Flinders University | Research Centre for Palliative Care, Death & Dying

Evaluating the impact of online health information: A scoping review of measures

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About this White Paper

This publication is a RePaDD White Paper and Research Report.

The RePaDD White Paper and Research Report Series provides researchers and policy makers with evidence-based data and recommendations. By organising, summarising, and disseminating previous and current studies, the series aims to inform ongoing and future research in palliative care, death, and dying.

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Acknowledgement of Country

Flinders University was established on the lands of the Kaurna nation, with the first University campus, Bedford Park, located on the ancestral body of Ngannu near Warriparinga.

Warriparinga is a significant site in the complex and multi-layered Dreaming of the Kaurna ancestor, Tjilbruke. For the Kaurna nation, Tjilbruke was a keeper of the fire and a peace maker/law maker. Tjilbruke is part of the living culture and traditions of the Kaurna people. His spirit lives in the Land and Waters, in the Kaurna people and in the glossy ibis (known as Tjilbruke for the Kaurna). Through Tjilbruke, the Kaurna people continue their creative relationship with their Country, its spirituality, and its stories.

Flinders University acknowledges the Traditional Owners and Custodians, both past and present, of the various locations the University operates on, and recognises their continued relationship and responsibility to these Lands and waters.

About the RePaDD

Death and dying will affect all of us. The Research Centre for Palliative Care, Death, & Dying or RePaDD works to make a difference to the care of persons at the end of life.

We examine the universal experience of dying and create innovative solutions for people living with a life-limiting illness, their carers, and the clinicians caring for them. Our members lead major national palliative care projects in Australia. Our team of multidisciplinary researchers and experts work collaboratively with various organisations and funding agencies to deliver impact. We also strengthen research capacity by offering evidence-based resources, researcher education, training and scholarships.

Our research

We focus on the following research areas:

Palliative care across the health system: We conduct clinical and service studies and develop online palliative care resources and applications. Our work in this area contributes towards ensuring that quality palliative care can be delivered in all healthcare settings - whether in hospitals, aged care, homes, hospices, clinics, or the community.

Death and dying across the community: We examine and respond to community and consumer attitudes, views, and needs with respect to death and dying and palliative care. Our research in this area empowers the wider community to make informed decisions by raising awareness and building death literacy.

Online evidence and practice translation: We build, synthesise, and disseminate the evidence for palliative care. We also create innovative digital solutions to improve evidence translation and use. Our research in this area builds palliative care capacity of the health and aged care workforce, access and use of information by health consumers and the community.

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Abstract

Background: High-quality, reputable online health information (OHI) offers a cost-effective and accessible means to enhance health professionals' knowledge and empower individuals to make informed health decisions. As digital health resources proliferate, there is growing pressure on OHI producers and providers to demonstrate the value and effectiveness of their offerings. However, current evaluation practices of OHI often rely on engagement and usability metrics, which fail to capture broader, meaningful outcomes such as knowledge acquisition, behaviour change, or organisational or societal benefits. Without more robust and aligned evaluation frameworks, the effectiveness of OHI may be overstated, leading to misinformed investment decisions and missed opportunities to improve health literacy and care delivery.

Objective: To systematically map how the impact of OHI is defined, assessed, and measured in the published literature, including study designs, measurement tools, and the levels of impact evaluated (micro, meso, macro).

Design: Scoping review conducted in accordance with the Arksey and O'Malley framework and reported using the PRISMA Extension for Scoping Reviews (PRISMA-ScR).

Data sources: Systematic search of Ovid Medline, CINAHL, and the full Journal of Medical Internet Research suite of journals, covering publications from 1 January 2013 to 18 May 2023.

Eligibility criteria: Primary research studies in English evaluating the impact of OHI resources—including websites, knowledge hubs, toolkits, and elearning resources—accessed independently and asynchronously by end-users. Impact was defined as demonstrable benefits to individuals, organisations, or societies causally linked to engagement with OHI.

Data extraction and charting: Two reviewers independently extracted data using a structured template, capturing study design, OHI topic, intended audience, terminology for 'impact', and impact evaluation measures. Findings were synthesised narratively and supported by descriptive statistics.

Results: Of 2762 articles retrieved, 333 met inclusion criteria. Most studies focused on physical (26.7%), mental (15.0%), lifestyle (13.8%), and professional development (11.1%) outcomes with patients (31.5%) and health professionals (27.0%) as primary participants. Randomised controlled trials were the most common design (42.6%). Outcomes were measured using validated (50.2%) or non-validated repeated measures (42.3%). Terminology for impact varied. Only 11.1% of studies used the term 'impact', 42% used 'effect' while 5.1% focussed on measuring acceptability or feasibility. Most studies evaluated individual-level outcomes such as knowledge or behaviour change. Only 3.3% addressed organisational, economic, or societal impacts.

Conclusions: Despite the widespread availability and potential influence of OHI, the literature reveals a limited and inconsistent range of methods for assessing its impact. Approaches from public health may offer strategies for evaluating broader outcomes beyond the individual level. Developing a framework that aligns evaluation metrics with the intended goals of online health information resources could improve evaluation practices. Without such frameworks, funders and developers may struggle to justify investments or demonstrate value, potentially undermining the role of OHI in advancing health outcomes. This review provides a foundation for future work toward more consistent and meaningful evaluation of OHI impact across multiple levels.

Article Summary

Strengths and limitations of this study

- The review employed a systematic scoping methodology to map how the impact of online health information (OHI) is evaluated, using established frameworks to ensure rigour and reproducibility.
- It followed the Arksey and O'Malley framework and PRISMA-ScR guidelines, with independent screening and data charting by multiple reviewers, enhancing reliability and transparency.
- A structured micro-meso-macro framework was applied to guide data analysis, enabling clearer categorisation of impact levels and informing future evaluation strategies.
- The search was limited to a representative set of data sources—Ovid Medline, CINAHL, and the JMIR suite— potentially excluding relevant studies indexed in other databases (e.g., Embase, PsycINFO).
- By omitting non-peer-reviewed sources and restricting to English-language publications, the review may have missed practical evaluations and insights from diverse global contexts.

Keywords: web-based; intervention evaluation; online health information; implementation framework; impact measurement

Introduction

Information and communication technologies are increasingly central to our personal and professional lives, connecting people and making it possible to access information and an ever-expanding array of services on demand. With rapid advances in mobile technology, an estimated 67.1% of the world's population is now able to access the internet [1]. Online health interventions therefore hold the potential to support equitable and universal access to healthcare, at least for digitally included populations [2]. This includes high-quality, current online health information (OHI) about one or more health topics in the form of, but not limited to, websites, apps, guidelines, webinars, videos, decisional aids or knowledge hubs, that are accessible when needed. For health professionals, patients, and informal care providers, online information platforms, including elearning resources, provide the means to update knowledge at times convenient to the learner [3].

Openly accessible online health information might also be considered a public health intervention by empowering individuals to make more informed health and healthcare decisions and supporting discussion with health providers [4]. A large proportion of internet users are known to seek information digitally regarding their medical symptoms ahead of a medical diagnosis [5]. Furthermore, with globally ageing societies and increasing rates of multimorbidity, online health information resources are likely to be viewed as cost-effective mechanisms for helping people self-manage their chronic conditions [6].

With millions of people relying on OHI to guide their health choices, these resources serve as more than passive repositories. They might be considered active interventions capable of shaping health behaviours and outcomes [7]. However, not all OHI is accurate or trustworthy, and misinformation is a recognised risk of using it [8]. This makes the impact of OHI on what users think, believe, and do a matter of public importance [9].

Furthermore, just as recipients of research funding are increasingly required to make defensible claims about value across economic, social, and health domains, [10, 11] funders of digital health resources require evidence of tangible benefits such as improved health outcomes, positive behaviour change, or more efficient use of health services [12]. Demonstrating the real-world impact of OHI is therefore essential for ensuring accountability and effective resource use, justifying ongoing investment and informing future decision-making.

Despite this imperative, most evaluations of OHI have historically focused on user engagement metrics such as website visits or useability feedback with less attention paid to whether these resources create meaningful change at the individual, health service, or system level [13]. A 2013 systematic review—to our knowledge, the only existing overview on this topic—identified a diverse range of methods for evaluating online health information websites [13]. These focused almost exclusively on navigability and content quality, exploring issues of accuracy, currency, and readability. The review concluded that OHI is rarely subjected to structured evaluation for its impact on behaviour change or knowledge transfer [13].

Despite the growing emphasis on impact evaluation, the term 'impact' lacks a clear and consistent definition in both research and OHI contexts. For example, a recent systematic review of public health research identified 108 different definitions of impact [14]. In the broader literature, a comprehensive, cross-disciplinary framework on research impact defines it as the 'demonstrable and/or perceptible benefits to individuals, groups, organisations and society (including human and non-human entities in the present and future) that are causally linked (necessarily or sufficiently) to research' [10].

To bring greater clarity and structure to the assessment of OHI, impact might be conceptualised using a micro-meso-macro framework [15]. This approach considers effects at the level of individual awareness, knowledge, or behaviour (micro); changes in organisational practices or service delivery (meso); and shifts in policy or health system outcomes (macro). Applying this framework in OHI evaluations may offer a holistic approach to understanding the range and significance of potential benefits, including those that are indirect or diffuse.

However, most known measures of OHI appear to focus on the micro, or individual level, for example the E-Health Impact Questionnaire [16]. This represents a challenge for OHI resource developers such as the CareSearch project. CareSearch has been consistently funded by the Australian Commonwealth Government since 2006 to consolidate and provide 24/7 access to digital palliative care knowledge for health professionals, patients, and families [17]. As the CareSearch website is a free resource that does not require user registration, determining how people or organisations value, use, and are influenced by the information and resources it provides presents a challenge. To support CareSearch's efforts to measure and report on its own impact, we undertook a scoping review to investigate how research studies have defined and measured the impact of online health information. Specifically, we sought to map the types of outcomes assessed, the study designs and measurement tools used, and the levels at which impact is evaluated, whether at the individual (micro), organisational (meso), or societal (macro) level.

Methods

This systematic scoping review follows reporting guidelines from the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) checklist [18].

Eligibility criteria

For inclusion, studies needed to measure the 'impact' of an online health information resource in some way on the end-user of the resource. In the absence of a universal definition of impact in the context of OHI, we adapted the definition by Reed et al. [10] to state that impact is: 'demonstrable and/or perceptible benefits to individuals, groups, organisations and society … that are causally linked to engaging with online health information.'

We took an inductive approach to defining 'impact' outcomes to ascertain what researchers considered feasible and measurable consequences of OHI use. However, we expected to identify studies measuring tangible changes to knowledge, beliefs, attitudes, behaviours, decision-making, professional practice, policy, culture, education/training curricula, program or service delivery or economic benefits. Full eligibility criteria are provided as Table 1. All primary study designs were eligible, providing they measured impact of information use in some way.

Table 1 - Inclusion and exclusion criteria of sources selected for the present study.

Inclusion criteria	Exclusion criteria
• Must describe digital health products designed for the purpose of conveying information on one or more health-related topics. • Can be accessed independently by the end-user at the time of their choosing. This includes, but is not limited to, websites, knowledge hubs, toolkits, decision aids, guidelines, webinars, videos, information-based apps and self-directed learning modules. • Should describe the process used to measure the impact of the information conveyed on the end-user. End-users include, but are not limited to, individuals, organisations, government departments, policy makers, or communities. • Empirical primary research studies. • Written in English language and published in a peer-reviewed journal. • Published between 1 January 2013 to 18 May 2023 (the date of the searches).	• Describes non-health related digital information. • Has a primary purpose other than conveying information for independent access at any time by any individual. This includes interventions dependent on data input from the end-user such as self-tracking exercise or diet apps. • Involves mediated or guided interventions (i.e. counsellor coaching), to make it unclear which component contributed to impact and to what extent. • Describes synchronous resources that cannot be accessed at a time of a person's choosing. • Evaluates resource development (summative), or user engagement, usability, or satisfaction with the final product (formative). • Is written in any language other than English and published prior to 2013. • Non-empirical studies such as commentaries, editorials, etc. Systematic or scoping reviews will be excluded but their included studies checked for relevance if the review is on topic. • Grey literature, including theses and conference abstracts/posters.

Information sources

Articles were searched from January 2013 to May 18, 2023, across the Ovid Medline and CINAHL databases. The aim of the review was to explore and map the landscape of impact evaluation, identifying broad trends and knowledge gaps. We therefore limited our choice of databases to these two as representative of the major health disciplines, rather than conducting an exhaustive search of all possible literature, as would be required in a systematic review.

Iterative keyword searches of all online journals belonging to the Journal of Medical Internet Research suite of journals were also conducted and the first 10 pages of results for each search iteration examined. This set was included as a likely source of evidence on evaluation of digital health resource impact. Furthermore, not all journals within the set are evenly indexed within the Medline and CINAHL databases.

Search strategy

The starting search date of 1 January 2013 was chosen to align with a 10-year review window, capturing the contemporary evolution of the field during which online health information platforms have become increasingly integrated into mobile technologies. Furthermore, this marks the publication date of the only other review to our knowledge examining this topic [13].

The database search strategy incorporated four concepts to identify literature that included an evaluation of impact: (1) online availability (e.g., online, digital, web); (2) informative purpose (i.e., information, learning, guidance); (3) evaluation; and (4) impact. An extensive range of terms and synonyms entered as subject headings and text words were employed to capture literature across each of these four concepts. The search strategies are included as Supplementary file 1.

Selection of sources of evidence

After duplicate articles were removed, titles and abstracts were screened for eligibility in Covidence (Veritas Health Innovation, Melbourne, Australia). As multiple people were involved in the screening process, we first tested the clarity of our eligibility criteria through a calibration exercise involving the first 50 retrieved citations. This led to further refinement of the criteria and piloting of another 50 citations. Study selection then occurred in two phases. In the first phase, three reviewers [RD, CC, SG] independently screened titles and abstracts for relevance. In the second stage, full text articles of potentially relevant studies were retrieved and assessed against inclusion criteria (Table 1) by two reviewers [SG, CC]. Disagreements at either stage were resolved through discussion, and if consensus was not reached, an additional reviewer [JT] was consulted. All screening decisions were recorded within Covidence.

Data charting

Data from included studies were charted (akin to systematic review 'extraction') based on a pre-designed template and in accordance with established scoping review methodology [18, 19]. This charting process was performed within the Covidence systematic review software. Charted elements included title, author and year, country, study aim(s), research design, target population(s), health-related topic(s), online information format, type of impact measurement, and level of impact outcomes. Charting was completed independently by two reviewers [CC, SG] and confirmed by a third [RD] with any discrepancies discussed to consensus. Critical appraisal of included studies was not required, as is the norm within a scoping review methodology.

Data synthesis

Once data from all studies were charted using the Covidence extraction tool, the data was exported to an Excel spreadsheet. One reviewer [CC] then aggregated the extracted information, grouping studies by key characteristics and the concepts relevant to the review question. Details on health topics covered and stated audience had been extracted verbatim, creating long lists of terms using variable language to describe similar items. We used content analysis to reduce these sets to broader, encompassing categories and organised the studies within this framework. A descriptive summary of the collated data elements from across all studies is provided in the results section.

Results

Study Selection

Our initial search retrieved a total of 2765 articles, with 2762 remaining after removing duplicates. After title and abstract screening, 2217 irrelevant articles were excluded and 545 were included in the full article review. A total of 333 articles were included in our final analysis. This screening process and reasons for exclusion of full texts are summarised in the PRISMA flow diagram (Figure 1).

