trust is another antecedent. Users must trust not only information sources but also the privacy, legitimacy, and reliability of digital platforms. Qualitative evidence shows that usability problems,

privacy concerns, language barriers, low confidence, and lack of assistance can block digital health participation even when the technology is physically available (Alkureishi et al., 2021). Digital health literacy is therefore preceded by both individual capabilities and enabling structural conditions.

3.5 Consequences

When digital health literacy is present, users are more likely to engage productively with portals, telehealth, educational content, and self-management tools. This includes greater ability to obtain relevant information, communicate with clinicians, interpret guidance, and act appropriately on digital outputs. In applied studies, higher digital health literacy is associated with more effective portal use, higher confidence in digital resource use, and stronger capacity for technology-supported health management (Philpot et al., 2024). Intervention evidence suggests that digital health literacy can also be improved and that improvement is consequential. Educational programmes, misinformation-focused training, and tailored support interventions have produced gains in appraisal, confidence, and service use, although effect sizes and durability vary by context and measurement strategy (Barbati et al., 2025). The converse consequences are equally important. Low digital health literacy is associated with delayed uptake of digital services, dependence on informal intermediaries, higher vulnerability to misinformation, weaker self-management, and deeper forms of exclusion when services become digital by default. Because health systems increasingly routinise portal access, remote consultations, and app-based communication, low digital health literacy risks becoming a mechanism through which digital transformation reproduces inequity (van Kessel et al., 2022).

3.6 Empirical referents

The literature shows that digital health literacy is measurable, but no single instrument captures the full construct across all populations and settings. Available measures include self-report scales, capability-oriented questionnaires, performance-based tasks, and context-specific instrument variants. This diversity is useful, but it also reflects conceptual fragmentation because instruments do not all measure the same dimensions (Lee et al., 2021). Recent measurement work strengthens the concept's empirical referents. Kim et al. (2025) demonstrated that digital health literacy in older adults can be operationalised as a multidimensional construct, while Thorup et al. (2025) showed that the choice of instrument should be driven by the specific research purpose and target population. Crocker et al. (2023) further argued that performance-based measures can reveal capability limitations that remain hidden in self-reports. Taken together, the evidence suggests that empirical referents should capture not only perceived competence but also enacted understanding, appraisal, and digital task performance.

4. Discussion

The analysis indicates that digital health literacy should be conceptualised as a socio-technical capability rather than as a narrow technical skill. It is socio-technical because competence is distributed across the individual, the interface, the service pathway, and the surrounding support environment. A person may fail in a digital health task because of limited skills, but equally because the platform is poorly designed, the language is opaque, the service assumes prior knowledge, or support is absent. This is why digital health literacy cannot be reduced to device use alone. The concept is also relational. It emerges when digital skill and health understanding are mobilised for health-related action in a specific context. That is why digital literacy and health literacy are better

understood as neighbouring or antecedent capabilities rather than interchangeable labels. Clarifying this relationship matters theoretically because interventions aimed only at technical training may leave appraisal, interpretation, and application untouched. Similarly, traditional health education may fail when the practical barriers are authentication, portal navigation, communication conventions, or misinformation management.

For nursing practice, the implication is direct. Nurses increasingly work in digitally mediated systems and routinely encounter patients who must read appointment messages, retrieve results, use remote-monitoring information, or follow digital self-management instructions. Assessment should therefore move beyond asking whether patients own a smartphone or can open an application. The relevant question is whether patients can understand what the digital system is asking of them, judge whether the information is reliable, and use it safely in decision-making. That distinction is especially important in older adults, people with chronic conditions, linguistically diverse populations, and groups already exposed to digital exclusion. For policy and service design, the analysis reinforces that availability does not equal accessibility. Health systems that digitise services without accounting for differential capability may unintentionally produce exclusion by design. Organisational responses should therefore include plain-language communication, multimodal access routes, assisted digital support, usability testing with real users, and service pathways that do not penalise people with low digital capability. From this perspective, digital health literacy is not merely an individual deficit issue; it is also an organisational and equity issue (Sentell et al., 2021).

For research, the concept analysis supports the use of multidimensional, context-sensitive measurement. Studies that rely on single undifferentiated indicators risk obscuring whether they are measuring access, confidence, navigation, evaluation, or behavioural application. Future work should distinguish these components more explicitly, test how they interact across populations, and examine how interface design, social support, trust, and repeated digital practice shape digital health literacy over time. This paper is a concept analysis rather than a full systematic review, and its claims should be interpreted accordingly. The objective was conceptual clarification, not quantitative synthesis. Although the evidence base was identified through structured searching and transparent screening, the emphasis remained interpretive. The concept is also evolving quickly. New platforms, algorithmic interfaces, and service models may alter what digital health literacy requires in practice, which means any conceptual definition should remain open to refinement. In addition, the operational diversity of existing measures means that empirical work still varies in what it labels as digital health literacy.

