



## Original Article

# Dietary and herbal supplement consumer health information for pain: A cross-sectional survey and quality assessment of online content



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## ARTICLE INFO

## Keywords:

Consumer health information  
Dietary and herbal supplements  
Information assessment  
Quality of information  
Pain

## ABSTRACT

**Background:** Patients are increasingly utilizing the internet to learn about dietary and herbal supplements (DHSs) for various diseases/conditions, including pain management. Online health information has been found to be inconsistent and of poor quality in prior studies, which may have detrimental effects on patient health. This study assessed the quality of online DHSs consumer health information for pain.

**Methods:** Six search items related to DHSs and pain were used to generate the first 20 websites on Google across four English-speaking countries. The identified 480 webpages produced 68 eligible websites, which were then evaluated using the DISCERN tool. The mean scores and standard deviations (SD) of the reviewers' ratings on each of the 15 DISCERN instrument items as well as the overall total score were calculated.

**Results:** The mean summed score for the 68 eligible websites was 46.6 (SD = 10.1), and the mean overall rating was 3.3 (SD = 0.8). Websites lacked information regarding areas of uncertainty, the effects of no treatment being used, and how treatments affect the overall quality of life. These shortcomings were especially apparent across commercial websites, which frequently displayed bias, failed to report the risks of DHS products, and lacked support for shared decision-making regarding the use of DHSs.

**Conclusion:** Variability exists in the quality of online consumer health information regarding DHS use for pain. Healthcare providers should be aware of and provide guidance to patients regarding the identification of reliable online resources so that they can make informed decisions about DHS use for pain management.

## 1. Introduction

Pain is a public health concern that can have severe negative implications on the quality of one's life.<sup>1</sup> Pain refers to a distressing sensory and emotional occurrence originating from or resembling tissue injury.<sup>2</sup> Pain can be categorized into different types, including acute (sudden and short-lived, often induced by injury), chronic (persistent pain lasting over three months and often indicative of a disease state), nociceptive (resulting from activation of nociceptors due to tissue damage), and neuropathic (arising from damage to the nervous system).<sup>3,4</sup> A 2014 study on the global burden of pain found that over 10% of the world's population suffers from chronic pain, with an additional 1 in 10 people developing it every year.<sup>5</sup> Some common therapies for pain include pharmacotherapy, physical rehabilitation and therapy, neuromodulation, and surgery.<sup>6</sup> In certain cases, such as when negative reactions to medications occur, the desired effects are not achieved, or when there is an increased risk of severe complications, conventional treatments need to be stopped. In such situations, patients, especially

older individuals, are left with limited choices and are forced to endure long-lasting pain or explore alternative methods of treatment.<sup>7</sup> Consequently, patients may turn to dietary and herbal supplements (DHSs) to alleviate their symptoms.<sup>8</sup>

DHSs are defined as naturally occurring substances that are found in products formulated to enhance the diet and restore or sustain health.<sup>8</sup> These include but are not limited to the following: vitamins and minerals, herbs and other types of botanicals, enzymes, and probiotics.<sup>8</sup> In North America, these products do not require prescriptions and can be purchased over the counter from pharmacies, online retailers, as well as health food stores.<sup>9,10</sup> Over 70% of adults in the United States make use of DHSs for several reasons, including pain management.<sup>11</sup> Renewed public interest in DHSs can be attributed to multiple factors, including consumer preference for natural therapies, the misconception that herbal products outperform pharmaceutical medications, and dissatisfaction with the outcomes of the latter.<sup>12</sup>

Despite the increased usage of DHSs, there have not been concurrent improvements in communication between patients and healthcare

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<https://doi.org/10.1016/j.imr.2023.100996>

Received 12 December 2022; Received in revised form 13 August 2023; Accepted 25 September 2023

Available online 28 September 2023

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providers (HCPs) regarding the use of these products.<sup>13</sup> Multiple research studies have indicated that patients chose not to disclose their use of supplements when they perceived their HCPs to be uninterested, disapproving, or responding negatively to such information or when the providers simply did not inquire about it.<sup>14–16</sup> Research has shown that HCPs possess limited knowledge regarding DHSs.<sup>13,17</sup> Additionally, HCPs themselves recognize their insufficient understanding of DHSs and acknowledge their need for further education on this topic.<sup>13</sup> Despite this awareness, most HCPs do not regularly inquire about patients' usage of DHSs when discussing drug therapy, and even less frequently do they document such information in their patient medical records.<sup>13,14</sup> Information on DHSs is widely available on the Internet, which has become a popular source of information for patients.<sup>10,18</sup> As of 2021, nearly 93% of the American population had access to the Internet, and approximately 70% of them used it to search for health-related information.<sup>19,20</sup> This information can influence consumer behaviours as well as their health-related decisions.<sup>21</sup> This may prove to be harmful to patients considering that assessments of the quality of online health information have uncovered that their quality is often inconsistent or poor.<sup>21</sup> This can have harmful consequences for patients seeking this information as it may result in patients making use of remedies or products that are useless or even harmful while delaying other forms of effective treatment.<sup>21</sup> To date, and to our knowledge, few studies have been recently conducted to assess the quality of consumer health information about the use of DHSs for the treatment of pain that are accessible to the typical consumer.<sup>22–24</sup> Therefore, the objective of this study is to evaluate the quality of online consumer health information related to DHSs used for the treatment and/or management of pain. The results of this study can be valuable for healthcare providers and researchers alike, as they provide insights into the kind of information patients with pain might access online, possibly in the absence of professional medical guidance.

## 2. Methods

### 2.1. Search Strategy and Screening

A cross-sectional survey of websites containing consumer health information on DHSs for pain management was conducted. Six search terms were used to generate the first 20 search results (webpages) on the Google search engine across four English-speaking countries to provide a more internationally representative search strategy ( $n = 480$  webpages): Australia (Google.com.au), Canada (Google.ca), the United Kingdom (Google.com.uk), and the United States (Google.com). Google was chosen as the search engine since it is the most widely utilized and accounts for roughly 90% of all searches.<sup>25</sup> Given that user traffic drops by 95% after the first page of results, only the first 20 websites of each search were selected for inclusion.<sup>26</sup> The 6 search terms used were as follows: “herbs for pain”, “herbal medicine for pain”, “natural health products for pain”, “natural products for pain”, “supplements for pain”, and “dietary supplements for pain”. The following searches were developed by JYN and conducted by SP and SS on May 25, 2022. Google Chrome's incognito mode was used to clear the cookies and browser history to reduce potential bias or effect on the search results.