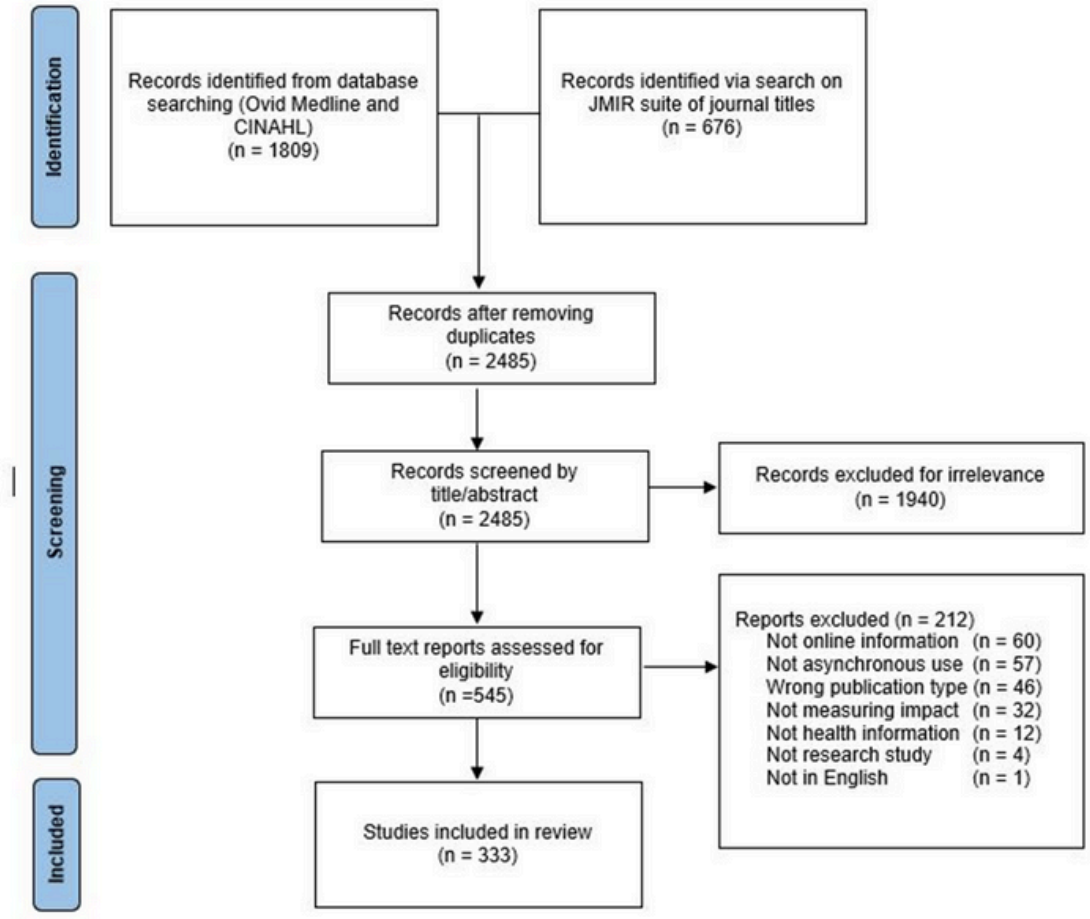

Figure 1. PRISMA flow diagram.

Study Characteristics

Of the 333 included articles, 113 (33.9%) were conducted in the United States, 48 (14.4%) in Australia, 27 (8.1%) in the United Kingdom, 27 (8.1%) in Canada, 24 (7.2%) in the Netherlands, 20 (6.0%) in Germany, and 74 (22.2%) in other countries such as China, Japan, Sweden, Spain and Turkey which contributed 3 or less studies each. A wide range of health topics were represented and categorised for the purpose of this study using content analysis (see Supplementary file 2) into physical health, mental/psychiatric health, lifestyle health, professional development/health profession education, cancer, health literacy/evidence-based health practice, sexual/reproductive health, health in later life, children's health and other. The prevalence of these health topics in the included articles was then calculated (see Table 2). The target populations for information on these health topics ranged from patients (31.5%), health professionals (27.0%), general public (11.7%), students (8.7%), parents/guardians (7.5%), patients and health professionals (2.4%) and other more specific audiences (9.0%) including employees, adolescents, and teaching staff. See Supplementary file 3 for detailed study characteristics and references.

Table 2. Health topic prevalence in the included online health intervention studies (N=333).

Health topic	Number of studies on topic (%)
Physical health	26.7
Mental/psychiatric health	15
Lifestyle health	13.8
Health professional development	11.1
Cancer	8.7
Health literacy/evidence-based health	6.6
Sexual/reproductive health	6.3
Health in later life	4.8
Children's health	3.6
Other	3.3

Methods and measures

Randomised controlled trials (42.6%) were the most commonly used method to assess intervention impact. Other methods such as cross sectional (19.8%), non-randomised experimental (12.6%), mixed-methods (9.9%), qualitative (2.4%) and cohort (1.2%) studies were used less frequently. Protocols of any of the above designs were also not as common (9.3%), and 5 studies (1.5%) used none of the above designs.

To assess impact, most studies used a combination of measurement types. These are: validated repeated-measures (50.2%), non-validated repeated-measures (42.3%), single administration non-validated questionnaires (30.6%), web metrics (29.1%), interviews (14.7%), clinical indices (14.4%), single administration validated questionnaires (12.6%), cost-benefit analyses (4.5%), analysis of existing datasets (4.2%), focus groups (3.6%) and other measures (9.6%) such as daily diaries. Combining two measure types was the method most frequently used (36.3%), followed by only one measure type (31.5%), three measure types (18.9%), four measure types (8.7%), five measure types (3.3%) and six measure types (.6%). Subjective measurements were used more often than objective measurements, with 94.6% of studies using one or more subjective measures and only 38.4% of studies using one or more objective measures.

Level of impact

Within these studies, impact was predominately measured on a micro-level focussing on changes in behaviour (33.0%), knowledge (20.1%), attitude (5.1%) or varying combinations of the three (37.8%). Few studies measured impact through changes to organisational practices and financial costs for measurement on a meso- (2.7%) or macro-level (0.6%). Table 3 provides examples of impact outcomes and measurement methods at micro-, meso- and macro-levels. These examples may offer a starting point for the development of future frameworks or evaluation strategies.

Table 3. Examples of impact measurement at micro-, meso- and macro-levels.

Example number	Micro level impact	Meso level impact	Macro level impact
1	Measuring impact on perceived change in hopelessness and problem solving in young people using questionnaires for symptoms [20]	Measuring impact on medication prescription numbers and the number of emergency department visits for migraines within a designated region [21]	Measuring impact on costs to the Dutch healthcare system and productivity costs to the Dutch population with surveys and cost-benefit analyses [22]
2	Measuring impact on physical activity behaviours and overall health symptoms of individuals using symptom questionnaires, interviews and activity frequency questionnaires [23]	Measured burden of the intervention on organisations with clinician reports on required adaptations to regular organisational practice and impact on prescription rates using pharmaceutical data for the region [24]	Measuring impact on costs to the included regions including productivity, healthcare, family and practitioner costs using cost-benefit analyses [25]
3	Measured impact on knowledge of infant health and breastfeeding, and parent self-efficacy using questionnaires, and a breastfeeding assessment to capture behavioural changes [26]	Measured impact on the frequency of post resuscitation debriefing including supervisor endorsement of change and influence of supervisors on outcomes using pre-post intervention surveys of health professionals [27]	NA
4	Measured clinician's opinions and perceived usefulness of the online information with questionnaires [28]	Interviews with administration staff on the influence of implementing management strategies and organisational support for the impact of new concussion protocols in schools [29]	NA

Impact terminology

The phrasing of aims and objectives for measurement varied widely across studies, with many using different terms for 'impact'. Only 11.1% of studies explicitly used the term 'impact' in measuring the effectiveness of their information on influencing primary outcomes. A large proportion (42%) of studies instead described impact by measuring the 'effect, effectiveness or efficacy' of the information, often using these terms interchangeably. 'Evaluating the information' was another term often used (15.6%), but only one study explicitly mentioned evaluating the value of their information. A small percentage of studies (5.4%) described specifically measuring an increase, improvement or reduction of the primary outcome in relation to their information. A few studies (5.1%) outlined a focus on measuring acceptability and usefulness of the information as perceived by their participants. Some studies did not include a clear description of which aspects of impact would be measured within their aims and objectives (4.8%). No studies defined the meaning or what constituted their impact terminology within the aims or objectives. See Supplementary file 4 for a detailed breakdown of terms used to describe impact.

Discussion

This study aimed to identify current research approaches to measuring the impact of online health information (OHI) resources and clarify definitions of impact as it relates to online information. High variability in study methodology, primary outcome measures and impact terminology were found. We propose multiple factors which may be contributing to this variability.

Patterns in study design and methodology appear to vary according to health topic and target audience but were restricted by availability of evaluative resources. Resource limitations such as time and money appear to have led to a large proportion of studies using questionnaires administered at a single time point, therefore unable to capture the effect size or long-term impact. Frequent measurement at a single time point was also found in a previous systematic review by Tieman and Bradley in 2013 [13]. However, most studies combined two or more measures to capture multiple changes in primary outcomes, adherence, and participant's perspectives of acceptability and usability. A number of studies used solely subjective measures or created a non-validated measure. Often studies with these limitations reported a lack of validated measures for their sample or health topic and suggested future research combine objective and subjective measures for increased reliability. Other studies followed this suggestion, employing pre- post-intervention knowledge tests and clinical indicators to supplement subjective measures. Consistent with previous research [30], the studies also suggested follow up periods of six-months or longer should be included to capture further unintended or larger scale impacts from OHI, maintenance of changes and behavioural changes which take longer to manifest than changes to knowledge.

The practical implementation of impact evaluation presents several challenges. Many studies relied on single-time-point surveys or self-reported data due to resource limitations, which limits the ability to detect sustained or causal effects. In addition, while web metrics such as page views or session duration are commonly used, they do not easily link to downstream knowledge or behaviour change. Measuring meso- or macro-level outcomes presents further challenges, particularly for developers without access to organisational or policy-level data. Attributing changes in practice or policy directly to a OHI is difficult in complex systems with multiple contributing factors. These methodological and practical constraints likely contribute to the continued focus on micro-level outcomes.

We also found high variability in the descriptions of how studies conceptualised impact. Many studies used terms such as effect, effectiveness, efficacy and evaluation interchangeably with impact to describe measurement of a change in primary or secondary outcomes attributed to the OHI administered during the study. Such conceptualisations are limiting in that they do not afford an understanding of impact on levels beyond an individual, for example, on organisations and policy. This in turn limits an understanding of values beyond an individual's owned knowledge to more complex changes such embedding service processes or prompting funding changes at the sector level. Impact value is often seen as more beneficial if it is broader in scale. Overall, while many authors provided an explanation of measurement in the aims or objectives, in most cases they did not provide a definition of the terms used such as impact, effect or outcome nor articulate if the focus was on the micro-, meso- or macro-level. Clear definitions of these terms which address meso and macro perspectives, may assist in allocating meaning to be used by organisations when calculating value of OHI.

To help OHI developers more effectively apply public health evaluation approaches, the micro–meso–macro framework can be adapted to suit different levels of assessment. For example, micro-level impacts may include changes in individual knowledge, attitudes, health literacy, confidence, or behaviour following engagement with OHI. Meso-level impacts may be seen in organisational changes, such as the incorporation of OHI into clinical guidelines, health service protocols, or staff training programs. Macro-level impacts could include policy development, integration of OHI into national strategies, or measurable shifts in health-related behaviours across populations. Mapping studies using these categories may assist developers in selecting outcomes and tools relevant to their intended scope of influence.

As identified in the results, the focus on measuring impact at a micro-level may be due to need to demonstrate linear relationships and financial restrictions. One possible explanation for the measurement of impact through a micro-level lens may be that research in OHI is still driven by medical definitions of health literacy which situate with an individual's skill levels [31]. This may have influenced researchers to focus on micro-level changes. However, recognition that social determinants such as environmental, cultural, commercial and digital influence our individual capacity speak to the need to consider how structural and societal aspects need to be addressed if broader impacts are to be realised [32].

Researcher priorities may also influence measurement of impact on a micro-level. Bibliometric analysis of consumer health informatics demonstrates a consolidation in the evolutionary period from 2004-2008 to 2015-2019 around three research directions: patient education and intervention, consumer demand attitude and behaviour, and internet information technology application [33]. More complex pathways which consider actors in the system such as pharmacists, doctor-patient relationships, or service-systems issues such as costs have a lesser research focus. With pressure from funding organisations, research groups may also be predisposed to micro-level measurement as it can demonstrate a linear relationship between symptom relief, increased knowledge or behavioural change and an intervention in less time, with lower costs. As meso- and macro-levels require a multifaceted approach with more funding, time and active involvement of multiple organisations, publication of impact evaluation processes at this level may be relinquished for the easier alternative. Moreover, evaluating the impact of OHI purely based on micro-level changes fails to demonstrate relevant value to organisations needing evidence for effective implementation which occurs at meso- and macro-levels [34, 35].

Compared to public health contexts, evaluation of OHI raises further complications. These additional complications have been acknowledged by previous reviews exploring evaluation of internet interventions [13, 30, 36]. Identified methodological challenges for OHI evaluation include difficulty choosing appropriate controls, imprecise replication of information over varying medias, limited control over public availability, reliance on subjective measures and selection bias [30]. Buljac-Samardzic et al. [36] found studies on interventions for healthcare professionals collected limited comparable information on impact due to differences between the quality of study methods and conceptualisation of evaluation. Similarly, the review by Tieman and Bradley [13] found a reliance on monitoring individual changes to the consumer through behaviour and knowledge changes directly related to the OHI. These findings suggest that methodological challenges in evaluating OHI may contribute to a reliance on measuring micro-level impact. Some studies may be continuing to use flawed methods due to a lack of available funding, accepted alternative methods and appropriately validated measures. The requirement of demonstrating impact to earn funding for continuation and upscaling of OHI impact evaluation poses a further challenge. A predetermined, standardised framework to guide impact evaluation across micro-, meso- and macro-levels regardless of available funding would simplify this process of demonstrating impact and therefore value of OHI.

Interestingly there is still a limited evidence base around the utilisation of system data to explore engagement and outcomes [37]. Increasing interest in metrics that track how users navigate and make use of OHI are emerging. It is likely that generative AI will accelerate identification, monitoring and assessing outcomes and support scaling to societal level impact in the coming years [38, 39].

Future implications

The availability of a standardised impact framework might guide research protocols in selecting designs appropriate for reliably measuring impact on all three levels (micro; meso; macro). In Australia, this could be made consistent with the definition of impact provided by the Australian Research Council [11]. The predominant focus on impact with micro-level lens, as demonstrated in this review, may have influenced the prioritisation of effective intervention strategies which improve engagement, rather than quality measurement of impact. By providing a holistic framework, impact measurement in studies for any digital health topic can be compared and evaluated by other researchers to increase the quality of research being conducted. The framework can also be used by research groups to demonstrate the holistic value of OHI to funding organisations for informing decision making regarding further funding or wider scale implementation.

Future research could build on these categories to co-develop a practical framework with OHI developers, helping to match appropriate outcome levels (micro, meso, macro) with realistic evaluation methods and available resources. While our findings support the utility of a multi-level impact framework for evaluating online health information, we acknowledge that the development of such a framework falls outside the scope of this scoping review. Creating a validated and actionable framework would require multiple phases of research, including synthesis of broader evidence and stakeholder input via methods such as Delphi studies or realist synthesis. Future research could build on the examples summarised in Table 3 to define domains, indicators, and tools across micro-, meso-, and macro-levels, and to guide more consistent evaluation practices in this field.

Beyond the world of researchers, policymakers may consider how an impact framework could influence the design and monitoring of online health policies that address system-wide challenges including their impacts on individuals and services [40]. Health and care services could adapt elements from the framework as they look at assessing the value of online health solutions and how they could affect to improve service delivery and operational efficiency [41]. Online health developers could also use insights from micro-level analyses to better understand the diversity of users and needs as they strive to develop fit for purpose online health solutions [42].

Strengths and limitations

This review applied a structured micro–meso–macro framework to guide data analysis, enabling clearer categorisation of impact levels and potentially informing future evaluation strategies. It followed the Arksey and O'Malley framework and PRISMA-ScR guidelines, with independent screening and data charting by multiple reviewers, enhancing methodological rigour and transparency. The use of a systematic scoping approach allowed for broad mapping of evaluation practices across diverse health topics and populations.

Several limitations should also be considered. First, the search strategy was limited to Ovid Medline, CINAHL, and the Journal of Medical Internet Research suite. While Medline and CINAHL are widely recognised as capturing most of the published health literature, and the JMIR suite was included as a likely source of studies on digital resource evaluation, this approach may have excluded relevant studies indexed in other databases such as Embase or PsycINFO. Second, of the eligible studies, few were conducted in developing countries, limiting generalisability to populations with lower internet and healthcare access. This may have been influenced by the eligibility criteria requiring studies to be written in English. Third, only ten of the retrieved studies evaluated impact on a meso- or macro-level. While extensive key terms were used, this may reflect a broader trend in impact measurement that warrants further investigation. Finally, the review excluded grey literature, such as evaluation reports and internal assessments, which may contain valuable insights into real-world OHI evaluation practices. This omission may have led to an underrepresentation of applied strategies used by non-academic organisations or in resource-limited settings.