5. Conclusion

Digital health literacy is best understood as a multidimensional socio-technical capability that enables people to access, navigate, understand, appraise, communicate within, and act through digital health environments. It is conceptually broader than digital literacy, more context-bound than generic health literacy, and more contemporary in scope than the original information-oriented formulation of eHealth literacy. Its development depends on antecedents such as literacy, digital access, readiness, motivation, trust, and supportive structural conditions. Its consequences include more effective use of digital services, stronger engagement, better informed decisions, and improved self-management, while its absence increases the risk of exclusion and misinformation. Clarifying the concept strengthens nursing scholarship and supports more defensible measurement, intervention design, and equitable digital health implementation.

Acknowledgement

The authors acknowledge the scholarly contributions of researchers whose work on digital health literacy, digital inclusion, and health literacy informed this concept analysis.

Conflict of Interest Statement

The authors declare that there is no conflict of interest related to this study.

References

- Alkureishi, M. A., Choo, Z.-Y., Rahman, A., Ho, K., Benning-Shorb, J., Lenti, G., Lee, W. W. D., Kripp, S., Sherer, E. A., & Meltzer, D. O. (2021). Digitally disconnected: Qualitative study of patient perspectives on the digital divide and potential solutions. *JMIR Human Factors*, 8, e33364. <https://doi.org/10.2196/33364>
- Anrijs, S., Mariën, I., De Marez, L., & Ponnet, K. (2023). Excluded from essential internet services: Examining associations between digital exclusion, socioeconomic resources, and internet resources. *Technology in Society*, 73, 102211. <https://doi.org/10.1016/j.techsoc.2023.102211>
- Ban, S., Kim, Y., & Seomun, G. (2024). Digital health literacy: A concept analysis. *Digital Health*, 10, 20552076241287894. <https://doi.org/10.1177/20552076241287894>
- Barbati, C., Maranesi, E., Giammarchi, C., Lenge, M., Bonciani, M., Barbi, E., & Bevilacqua, R. (2025). Effectiveness of eHealth literacy interventions: A systematic review and meta-analysis of experimental studies. *BMC Public Health*, 25, 288. <https://doi.org/10.1186/s12889-025-21354-x>
- Crocker, B., Feng, O., & Duncan, L. R. (2023). Performance-based measurement of eHealth literacy: Systematic scoping review. *Journal of Medical Internet Research*, 25, e44602. <https://doi.org/10.2196/44602>
- 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. <https://doi.org/10.1016/j.ijmedinf.2023.105124>
- Hwang, M., Kim, G., Lee, S., & Park, Y.-H. (2025). Loneliness, social isolation, and digital health literacy among older women living alone in South Korea during the COVID-19 pandemic. *Psychiatry Investigation*, 22(1), 75-83. <https://doi.org/10.30773/pi.2024.0210>
- Kim, S., Chow, B. C., Park, S., & Liu, H. (2023). The usage of digital health technology among older adults in Hong Kong and the role of technology readiness and eHealth literacy: Path analysis. *Journal of Medical Internet Research*, 25, e41915. <https://doi.org/10.2196/41915>
- Kim, S., Park, C., Park, S., Kim, D. J., Bae, Y. S., Kang, J. H., & Chun, J. W. (2025). Measuring digital health literacy in older adults: Development and validation study. *Journal of Medical Internet Research*, 27, e65492. <https://doi.org/10.2196/65492>