### 2.2. Eligibility Criteria

Webpages were screened for eligibility, duplicates were removed, and webpages from the same website were collapsed into a single item for the purpose of assessment. A quality assessment of the entire website was performed using the DISCERN tool if more than one qualifying webpage was identified from the same website. Websites were included if at least one of their webpages contained consumer health information on DHSs for pain. We excluded Wikipedia pages, forums, invalid addresses, non-English websites, peer-reviewed articles, news websites, video-sharing websites (e.g., YouTube), and major online retailers (e.g., Amazon).

### 2.3. Data extraction and website quality assessment

Once all eligible websites were determined, SP and SS independently conducted a data extraction of the following items: website URL, website type, types of DHSs discussed, types of non-DHS therapies addressed, and if the website appeared in searches conducted using different search keywords and/or from different geographical regions. All eligible websites were independently assessed by SP and SS using the DISCERN instrument, a standardized index of the quality of written consumer health information developed by the British Library, National Health Service, and Oxford University.<sup>27</sup> The DISCERN instrument was used as it focuses on assessing the clarity, balance, and relevance of the information provided.<sup>27</sup> This instrument has been validated to ensure its effectiveness.<sup>27</sup> Due to its availability in both online and print forms, it can be easily utilized by healthcare professionals making treatment decisions or by patients seeking information about their treatments. The DISCERN instrument consists of 16 key questions (including an overall rating), which are evaluated on a 5-point Likert scale from 1 (no) to 5 (yes). The instrument's questions are divided into 3 subsections which examine: (1) the publication's reliability, (2) the details of the information on treatment options, and (3) the overall quality of the information source. Following the completion of the quality assessments, SP and SS met with JYN to discuss and resolve any discrepancies in data extractions and DISCERN scores via consensus. For each eligible website, the rating for every quality criterion along with the overall quality rating was calculated by averaging the final ratings from both assessors. The mean scores and standard deviations (SDs) of each of the DISCERN instrument items, including the overall quality score as well as an overall summed score between 15 and 75 for each assessed website, were calculated.

## 3. Results

### 3.1. Search results

A total of 480 webpages were retrieved from all the Google searches, of which 376 duplicates (inclusive of webpages from the same website) were removed. Of the remaining 104 websites, 36 were excluded for the reasons listed: peer-reviewed articles ( $n = 16$ ), major online retailers such as Amazon ( $n = 5$ ), no consumer health information on DHS use for pain ( $n = 6$ ), targeted towards health professionals ( $n = 4$ ), news website ( $n = 2$ ), video-based website ( $n = 2$ ), and invalid URL ( $n = 1$ ). This left a total of 68 websites eligible for quality assessment. A flowchart depicting this process is provided in Fig. 1.

### 3.2. Generalized characteristics of eligible websites

The 68 eligible websites were categorized into 5 groups. Twenty-one were categorized as “commercial” sites (websites that marketed and sold products and services to consumers), 21 as “practitioners” (websites that offered health services), 20 as “health portals” (websites that contained health information on various topics), 5 as “institutional” (websites that represented an educational or organizational institution) and 1 as other (websites that did not meet our other defined criteria). Nearly all the websites that qualified for eligibility discussed a wide range of DHSs. Only 33 of the websites appeared in more than one search. Twenty-four websites did not discuss non-DHS therapies, while 44 websites did. Of those that did discuss them, the vast majority mentioned surgical procedures and/or pharmaceutical medications. General characteristics associated with each eligible website included in this study's analysis can be found in Table 1.

### 3.3. DISCERN instrument ratings

The mean score for the sum of the 15 DISCERN instrument items was 46.6 (SD = 10.1) across all the assessed websites. The mean over-

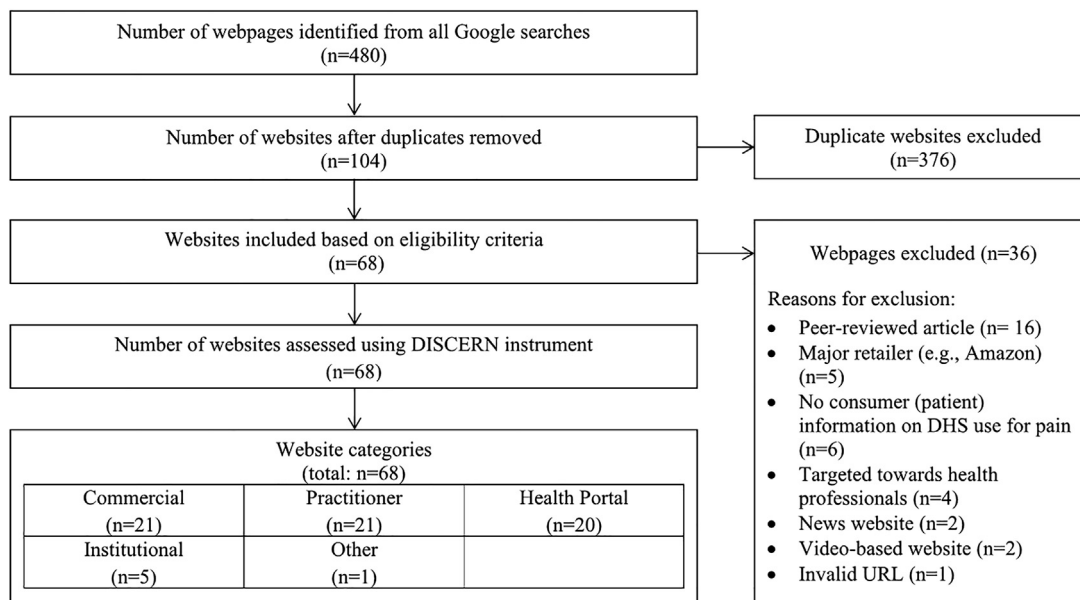


Fig. 1. Web information search strategy and assessment flowchart.