Conclusion

Although evaluation of the impact of online health information frequently includes measurement of changes in knowledge, attitude and behaviour at a micro-level, evaluation did not often extend to meso- and macro-levels, rendering organisational and societal impact under researched. Additionally, the definition and methods for measuring impact varied greatly in design and quality between studies. Application of evaluation strategies used in public health campaigns, may assist choice in measurement of impact to better demonstrate value to funding organisations. However, these strategies may be more expensive and time consuming in the context of OHI, possibly contributing to continual inconsistencies in impact definition and measurement. Development of a framework for impact measurement specific to OHI, based on these strategies, could guide more standardised methods of holistic impact definition and measurement. A framework to measure impact across micro-, meso- and macro-levels could also better inform funding organisations of the value of the OHI for evidence-based financial decisions.

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Author contributions

JT conceptualised the study, supervised, provided critical revision of the final draft, and serves as guarantor, taking overall responsibility for the content. RD contributed to the study design and methodology, conducted the searches, managed the data, screened the articles, and contributed to the writing (drafting, reviewing and editing). MJ contributed to writing (drafting, reviewing and editing). CC was involved in screening, data extraction and charting, and writing (original draft, reviewing and editing).

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Supplementary files

S1. Search strategies

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, Daily and Versions 1946 to May 04, 2023

Search run 8 May 2023

#	Searches
1	((online or on-line or web or web-based or website* or internet or digital* or e-hub* or ehub*) adj4 (knowledge or evidence or tool or tools or toolkit* or toolbox* or information* or resource* or hub or hubs or portal* or platform* or guidance or guideline* or advice or e-learning or elearning)).ti.
2	*Internet/ or *Online systems/
3	Knowledge/ or Information services/ or Health information systems/ or "Information storage and retrieval"/
4	Access to information/ or Information dissemination/
5	Consumer health information/ or Patient education as topic/ or Health promotion/
6	Guidelines as topic/ or Practice guidelines as topic/
7	exp Education, Continuing/
8	or/3-7
9	Program evaluation/ or Evaluation studies as topic/ or Cost-benefit analysis/
10	(Evaluat* or assess* or measur* or effective* or efficac* or feedback or metric* or analytic*).ti,kf.
11	or/9-10
12	Health knowledge, attitudes, practice/ or Health behavior/ or Attitude of health personnel/ or Attitude to health/ or Learning/ or Health literacy/ or Health education/ or Evidence based medicine/ or Evidence based practice/ or Outcome assessment, health care/ or Professional competence/ or Clinical competence/ or Practice patterns, Physicians/ or Decision making/ or Consumer behavior/ or Choice behavior/ or Patient satisfaction/ or Patient participation/
13	(impact* or influence? or influential* or engag* or effect? or effective* or efficac* or increas* or improv* or benefi*).ti.
14	("use" or us?age or uptake or adopt* or intent* or behavio?r* or practice* or choice* or decision* or acceptance or outcome* or literacy or knowledg* or awareness or attitude* or belief* or competen* or aptitude* or skill* or understanding).ti,ab,kf.
15	or/12-14
16	1 or (2 and 8)
17	11 and 15 and 16
18	limit 17 to english language
19	limit 18 to yr="2013 -Current"

CINAHL (EBSCOhost)

Run 8 May 2023

#	**Query**
S1	TI ((online or "on-line" or web or "web-based" or website* or internet or digital* or "e-hub*" or ehub*) N5 (knowledge or evidence or tool or tools or toolkit* or toolbox* or information* or resource* or hub or hubs or portal* or platform* or guidance or guideline* or advice or "e-learning" or elearning))
S2	(MH "Electronic Publishing") OR (MM "Internet") OR (MH "Website Development") OR (MH "World Wide Web") OR (MM "Online systems")
S3	(MH "Knowledge") OR (MH "Health Knowledge") OR (MH "Professional Knowledge") OR (MH "Nursing Knowledge")
S4	(MH "Access to Information") OR (MH "Information Resources") OR (MH "Health Information") OR (MH "Consumer Health Information") OR (MH "Drug Information") OR (MH "Information Services") OR (MH "Remote Access to Information")
S5	(MH "Health Information Systems")
S6	(MH "Information Retrieval")
S7	(MH "Health Education+")
S8	(MH "Health Promotion+")
S9	(MH "Practice Guidelines")
S10	(MH "Education, Continuing+")
S11	S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10
S12	S2 AND S11
S13	S1 OR S12
S14	(MH "Data Analytics") OR (MH "Evaluation") OR (MH "Product Evaluation") OR (MH "Program Evaluation")
S15	(MH "Summative Evaluation Research") OR (MH "Evaluation Research")
S16	(MH "Cost Benefit Analysis")
S17	TI Evaluat* or assess* or measur* or effective* or efficac* or feedback or metric* or analytic*
S18	S14 OR S15 OR S16 OR S17
S19	S13 AND S18
S20	(MH "Attitude of Health Personnel+") OR (MH "Behavior") OR (MH "Behavioral Changes") OR (MH "Health Behavior+") OR (MH "Attitude to Change") OR (MH "Consumer Attitudes") OR (MH "Personal Satisfaction") OR (MH "Social Attitudes") OR (MH "Uncertainty")
S21	(MH "Attitude to Health+") OR (MH "Health Beliefs")
S22	(MH "Learning") OR (MH "Personal Growth") OR (MH "Skill Acquisition") OR (MH "Lifelong Learning")
S23	(MH "Health Literacy") OR (MH "Information Literacy")
S24	(MH "Professional Practice") OR (MH "Medical Practice") OR (MH "Outdated Practice") OR (MH "Nursing Practice") OR (MH "Advanced Nursing Practice") OR (MH "Nursing Practice, Evidence-Based") OR (MH "Occupational Therapy Practice") OR (MH "Physical Therapy Practice") OR (MH "Podiatry Practice") OR (MH "Practice Patterns") OR (MH "Prescribing Patterns") OR (MH "Professional Practice, Evidence-Based") OR (MH "Medical Practice, Evidence-Based") OR (MH "Occupational Therapy Practice, Evidence-Based")

	OR (MH "Physical Therapy Practice, Evidence-Based") OR (MH "Professional Practice, Research-Based+")
S25	(MH "Diffusion of Innovation")
S26	(MH "Outcomes (Health Care)") OR (MH "Outcome Assessment") OR (MH "Patient-Reported Outcomes") OR (MH "Nursing Outcomes")
S27	(MH "Professional Competence") OR (MH "Clinical Competence") OR (MH "Nursing Skills") OR (MH "Cultural Competence")
S28	(MH "Prescribing Patterns") OR (MH "Practice Patterns")
S29	(MH "Decision Making") OR (MH "Advance Care Planning") OR (MH "Decision Making, Clinical") OR (MH "Clinical Reasoning") OR (MH "Decision Making, Ethical") OR (MH "Decision Making, Family") OR (MH "Decision Making, Organizational") OR (MH "Decision Making, Patient") OR (MH "Decision Making, Shared")
S30	(MH "Patient Satisfaction") OR (MH "Consumer Satisfaction") OR (MH "Patient Preference")
S31	(MH "Consumer Participation")
S32	TI impact* or influence? or influential* or engag* or effect? or effective* or efficac* or increas* or improv* or benefi*
S33	TI (use or usage or useage or uptake or adopt* or intent* or behavior* or behaviour* or practice* or choice* or decision* or acceptance or outcome* or literacy or knowledg* or awareness or attitude* or belief* or competen* or aptitude* or skill* or understanding) OR AB (use or usage or useage or uptake or adopt* or intent* or behavior* or behaviour* or practice* or choice* or decision* or acceptance or outcome* or literacy or knowledg* or awareness or attitude* or belief* or competen* or aptitude* or skill* or understanding)
S34	S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33
S35	S19 AND S34
S36	S19 AND S34
S37	S19 AND S34 Limiters - Published Date: 20130101-20231231 Narrow by Language: - English

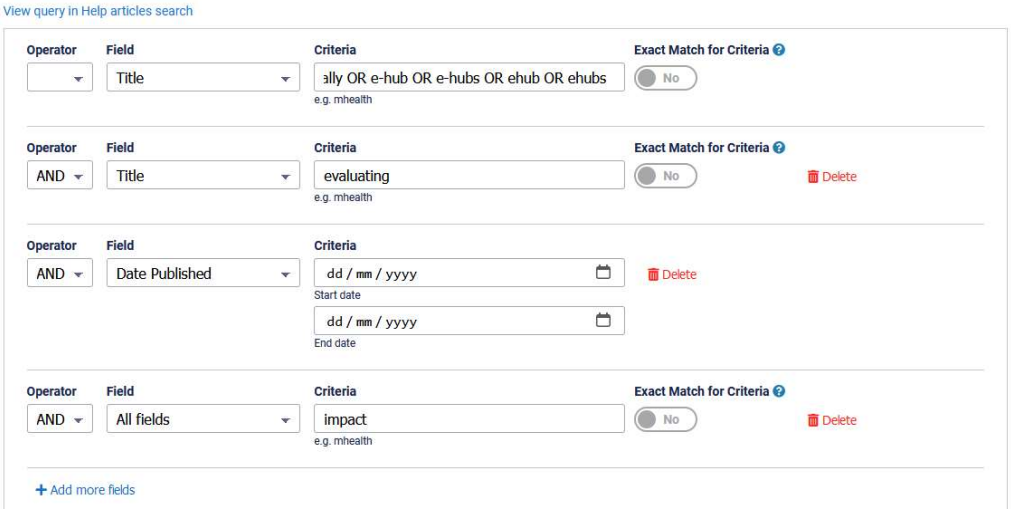
JMIR journals search strategy

Run 12/5/23

Main search strategy

- Title terms AND title term 'Evaluating' AND All field term variants (entered individually)
- Limited to date range: 2013-2023
- No. of citations screened: n=676
- No. of citations downloaded into EndNote: n=119

Search terms



Title field 1	Title field 2	All fields search variants	No. citations screened
online or on-line or web or web-based or website OR websites or internet or digital OR digitally or e-hub OR e-hubs or ehub OR ehubs	Evaluating	Impact	First 100 only
		Assessing	First 100 only
		Assessment	First 100 only
		Effective	First 100 only
		Effectiveness	First 100 only
		Engagement	First 100 only
		Measuring	31
		Evaluate	21
		Measure	21
		Evaluating	3

S2. Categorisation of health topics

Category	Health topic
Physical health	Arthritis
	Diabetes
	Pain management
	Wheelchair transfers
	Heart failure
	Oral health
	Acne
	Chronic kidney disease
	Multiple sclerosis
	Dermatology
	Gestational diabetes mellitus
	Malignant hyperthermia
	Insomnia
	Low back pain
	Musculoskeletal anatomy
	Whiplash
	Developmental coordination disorder
	Systemic sclerosis
	Colonoscopy
	Food allergies
	Chronic obstructive pulmonary disease
	Traumatic brain injury
	Asthma
	Running related injury
	Concussion
	Urinary incontinence
Mental health	Mental health
	Suicide
	Psychotic disorders

	Addiction
	Eating disorder
	Trauma therapy
	Attention deficit hyperactivity disorder
	Post traumatic stress disorder
	Distress
	Stress management
	Schizophrenia
	Depression
	Anxiety
	Autism spectrum disorder
	Bipolar disorder
Lifestyle health	Smoking/vaping
	Obesity
	Nutrition
	Binge drinking
	Physical activity
	Workplace health and wellbeing
	Lifestyle
	Health behaviour
	Substance use
Sexual/reproductive health	Pregnancy
	Sex education
	HIV
	Sexual health in same-sex relationships
	Fertility
Children's health	Mental health in childhood
	Infant health
	Parenting
	Childhood obesity
	Early childhood carries
Cancer	Breast cancer

	Prostate cancer
	Skin cancer
	Cancer survivorship
	Colorectal cancer
	Cervical cancer
Professional development/health professions	Surgery
	Radiology
	Venous blood specimen collection
	Oncology
	Physiotherapy professional development
	Dietetics
	Wound care training
	Nursing professional development
	General practitioner
	Rheumatology
	Psychiatry
	Anaesthesia
	Electroencephalogram
	Genetic counselling
Health literacy/evidence-based health	Patient education
	Health literacy
	Evidence-based medicine
	Public health education
	Medical knowledge acquisition
	Clinical decisions
Health in later life	Advanced care planning
	Healthy ageing
	Dementia care
	Palliative care
Other	Opioid risk
	Immunisations
	Prescription drugs

	Organ donation
	Firearm safety
	Safety around dogs
	Domestic violence

S3. Characteristics of included studies

Study (year published) Reference Number, Country	Design, Target Population, Health Topic(s), Information Format	Aims (in relation to impact)	Types of measurement	Level of impact outcomes
Abdul Haq (2023) [1], Germany	Parents/guardians, Randomised controlled trial, Early childhood caries, Website and App	To evaluate the acceptance and short-term efficacy of a digital application in improving knowledge.	Non-validated repeated measures Clinical indices	Individual level: knowledge or understanding, health behaviour, attitudes/beliefs
Abuidhail (2018) [2], Jordan	Patients, Randomised controlled trial, Breastfeeding, Website	To measure the effectiveness of a web-based education on enhancing knowledge, attitude, and self-efficacy.	Validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs
Adam (2018) [3], Canada	Parents/guardians, Randomised controlled trial, Genetic counselling, Toolkits	To develop an interactive online decisional support tool.	Validated repeated measures	Individual level: knowledge or understanding
Albanese (2022) [4], United States	Patients, Non-randomised experimental study, Postpartum, Toolkits	To develop a patient-centred online tool, collect data on the feasibility, acceptability, and impact on functioning and wellbeing.	Validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, health behaviour
Allen (2015) [5], United Kingdom	Health professionals, Cohort study, Oncology,	To evaluate the demographic characteristics	One-off validated questionnaire,	Individual level: knowledge or understanding

	Website	and evidence-based practice knowledge.	Analysis of existing dataset(s)	
Ammann (2012) [6], Australia	General public, Non-randomised experimental study, Physical activity, Website	To evaluate an intervention, acceptability, usability, and physical activity change.	Validated repeated measures, One-off non-validated questionnaire, Web metrics	Individual level: health behaviour
Aoun (2020) [7], Lebanon	General public, Prevalence study, Health information seeking, Not specified	To estimate the prevalence of Web-based health information seeking for acute symptoms and the impact of information on symptom management.	One-off non-validated questionnaire	Individual level: health behaviour
Arjadi (2016) [8], Indonesia	Patients, Randomised controlled trial, Depression, Website	To investigate whether an Internet-based treatment for depression is effective.	Validated repeated measures	Individual level: health behaviour
Armour (2022) [9], Australia	General public, Non-randomised experimental study, Menstrual cycle-related conditions, Website	To determine if a web-based resource was feasible and acceptable for improving menstrual health literacy and health seeking behaviour.	Validated repeated measures	Individual level: knowledge or understanding, health behaviour
Arnold (2015) [10], United States	Students, Randomised controlled trial, Melanoma, Website	To develop a website to promote knowledge and test its efficacy.	One-off non-validated questionnaire	Individual level: knowledge or understanding, health behaviour
Astrid Peels (2013) [11], Netherlands	General public over 50, Randomised controlled trial,	To test the long-term efficacy of the Web-based	Validated repeated measures	Individual level: knowledge or

	Physical activity, Website	intervention to promote physical activity.		understanding, behavioural intention
Asukile (2022) [12], South Africa	Health professionals and Students (health professions), Cohort study, EEG, eLearning module(s)	To determine the effectiveness of a Web-based EEG teaching program in improving analysis and interpretation skills.	Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding
Bailey (2016) [13], United Kingdom	Heterosexual males, Randomised controlled trial, Sexual health, Website	Develop the website to address barriers, determine the best design for an online RCT, inform methods for health economic data; assess the measurements and explore participant perspectives.	Validated repeated measures, Non-validated repeated measures, Interview, Clinical indices, Web metrics, Cost-benefit analysis	Individual level: knowledge or understanding, health behaviour
Barry (2015) [14], United States	Students, Qualitative research, Alcohol use, eLearning module(s)	To assess student's perspectives and if they implemented specific strategies or self-report altering their behaviour.	Focus group	Individual level: knowledge or understanding, attitudes/beliefs, health behaviour
Bashi (2016) [15], Australia	Patients, Randomised controlled trial, Heart failure, Website and eLearning module(s)	To develop and pilot a Web-based self-care intervention.	Validated repeated measures, Clinical indices, Web metrics	Individual level: knowledge or understanding, health behaviour
Batchelor-Murphy (2015) [16], United States	Patients and Health professionals, Randomised controlled trial,	To test a web-based dementia feeding skills program.	Validated repeated measures, Non-validated repeated measures	Individual level: health behaviour, professional practice