- Kizilkilic, S. E., Xu, L., Van Erum, H., Falter, M., De Pauw, M., Dendale, P., & Kindermans, H. (2024). Digital health readiness, health literacy, and patients' awareness in cardiac (tele) rehabilitation participation. *European Journal of Preventive Cardiology*, 31(Suppl. 1), zwae175.105. <https://doi.org/10.1093/eurjpc/zwae175.105>
- Lee, J., Lee, E., & Chae, D. (2021). eHealth literacy instruments: Systematic review of measurement properties. *Journal of Medical Internet Research*, 23, e30644. <https://doi.org/10.2196/30644>
- López, M. D. P. A., Ong, B. A., Borrat Frigola, X., Fernández, A. L., Hicklent, R. S., Obeles, A. J. T., Rocimo, A. M., & Celi, L. A. (2023). Digital literacy as a new determinant of health: A scoping review. *PLOS Digital Health*, 2(10), e0000279. <https://doi.org/10.1371/journal.pdig.0000279>
- Milanti, A., Norman, C., Chan, D. N. S., So, W. K. W., & Skinner, H. (2025). eHealth Literacy 3.0: Updating the Norman and Skinner 2006 model. *Journal of Medical Internet Research*, 27, e70112. <https://doi.org/10.2196/70112>
- Moretti, V., Brunelli, L., Conte, A., Valdi, G., Guelfi, M. R., Masoni, M., Anelli, F., & Arnoldo, L. (2023). A web tool to help counter the spread of misinformation and fake news: Pre-post study among medical students to increase digital health literacy. *JMIR Medical Education*, 9, e38377. <https://doi.org/10.2196/38377>
- Mukhtar, T., Babur, M. N., Abbas, R., Irshad, A., & Kiran, Q. (2025). Digital health literacy: A systematic review of interventions and their influence on healthcare access and Sustainable Development Goal 3. *Pakistan Journal of Medical Sciences*, 41(3), 910-918. <https://doi.org/10.12669/pjms.41.3.10639>
- Norman, C. D., & Skinner, H. A. (2006). eHealth literacy: Essential skills for consumer health in a networked world. *Journal of Medical Internet Research*, 8(2), e9. <https://doi.org/10.2196/jmir.8.2.e9>
- Nutbeam, D., & Lloyd, J. E. (2021). Understanding and responding to health literacy as a social determinant of health. *Annual Review of Public Health*, 42, 159-173. <https://doi.org/10.1146/annurev-publhealth-090419-102529>
- Oh, K. M., Hong, S. R., Beran, K., Song, Y., & Lee, J. A. (2025). Digital health literacy and self-efficacy in using digital health resources among caregivers of individuals with Alzheimer's disease and related dementias. *Sage Open Aging*, 11, 30495334251398089. <https://doi.org/10.1177/30495334251398089>
- Palumbo, R., Capolupo, N., & Adinolfi, P. (2022). Addressing health literacy in the digital domain: Insights from a literature review. *Kybernetes*, 51(13), 82-97. <https://doi.org/10.1108/K-07-2021-0547>
- Patel, S., Sreelal, B. S., Kalyani, S., Joy, S. G., Pravalika, T., Ramya, T., Khan, S., Archana, V., & Gandhi, A. P. (2024). Digital health literacy among the ageing population: A comparative cross-sectional study between rural and urban Telangana, India. *Medical Journal Armed Forces India*, 80, 313-319. <https://doi.org/10.1016/j.mjafi.2023.09.006>

- Philpot, L. M., Ramar, P., Roellinger, D. L., McIntee, M. A., & Ebbert, J. O. (2024). Digital health literacy and use of patient portals among Spanish-preferred patients in the United States: A cross-sectional assessment. *Frontiers in Public Health*, 12, 1455395. <https://doi.org/10.3389/fpubh.2024.1455395>
- Qiu, C. S., Lunova, T., Greenfield, G., Kerr, G., Ergüven, Ö., Beaney, T., Hayhoe, B., Mayer, E., Majeed, A., & Neves, A. L. (2025). Determinants of digital health literacy: International cross-sectional study. *Journal of Medical Internet Research*, 27, e66631. <https://doi.org/10.2196/66631>
- Rangnow, P., Fischer, L., Hartmann, A., Renninger, D., Stauch, L., Okan, O., & Dadaczynski, K. (2024). Digital health literacy among primary and secondary school teachers: A quantitative study. *Frontiers in Public Health*, 12, 1334263. <https://doi.org/10.3389/fpubh.2024.1334263>
- Seifert, A., Cotten, S. R., & Xie, B. (2021). A double burden of exclusion? Digital and social exclusion of older adults in times of COVID-19. *The Journals of Gerontology: Series B*, 76(3), e99-e103. <https://doi.org/10.1093/geronb/gbaa098>
- Sentell, T., Foss-Durant, A., Patil, U., Taira, D., Paasche-Orlow, M. K., & Trinacty, C. M. (2021). Organizational health literacy: Opportunities for patient-centered care in the wake of COVID-19. *Quality Management in Health Care*, 30(1), 49-60. <https://doi.org/10.1097/QMH.0000000000000279>
- Shao, Y., Yang, X., Chen, Q., Guo, H., Duan, X., Xu, X., Yue, J., Zhang, Z., Zhao, S., & Zhang, S. (2025). Determinants of digital health literacy among older adult patients with chronic diseases: A qualitative study. *Frontiers in Public Health*, 13, 1568043. <https://doi.org/10.3389/fpubh.2025.1568043>
- Shi, Z., Du, X., Li, J., Hou, R., Sun, Y., & Chen, X. (2024). Factors influencing digital health literacy among older adults: A scoping review. *Frontiers in Public Health*, 12, 1447747. <https://doi.org/10.3389/fpubh.2024.1447747>
- Smith, C., Behan, S., Belton, S., Nicholl, C., Murray, M., & Goss, H. (2025). An update on health literacy dimensions: An umbrella review. *PLOS ONE*, 20(6), e0321227. <https://doi.org/10.1371/journal.pone.0321227>
- Stauch, L., Renninger, D., Rangnow, P., Hartmann, A., Fischer, L., Dadaczynski, K., & Okan, O. (2025). Digital health literacy of children and adolescents and its association with sociodemographic factors: Representative study findings from Germany. *Journal of Medical Internet Research*, 27, e69170. <https://doi.org/10.2196/69170>
- Thorup, C. B., Uitto, M., Butler-Henderson, K., Wamala-Andersson, S., Hoffrén-Mikkola, M., Schack Thoft, D., Hæsum, L. K. E., Irrazabal, G., Pruneda González, L., & Valkama, K. (2025). Choosing the best digital health literacy measure for research: Mixed methods study. *Journal of Medical Internet Research*, 27, e59807. <https://doi.org/10.2196/59807>
- Tran, T. T., Chang, P. W. S., Yang, J.-M., Chen, T.-H., Su, C.-T., Levin-Zamir, D., Baron-Epel, O., Neter, E., Tsai, S. F., Lo, B., Duong, T. V., & Yang, S.-H. (2024). Digital health literacy and