Table 1 General characteristics of eligible websites.

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSs Discussed	Types of Non-DHSs Therapies Discussed	Appeared in More than One Search?
Abundant Natural Health	<a href="https://abundantnaturalhealth.com/">https://abundantnaturalhealth.com/</a>	“Abundant Natural Health is an Australian owned business that manufactures in the USA with sustainable and ethically sourced ingredients. Our ranges include Ocean Soothe for the treatment of Psoriasis & problematic skin conditions and Magnesium for natural pain relief & wellness.”	Commercial	Arthritis, backache, muscle strains, sprains	Supplements - magnesium	None	Yes
Arizona Pain	<a href="https://arizonapain.com/">https://arizonapain.com/</a>	“At Arizona Pain, we are passionate about treating those who suffer from pain. We empathize with chronic pain’s burden on you and those closest to you. We provide life-changing, intelligent, and comprehensive pain treatments.”	Practitioner	Chronic pain	Herbs	Pharmaceutical and surgical	Yes
Aromatic Ingredients	<a href="https://www.auroma.com.au/">https://www.auroma.com.au/</a>	“Auroma has developed a reputation as one of the leading suppliers of essential oils, carrier oils, natural skin-care products, raw materials, perfumes and fragrances for the professional user in Australia. Auroma has supplied these products for use in the flavour, fragrance, pharmaceutical and cosmetic industries.”	Commercial	Not specified	Herbs	None	No
Arthritis Foundation	<a href="https://www.arthritis.org/home">https://www.arthritis.org/home</a>	“We provide ways for you to take control of arthritis by connecting you with others who understand the challenges. We shape and influence health care policies and laws at both state and federal levels. We make sure effective arthritis treatments are being developed while also pursuing a cure.”	Institutional	Arthritis	Herbals, vitamins, probiotics	Pharmaceutical and surgical	Yes
Arthritis Health	<a href="https://www.arthritis-health.com/">https://www.arthritis-health.com/</a>	“We publish health information. Our content is expertly written and edited, accurate, balanced, and comprehensive. More than that, it is richly detailed and compelling. We publish information in a variety of formats—text and visual, peer-reviewed and conversational, online and offline.”	Health portal	Arthritis	Herbals, vitamins, supplements	Pharmaceutical and surgical	Yes

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Table 1 (continued)

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSS Discussed	Types of Non-DHSS Therapies Discussed	Appeared in More than One Search?
Beebe Healthcare	<a href="https://www.beebehealthcare.org/">https://www.beebehealthcare.org/</a>	“Beebe Healthcare serves the Sussex County community with a medical center. It is a 210-licensed-bed, not-for-profit seaside community hospital. Beebe’s specialized service lines include cardiac and vascular, surgical services, oncology, women’s health, and orthopaedic services. Beebe offers an array of inpatient, outpatient, emergency, and diagnostic services.”	Practitioner	Not specified	Herbal and vitamins	Surgical	No
BLB Solicitors	<a href="https://www.blbchronicpain.co.uk/">https://www.blbchronicpain.co.uk/</a>	“Our team of solicitors has specialised in compensation claims involving chronic pain. Our extensive experience as specialist chronic pain solicitors means that we understand: The devastating effect that persistent pain has, not only on you but also on your family. The fundamental importance of early treatment and rehabilitation. The need to keep you protected financially, both now by way of interim payments and for the long term.”	Practitioner	Chronic pain	Vitamins	Pharmaceutical	No
Carolinas Pain Center	<a href="https://www.carolinaspaincenter.com/">https://www.carolinaspaincenter.com/</a>	“Chronic pain is the second-most common reason that people visit doctors, therefore many are unable to find relief. Our promise to you is that we will make the pain more tolerable and improve your daily life. At Carolinas Pain Center our group of Pain Specialists in Charlotte and Huntersville serve patients dealing with all types of pain.”	Practitioner	Chronic pain	Herbals	Pharmaceutical and surgical	Yes
Caruso’s Natural Health	<a href="https://carusosnaturalhealth.com.au/">https://carusosnaturalhealth.com.au/</a>	“Caruso’s probiotics help restore and enhance the growth of your friendly gut flora. It helps to relieve uncomfortable digestive issues such as abdominal pain, bloating, diarrhoea and flatulence, and support healthy digestion and bowel regularity.”	Commercial	Abdominal pain	Herbals, vitamins, probiotics	None	No
CFAH	<a href="https://cfah.org/">https://cfah.org/</a>	“We are a team of experts committed to promoting health & wellness through education, support, and awareness.”	Health portal	Acute and chronic pain	Herbals, supplements	Pharmaceutical	Yes
Cobb Chiropractic Clinic	<a href="https://www.cobbchiropracticclinic.com/">https://www.cobbchiropracticclinic.com/</a>	“Chiropractic care is based on the concept of eliminating a misalignment of the spine. A properly aligned spine can help ease many different physical conditions including, but not limited to, muscle strains, pain in the neck or back, and even headaches or migraines. Chiropractors use a strategic and effective approach in repositioning a misaligned spine back to its correct shape to achieve lasting results.”	Practitioner	Neck pain, back pain, headaches	Herbals, supplements	None	Yes
Creaky Joints Australia	<a href="https://creakyjoints.org.au/">https://creakyjoints.org.au/</a>	“CreakyJoints Australia is an important source of information for Australian arthritis patients and their families. Our website helps people find reliable information, support, offers opportunities to become involved in advocacy and will also help link patients to patient-centred research opportunities as they become available.”	Health portal	Arthritis	Herbals, vitamins, supplements	Pharmaceutical	No
eOrthopod	<a href="https://eorthopod.com/">https://eorthopod.com/</a>	“Clear understandable information about muscles, bones, and joints.”	Health portal	Not specified	Herbal and vitamins	Pharmaceutical	Yes
Euphoric Herbals	<a href="https://www.euphoricherbals.com/">https://www.euphoricherbals.com/</a>	“Since 2010 Euphoric Herbals has served over 40,000 families, friends and sisters to naturally increase milk supply, and support their health through herbal products.”	Health portal	Not specified	Herbals	Pharmaceutical	Yes