	Dementia feeding, eLearning module(s)			
Batra (2018) [17], United States	Patients, Randomised controlled trial, Female reproductive health, Toolkits	To evaluate whether a web-based preconception health education module changes the proportion of reproductive health discussions.	One-off validated questionnaire, One-off non-validated questionnaire, Web metrics	Individual level: health behaviour
Baumgartner (2019) [18], Switzerland	Patients, Randomised controlled trial, Gambling disorder, Online behavioural therapy intervention	To examine the efficacy of a web-based self-help intervention at reducing problem gambling.	Validated repeated measures, Web metrics	Individual level: health behaviour
Baumgartner (2021) [19], Austria	Patients, Randomised controlled trial, Alcohol misuse and depression, Website and eLearning module(s)	To test the efficacy of an integrated internet-based intervention.	Validated repeated measures	Individual level: health behaviour
Becker (2013) [20], United States	Patients, Non-randomised experimental study, Cancer survivors with disabilities, eLearning module(s)	To develop and pilot the feasibility.	One-off non-validated questionnaire	Individual level: health behaviour
Becker (2016) [21], Germany	Patients, Randomised controlled trial, Inpatient rehabilitation, Website	To evaluate the impact of a targeted video-based intervention on patient's expectations and treatment success.	Validated repeated measures	Individual level: attitudes/beliefs

Bentley (2019) [22], Australia	Health professionals, Mixed methods, Dementia, eLearning module(s)	To develop an online educational resource.	Validated repeated measures, Interview	Individual level: knowledge or understanding, attitudes/beliefs, behavioural intentions
Berk (2013) [23], Australia	Carers (unpaid) and Health professionals, Mixed methods, Bipolar disorder, Website	To evaluate the acceptability and usefulness.	Non-validated repeated measures	Individual level: health behaviour
Billings (2015) [24], United States	Patient, Randomised controlled trial, HIV, eLearning module(s)	To develop and test a cost-effective behavioural intervention.	Non-validated repeated measures	Individual level: knowledge or understanding, health behaviour
Bokne (2019) [25], Sweden	General public, Randomised controlled trial, Stress urinary incontinence, Website	To evaluate the effectiveness of internet-based programmes for self-management.	Validated repeated measures	Individual level: health behaviour
Bond (2018) [26], Australia	Health professionals, Randomised controlled trial, Vancomycin antibiotics, Toolkits and eLearning module(s)	To develop and implement the e-learning tool to improve knowledge.	Non-validated repeated measures	Individual level: knowledge or understanding, health behaviour
Bos-Bonnie (2017) [27], Netherlands	Health professionals and Students (health professions), Cohort study	To evaluate if the individual and online e-learning program improves knowledge, attitude and behaviour.	Non-validated repeated measures	Individual level: health behaviour

	Sexually transmitted infections, eLearning module(s)			
Boß (2015) [28], Germany	Patient, Randomised controlled trial, Alcohol misuse, eLearning module(s)	To evaluate the (cost)-effectiveness of a guided and unguided Internet-based self-help intervention.	One-off validated questionnaire, Validated daily diary	Individual level: health behaviour
Boß (2017) [29], Germany	Patient, Randomised controlled trial, Alcohol misuse, eLearning module(s)	To test the efficacy of a web-based alcohol intervention with and without guidance.	Validated repeated measures	Individual level: health behaviour
Bradley (2017) [30], Australia	General public, Randomised controlled trial, Financial and health advance care directives, eLearning module(s)	To assess computer-based online Advance Directives information and email prompting for facilitating completion of ADs.	Non-validated repeated measures	Individual level: health behaviour
Brochu (2019) [31], Canada	Patients, Cross sectional study, Fertility, Online Survey	To better understand the information and support needs of fertility patients.	One-off validated questionnaire, Web metrics	Individual level: health behaviour
Bryant (2023) [32], United States	Patients, Mixed methods, Postpartum, Toolkits and App	To evaluate the Joyuus prototype.	Validated repeated measures, Web metrics	Individual level: health behaviour
Bugajski (2020) [33], United States	Patients, Non-randomised experimental study, Chronic obstructive pulmonary disease,	To develop and test the feasibility and acceptability of a digital, educational self-care intervention to improve self-care ability,	Validated repeated measures, Web metrics	Individual level: knowledge or understanding and organisational level: procedure

	Website and eLearning module(s)	adherence, knowledge and symptoms.		
Bujnowska-Fedak (2020) [34], Poland	General public, Prevalence study, Health seeking, Not specified	To investigate whether and how information about health and disease obtained from the Internet influenced patients.	Interview, One-off non-validated questionnaire	Individual level: health behaviour
Buntrock (2014) [35], Germany	Patients, Randomised controlled trial, Major Depressive Disorder, Website and eLearning module(s)	To evaluate the (cost-) effectiveness of a web-based intervention.	Validated repeated measures, Cost-benefit analysis	Individual level: health behaviour
Burns (2019) [36], United Kingdom	Health professionals, Mixed methods, Midwifery, eLearning module(s)	To test the effectiveness of an online learning tool to improve midwives' accuracy of estimations.	Non-validated repeated measures	Individual level: knowledge or understanding
Camerini (2013) [37], Switzerland	Patients, Cross sectional study, Fibromyalgia Syndrome, Website	To evaluate the effectiveness of an Internet-based patient education intervention.	One-off validated questionnaire, One-off non-validated questionnaire, Web metrics	Individual level: knowledge or understanding
Cameron (2015) [38], United Kingdom	Students, Randomised controlled trial, Lifestyle, eLearning module(s)	To re-assess the effectiveness of an online intervention to promote healthy lifestyle behaviours.	Validated repeated measures, Non-validated repeated measures, Clinical indices, Web metrics, Consumption diary	Individual level: health behaviour

Chan (2017) [39], Canada	Health professionals, Mixed methods, Medical decision making, Website and Video(s)	To develop workshops and webinars to build public health capacity for evidence-informed decision-making.	Non-validated repeated measures, Interview	Individual level: knowledge or understanding
Chee (2020) [40], United States	Patients, Randomised controlled trial, Physical activity and cardiovascular symptoms, Website and eLearning module(s)	To determine the efficacy of an online program for physical activity promotion on cardiovascular symptoms.	Validated repeated measures, Web metrics	Individual level: health behaviour
Chen (2014) [41], United States	Patients, Qualitative research, Colorectal cancer, All online information formats	To investigate the extent to which online information educated consumers.	Interview, One-off validated questionnaire, Analysis of existing dataset(s)	Individual level: health behaviour
Chen (2022) [42], United States	Patients, Randomised controlled trial, Irritable bowel syndrome, Website, eLearning module(s) and phone consultations	To examine the effect of a program on pain, symptoms and quality of life.	Validated repeated measures, Interview, Web metrics, Daily diaries	Individual level: health behaviour
Chlipalski (2019) [43], United States	Health professionals, Non-randomised experimental study, Prenatal nutrition, Video(s)	To design, implement, and evaluate the effectiveness of a video-based online training.	Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding
Choma (2015) [44], United States	Health professionals, Non-randomised experimental study,	To determine the effects of a Web-based continuing education unit program on	One-off validated questionnaire,	Individual level: knowledge or understanding

	Cervical cancer, eLearning module(s)	knowledge and recommendations.	One-off non-validated questionnaire	
Christy (2022) [45], United States	Patients, Randomised controlled trial, Cancer, Website	To assess intervention feasibility and acceptability and compare the effectiveness to improve knowledge.	Non-validated repeated measures	Individual level: knowledge or understanding
Clark (2018) [46], New Zealand	Patients, Randomised controlled trial, Physiotherapy, Website and eLearning module(s)	To investigate the effect of combining web-based patient education with action and coping plans on patient's adherence, function, and satisfaction.	Validated repeated measures, Daily diary	Individual level: health behaviour
Clarke Walper (2020) [47], United States	Health professionals, Randomised controlled trial, Burnout, Website	To determine whether the PTSD Clinicians Exchange could reduce burnout among clinicians.	Validated repeated measures, Web metrics	Individual level: health behaviour
Clough (2020) [48], Australia	Students (general), Randomised controlled trial, Mental health help seeking, Website	To construct and evaluate a brief online educational intervention to increase mental health literacy and help-seeking.	Validated repeated measures	Individual level: knowledge or understanding, health behaviour
Connelly (2020) [49], United States	Health professionals, Non-randomised experimental study, Paediatric migraines, Toolkits	To evaluate whether access to an online decision support tool is associated with a change in evidence-based primary care.	Clinical indices, Web metrics	Organisational level
Connolly (2013) [50], Australia	Students (health professions),	To create and evaluate the educational effectiveness of a digital resource	Validated repeated measures,	Individual level: knowledge or understanding

	Randomised controlled trial, Child development, Video(s) and eLearning module(s)	instructing paediatric trainees.	Non-validated repeated measures	
Cramer (2019) [51], United States	Health professionals, Non-randomised experimental study, Suicide, eLearning module(s)	To evaluate the preliminary effectiveness of a web-mediated suicide prevention training program.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding
Cristancho-Lacroix (2013) [52], France	Carers (unpaid), Protocol, Alzheimer's disease, Website	To assess the efficacy of a French Web-based psychoeducational program.	Validated repeated measures, Interview, Web metrics	Individual level: health behaviour
Croom (2015) [53], United States	Students, Randomised controlled trial, Alcohol consumption, Online course	To evaluate the short-term effectiveness of an online alcohol prevention program.	Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, health behaviour
Curtis (2016) [54], Australia	Health professionals, Non-randomised experimental study, Trauma, eLearning module(s)	To develop and evaluate a trauma eLearning module.	Validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, health behaviour
Daniluk (2014) [55], Canada	People of childbearing age, Non-randomised experimental study, Fertility, Website	To evaluate the effectiveness of online education in increasing knowledge and changing beliefs.	Validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs

Davies (2014) [56], United States	Parents/guardians, Mixed methods, Child obesity, Website	To evaluate the effects of web-based information on parental self-efficacy.	Non-validated repeated measures	Individual level: knowledge or understanding
Davies (2017) [57], United Kingdom	General public, Mixed methods, Mental health, App	To demonstrate how analytical data and user feedback can provide a proportionate and practical approach to evaluation of mental well-being.	Interview, One-off validated questionnaire, Web metrics	Individual level: health behaviour
Davis (2017) [58], United States	Patients, Non-randomised experimental study, Diabetes, Video(s)	To investigate the effect of a video intervention on patient self-efficacy, problems.	Validated repeated measures, Interview, One-off non-validated questionnaire, Web metrics	Individual level: health behaviour
De Cocker (2016) [59], Belgium	Employees with jobs involving sitting, Randomised controlled trial, Workplace posture, Website	To investigate the effects of this intervention on objectively measured sitting time, standing time, and breaks from sitting, as well as self-reported sitting.	Non-validated repeated measures, Clinical indices, Web metrics	Individual level: knowledge or understanding, health behaviour
de Hosson (2019) [60], Netherlands	Patients Randomised controlled trial, Neuroendocrine tumour, Website	To determine whether a web-based, personalised information and support system reduces distress and/or improves patient's perception and satisfaction.	Validated repeated measures, One-off non-validated questionnaire, Web metrics	Individual level: attitudes/beliefs
de Josselin de Jong (2014) [61], Netherlands	Students, Randomised controlled trial, Smoking,	To describe the intervention characteristics and show the effectiveness.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: behavioural intention

	Website			
Dekker (2018) [62], Netherlands	Health professionals, Randomised controlled trial, Antibiotics, Website	To reduce antibiotic prescribing by online training.	Clinical indices, Web metrics	Organisational level: practice prescription rates
Deloian (2015) [63], United States	Health professionals and students (health professions), Non-randomised experimental study, Breastfeeding, eLearning module(s)	To evaluate knowledge gained from an online educational program.	Non-validated repeated measures	Individual level: knowledge or understanding
Denneson (2019) [64], United States	Patients, Cross sectional study, Veteran mental health, Website	To evaluate whether a web-based educational program improves patient-clinician communication and patient activation.	Validated repeated measures, Analysis of existing dataset(s), Web metrics	Individual level: attitudes/beliefs
Desteghe (2018) [65], Belgium	Patients, Randomised controlled trial, Atrial fibrillation, Website and eLearning module(s)	To evaluate the effectiveness of an online tailored education platform.	Clinical indices, Web metrics	Individual level: knowledge or understanding
Dickter (2021) [66], United States	Parents/guardians, Non-randomised experimental study, Autism, Website	To characterize implicit bias and examine whether viewing educational materials would change attitudes.	Validated repeated measures, Non-validated repeated measures	Individual: attitudes/beliefs
Dobscha (2019) [67], United States	Health professionals, Non-randomised experimental study,	To evaluate changes in mental health clinician's attitudes and	Validated repeated measures, Web metrics	Individual: health behaviour

	Mental health, Website and Online course	communications with patients.		
Doubova (2016) [68], Mexico	Students, Protocol, Sexual behaviour, Website	To present the design of an internet-based educational strategy to prevent risky sexual behaviors.	Validated repeated measures	Individual level: knowledge or understanding, health behaviour
Duggleby (2017) [69], Canada	Carers (unpaid), Protocol, Alzheimer's disease, related dementia and multiple chronic conditions, Toolkits	To evaluate the intervention.	Validated repeated measures, Interview, Cost-benefit analysis	Individual level: attitudes/beliefs
Duggleby (2020) [70], Canada	Carers (unpaid), Protocol, Dementia, Toolkits	To evaluate the intervention.	Validated repeated measures, Interview	Individual level: knowledge or understanding
Eaton (2021) [71], United States	Health professionals, Non-randomised experimental study, Post resuscitation, Video(s)	To evaluate the impact of an educational tool on the frequency of PRD.	Non-validated repeated measures	Individual level: knowledge or understanding And Organisational level: procedure
Eck (2016) [72], United States	Health professionals, Non-randomised experimental study, Healthy lifestyle, Video(s)	To create an online training program and assess the effectiveness at improving knowledge, attitudes, and behaviors.	Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs, behavioural intentions

Edwards (2019) [73], United Kingdom	Patients, Protocol, Labour, Website	To evaluate an intervention for improving women's experiences of remaining at home in early labour.	Validated repeated measures, Clinical indices	Individual level: attitudes/beliefs
Elbers (2013) [74], Netherlands	People making an insurance claim from an accidental injury, Randomised controlled trial, Accidental injury, Website and eLearning module(s)	To empower injured claimants to facilitate recovery from physical and/or mental injuries after the legal compensation process.	Validated repeated measures, Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs, health behaviour
Elkman (2018) [75], United Kingdom	Health professionals, Mixed methods, Haemato-oncology, eLearning module(s)	To develop an online educational resource to enhance knowledge and improve confidence.	Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs, behavioural intention
Elliot (2014) [76], United States	Marijuana users, Randomised controlled trial, Marijuana use, Website	To evaluate the short-term effectiveness of the intervention in changing marijuana involvement and perceived norms.	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire	Individual level: attitudes/beliefs, health behaviour
Eng (2014) [77], Canada	Health professionals, Mixed methods, Spinal cord injury, Website	To evaluate the impact of the project on access to information and how it influenced management of clients.	Focus group, One-off non-validated questionnaire, Web metrics	Individual level: professional practice