- its determinants among community-dwelling elderly people in Taiwan. *Digital Health*, 10, 20552076241278926. <https://doi.org/10.1177/20552076241278926>
- van Kessel, R., Wong, B. L. H., Clemens, T., & Brand, H. (2022). Digital health literacy as a super determinant of health: More than simply the sum of its parts. *Internet Interventions*, 27, 100500. <https://doi.org/10.1016/j.invent.2022.100500>
- Walker, L. O., & Avant, K. C. (2019). *Strategies for theory construction in nursing* (6th ed.). Pearson.
- Wang, X., & Luan, W. (2022). Research progress on digital health literacy of older adults: A scoping review. *Frontiers in Public Health*, 10, 906089. <https://doi.org/10.3389/fpubh.2022.906089>
- Wiener, R. C., & Abuhlimeh, B. J. (2025). Evaluating adult digital health literacy, 2020-2025: A systematic review. *PLOS Digital Health*, 4(11), e0001075. <https://doi.org/10.1371/journal.pdig.0001075>
- Xie, L., et al. (2025). Multi-level factors influencing eHealth literacy among Chinese older adults: A longitudinal study. *Journal of Advanced Nursing*, 81(9), 5831-5844. <https://doi.org/10.1111/jan.16702>
- Xiong, S., Lu, H., Peoples, N., Duman, E. K., Najarro, A., Ni, Z., Gong, E., et al. (2023). Digital health interventions for non-communicable disease management in primary health care in low- and middle-income countries. *npj Digital Medicine*, 6(1), 12. <https://doi.org/10.1038/s41746-023-00764-4>
- Yang, K., Hu, Y., & Qi, H. (2022). Digital health literacy: Bibliometric analysis. *Journal of Medical Internet Research*, 24, e35816. <https://doi.org/10.2196/35816>
- Yoon, J., Yang, S., Kang, S. J., Lee, M., Kim, D., Park, J., Kim, S. J., Han, J., Joo, J., & Cho, J. (2025). Digital health literacy in the general population: National cross-sectional survey study. *Journal of Medical Internet Research*, 27, e67780. <https://doi.org/10.2196/67780>
- Zaghloul, H., et al. (2025). Digital health literacy in patients with common chronic diseases: Systematic review and meta-analysis. *Journal of Medical Internet Research*, 27, e56231. <https://doi.org/10.2196/56231>
- Zhang, C., Mohamad, E., Azlan, A. A., Wu, A., Ma, Y., & Qi, Y. (2025). Social media and eHealth literacy among older adults: Systematic literature review. *Journal of Medical Internet Research*, 27, e66058. <https://doi.org/10.2196/66058>
- Zhang, X., Yuan, Y., & Jiang, J. (2025). Digital health literacy among older adults in China: A cross-sectional study on prevalence and influencing factors. *Frontiers in Public Health*, 13, 1661177. <https://doi.org/10.3389/fpubh.2025.1661177>
- Zhao, B.-Y., Huang, L., Cheng, X., Chen, T.-T., Li, S.-J., Wang, X.-J., Huang, S.-X., Hu, R.-F., & Li, H. (2024). Digital health literacy and associated factors among internet users from China: A cross-sectional study. *BMC Public Health*, 24, 908. <https://doi.org/10.1186/s12889-024-18324-0>