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Table 1 (continued)

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSs Discussed	Types of Non-DHSs Therapies Discussed	Appeared in More than One Search?
Everyday Health	<a href="https://www.everydayhealth.com/">https://www.everydayhealth.com/</a>	“Everyday Health’s passionate, award-winning editorial team is committed to supporting you in your journey to live a healthy life each day. By adhering to the highest standards for accuracy, objectivity, and balance, we create trustworthy content based on up-to-date, evidence-based health and medical information and real-world patient and clinician experience to help inform you how to take control of your health.”	Health portal	Not specified	Herbal and vitamins	Pharmaceutical and surgical	Yes
Gaia Herbs	<a href="https://www.gaiaherbs.com/">https://www.gaiaherbs.com/</a>	“Since Gaia Herbs was just a seedling in 1987, we have remained true to our purpose: connecting people, plants, and planet to create healing. We knew then what many are coming to realize now—plants and people evolved together, that we are inextricably linked, and that plants hold the wisdom we need to heal.”	Commercial	Not specified	Herbals	None	No
Good Path	<a href="https://www.goodpath.com/">https://www.goodpath.com/</a>	“Our team has many different types of medical professionals, including generalist doctors, specialist doctors, pharmacists, physical therapists, nutritionists, behavioral psychologists, yoga teachers, and health coaches who have deep expertise in the conditions we target. This diversity allows us to provide a truly integrative approach to your care, which spans nutrition & supplements, movement & lifestyle, mindfulness & meditation, and coaching & guidance.”	Practitioner	Back and joint pain	Herbals, supplements	None	Yes
Health Insight	<a href="https://www.healthinsight.ca/">https://www.healthinsight.ca/</a>	“Health Insight is a Mediaplanet content hub that is dedicated to informing Canadians about healthcare innovations and best practices in disease management and prevention. Featuring leading celebrity advocates, physicians, and patient voices, we educate and engage our readers on a wide range of information, advice and inspiration. Ultimately, our goal is to empower Canadians to be advocates for their own health care, and spark dialogue between patients and their health care providers.”	Health portal	Not specified	Supplements	None	No
Healthline	<a href="https://www.healthline.com/">https://www.healthline.com/</a>	“Healthline Media is a media company that reaches more people on their road to well-being than any other health property. Through rigor in research, diversity of perspective, and compassion in action, we are relentless leaders in helping people find their best path forward.”	Health portal	Not specified	Herbals	None	Yes
Herbal Academy	<a href="https://theherbalacademy.com/">https://theherbalacademy.com/</a>	“The mission of the Herbal Academy is to empower people with the art and science of herbalism through accessible, affordable herbal education that represents many points of view and honors our intrinsic connection to nature.”	Institutional	Not specified	Herbals	None	No
Herbs of Gold	<a href="https://herbsofgold.com.au/">https://herbsofgold.com.au/</a>	“Herbs of Gold was born in 1989 as a humble herbal liquid product range. Proudly Australian, we have a desire to promote health and wellbeing throughout all of Australia.”	Commercial	Not specified	Herbals, vitamins, probiotics	None	No
Holland Barret	<a href="https://www.hollandandbarrett.com/">https://www.hollandandbarrett.com/</a>	“Holland & Barret is one of the world’s leading health and wellness retailers and the largest in Europe, supplying our customers with a wide range of vitamins, minerals, health supplements, specialist foods and natural beauty products.”	Commercial		Herbals, Vitamins, Probiotics	None	No

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Table 1 (continued)

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSs Discussed	Types of Non-DHSs Therapies Discussed	Appeared in More than One Search?
Home Care Assistance	<a href="https://www.torontohomecareassistance.ca/">https://www.torontohomecareassistance.ca/</a>	“At Toronto Home Care Assistance, we believe home care is about more than just helping our senior clients with the activities of daily living—it’s about making a difference in their lives. Our Balanced Care Method philosophy focuses on healthy nutrition, physical activity, mental stimulation, social interaction, and sense of purpose. By incorporating these aspects into each home care plan, we provide the support seniors need to continue living happier, healthier, and independent lives in the comfort of their own homes.”	Practitioner	Not specified	Herbals and vitamins	None	No
Indian Country Today	<a href="https://indiancountrytoday.com/">https://indiancountrytoday.com/</a>	“An independent, nonprofit news enterprise. IndiJ Public Media honors our ancestors and future generations through stories that make Indigenous peoples come alive. ICT is an independent, nonprofit, multimedia news enterprise. We reach audiences through our digital platform and as a broadcast carried via public television stations.”	Health portal	Not specified	Herbals, supplements	Pharmaceutical	Yes
Indigo Herbs	<a href="https://www.indigo-herbs.co.uk/">https://www.indigo-herbs.co.uk/</a>	“Indigo Herbs prides itself on bringing customers a wide range of Premium Quality health & wellness products, information resources, articles and recipes. As well as having the very best prices, our products are ethically and sustainably sourced from the highest quality suppliers, giving customers peace of mind with their purchases. You can also sign up to hear about promotions, latest news and articles and receive discount codes.”	Commercial	Not specified	Herbals, vitamins, probiotics	Pharmaceutical	No
International Association for the Study of Pain	<a href="https://www.iasp-pain.org/">https://www.iasp-pain.org/</a>	“The International Association on the Study of Pain (IASP) is the leading global organization supporting the study and practice of pain and pain relief. IASP brings together scientists, clinicians, health care providers, and policymakers from around the world in pursuit of their mission to bring relief to those who are in pain.”	Institutional	Not specified	Vitamins and supplements	Pharmaceutical	No
Jersey Premier Pain	<a href="https://jerseypremierpain.com/">https://jerseypremierpain.com/</a>	“Jersey Premier Pain is a world-class pain management clinic serving Jersey City and the surrounding areas. Our full-service team is dedicated to providing clients with the rehabilitation and world-class pain management care they need to get the pain relief they deserve.”	Practitioner	Chronic pain	Herbals and vitamins	Pharmaceutical and surgical	No
Life Extension	<a href="https://www.lifeextension.com/">https://www.lifeextension.com/</a>	“Achieve your goals with the best supplements that science can offer. Become an expert in your body’s unique needs by accessing groundbreaking information about the science of wellness right at your fingertips. You can talk to our diverse team of experts—doctors, nutritionists and nurses— or easily find out exactly what your body needs with our blood testing services.”	Commercial	Joint pain	Herbals, vitamins, probiotics	None	No
Lloyds Pharmacy	<a href="https://lloydspharmacy.com/">https://lloydspharmacy.com/</a>	“LloydsPharmacy is a leading community pharmacy and healthcare provider with branches across the UK. Prevention, management and treatment are at the very core of our business, and we aim to deliver high quality outcomes for chronic conditions, such as diabetes and heart health. We also strive to support local communities in making informed health decisions.”	Commercial	Not specified	Herbals and vitamins	Pharmaceutical	No