Epton (2014) [78], United Kingdom	General public and students, Randomised controlled trial, Health behaviour. Website and App	To assess the efficacy and cost-effectiveness of a theory-based online health behaviour intervention.	Validated repeated measures, Clinical indices, Web metrics	Individual level: attitudes/beliefs, health behaviour
Ezegbe (2018) [79], Nigeria	Students, Randomised controlled trial, HIV/AIDS, Video(s)	To determine the efficacy of a therapy on knowledge and perception of risk.	Validated repeated measures	Individual level: knowledge or understanding
Fang (2020) [80], Taiwan	Patients, Randomised controlled trial, Breast cancer, Website and eLearning module(s)	To evaluate the effect of a web-based survivorship care plan on unmet needs, fear of recurrence, symptom distress, anxiety, depression, and quality of life.	Validated repeated measures, Clinical indices, Web metrics	Individual level: knowledge or understanding, health behaviour
Ferré (2020) [81], France	Patients, Non-randomised experimental study, Anaesthesia, Website and Conversational agent	To evaluate the effectiveness of a digital companion on patients' knowledge and satisfaction.	Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding
Finlay-Jones (2020) [82], Australia	Patients, Protocol, Chronic medical conditions, Website	To evaluate online self-compassion training as an accessible alternative for youth with a chronic medical condition.	Validated repeated measures, Non-validated repeated measures, Interview, Web metrics, Cost-benefit analysis	Individual level: health behaviour

Fletcher (2022) [83], Australia	Patients, Cross sectional study, Bipolar II disorder, Website, App and eLearning module(s)	To assess the feasibility, acceptability, and clinical utility of an intervention for BD-II.	Validated repeated measures, Interview, Web metrics	Individual level: health behaviour
Fontaine (2016) [84], Japan	Health professionals, Evaluation, Cardiovascular disease Video(s) and eLearning module(s)	To examine the feasibility and acceptability of a Web-based e-learning platform for brief motivational interviewing.	Non-validated repeated measures	Individual level: knowledge or understanding, professional practice
Ford-Gilboe (2020) [85], Canada	Women in potentially risky relationships, Randomised controlled trial, Intimate partner violence, Website	To test the effectiveness of an interactive, tailored, online safety and health intervention on mental health and safety outcomes.	Validated repeated measures, Non-validated repeated measures, Interview, One-off validated questionnaire, One-off non-validated questionnaire	Individual level: health behaviour
Fortier (2015) [86], United States	Patients and parents/guardians, Randomised controlled trial, Preoperative preparation, Website	To conduct a formative evaluation and test the preliminary efficacy of a Web-based Tailored Intervention.	Validated repeated measures, Interview, Focus group, One-off non-validated questionnaire, Clinical indices, Web metrics	Individual level: health behaviour
Fowler (2017) [87], United States	Women, Randomised controlled trial, Breast cancer and physical activity,	To test the effects of a publicly available, Internet-based, risk assessment tool on social-cognitive	One-off non-validated questionnaire	Individual level: behavioural intention

	Website	precursors of physical activity.		
Franko (2013) [88], United States	Students, Randomised controlled trial, Body image, Website	To test the efficacy of an Internet-based health promotion program.	Validated repeated measures, One-off non-validated questionnaire	Individual level: attitudes/beliefs, health behaviour
Frazzoni (2021) [89], Italy	Pakistani people living in northern Italy, Cross sectional study Hepatitis C Virus, Video(s)	To evaluate the effectiveness of a web-based platform to assess and raise the awareness of HCV.	Non-validated repeated measures	Individual level: knowledge or understanding
Frederix (2016) [90], Belgium	Patients, Protocol, Coronary artery disease, eLearning module(s)	To investigate the medium-term effectiveness of the web-based eLearning platform.	Validated repeated measures, Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, health behaviour
Fristedt (2021) [91], Sweden	Patients, Protocol, Radiation therapy, App	To evaluate whether a digital information tool can decrease distress and enhance self-efficacy and health literacy.	Validated repeated measures, Interview, Notebooks and treatment observations	Individual level: health behaviour
Gadja (2018) [92], Poland	General public, Randomised controlled trial, Cancer, Website	To identify the role of web-based educational campaigns in cancer prevention.	Validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs
Gagne (2015) [93], South Korea	Health professionals, Cross sectional study, Urinary incontinence, Website	To develop an online education course and to examine its effectiveness.	Validated repeated measures, One-off validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs

Garside (2018) [94], United Kingdom	Health professionals, Mixed methods, Geriatric medicine, Video(s)	To explore how the Mini Geriatric E-Learning Modules are accessed and used.	Focus group, Web metrics	Individual level: professional practice
Geraghty (2014) [95], United Kingdom	Patients, Protocol, Vestibular rehabilitation, Website	To examine whether an internet-based intervention is effective in reducing symptoms and is cost-effective.	Web metrics, Cost-benefit analysis	Individual level: health behaviour
Gerdesköld (2020) [96], Sweden	General public, Prevalence and cross sectional, Patient care outcomes, Website	To explore the effect of an online knowledge base on patient experiences and health care quality.	One-off validated questionnaire, Analysis of existing dataset(s), Web metrics, Cost-benefit analysis	Individual level: professional practice And Organisational level: procedure
Glang (2014) [97], United States	Parents/guardians and students, Randomised controlled trial, Concussion, Website	To report the findings of a randomized controlled trial of a school-wide intervention.	Validated repeated measures, Non-validated repeated measures, Interview, Clinical indices	Individual level: knowledge or understanding And Organisational level: policy
Glang (2018) [98], United States	Teachers, Non-randomised experimental study, Concussion/traumatic brain injury (TBI), eLearning module(s)	To understand the effect of the training program by general educators on their knowledge.	Non-validated repeated measures	Individual level: knowledge or understanding, professional practice
Glaser (2017) [99], Canada	Patients,	To examine the impact of a web-based communication	Interview, Clinical indices,	Individual level: health behaviour

	Randomised controlled trial, Chronic diseases, eLearning module(s)	intervention on reaching treatment goals.	Web metrics	
Golsteijn (2014) [100], Netherlands	General public over 50, Randomised controlled trial, Physical activity, Website	To provide insight in the cost-effectiveness and cost-utility of a tailored physical activity intervention.	Cost-benefit analysis	Individual level: health behaviour And Societal: public costs
Goodman (2016) [101], Canada	General public, Randomised controlled trial, Vitamin D, Video(s) and App	To improve knowledge, perceptions, dietary intake and blood concentrations of vitamin D.	Validated repeated measures, Non-validated repeated measures, Clinical indices, Web metrics	Individual level: knowledge or understanding, health behaviour
Grimmet (2013) [102], United Kingdom	Patients, Protocol, Cancer, eLearning module(s)	An online intervention to support self-management.	Validated repeated measures, Interview, Cost-benefit analysis	Individual level: attitudes/beliefs, health behaviour
Gulati (2015) [103], United Kingdom	Health professionals, Mixed methods, Skin cancer, Website and Toolkits	To evaluate the impact of a toolkit on confidence and knowledge.	Non-validated repeated measures, Focus group, One-off validated questionnaire, Analysis of existing dataset(s), Web metrics	Individual level: knowledge or understanding, attitudes/beliefs And Organisational level: national statistics
Gültzow (2022) [104], Netherlands	Patients, Randomised controlled trial,	To test the added value of an effective element of a web-based decision aid.	One-off validated questionnaire,	Individual level: health behaviour

	Smoking, Website and Decision aid		Prevalence of behaviour log	
Hall (2018) [105], Australia	Patients, Protocol, Back pain, Website	To measure the effectiveness of a website in improving spinal health literacy, treatment preferences and clinical outcomes.	Web metrics, Weekly/monthly symptom diaries	Individual level: health behaviour
Hammal (2022) [106], Canada	Employees of tobacco companies, Cross sectional study, Smoking, eLearning module(s)	To evaluate the acceptability, usability and knowledge impact of an online program.	Non-validated repeated measures, Interview	Individual level: knowledge or understanding
Han (2020) [107], United States	General public, Cross sectional study, Evidence based health care, Website	To assess whether participation in a free, self-paced online course affects confidence.	Analysis of existing dataset(s), Repeated measure not specified	Individual level: knowledge or understanding
Hansen (2018) [108], United States	Health professionals and students (health professions), Cross sectional study, Medical response to sex-trafficking, eLearning module(s)	To develop an interactive training for medical professionals.	Non-validated repeated measures	Individual level: knowledge or understanding, behavioural intent
Haq (2018) [109], Canada	Students (health professions), Cross sectional study, Oncology, Toolkits	To improve knowledge through an educational tool that we developed and evaluated.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs
Harries (2018) [110], United Kingdom	Health professionals,	Design and testing of the decision training tool	Non-validated repeated measures	Individual level: professional practice

	Randomised controlled trial, Referral to dietitians, Website	aiming to improve decision making.		
Hart (2019) [111], Canada	Parents/guardians and carers (unpaid), Randomised controlled trial, Paediatrics (childhood fever), Website and eLearning module(s)	Compare caregivers' knowledge acquisition and satisfaction with two Web-based tools.	Non-validated repeated measures	Individual level: knowledge or understanding
Havermans (2018) [112], Netherlands	Health professionals, Non-randomised experimental study, Healthcare worker stress, Website	To investigate the effectiveness of a digital platform-based implementation strategy on stress.	Validated repeated measures, One-off validated questionnaire, One-off non-validated questionnaire	Individual level: health behaviour
Hespanhol (2018) [113], Netherlands	Patients, Randomised controlled trial, Running related injury (RRI), Website	To evaluate the effectiveness of online tailored advice on prevention of RRIs and determinants and preventive behaviour.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: health behaviour
Hoffmann (2018) [114], United States	Health professionals, Cross sectional study, Cancer, Website	To evaluate the impact of the curriculum on cancer knowledge.	Non-validated repeated measures, One-off non-validated questionnaire, Observations	Individual level: knowledge or understanding
Holst (2022) [115], Norway	General public in rural areas,	To assess the effect of a digital health education intervention on the uptake	Validated repeated measures, Interview	Individual level: knowledge or understanding

	Non-randomised experimental study, HIV/AIDS, tuberculosis (TB), and Taenia Solium (neuro)cysticercosis and taeniosis, Website and Video(s)	and retention of knowledge.		
Holtz (2020) [116], United States	Parents/guardians, Cross sectional study, Type-1 diabetes, Website	To develop a resource to be used as a preliminary intervention step.	Non-validated repeated measures, Interview, Focus group	Individual level: knowledge or understanding, attitudes/beliefs
Hughes (2014) [117], Ireland	Students, Cross sectional study, Asthma, eLearning module(s)	To develop an online e-learning program to provide support.	Validated repeated measures, Focus group, One-off non-validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs
Imamura (2016) [118], Japan	Employees, Randomised controlled trial, Depression, Website	To examine whether a website on stress and depression was effective in improving symptoms.	Validated repeated measures, Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, health behaviour
Ingersoll (2018) [119], United States	Fertile women with risky drinking, Randomised controlled trial, Alcohol exposed pregnancies, Website	To compare interactive, and tailored Internet interventions for its effect on AEP risk.	Validated repeated measures, Interview, Web metrics, Online diary	Individual level: health behaviour
Innes (2019) [120], United Kingdom	Patients, Randomised controlled trial, Obesity,	To evaluate the effectiveness of reducing body mass through the scalable NHS resource.	One-off validated questionnaire, Clinical indices	Individual level: health behaviour

	Toolkits			
Ipsen (2014) [121], United States	Patients, Randomised controlled trial, Vocational Rehabilitation, Website	To test the comparative effectiveness of an online-based health promotion program for improving health and employment outcomes.	Validated repeated measures	Individual level: health behaviour
Jahangiry (2014) [122], Iran	Patients, Protocol, Metabolic syndrome, Website	To determine the feasibility, acceptability, usability, and effectiveness of the interactive intervention.	Clinical indices, Web metrics	Individual level: health behaviour
Jaycox (2019) [123], United States	Students, Cross sectional study, Mental health, Website	To assess feasibility and acceptability of LIFT, and whether potential mechanisms of action showed improvement over time.	One-off non-validated questionnaire, Web metrics	Individual level: attitudes/beliefs, health behaviour
Jeon (2018) [124], Australia	Patients, Qualitative research, Osteoarthritis, Toolkits and Decision aid	To examine the experiences with, and impact of, evidence-based online resources in self-management.	Interview	Individual level: attitudes/beliefs
Jiao (2019) [125], Singapore	Patients, Randomised controlled trial, Post partum, Website	To examine the effectiveness of web-based and home-based postnatal psychoeducational interventions.	Validated repeated measures	Individual level: health behaviour
Johnson (2018) [126], Australia	Patients, Protocol, Physical activity, Website and App	To evaluate the effectiveness of delivering a home exercise programme.	Validated repeated measures, One-off non-validated questionnaire	Individual level: health behaviour

Justicia (2017) [127], Spain	Patients, Protocol, Depression, Toolkits	To examine the efficacy of an internet-based self-management tool.	Validated repeated measures, One-off non-validated questionnaire, Clinical indices	Individual level: health behaviour
Kain (2017) [128], Australia	Health professionals, Randomised controlled trial, Neonatal palliative care, eLearning module(s)	To develop and pilot test an educational program to optimise palliative care.	Validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs
Kamke (2020) [129], United States	Patients, Non-randomised experimental study, Sexual and mental health, eLearning module(s)	To test the feasibility, acceptability, and efficacy of a brief, online sexual health program.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs, health behaviour
Karvinen (2017) [130], Canada	Health professionals, Randomised controlled trial, Oncology nursing, eLearning module(s)	To examine the effectiveness of online learning modules for improving physical activity counselling practices.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding, professional practice
Kasparik (2022) [131], Germany	Health professionals and students (health professions), Cross sectional study, Post traumatic stress disorder in children, eLearning module(s)	To evaluate the effectiveness and user friendliness of the programme.	Non-validated repeated measures, One-off non-validated questionnaire, Web metrics	Individual level: knowledge or understanding
Kenjrawi (2022) [132], Syria	Health professionals, Non-randomised experimental study, Evidence-based medicine, eLearning module(s)	To test the effectiveness and the feasibility of a course in improving the competencies of Syrian health care professionals.	Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs, professional practice

Kennedy (2016) [133], Australia	General public and patients, Protocol, Suicide, Website	To reduce suicide stigma.	Validated repeated measures, Interview, One-off non-validated questionnaire, Program engagement	Individual level: attitudes/beliefs
Kerr (2020) [134], United States	People working with the target population, Mixed methods Mental health, Toolkits	To prepare adults to support American Indian and Alaskan Native youth who post or view concerning messages.	One-off non-validated questionnaire, Content specific role-plays	Individual level: attitudes/beliefs, professional practice
Kim (2020) [135], United States	Women, Randomised controlled trial, Human papillomavirus (HPV) vaccination, Video(s)	To assess the effectiveness of a video intervention to promote HPV vaccination.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: motivation/behavioural intent, knowledge or understanding, attitudes/beliefs
Kim (2021) [136], United States	Health professionals, Non-randomised experimental study, Palliative care, eLearning module(s)	To evaluate the effectiveness of an online training on knowledge and self-efficacy.	Non-validated repeated measures	Individual level: knowledge or understanding, professional practice
King (2021) [137], Australia	Patients, Mixed methods, Acute care, Toolkits	To undertake an online evaluation of educational materials to improve consumer's knowledge and confidence.	Validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding
Knowlden (2015) [138], United States	Parents/guardians, Randomised controlled trial, Childhood obesity, eLearning module(s)	To pilot test the intervention.	Validated repeated measures	Individual level: health behaviour

Knowlden (2016) [139], United States	Parents/guardians, Randomised controlled trial, Childhood obesity, eLearning module(s)	To evaluate the efficacy of the intervention at 1-year, postintervention.	Validated repeated measures	Individual level: health behaviour
Knowlden (2018) [140], United States	Parents/guardians, Randomised controlled trial, Childhood obesity, eLearning module(s)	To evaluate a web-based prevention intervention for sustained effects at 2-years postintervention.	Validated repeated measures	Individual level: health behaviour
Kobak (2013) [141], United States	Health professionals, Cross sectional study, Anxiety, eLearning module(s) and Videoconferencing role plays	To examine the effectiveness of this model in training clinicians.	Non-validated repeated measures, One-off validated questionnaire, One-off non-validated questionnaire, Role play ratings	Individual level: knowledge or understanding, professional practice
Kohler (2020) [142], Germany	Patients, Randomised controlled trial, Asthma, eLearning module(s)	To compare the effectiveness of two programs for asthma knowledge.	Validated repeated measures	Individual level: knowledge or understanding
König (2022) [143], Germany	Students, Cross sectional study, Health literacy, eLearning module(s)	To evaluate an e-learning course to improve (digital) health literacy.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding
Korkmaz (2020) [144], Turkey	Patients, Randomised controlled trial, Breast cancer, Website	To evaluate the influence of web-based education on anxiety and quality of life.	Validated repeated measures	Individual level: health behaviour

Kratz (2021) [145], United States	Patients, Cross sectional study, Multiple sclerosis, fibromyalgia, Toolkits	To develop a web-based multi-symptom self-management program.	Validated repeated measures, One-off validated questionnaire, Web metrics	Individual level: professional practice, health behaviour
Kulatunga (2013) [146], Sri Lanka	Health professionals, Cross sectional study, Medical genetics, Not mentioned	To develop, implement and evaluate a web-based continuing professional development programme.	One-off non-validated questionnaire, Web metrics, Pre and post but not specified	Individual level: knowledge or understanding
Lafreniere (2014) [147], Canada	Female academics, Mixed methods, Nutrigenomics-nutrigenetics (NGx) research, Website	To evaluate the effectiveness of a knowledge dissemination intervention.	One-off non-validated questionnaire	Individual level: professional practice
Laine (2019) [148], Finland	Health professionals, Non randomised experimental and mixed methods, Healthcare worker competence, eLearning module(s)	To describe the impact of a Web-based educational course to increase self-efficacy, self-esteem, and team climate.	Validated repeated measures, One-off non-validated questionnaire	Individual level: attitudes/beliefs
Lamers (2023) [149], Netherlands	Patients, Cohort study, Inflammatory bowel disease, Toolkits	To assess diet quality of IBD patients and study changes in diet quality.	Validated repeated measures, One-off non-validated questionnaire, Clinical indices	Individual level: knowledge or understanding, health behaviour
Langford (2020) [150], United States	Health professionals, Non-randomised experimental study, Pain management,	The impact of the education module on clinician's knowledge, perceived competence, and	One-off non-validated questionnaire	Individual level: knowledge or understanding, professional practice

	eLearning module(s)	use of guideline-adherent practices.		
Lau (2017) [151], United States	Health professionals, Randomised controlled trial, Venous thromboembolism, eLearning module(s)	To evaluate the effectiveness of nurse education on medication administration practice.	One-off non-validated questionnaire, Analysis of existing dataset(s)	Individual level: professional practice
Lauder (2015) [152], Australia	Patients, Randomised controlled trial, Bipolar disorder, eLearning module(s)	To investigate the comparative efficacy of the intervention and establish the impact on functionality, Locus of Control, social support, medication adherence and quality of life.	Validated repeated measures, Non-validated repeated measures	Individual level: health behaviour
Lee-Easton (2022) [153], United States	General public, Qualitative research, Evidence-based program, Website	To examine information needs that motivate visitors to EBPRs, if the information provided by the EBPRs met needs, how they planned to use the information and recommendations for improvement.	Interview	Individual level: health behaviour
Leeuw (2018) [154], Netherlands	Patients, Randomised controlled trial, Obstetrics, Website	To evaluate face-to-face information provision in patient counselling.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding

Lei (2018) [155], United States	Parents/guardians, Non-randomised experimental study, Autism, eLearning module(s)	To evaluate genetic knowledge and test perceptions.	Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs, motivational/behavioural intent
Lewis (2022) [156], United States	Health professionals, Non-randomised experimental study, Psychiatry, eLearning module(s)	To develop a web-based educational toolkit to effect knowledge, attitudes, and practices.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs, professional practice
Li (2018) [157], Canada	Patients, Mixed methods, Rheumatoid Arthritis, Decision aid	To assess how an interactive online patient decision aid, reduces decisional conflict and improves medication-related knowledge and self-management capacity.	Validated repeated measures, Non-validated repeated measures, Interview	Individual level: knowledge or understanding
Liang (2019) [158], China	Students, Protocol, Healthy lifestyle, eLearning module(s)	To describe the design and baseline characteristics of a web-based lifestyle intervention program.	Validated repeated measures, Non-validated repeated measures, Clinical indices	Individual level: health behaviour, behavioural intent
Lidington (2020) [159], United Kingdom	Patients, Protocol, Breast cancer, Toolkits	To assess the impact of a mobile application for self-monitoring symptoms on self-management.	Validated repeated measures, Analysis of existing dataset(s), Web metrics	Individual level: knowledge or understanding, health behaviour
Lima-Serrano (2018) [160], Spain	Adolescents, Protocol, Binge drinking, Website	To design a web-based computer tailored intervention aimed at the	Validated repeated measures, Non-validated repeated measures,	Individual level: attitudes/beliefs, behavioural intent

		prevention of binge drinking.	Web metrics	
Lintvedt (2013) [161], Norway	Adolescents and young adults, Randomised controlled trial, Depression, Website	To investigate whether an unguided Internet-based self-help intervention can reduce symptoms of depression.	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge of understanding, health behaviour
Lisón (2020) [162], Spain	Patients, Randomised controlled trial, Obesity and hypertension, eLearning module(s)	To investigate the short- and long-term efficacy.	Clinical indices, Web metrics	Individual level: health behaviours
Loskutova (2021) [163], United States	Health professionals, Mixed methods, ADHD, Toolkits	To assess the impact of using a Toolkit in a practice setting.	Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs, professional practice
Ma (2020) [164], China	General public, Cohort study, Health decision-making, All online information formats	To explore the associations between internet behaviors and medical decisions.	Analysis of existing dataset(s)	Individual level: motivation/behavioural intent
Maguire (2019) [165], Australia	Health professionals, Cross sectional study, Eating disorders, eLearning module(s)	To evaluate the effectiveness of the online training program.	Non-validated repeated measures, Web metrics, Cost-benefit analysis	Individual level: knowledge or understanding, attitudes/beliefs, motivation/behavioural intent, professional practice
Magura (2023) [166], United States	General public and health professionals,	To determine if visitors to selected EBPRs	Interview	Individual level: knowledge or

	Qualitative research, Evidence-based program registries (EBPRs), Website	accomplished the objectives of their visits.		understanding, professional practice
Malik (2017) [167], Malaysia	Health professionals, Randomised controlled trial, Oral care, eLearning module(s)	To evaluate the effectiveness of a Web-based program on 'general intention'.	Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs, professional practice, motivation/behavioural intent
Mann (2013) [168], Canada	Young people, Mixed methods, Sexual health, Website	To increase access to chlamydia and gonorrhea testing and sexual health information.	One-off non-validated questionnaire, Analysis of existing dataset(s), Web metrics, Reports from texting services	Individual level: knowledge or understanding, behavioural intent
Marel (2023) [169], Australia	Health professionals, Cross sectional study, Mental disorders and substance abuse, eLearning module(s)	To evaluate an evidence-based online program for improving the knowledge, attitudes, and confidence.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs, professional practice
Marianayagam (2017) [170], Canada	Patients, Cross sectional study, Hepatopulmonary Syndrome, Website	To develop and evaluate a tailored educational website.	Validated repeated measures	Individual level: knowledge or understanding
Marín-Marín (2020) [171], Spain	Students (health professions), Cross sectional study, Dietetics,	To analyse the effectiveness of different training actions.	Validated repeated measures	Individual level: knowledge or understanding,

	Digital resources			attitudes/beliefs, health behaviour
Mariño (2016) [172], Australia	General public, Cross sectional study, Oral health, eLearning module(s)	To develop and test a theory-based, interactive, Internet-based promotion intervention.	Non-validated repeated measures, Focus group	Individual level: knowledge or understanding, attitudes/belief, health behaviour
Marsch (2015) [173], United States	Patients, Randomised controlled trial, HIV, eLearning module(s)	To evaluate the effectiveness of a web-based prevention program.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding, health behaviour, motivation/behavioural intent
Martinic (2022) [174], Croatia	Students (health professions), Randomised controlled trial, Evidence-based health, eLearning module(s)	To evaluate the effect of a short web-based educational intervention on short-term knowledge.	Non-validated repeated measures	Individual level: knowledge or understanding
Matthys (2021) [175], Belgium	Patients and carers (unpaid), Protocol, Cancer, Website and Online sessions	To evaluate the effectiveness of psychosocial and educational interventions for improving emotional functioning and self-efficacy.	Validated repeated measures, Interview, One-off non-validated questionnaire, Web metrics	Individual level: health behaviour
McCall (2019) [176], Canada	Patients, Cross sectional study, Mental health (anxiety), Website	To evaluate the intervention's effectiveness.	Validated repeated measures, Non-validated repeated measures, Analysis of existing dataset(s),	Individual level: health behaviour

			Web metrics	
McCart (2020) [177], United States	Teachers and educators, Cross sectional study, Traumatic brain injury, eLearning module(s)	To examine the efficacy of an online traumatic brain injury professional development intervention.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding
McCaslin (2020) [178], United States	Health professionals, Mixed methods, Veteran health care, Toolkits	To examine the impact of the Toolkit on provider knowledge and behaviors.	Non-validated repeated measures	Individual level: professional practice
McElfish (2019) [179], United States	Patients, Non-randomised experimental study, Diabetes care, Video(s)	Describe the development of a YouTube video and assess its effectiveness.	Non-validated repeated measures Interview	Individual level: knowledge or understanding, attitudes/beliefs, health behaviour
McGeoch (2015) [180], New Zealand	Health professionals, Cross sectional study, Healthcare coordination, Website	To determine the perceptions of healthcare professionals on a website that provides clinical and referral information.	One-off non-validated questionnaire	Individual level: professional practice
McGlashan (2018) [181], United Kingdom	Patients, Non-randomised experimental study, Procedural anxiety, Video(s)	To evaluate the value of an internet-based educational animated video.	Non-validated repeated measures	Individual level: knowledge or understanding, health behaviour
McLaughlin (2013) [182], United States	Carers (unpaid) and family members, Randomised controlled trial, Traumatic brain injury, Website	To examine the efficacy of an interactive multimedia intervention that teaches advocacy skills.	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs, behavioural intent

Meischke (2023) [183], United States	Workplace managers, Cross sectional study, Workplace stress, Toolkits	To develop and evaluate of an online occupational stress reduction toolkit.	One-off non-validated questionnaire, Analysis of existing dataset(s), Web metrics	Individual level: behavioural intent
Meropol (2016) [184], United States	Patients, Randomised controlled trial, Cancer research, Video(s)	To assess whether an interactive computer program helps patients overcome barriers to considering clinical trials.	Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs, motivation/behavioural intent
Merrill (2021) [185], United States	Students and adolescents, Cross sectional study, Smoking/vaping, Website and eLearning module(s)	To evaluate a prevention program.	Non-validated repeated measures	Individual level: behavioural intent, attitudes/beliefs
Micheel (2017) [186], United States	Health professionals, Randomised controlled trial, Oncology, Website	To assess learning styles of oncology health care professionals.	Non-validated repeated measures, One-off non-validated questionnaire, Web metrics	Individual level: knowledge or understanding
Moe-Byrne (2022) [187], United Kingdom	Patients, Randomised controlled trial, Paediatric orthopaedics, Video(s)	To evaluate digital, multimedia information for its effects on trial recruitment, retention and acceptability.		Individual level: motivation/behavioural intent
Molan (2019) [188], Australia	Patients, Cross sectional study, Heart conditions, Website	To evaluate the effectiveness of a website in educating patients.	Validated repeated measures	Individual level: knowledge or understanding

Moore (2017) [189], United States	Health professionals, Non-randomised experimental study, Evidence-based practice, eLearning module(s)	To evaluate the efficacy of an online EBP educational intervention.	Validated repeated measures	Individual level: knowledge of understanding, attitudes/beliefs, professional practice
Morriss (2021) [190], United Kingdom	General public and patients, Randomised controlled trial, Mental disorder (depression and anxiety), Website	To determine the reach, feasibility, acceptability, costs, and outcomes of a public health campaign.	Validated repeated measures, Non-validated repeated measures	Individual level: health behaviour
Morshed (2017) [191], United States	Health professionals, Cross sectional study, Cancer, eLearning module(s)	To assess the effect of the online evidence-based training on improving self-reported evidence-based decision-making skills.	Non-validated repeated measures	Individual level: professional practice
Mulligan (2022) [192], United Kingdom	Parents/guardians, Randomised controlled trial, Rheumatology (paediatric), Website	To evaluate the benefits of a web-based tool.	Validated repeated measures	Individual level: attitudes/beliefs, health behaviour
Mustanski (2014) [193], United States	LGBT youth, Cross sectional study, LGBT sexual health, eLearning module(s)	To determine the feasibility, evaluate the acceptability and obtain estimates of intervention efficacy.	Validated repeated measures, One-off validated questionnaire, One-off non-validated questionnaire, Web metrics, Content feedback star ratings	Individual level: knowledge or understanding

Myers (2017) [194], United States	General public, Randomised controlled trial, Mental health (wellbeing), Website	To provide an initial evaluation of the efficacy of Fun For Wellness.	Validated repeated measures	Individual level: health behaviour
Myers (2018) [195], United States	General public, Randomised controlled trial, Wellbeing, Website	To provide an initial evaluation of the efficacy of the Fun For Wellness intervention.	Validated repeated measures, Analysis of existing dataset(s)	Individual level: behavioural intent
Myers (2019) [196], United States	Patients, Protocol, Obesity management, Website	To describe the protocol for the effectiveness of Fun For Wellness.	Validated repeated measures, Non-validated repeated measures Clinical indices	Individual level: health behaviour, attitudes/beliefs
Myers (2019) [197], United States	Health professionals, Cross sectional study, Online health assessment resources, Website	To explore perceptions of online competence assessment and evidence-based resources.	One-off validated questionnaire	Individual level: knowledge or understanding, professional practice
Neil-Sztramko (2019) [198], Canada	General public, Randomised controlled trial, Cancer, Social media	To explore if and how knowledge translation strategies influence knowledge, intentions and health behaviours.	Validated repeated measures, Interview, One-off non-validated questionnaire, Web metrics, Alcohol intake recall diary	Individual level: behavioural intent, knowledge or understanding, attitudes/beliefs, health behaviour
Nguyen (2019) [199], Netherlands	Patients, Randomised controlled trial, Cancer,	To test the effects of a Web-based tailored educational intervention.	Validated repeated measures, Non-validated repeated measures,	Individual level: knowledge or understanding,

	Website		One-off validated questionnaire, Web metrics	attitudes/beliefs, health behaviour
Nguyen (2022) [200], Switzerland	Health professionals, Cross sectional study, Schizophrenia, eLearning module(s)	To test the perceived usefulness of training and knowledge improvements.	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs
Nigg (2019) [201], United States	Adolescents, Cross sectional study, Substance use, Website	To develop and investigate the effect of an adolescent substance use prevention intervention.	Non-validated repeated measures, Focus group	Individual level: knowledge or understanding
Nikolaou (2015) [202], United Kingdom	General public, Randomised controlled trial, Obesity, eLearning module(s)	To examine whether weight gain can be prevented by online approaches.	Clinical indices, Web metrics	Individual level: health behaviour
Nixon (2021) [203], Germany	General public, Randomised controlled trial, Stress management, eLearning module(s)	To examine the impact of adherence-focused guidance on the efficacy of stress management interventions.	Validated repeated measures, Non-validated repeated measures	Individual level: health behaviour
Nobis (2015) [204], Germany	Patients, Randomised controlled trial, Diabetes, Website	To evaluate the efficacy of a guided web-based intervention.	Validated repeated measures	Individual level: health behaviour
Noor Hanita (2022) [205], Malaysia	Patients, Non-randomised experimental study,	To develop and test feasibility of MyEducation.	Validated repeated measures, One-off validated questionnaire	Individual level: health behaviour

	Coronary artery bypass graft (CABG) surgery, Website and App			
Nyberg (2017) [206], Sweden	Patients and health professionals, Protocol, Chronic obstructive pulmonary disease, Website	To evaluate the feasibility of the study considering effectiveness of the intervention.	Validated repeated measures, Non-validated repeated measures, Interview	Individual level: knowledge or understanding, health behaviour
O'Sullivan (2019) [207], Australia	Patients, Cross sectional study, Antenatal colostrum expression, Video(s)	To determine whether an online video can improve knowledge and confidence.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding
O'Dea (2019) [208], Australia	Students, Protocol, Mental health (depression, anxiety), Website and eLearning module(s)	To evaluate the effectiveness of the Smooth Sailing service for improving help-seeking intentions and behaviour.	Validated repeated measures	Individual level: health behaviour, behavioural intent
Okuroglu (2016) [209], Istanbul	Health professionals, Cross sectional study, Type 2 diabetes, Website	To develop a Web-based education program for health care professionals.	Non-validated repeated measures, One-off validated questionnaire, One-off non-validated questionnaire	Individual level: knowledge or understanding
Osborne (2018) [210], Australia	Parents/guardians, Non-randomised experimental study, Infant sleep health, eLearning module(s)	To test sleep knowledge acquisition.	Non-validated repeated measures, Focus group	Individual level: knowledge or understanding