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Table 1 (continued)

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSs Discussed	Types of Non-DHSs Therapies Discussed	Appeared in More than One Search?
Main Line Spine	<a href="https://mainlinespine.com/">https://mainlinespine.com/</a>	“Pain Medicine at Main Line Spine offers a comprehensive range of services for patients with acute or chronic painful disorders. We develop individualized treatment plans to ensure you get the right therapy when you need it.”	Practitioner	Acute and chronic pain	Herbals	Pharmaceutical and surgical	No
Mayo Clinic	<a href="https://www.mayoclinic.org/">https://www.mayoclinic.org/</a>	“Mayo Clinic is the largest integrated, not-for-profit medical group practice in the world. We’re building the future, one where the best possible care is available to everyone — and more people can heal at home. Our relentless research turns into earlier diagnoses and new cures.”	Practitioner	Not specified	Herbals, vitamins, probiotics	Pharmaceutical	Yes
McMaster Optimal Aging Portal	<a href="https://www.mcmasteroptimalaging.org/">https://www.mcmasteroptimalaging.org/</a>	“Consult our evidence-based Blog Posts, Web Resource Ratings and Evidence Summaries for trustworthy information about health and social aspects of aging.”	Institutional	Not specified	Herbals	None	No
Med Broadcast	<a href="https://www.medbroadcast.com/">https://www.medbroadcast.com/</a>	“The MediResource Medical Review Faculty includes a dedicated staff of in-house health care professionals, editors and medical writers, along with a team of medical advisors and freelance medical writers. All have extensive experience in their medical specialty and in producing medical information for the public that is relevant, timely and accurate. We take pride in our medical experts and the high-quality medical information they produce for the public.”	Health portal	Not specified	Herbals, supplements	Pharmaceutical and surgical	Yes
Med India	<a href="https://www.medindia.net/index.asp">https://www.medindia.net/index.asp</a>	“Medindia is dedicated to empowering consumers and healthcare professionals with authentic, accurate, and timely health information.”	Health portal		Herbals	Yoga	Yes
Medical News Today	<a href="https://www.medicalnewstoday.com/">https://www.medicalnewstoday.com/</a>	“Medical News Today is one of the fastest growing health information sites in the United States. We believe that knowledge enables the pursuit of good health & well-being. Using peer reviewed studies, medical experts, & reputable sources, our passionate and curious team of writers and editors unravels the complexities of medical research & science, breaking it down to give you clear, objective, and accurate health information.”	Practitioner	Not specified	Herbals	Pharmaceutical	Yes
Memorial Sloan Kettering Cancer Center	<a href="https://www.mskcc.org/">https://www.mskcc.org/</a>	“The people of Memorial Sloan Kettering Cancer Center (MSK) are united by a singular mission: ending cancer for life. Our specialized care teams provide personalized, compassionate, expert care to patients of all ages. Informed by basic research done at our Sloan Kettering Institute, scientists across MSK collaborate to conduct innovative translational and clinical research that is driving a revolution in our understanding of cancer as a disease and improving the ability to prevent, diagnose, and treat it.”	Practitioner	Pain from cancer	Herbals	Pharmaceutical	Yes
Mother Earth Living	<a href="https://www.motherearthliving.com/">https://www.motherearthliving.com/</a>	No information available.	Health Portal	Not specified	Herbals and aromatherapy	Pharmaceutical and surgical	Yes
Natural Health Products	<a href="https://www.nhproducts.com/">https://www.nhproducts.com/</a>	“Founded over 30 years ago by Robert Baird, with the sole aim of providing the best range of herbal, homeopathic and natural food supplements available. Sourcing and introducing new innovative products has been a hallmark of our development.”	Commercial	Not specified	Herbals, vitamins, probiotics	None	No

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Table 1 (continued)

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSS Discussed	Types of Non-DHSS Therapies Discussed	Appeared in More than One Search?
Natural Pain Products	<a href="https://www.naturalpainproducts.ca/">https://www.naturalpainproducts.ca/</a>	“The Alpha-Stim® M is a handheld, prescription electrotherapy device that delivers advanced Microcurrent Electrical Therapy (MET) directly to your pain site through an exclusive, patented waveform. The unique waveform uses a highly refined and extensively researched current to provide non-invasive, sustainable pain relief and pain management wherever and whenever you feel discomfort.”	Commercial	Not specified	Herbals	Pharmaceutical	No
Nature’s Best	<a href="https://www.naturesbest.co.uk/pharmacy/">https://www.naturesbest.co.uk/pharmacy/</a>	“Founded in 1981 and now one of the UK’s best loved nutritional supplement suppliers. Leaders in nutrition science with over 250 products in our range, amazing service and FREE expert nutrition advice.”	Commercial	Not specified	Herbal and vitamins	Pharmaceutical	No
Nevada Comprehensive Pain Center	<a href="https://nvcpc.com/">https://nvcpc.com/</a>	“Nevada Comprehensive Pain Center is one of the leading medical centers in Las Vegas, specializing in the treatment of pain and pain related conditions. We strive to keep our patient’s best interests in mind by providing compassionate care and utilizing a multidisciplinary approach to the treatment of pain.”	Practitioner	Acute and chronic pain	Vitamins	Surgical	Yes
Pain Science	<a href="https://www.painscience.com/">https://www.painscience.com/</a>	“PainScience.com explores the surprisingly weird science of many kinds of chronic pain and injury, from fibromyalgia to runner’s knee. The site is a library of a couple deep-dive articles for both patients and healthcare professionals, informal but heavily referenced and constantly updated for 20 years. Like it says on the tin, there’s a pro-science bias here, and quackery is kicked to the curb.”	Health portal	Not specified	Herbals, vitamins, supplements	Pharmaceutical	Yes
Physiotherapy and Sports Injuries Center	<a href="https://wphphysio.com.au/">https://wphphysio.com.au/</a>	“West Pennant Hills Physio provides individualised treatment for a host of conditions that cause pain and discomfort. Much of what people do these days can result in painful conditions. Physiotherapy is an effective, holistic approach to treatment that addresses a range of common issues.”	Practitioner	Not specified	Vitamins and supplements	None	No
Practical Pain Management	<a href="https://www.practicalpainmanagement.com/">https://www.practicalpainmanagement.com/</a>	“Practical Pain Management (PPM) was founded in the year 2000 to provide in-depth clinical information on a variety of pain conditions and treatment approaches. Written and reviewed by pain experts and leaders in the field, our content helps clinicians navigate the evolving landscape of pain management, from the latest research in assessment to novel approaches in care to bring about the best long-term outcomes for individual patients.”	Practitioner	Not specified	Herbs	Pharmaceutical	Yes
Prairie Spine and Pain Institute	<a href="https://prairiespine.com/">https://prairiespine.com/</a>	“When it comes to patient care, our first responsibility is to gather as much information about you and your medical history so we can provide the best care possible. We offer a very wide range of minimally invasive surgeries and non-surgical pain management solutions.”	Practitioner	Not specified	Herbals	Pharmaceutical and surgical	Yes
Premier Health Chiropractors Prevention	<a href="https://premierhealthmn.com/">https://premierhealthmn.com/</a> <a href="https://www.prevention.com/">https://www.prevention.com/</a>	No information available.  “Prevention brand has been a leading provider of trustworthy health information, empowering readers with practical strategies to improve their physical, mental, and emotional well-being. With a problem-solving mission and inclusive approach, we recognize that everyone’s path to wellness is unique.”	Practitioner Health portal	Not specified Not specified	Herbals Herbals	None Pharmaceutical	No Yes

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Table 1 (continued)

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSs Discussed	Types of Non-DHSs Therapies Discussed	Appeared in More than One Search?
RCH Natural Products	<a href="https://www.rchnaturalproducts.com.au/">https://www.rchnaturalproducts.com.au/</a>	RCH is specialized in the most recognizable and trusted brands within the health industry at discount prices. Our retailing online health supplements ranging from Homeopathic dilutions, Health supplements (vitamins, minerals, herbs, organics etc), Practitioner brands, Natural Health products for personal care, Ayurvedic, Fitness supplements, Detox, Aromatherapy oils, Natural cosmetics and Natural foods. RCHNP operates from Sydney, serving many satisfied customers across Australia and the world.”	Commercial	Not specified	Herbals, supplements	None	No
Relief Factor	<a href="https://www.reliefactor.com/">https://www.reliefactor.com/</a>	“Relief Factor is a unique combination of botanical ingredients and fish oil. It was formulated by physicians and is now trusted by many thousands to provide ongoing relief from their pain...back, neck, shoulder, hip and knee pain, including general muscle aches and pains.”	Commercial	Not specified	Herbals, supplements	None	No
Seattle Neuro & Spine Surgery	<a href="https://seattleneuro.com/">https://seattleneuro.com/</a>	No information available.	Practitioner	Not specified	Herbals	Pharmaceutical and surgical	Yes
Shop Naturally	<a href="https://www.shopnaturally.com.au/">https://www.shopnaturally.com.au/</a>	No information available.	Commercial	Not specified	Herbals, vitamins, probiotics and supplements	None	No
Sonima	<a href="https://www.sonima.com/">https://www.sonima.com/</a>	“You have it in you to become fit, and we at Sonima want to help. By fit, we don’t mean perfect legs and six-pack abs and routines that require hours of your already hectic days. We mean doing what you can do, each day, to reduce the limits on your bodies and minds. It’s about achieving physical and mental freedom one step at a time.”	Health portal	Not specified	Herbals	Surgical	No
Speaking of Women’s Health	<a href="https://speakingofwomenshealth.com/">https://speakingofwomenshealth.com/</a>	“Speaking of Women’s Health is a program of the Cleveland Clinic Center for Specialized Women’s Health whose mission is: “Educating women to make informed decisions about health, well-being and personal safety for themselves and their families.”	Practitioner	Not specified	Herbals, vitamins, probiotics	Pharmaceutical and surgical	No
Spine Universe	<a href="https://www.spineuniverse.com/">https://www.spineuniverse.com/</a>	“For people with chronic or serious conditions, the meaning of good health doesn’t fit into one tight little box. Instead, the definition of wellness ebbs and flows along a continuum, shifting with each and every person. At HealthCentral, our goal is to help you create your healthiest life, whatever that means in this moment. Anchored at the intersection of science and community, we provide a perspective so often missing in health information: the warmth of a friend, the authority of trusted experts, and a clear-eyed understanding of the facts. Through real-life advice, medically vetted articles, and inspirational stories, we help you make informed decisions about your care with confidence—not fear—so you can continue to live your best life, whatever that means for you.”	Health portal	Not specified	Herbal and vitamins	Pharmaceutical and surgical	Yes
Spine-health	<a href="https://www.spine-health.com/">https://www.spine-health.com/</a>	“Veritas Health is a publisher connecting people to trusted health information, qualified physicians, and a supportive online community.”	Health portal	Not specified	Herbals, supplements	Surgical	Yes

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Table 1 (continued)