Ozel (2012) [211], Turkey	Health professionals, Cross sectional study, Clinical decisions, Website	To develop and evaluate a web-based clinical decision support system.	Non-validated repeated measures, One-off validated questionnaire, One-off non-validated questionnaire, Observations	Individual level: attitudes/beliefs, professional practice
Pádua (2018) [212], Portugal	People working in education and restaurants, Protocol, Food allergies, eLearning module(s)	To evaluate the effectiveness of a Web-based training program for professionals to improve knowledge.	Non-validated repeated measures	Individual level: knowledge or understanding
Parker (2018) [213], Lebanon	Patients, Randomised controlled trial, Colonoscopy, Website	To assess the impact of a multimedia engagement program on patient anxiety, perception and knowledge.	One-off validated questionnaire, One-off non-validated questionnaire	Individual level: knowledge or understanding, health behaviour
Parker (2021) [214], Australia	Carers (unpaid) and health professionals, Mixed methods, Wellbeing, Website	To investigate the usefulness of CarerHelp, from the perspective of health professionals.	One-off non-validated questionnaire	Individual level: attitudes/beliefs
Patton (2017) [215], United States	Health professionals and students (health professions), Cross sectional study, Fall risk, eLearning module(s)	To examine the effect of a mixed education approach on knowledge and self-efficacy.	Non-validated repeated measures, One-off non-validated questionnaire, Practical assessments	Individual level: knowledge or understanding, professional practice
Pelayo-Alvarez (2013) [216], Spain	Health professionals, Randomised controlled trial, Palliative care,	To test the effectiveness of online education through impact on symptom control, quality of life,	Validated repeated measures	Individual level: knowledge or understanding,

	Website	caregiver satisfaction, and knowledge-attitude.		attitudes/beliefs, professional practice
Peskin (2015) [217], United States	Students, Randomised controlled trial, Sexual health, eLearning module(s)	To test the efficacy of a sexual health education program.	Non-validated repeated measures, Interview, Web metrics	Individual level: health behaviour
Pham (2016) [218], Australia	Health professionals, Randomised controlled trial, Radiation oncology, eLearning module(s)	To investigate knowledge retention and individual self-confidence before and after an eLearning intervention.	Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs
Phelan (2017) [219], United States	Patients, Randomised controlled trial, Post-partum weight, Website	To test whether an internet-based could produce greater weight loss.	Clinical indices	Individual level: health behaviour
Piotrowicz (2019) [220], Australia	Patients, Randomised controlled trial, Type 1 diabetes, eLearning module(s)	To test an online educational exercise tool to determine improvements.	Validated repeated measures, Clinical indices	Individual level: health behaviour
Pluye (2020) [221], Canada	Parents/guardians, Mixed methods, Parenting, Website	To compare the perception of the outcomes of web-based parenting information and behaviour associated with the outcomes.	Interview, One-off validated questionnaire	Individual level: attitudes/beliefs, health behaviour
Poduval (2020) [222], United Kingdom	Patients and health professionals, Mixed methods, Type 2 diabetes,	To explore the feasibility and acceptability of delivering a Web-based	Interview, Web metrics	Individual level: knowledge or understanding

	Website	structured education program and its impact.		
Poelman (2013) [223], Netherlands	General public, Randomised controlled trial, Nutrition, eLearning module(s)	To develop a Web-based tool and evaluate its effectiveness in increasing awareness.	Non-validated repeated measures	Individual level: knowledge or understanding, health behaviour
Poole (2014) [224], United States	Patients, Cross sectional study, Systemic sclerosis, Website	To assess the effects of an internet self-management program.	Validated repeated measures, Non-validated repeated measures	Individual level: health behaviour
Powell (2013) [225], United Kingdom	General public, Randomised controlled trial, Health behaviour, eLearning module(s)	To evaluate the effectiveness of a training tool in improving mental well-being.	Validated repeated measures	Individual level: health behaviour
Prado (2018) [226], United States	Patients, Randomised controlled trial, Rheumatoid arthritis, Website	To assess knowledge and study whether a personalized education tool increases knowledge.	Validated repeated measures, Non-validated repeated measures, Clinical indices	Individual level: knowledge or understanding
Pratte (2019) [227], Canada	Patients and parents/guardians, Randomised controlled trial, Developmental coordination disorder, Website	To explore the effects of a web platform on parental knowledge and skills.	Validated repeated measures, Web metrics	Individual level: knowledge or understanding
Primbs (2022) [228], Germany	General public, Non-randomised experimental study, Distress about Covid-19,	To examine the efficacy and reception of an innovative website.	Non-validated repeated measures	Individual level: knowledge or understanding

	Website			
Rahimi-Ardabili (2021) [229], Australia	Health professionals, Mixed methods, GP clinical practice, eLearning module(s)	To explore experience with an online interactive training course to increase knowledge.	One-off non-validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs, professional practice
Ramadas (2018) [230], Malaysia	Patients, Randomised controlled trial, Type 2 diabetes, eLearning module(s)	To evaluate the effects of an intervention on dietary knowledge, attitude and behaviour.	Validated repeated measures, Clinical indices	Individual level: knowledge or understanding, attitudes/beliefs, health behaviour
Ramsay (2013) [231], United States	Parents/guardians and trainers in childcare setting, Non-randomised experimental study, Infant nutrition, Website	An evaluation of the nutrition communication component of the website.	Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs
Rebbeck (2013) [232], Australia	Health professionals, Cross sectional study, Whiplash, Website	To evaluate the effect of an online education program.	Non-validated repeated measures	I Individual level: knowledge or understanding
Reinwand (2017) [233], Netherlands	General public, Randomised controlled trial, Smoking, Website	To describe the effects of interaction with a website in terms of participants' knowledge, attitude change and behaviour.	Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs, health behaviour
Rice (2017) [234], United States	Patients, Cross sectional study, Type 2 diabetes, Video(s)	To pilot a service evaluation of prescribed internet-based patient education films.	Clinical indices, Web metrics	Individual level: motivation

Rich (2013) [235], Australia	Students (health professions) and students, Cross sectional study, Musculoskeletal anatomy, eLearning module(s)	To evaluate an online module.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding
Richmond (2016) [236], United Kingdom	Health professionals, Mixed methods, Low back pain, eLearning module(s)	To explore the feasibility and acceptability of an online programme and examine experiences.	Validated repeated measures, Interview, One-off validated questionnaire, One-off non-validated questionnaire, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs, professional practice
Rigot (2022) [237], United States	Patients, Randomised controlled trial, Transfers for wheelchair users, eLearning module(s)	To determine the effectiveness of a web-based transfer training program in improving transfer.	Validated repeated measures	Individual level: health behaviour
Ritterband (2017) [238], Canada	Patients, Randomised controlled trial, Insomnia, Website	To evaluate a web-based, automated CBT-I intervention.	Validated repeated measures, Interview, Web metrics, Sleep diaries	Individual level: health behaviour
Rodrigues (2022) [239], Brazil	Patients, Randomised controlled trial, Malignant hyperthermia, Digital manual	To evaluate the impact of digital manuals on the knowledge/quality of life.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding, health behaviour
Rohlman (2018) [240], United States	Apprentices in construction trades,	To evaluate the effectiveness of an online nutrition training to	Non-validated repeated measures, Clinical indices	Individual level: knowledge or

	Non-randomised experimental study, Nutrition, eLearning module(s)	improve knowledge and behaviors and evaluate the feasibility.		understanding, health behaviour
Romero-López (2020) [241], Spain	General public, Non-randomised experimental study, Smoking, Website	To know the dependence on nicotine and the motivation to quit smoking, and to evaluate the impact of an intervention.	Validated repeated measures, Web metrics	Individual level: health behaviour, motivation/behavioural intent
Rudd (2019) [242], Namibia and Tanzania	Health professionals, Cross sectional study, Health information systems, eLearning module(s)	To conduct a pilot of an eLearning course.	Non-validated repeated measures	Individual level: knowledge or understanding
Ruzek (2020) [243], United States	Health professionals, Randomised controlled trial, PTSD, Website	To examine the effectiveness of the intervention in increasing familiarity and perceived benefits.	Validated repeated measures, Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs
Ryan (2015) [244], United Kingdom	Parents/guardians, Cross sectional study, ADHD, Website	To see the effect of an educational website on parental perceptions, knowledge levels, and to obtain feedback for user-experience.	Validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding
Ryan (2017) [245], Australia	Health professionals and students (health professions), Cross sectional study, Professional development (nurses), Website	To investigate the impact of a specially designed professional development workshop.	Validated repeated measures	Individual level: knowledge or understanding, professional practice

Sadler (2017) [246], United States	Patients, Randomised controlled trial, Diabetes, Website	To assess the impact of Diabetes HealthSense on knowledge, attitudes, and behaviour changes.	Validated repeated measures, Clinical indices	Individual level: knowledge or understanding, health behaviour
Salazar (2019) [247], United States	General public, Randomised controlled trial, Sexual violence, eLearning module(s)	To examine the how a web-based sexual violence prevention program prevents perpetration and increases bystander behaviour.	Validated repeated measures, Non-validated repeated measures	Individual level: health behaviour
Sansen (2020) [248], Germany	Health professionals, Randomised controlled trial, Trauma therapy, eLearning module(s)	To develop and evaluate a web-based training.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs, motivation/behavioural intent
Sargent (2016) [249], United States	General public, Randomised controlled trial, Domestic violence, Website	To educate individuals about children's exposure to domestic violence (DV) and increase their self-efficacy.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding
Sari (2020) [250], Turkey	Patients, Randomised controlled trial, Maternal care and infant health, eLearning module(s)	To examine the efficacy of a web-based program.	Validated repeated measures, Non-validated repeated measures, Clinical indices	Individual level: knowledge or understanding, attitudes/beliefs, health behaviour
Saunders-Goldson (2018) [251], United States	Health professionals and students (health professions), Cross sectional study,	To assess the effect of a web-based educational intervention on risk assessment on knowledge.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding,

	Breast cancer, eLearning module(s)			attitudes/beliefs, professional practice
Sayakhot (2016) [252], Australia	Patients, Randomised controlled trial, Gestational diabetes mellitus (GDM), Website and eLearning module(s)	To explore whether or not the knowledge/understanding of gestational diabetes mellitus (GDM) could be improved.	One-off validated questionnaire, One-off non-validated questionnaire	Individual level: knowledge or understanding
Scaffidi (2017) [253], Canada	Students (health professions), Randomised controlled trial, Medical knowledge acquisition, Website	To evaluate the impact of Wikipedia use on medical student's short-term knowledge acquisition.	Non-validated repeated measures, One-off non-validated questionnaire, Web metrics	Individual level: knowledge or understanding
Scaperotti (2017) [254], United States	Students (health professions), Randomised controlled trial, Dermatology education, eLearning module(s)	To build an electronic curriculum and test its efficacy.	One-off non-validated questionnaire	Individual level: knowledge or understanding
Schiffmann (2020) [255], Germany	Patients, Protocol, Multiple sclerosis, Website	To design and evaluate an evidence-based online educational platform.	Validated repeated measures, Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding
Schlupeck (2021) [256], Germany	Students (health professions), Cross sectional study, Wound care (medical education),	To develop and evaluate an interactive, video-enhanced, and case-based online course.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs, professional practice

	eLearning module(s)			
Schneider (2016) [257], United States	Health professionals, Randomised controlled trial, Evidence-based practice (chiropractic), Website	To develop an online distance-learning program, test the effectiveness of the online program on the attitudes, skills, and use of EBP and determine the feasibility of expanding the program.	Validated repeated measures, One-off non-validated questionnaire	Individual level: attitudes/beliefs, health behaviour
Schonnesson (2016) [258], Sweden and United States	Gay, bisexual, and transgender or queer men, Randomised controlled trial, HIV, eLearning module(s)	To test the efficacy of the Internet-based SMART intervention.	Non-validated repeated measures	Individual level: knowledge or understanding, motivation/behavioural intent, health behaviour
Schulz (2014) [259], Netherlands	General public, Economic evaluation, Lifestyle, Website	To assess the cost-effectiveness and cost-utility of a Web-based computer-tailored lifestyle intervention.	One-off validated questionnaire, One-off non-validated questionnaire, Cost-benefit analysis	Societal level: economic
Schwarzer (2018) [260], Italy, Greece and Spain	General public, Randomised controlled trial, Dietetics, Website	To examine changes in FV intake levels.	Non-validated repeated measures, Food intake record	Individual level: health behaviours
Schwarzer (2018) [261], Italy, Spain, and Greece	General public, Randomised controlled trial, Lifestyle, Website	To examine changes in physical activity levels.	Validated repeated measures, One-off non-validated questionnaire	Individual level: health behaviour, motivation/behavioural intent
Schwebel (2016) [262], United States	Parents/guardians and children,	To evaluate the efficacy of a website.	Validated repeated measures,	Individual level: knowledge or

	Randomised controlled trial, Safety around dogs, Website		Non-validated repeated measures, Observations and play scenarios	understanding, attitudes/beliefs, health behaviour
Schwebel (2021) [263], United States	Children, Protocol, Firearm safety, Website	Develop and evaluate ShootSafe.	Validated repeated measures, Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs, health behaviour
Scott (2022) [264], Canada	Carers (unpaid), Cross sectional study, Dementia care, eLearning module(s)	To evaluate user's perceptions of impact of iGeriCare.	One-off validated questionnaire	Individual level: attitudes/beliefs
Scrivener (2021) [265], Australia	Health professionals and students (health professions), Cross sectional study, Professional development (physiotherapy), eLearning module(s)	To evaluate the use and acceptability of the TRAIN program.	Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs
Scull (2019) [266], United States	Parents/guardians and their teenagers, Randomised controlled trial, Sexual health, Website and eLearning module(s)	To evaluate the short-term impact of a web-based program on parent-adolescent communication.	Non-validated repeated measures, Web metrics	Individual level: attitudes/beliefs, behavioural intent, health behaviour
Selby (2021) [267], United Kingdom	Parents/guardians, Mixed methods, Mental health in childhood, Website	To establish whether animated films and digital resources could positively impact on parent and child outcome.	Validated repeated measures, Interview	Individual level: knowledge or understanding

Shaw (2017) [268], Australia	Health professionals, Mixed methods, Cancer survivorship, eLearning module(s)	To describe the development and evaluation of an online resource accessible to and tailored to the needs of nurses.	Interview, One-off non-validated questionnaire	Individual level: motivation/behavioural intent, professional practice
Sherif (2018) [269], Canada	General public and health professionals, Qualitative research, Online health information, All information formats	To describe negative outcomes associated with online consumer health information and identify potential preventive strategies from consumer's perspectives.	Interview	Individual level: attitudes/beliefs
Short (2017) [270], Australia	Patients, Randomised controlled trial, Cancer survivorship, eLearning module(s)	To investigate the impact of differing delivery schedules of physical activity modules on engagement and physical activity behaviour.	Validated repeated measures, One-off validated questionnaire, One-off non-validated questionnaire, Web metrics	Individual level: health behaviour
Shorten (2019) [271], United States	Patients, Cross sectional study, Pregnancy, Decision aid	To assess the acceptability and feasibility of implementing the web-based decision aid.	Validated repeated measures, Non-validated repeated measures, Interview, Clinical indices	Individual level: knowledge and understanding, attitudes/beliefs, health behaviour
Shroff (2023) [272], United States	Youth, Cross sectional study, Mental health, Website	To culturally adapt, disseminate, and gauge the acceptability and utility of an evidence-based digital mental health platform.	Validated repeated measures, One-off validated questionnaire, One-off non-validated questionnaire	Individual level: health behaviour