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSS Discussed	Types of Non-DHSS Therapies Discussed	Appeared in More than One Search?
Sun Warrior	<a href="https://sunwarrior.com/">https://sunwarrior.com/</a>	“Sunwarrior is here for every step as you take your nutritional journey to light, energy, and love. We believe the answers to optimal health are found in nature. Our vision is to taste better and be healthier so that we can accomplish our mission to help you be your best self, performing at your optimum and living your best life. We do this by offering clean, high-quality, plant-based ingredients from nature.”	Commercial	Not specified	Herbals	None	No
Super Pharmacy	<a href="https://www.superpharmacy.com.au/">https://www.superpharmacy.com.au/</a>	“SuperPharmacy are tech-savvy pioneers with a proven online history of providing Australians with your prescriptions, over-the-counter medicines, beauty, health, and well-being needs since the year 2000. A convenient online pharmacy where you can receive all your pharmacy and product needs, from the convenience of your phone or computer. We deliver straight to your home or designated delivery point. Our bulk buying power allows us to provide great everyday low prices alongside exciting new products from our continually expanding and broad product range.”	Commercial	Not specified	Herbals and vitamins	Pharmaceutical	No
The Center for Spine & Orthopedics	<a href="https://centerforspineandortho.com/">https://centerforspineandortho.com/</a>	“Strategically located in the center of the United States, the Center for Spine & Orthopedics is one of our nation’s leading spine and orthopedic practices for patients seeking industry leading spine and orthopedic care. Our staff focuses on making the patient feel like the ‘center’ of care, and all that we do revolves around them. Skilled physicians, trained staff, state-of-the-art medical facility are all designed to put patient care first.”	Practitioner	Not specified	Vitamins	Pharmaceutical and surgical	No
U.S .Department of Veterans Affairs	<a href="https://www.va.gov/">https://www.va.gov/</a>	“VA offers benefits that can help Veterans buy, retain, or modify a home; earn a degree; start a career; stay healthy, and do much more in life after the military.”	Health portal	Not specified	Herbals, vitamins, supplements	Pharmaceutical and surgical	Yes
Uniformed Services University - CHAMP	<a href="https://www.hprc-online.org/">https://www.hprc-online.org/</a>	“Human Performance Resources by CHAMP (HPRC) is a team of scientists and specialists who translate research into evidence-based resources to help Service Members and their families optimize their performance and reach total fitness. The HPRC team’s work is showcased on this website in articles, videos, and other resources to help you perform at your best in all areas of your life—and whether you’re at home, in the office, or in theater. The HPRC team also answers “Ask the Expert” questions, and delivers in-person educational presentations, trainings, and military community outreach.”	Institutional	Not specified	Herbals and vitamins	Pharmaceutical	Yes
UT Southwestern Medical Center	<a href="https://utswmed.org/">https://utswmed.org/</a>	“UT Southwestern’s patient care app – UTSWMyCare – helps you easily manage your health and stay connected to UTSW and your provider. Find a physician. Access your medical records. Schedule appointments, and much more. UTSWMyCare is simple to use, convenient, and always available. It’s medicine made easier.”	Practitioner	Not specified	Herbals, supplements	Pharmaceutical and surgical	Yes
Very Well Health	<a href="https://www.verywellhealth.com/">https://www.verywellhealth.com/</a>	“Welcome to Verywell Health, an award-winning resource for credible, fact-based, and up-to-date information you need to confidently make health choices for yourself and your loved ones. We are dedicated to empowering you with the best answers to your most pressing questions, from understanding infectious diseases to managing a new diagnosis and everything in between.”	Health portal	Not specified	Herbals	Pharmaceutical and surgical	Yes

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Table 1 (continued)

Website Name	URL	Brief Summary	Website Category	Pain Type/ Disease	Types of DHSS Discussed	Types of Non-DHSS Therapies Discussed	Appeared in More than One Search?
Wampole	<a href="https://www.wampole.ca/">https://www.wampole.ca/</a>	“Today, consumers are more aware of the need to take better care of their health. Our mission is to help them deal with this stressful and fast-paced life by offering support with our vitamin and mineral supplements. Our formulas are laboratory tested and all our products are subject to strict quality control measures to ensure consumer satisfaction.”	Commercial	Not specified	Herbals and yoga	Pharmaceutical	Yes
Web MD	<a href="https://www.webmd.com/">https://www.webmd.com/</a>	“WebMD has created an organization that we believe fulfills the promise of health information on the Internet. We provide credible information, supportive communities, and in-depth reference material about health subjects that matter to you. We are a source for original and timely health information as well as material from well known content providers.”	Health portal	Not specified	Herbals and probiotics	Pharmaceutical	Yes
Weleda	<a href="https://www.weleda.co.uk/">https://www.weleda.co.uk/</a>	“Weleda has been growing plants organically and creating natural health and wellbeing products for over 100 years At Weleda, we place very high demands on ingredients in our products and are proudly NATRUE certified, the first internationally recognised quality seal for organic and natural beauty products.”	Commercial	Not specified	Herbals	None	No
Whole Life	<a href="https://wholelife.com.au/">https://wholelife.com.au/</a>	“WholeLife Pharmacy & Healthfoods is Australia’s leading pharmacy and health foods retailer offering a true, holistic approach to health and well-being. We offer the pharmacy products and services Australians know and trust plus one of the country’s widest ranges of natural and organic products across skincare, beauty, healthfoods, eco-living and nutrition.”	Commercial	Not specified	Herbals, vitamins, probiotics and supplements	Pharmaceutical and surgical	No
Yellow Emperor	<a href="https://yellowemperor.com/">https://yellowemperor.com/</a>	“Yellow Emperor is a custom liquid manufacturing leader that produces high quality vitamins, herbals, nutraceuticals, skincare, and pet product formulas.”	Other	Not specified	Herbal and vitamins	None	No
Zea	<a href="https://www.zea.com.au/">https://www.zea.com.au/</a>	“Our line of natural health and wellness products blend organic, wild-crafted, and sustainably grown native Australian botanicals with the best of green science to help you harness the remarkable properties of nature.”	Commercial	Not specified	Herbals, vitamins, probiotics	None	No

all score (question 16) was 3.3 (SD = 0.8). There was high variability in the overall rating, with scores ranging from 1.0 to 4.5. The highest-scoring questions of the DISCERN instrument were questions 1, 2, and 10, with mean scores of 4.2, 4.4, and 4.6, respectively. Question 1 asked whether the website’s aims were clear, question 2 asked whether the aims were achieved, and question 10 asked whether the benefits of each treatment were described by the website. The lowest-scoring questions from the DISCERN instrument were 12 and 13, with mean scores of 1.1 and 1.2, respectively. Question 12 asked whether the website described what would happen if no treatment options were used, while question 13 asked whether the website described how the treatments affected the overall quality of life. The three highest-scoring websites were Medical News Today (64.5), MedIndia (63.5), and PainScience (63.0). The three lowest-scoring websites were Shopnaturally (22.5), Relief Factor (23.5), and Natural Health Products (28.0). The mean DISCERN instrument scores inclusive of all 68 eligible websites are provided in Table 2; individual DISCERN instrument scores for each of the eligible websites are provided in a table in Supplementary File 1.