Siegel (2021) [273], United States	Health professionals and students (health professions), Non-randomised experimental study, Skin cancer, eLearning module(s)	To test an educational intervention.	Non-validated repeated measures	Individual level: knowledge or understanding
Sigurdardottir (2014) [274], Iceland	Patients and parents/guardians, Cross sectional study, Cancer, Website	To assess the favourability of the website, and whether there was any impact on the cancer communication aspect.	One-off validated questionnaire, One-off non-validated questionnaire	Individual level: health behaviour
Silverman (2018) [275], United States	Patients and health professionals, Protocol, Breast cancer, Decision aid	To develop two decision support tools for breast cancer.	One-off validated questionnaire, Clinical indices	Individual level: knowledge or understanding
Siminoff (2020) [276], United States	Health professionals, Non-randomised experimental study, Organ donation, eLearning module(s)	To implement and evaluate an evidence-based communication intervention.	Non-validated repeated measures, One-off non-validated questionnaire, Web metrics, Authorization rates for organ donation	Individual level: professional practice
Sinclair (2019) [277], Australia	Health professionals, Randomised controlled trial, Chronic kidney disease, eLearning module(s)	To evaluate the effect of an asynchronous web-based e-learning module on general practice nurse's knowledge and general practice nurse's perceived satisfaction.	Non-validated repeated measures, One-off validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs
Smoktunowicz (2021) [278],	Health professionals,	To compare the efficacy of a self-guided internet	Validated repeated measures	Individual level: health behaviour

Poland	Randomised controlled trial, Wellbeing, eLearning module(s)	intervention to improve the multifaceted well-being of medical professionals.		
Soederberg Miller (2019) [279], United States	General public, Cross sectional study, Nutrition, eLearning module(s)	To investigate the impact of label-reading training on effort, as well as accuracy and motivation.	Non-validated repeated measures, One-off non-validated questionnaire, Eye tracking (EyeLink 1000)	Individual level: health behaviour
Soetens (2014) [280], Australia	General public, Randomised controlled trial, Physical activity, Website	To evaluate the acceptability and effectiveness of a computer-tailored physical activity intervention.	Validated repeated measures, One-off non-validated questionnaire, Clinical indices, Web metrics	Individual level: health behaviour
Song (2015) [281], United States	Patients and patients' partner/spouse, Mixed methods, Prostate cancer, eLearning module(s)	To evaluate the feasibility and acceptability of a newly developed web-based, couple-oriented intervention.	Validated repeated measures, Interview, One-off non-validated questionnaire, Web metrics	Individual level: health behaviour
Spanier (2015) [282], Germany	Older adults, Protocol, Healthy ageing, eLearning module(s)	To develop a web-based information guide.	One-off validated questionnaire, One-off non-validated questionnaire, Analysis of existing dataset(s)	Individual level: health behaviour, attitudes/beliefs
Springvloet (2015) [283], Netherlands	General public, Randomised controlled trial, Nutrition,	To evaluate the short- and medium-term efficacy and educational differences in efficacy of a cognitive and	Validated repeated measures	Individual level: health behaviour

	eLearning module(s)	environmental feedback version of a Web-based computer-tailored nutrition education intervention.		
Sridharan (2018) [284], United Kingdom	Students (health professions) and Students, Mixed methods, Public health education, eLearning module(s)	To evaluate People's Open Access Education Initiative (Peoples-uni).	Interview, One-off non-validated questionnaire	Individual level: knowledge or understanding
Stallman (2020) [285], Australia	Health professionals and Students (health professions), Cross sectional study, Suicide prevention, eLearning module(s)	To evaluate an online training programme.	Non-validated repeated measures, One-off validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs, professional practice
Stice (2014) [286], United States	Patients, Randomised controlled trial, Eating disorders, eLearning module(s)	To compare the effects of a new Internet-based version of an eating disorder prevention program.	Validated repeated measures, Clinical indices	Individual level: health behaviour
Sullivan (2018) [287], United States	Patients, Randomised controlled trial, Prescription drugs, Video(s)	To examine how videos on prescription drug websites influence consumer knowledge and perceptions.	One-off non-validated questionnaire, Web metrics	Individual level: knowledge or understanding, attitudes/beliefs, motivation/behavioural intent
Taha (2018) [288], Iraq	Health professionals and teachers, office personnel and other school staff members, Non-randomised experimental study,	To study the impact of an eLearning approach in delivering diabetes related education program that includes knowledge and sets of practices.	Validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, attitudes/beliefs, professional practice

	Diabetes, eLearning module(s)			
Talati (2018) [289], Australia	Employees, Cross sectional study, Workplace health and wellbeing, eLearning module(s)	To compare the perceived usefulness and relative effectiveness of an employee training course.	Non-validated repeated measures	Individual level: attitudes/beliefs
Thielmann (2015) [290], Germany	Health professionals, Protocol, Immunisations, Website	To evaluate the effectiveness of a web-based education program.	Non-validated repeated measures, Logbooks and checklists	Organisational level: policy
Timmers (2018) [291], Netherlands	Patients, Randomised controlled trial, Patient education, App	To determine whether providing patients with information in a subdivided, categorized, and interactive manner might increase the knowledge of their illness.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding
Treloar (2019) [292], Australia	General public, Mixed methods, Addiction, Website	To present an evaluation of livesofsubstance.org and comments on some of the methodological and practical challenges of evaluating health-related online information resources.	One-off non-validated questionnaire, Web metrics	Individual level: attitudes/beliefs And Organisational level: policy/practice
Trudeau (2015) [293], United States	Patients, Randomised controlled trial, Arthritis, eLearning module(s)	To evaluate an online self-management program	Validated repeated measures, Non-validated repeated measures, Web metrics	Individual level: health behaviour

Tsuchiya (2021) [294], Japan	Health professionals, Cross sectional study, Oncology (pharmacy), Webinar	To determine pharmacist's perception of a web-based educational programme in oncology, and assess changes in understanding	Non-validated repeated measures	Individual level: knowledge or understanding
Tucholka (2018) [295], United States	Patients, Randomised controlled trial, Breast cancer, Decision aid	To compare patient's knowledge after the pre-consultation delivery of standard websites vs a web-based decision aid	Validated repeated measures, Clinical indices, Web metrics, Cost-benefit analysis	Individual level: knowledge or understanding
Tuong (2015) [296], United States	Patients, Randomised controlled trial, Acne, Website	To compare the effectiveness of standard education and automated counselling website in improving acne knowledge.	Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding
Usher-Smith (2018) [297], United Kingdom	General public, Randomised controlled trial, Cancer, Website	To assess the effects of cancer risk information on cancer risk beliefs and self-reported behaviour.	Web metrics, Risk calculator	Individual level: health behaviour, behavioural intent
van Bruinessen (2016) [298], Netherlands	Patients, Randomised controlled trial, Patient communication, Website	To evaluate benefit from PatientTIME and if it enhances confidence	Validated repeated measures, One-off validated questionnaire, Clinical indices, Web metrics, Logbook and log files	Individual level: attitudes/beliefs
van der Krieke (2013) [299], Netherlands	Patients, Randomised controlled trial, Psychotic disorders, Website and decision tool	To evaluate a Web-based intervention to facilitate shared decision making	Interview, One-off validated questionnaire, One-off non-validated questionnaire,	Individual level: attitudes/beliefs, health behaviour

			Observations	
van Diest (2022) [300], Netherlands	Patients and family, Qualitative research Advance care planning, Toolkits	To explore the experiences of patient-proxy dyads	Interview	Individual level: attitudes/beliefs
van Spijker (2018) [301], Australia	Patients, Randomised controlled trial, Suicide, eLearning module(s)	To examine the effectiveness of an online self-help intervention for suicidal thinking compared to a control program.	Validated repeated measures, Web metrics	Individual level: health behaviour
van Woerden (2014) [302], Wales	Health professionals, Cross sectional study, Workplace health, eLearning module(s)	To assess the feasibility of a web-based tool to improve health behaviours	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire, Clinical indices, Weekly recordings	Individual level: health behaviour
Vandelanotte (2015) [303], Australia	General public, Protocol, Physical activity, Website	To examine whether a web-based physical activity intervention is more effective than a traditional intervention	Validated repeated measures, Interview, One-off non-validated questionnaire, Clinical indices, Web metrics, Activity monitor and log sheet	Individual level: health behaviour
Vandelanotte (2021) [304], Australia	General public, Randomised controlled trial, Physical activity, Video(s)	To examine whether web-based physical activity videos were more effective in promoting physical activity than personally	Interview, Clinical indices, Web metrics	Individual level: health behaviour

		tailored text and generic information.		
Vanoh (2019) [305], Malaysia	Older adults, Randomised controlled trial, Older person's health, Website	To determine the effectiveness of the web-based application for improving cognitive function, physical fitness, biochemical indices, and psychosocial variables	Validated repeated measures, Non-validated repeated measures, Clinical indices, Cost-benefit analysis	Individual level: health behaviour
Vargas-Martínez (2023) [306], Spain	Adolescents, Randomised controlled trial, Binge drinking, eLearning module(s)	To assess the cost-effectiveness and cost-utility of a web-based computer-tailored intervention to prevent binge drinking	Validated repeated measures, One-off non-validated questionnaire, Cost-benefit analysis	Individual level: health behaviour
Verlinden (2020) [307], Netherlands	Parents/guardians, Non-randomised experimental study, Oral health, Video(s)	To assess whether a film about oral health routines improved parental knowledge of oral health	Non-validated repeated measures	Individual level: knowledge or understanding
Voepel-Lewis (2019) [308], United States	Parents/guardians, Cross sectional study, Opioid risk, Website	To evaluate the effect of a web-based program on opioid risk knowledge, risk perceptions, analgesic self-efficacy and decision-making.	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire	Individual level: knowledge or understanding, health behaviour
Wade (2019) [309], Australia	Students (health professions), Mixed methods, Radiology, eLearning module(s)	To evaluate a form of asynchronous interactive e-learning	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire,	Individual level: knowledge or understanding

			Web metrics	
Wade (2020) [310], Australia	Health professionals, Mixed methods, Radiology, eLearning module(s)	To evaluate the impact of adaptive tutorials on learning the indications for, and interpretation of, basic imaging studies	Validated repeated measures, Non-validated repeated measures, Web metrics	Individual level: knowledge or understanding
Wagenaar (2015) [311], Netherlands	Patients, Protocol, Heart failure, Website	To assess whether replacement of routine consultations by e-health improves self-care	Validated repeated measures, One-off validated questionnaire, One-off non-validated questionnaire, Clinical indices, Cost-benefit analysis	Individual level: health behaviour, knowledge or understanding
Wai Han (2017) [312], China	Students, Randomised controlled trial, Sex education, Social media	To compare a peer-led, social media-delivered, safer sex intervention with a sexual health website.	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire	Individual level: health behaviour, motivation/behavioural intent, attitudes/beliefs
Wallwiener (2016) [313], Germany	Patients, Cross sectional study, Pregnancy, All internet and smartphone usage	To investigate the influence information-seeking behaviour has on decision-making.	One-off non-validated questionnaire	Individual level: health behaviour
Webber Cullen (2017) [314], United States	Parents/guardians and their children, Randomised controlled trial, Food consumption, Website	To evaluate intervention.	Validated repeated measures, Non-validated repeated measures, Clinical indices, Web metrics	Individual level: knowledge or understanding, health behaviour

Weber Cullen (2013) [315], United States	Adolescents, Randomised controlled trial, Physical activity, Website	To test the impact of a website promoting nutrition and physical activity for adolescents.	Validated repeated measures, One-off non-validated questionnaire, Clinical indices, Web metrics	Individual level: health behaviour
Weberschock, (2012) [316], Germany	Health professionals, Cross sectional study, Evidence-based medicine, eLearning module(s)	To develop a web-based educational course for clinical trainers	Validated repeated measures	Individual level: professional practice, knowledge or understanding
Wells (2022) [317], United States	Patients, Cross sectional study, Mental health, Website	To evaluate engagement in and impact of free digital resources	Validated repeated measures, Focus group, One-off non-validated questionnaire	Individual level: health behaviour
Weymann (2015) [318], Germany	Patients, Randomised controlled trial, Type 2 diabetes or chronic lower back pain, Website	To test the effectiveness of a Web-based, tailored, fully automated IHCA on patient's knowledge and empowerment.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding
Whatnall (2019) [319], Australia	Students, Randomised controlled trial, Nutrition, Website	To assess the feasibility and preliminary efficacy of web-based nutrition intervention	Validated repeated measures, Non-validated repeated measures, One-off non-validated questionnaire, Web metrics	Individual level: health behaviour
White (2017) [320], United States	Patients, Randomised controlled trial, Smoking and obesity,	To test the efficacy of an Internet-administered smoking cessation treatment	Interview, Clinical indices	Individual level: health behaviour

	Website			
Whiteside (2019) [321], United States	Patients and Health professionals, Cross sectional study, Suicide, Video(s)	To evaluate the utility of the site via user experience surveys.	One-off non-validated questionnaire, Web metrics	Individual level: attitudes/beliefs
Willman (2018) [322], Sweden	Health professionals, Mixed methods, Venous blood specimen collection, eLearning module(s)	To evaluate the efficiency of an e-learning program on personnel's adherence and their experience	One-off validated questionnaire, One-off non-validated questionnaire	Individual level: knowledge or understanding, professional practice
Wong (2015) [323], Australia	Students (health professions), Mixed methods, Radiology, eLearning module(s)	To determine whether adaptive tutorials are an acceptable and effective method of learning	One-off validated questionnaire, One-off non-validated questionnaire	Individual level: knowledge or understanding
Worobey (2018) [324], United States	Patients, Randomised controlled trial, Wheelchair transfers, eLearning module(s)	To determine the efficacy of a training module at improving transfer technique	Validated repeated measures	Individual level: health behaviour
Wright (2020) [325], Canada	Patients and Parents/guardians, Randomised controlled trial, Surgery (paediatrics), eLearning module(s)	To explore the effect of the timing of the delivery of the intervention on anxiety in children undergoing a day surgery procedure.	Validated repeated measures	Individual level: health behaviour
Wyatt (2019) [326], United States	Patients, Cross sectional study, Cancer (breast), App	To develop and evaluate a patient education application	One-off non-validated questionnaire	Individual level: attitudes/beliefs, health behaviour

Yoo (2019) [327], South Korea	Health professionals, Randomised controlled trial, Pain management, eLearning module(s)	To develop a web-based acute pain management education program for nurses and to evaluate its effectiveness.	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding
Yoo (2021) [328], United States	Health professionals, Non-randomised experimental study, Advance care planning, eLearning module(s)	To evaluate the impact of an online education program on nurses' knowledge on advance directives and the compliance rate	Validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs
Yuan (2014) [329], Hong Kong	Employees, Protocol, Mental health, Website	To assess the protective effects of a web-based psychology capital intervention and the organization’s return-on-investment.	Validated repeated measures, Interview, One-off non-validated questionnaire, Cost-benefit analysis	Individual level: health behaviour
Zacher (2022) [330], Germany	General public and Health professionals, Qualitative research, Health literacy, Website	To develop and pilot a web-based tool to teach the difference between relative and absolute risk reductions.	Validated repeated measures, Non-validated repeated measures, Interview, Think-aloud protocols	Individual level: knowledge or understanding
Zhang (2019) [331], New Zealand	Patients, Non-randomised experimental study, Nutrition (Diabetes type 2), Video(s)	To develop and test the effectiveness of an electronic nutritional education resource	Non-validated repeated measures, Focus group, One-off non-validated questionnaire, Web metrics	Individual level: knowledge or understanding, motivation/behavioural intent
Zhang (2021) [332], China	Students, Cross sectional study, Health literacy,	To describe online health information (OHI)-seeking behaviors and skills	One-off validated questionnaire	Individual level: attitudes/beliefs, health behaviour

	All information formats			
Zhitomirsky (2023) [333], Israel	General public, Randomised controlled trial, Patient education, eLearning module(s)	To examine the impact of digital training instrument on hospitalized patient education	Validated repeated measures, Non-validated repeated measures	Individual level: knowledge or understanding, attitudes/beliefs

S4: Study aims or objectives for measurement

Study aim/objective	Number of studies (%)[a]
To test/assess/examine/determine/evaluate/explore the effect/effectiveness/efficacy	140 (42)
To evaluate	52 (16)
To examine the impact	37 (11)
To (determine an) increase/improvement/prevention/reduce	18 (5)
To assess the feasibility/acceptability/usefulness	17 (5)
To develop, identify or report on	16 (5)
To test/assess	10 (3)
To assess changes	9 (3)
To pilot	6 (2)
To investigate/examine the influence	6 (2)
To describe	4 (1)
To compare	4 (1)
To explore the experiences/uses	4 (1)
To examine the process/needs	2 (1)
To demonstrate	2 (1)
To evaluate the value	1 (0)
To increase access	1 (0)
To empower	1 (0)

[a]Percentages are rounded to the nearest whole number.