### 3.4. Trends identified across resources assessed

#### 3.4.1. Questions 1–8: Reliability of the publication

Questions 1 (whether the website states the aims clearly) and 2 (whether the website achieves its aims) had the highest scores on the DISCERN instrument following question 10. Fifty-two (76.5%) and 56 (82.4%) websites scored 4 or greater on questions 1 and 2, respectively. The mean score for question 1 was 4.2 (SD = 1.1) and 4.4 (SD = 1.1) for question 2. The scores for both questions ranged from 1.0 to 5.0. There were consistently high scores for these 2 questions across websites, as almost all of them had an information page detailing what the website was about, the information users could expect, and the intended audience.

Question 3 assesses whether the information from the publication is relevant. It was mainly used to determine if the websites and DHS therapies targeted a broader range of people with different circumstances, such as pregnant women, the elderly, and children. The mean score for this question was 3.8 (SD = 1.0). Commercial websites and websites that

**Table 2**  
Mean DISCERN instrument scores inclusive of all eligible websites.

Section	SECTION 1 Is the publication reliable?								SECTION 2 How good is the quality of information on treatment choices?					SECTION 3 Overall Rating of the Publication				
DISCERN Question	1. Are the aims clear?	2. Does it achieve its aims?	3. Is it relevant?	4. Is it clear what sources of information were used to compile the publication (other than the author or producer)?	5. Is it clear when the information used or reported in the publication was produced?	6. Is it balanced and unbiased?	7. Does it provide details of additional sources of support and information?	8. Does it refer to areas of uncertainty?	9. Does it describe how each treatment works?	10. Does it describe the benefits of each treatment?	11. Does it describe the risks of each treatment?	12. Does it describe what would happen if no treatment is used?	13. Does it describe how the treatment choices affect overall quality of life?	14. Is it clear that there may be more than one possible treatment choice?	15. Does it provide support for shared decision-making?	16. Based on the answers to all of the above questions, rate the overall quality of the publication as a source of information about treatment choices.	Standard Deviation of Overall Score (Q16)	DISCERN Score (Sum of Q1-Q15)
TOTAL Means	4.2	4.4	3.8	3.2	3.2	3.2	2.4	2.4	2.9	4.6	2.8	1.1	1.2	3.8	3.5	3.3	0.3	46.8
TOTAL Standard Deviations	1.1	1.1	1.0	1.5	1.5	1.3	1.2	1.5	1.0	0.6	1.4	0.5	0.5	1.4	1.5	0.8	0.4	10.1

focused on specific populations, such as patients with arthritis, received the lowest scores on this question. Scores ranged from 1.5 to 5.0 across websites.

Question 4 assesses whether the sources of information used to compile the publication are clear. A high score would indicate the incorporation of both in-text citations as well as a reference list to cite the sources used. The mean score for this question was 3.2 (SD = 1.5). Most commercial websites scored poorly on this question, demonstrating a lack of credibility to their claims. Scores for this question ranged from 1.0 to 5.0.

Question 5 evaluates whether the dates of information sources and revision dates for the publication are available on the site. Health portals scored relatively well on this question, while commercial sites performed poorly. The scores ranged from 1.0 to 5.0, with a mean of 3.1 (SD = 1.5).

Question 6 assesses whether the information presented on the website is balanced and unbiased. Commercial websites scored very poorly on this question as they used persuasive language that seemed to promote the sale of their products, often did not list many risks if at all, and listed fewer reputable sources. With scores ranging from 1.0 to 5.0, the mean score was 3.2 (SD = 1.3).

Question 7 of the instrument assesses whether additional sources (not from the same website or organization) are provided by the website. The websites had a mean of 2.4 (SD = 1.2), with scores ranging from 1.0 to 5.0. Most websites did not provide links to additional readings or only provided links to webpages from the same website.

Finally, question 8 assesses whether the publication refers to any ‘grey’ areas or areas of uncertainty. This uncertainty could result from a lack of evidence from other studies on the effectiveness of the treatment methods or existing evidence that seemed to be contrary to the publication’s stance. Question 8 had a mean score of 2.4 (SD = 1.5) with scores ranging from 1.0 to 5.0. Only a few websites mentioned any uncertainties and among those, the common approach was to make a brief statement such as “effects are not fully known” or “more research is required”.

**3.4.2. Questions 9-15: How good is the quality of information on treatment choices?**

Question 9 determines whether the website describes how each treatment works. The websites had a mean score of 2.9 (SD = 1.0). Many websites did not include information about the treatments’ mechanism of action and of those that did, most provided this information on only

a few of the treatment options discussed. The scores ranged from 1.0 to 5.0.

Question 10 (whether the benefits of each treatment are described by the website) was the highest-scoring item in the DISCERN instrument. The mean score for this question was 4.6 (SD = 0.6). Sixty-two (91.2%) websites scored 4.0 or higher on this item, with scores ranging from 2.0 to 5.0. Most websites effectively mentioned the benefits associated with each of the treatments presented.

Question 11 asks whether the publication lists the risks of all the treatments mentioned. Twenty-eight websites (41.2%) earned a score of 2.0 or below on this question. Commercial websites performed very poorly on this question compared to health portals and practitioner websites. The mean score for this question was 2.7 (SD = 1.4) across all websites.

Question 12 (whether the website provides details on any consequences of not receiving any treatment option) and question 13 (whether the website describes the effects of the treatment on the overall quality of life) had the lowest mean scores of any items on the DISCERN instrument. The mean score for question 12 was 1.1 (SD = 0.5) and 1.2 (SD = 0.5) for question 13. A score of 1.0 was given to 58 websites (85.3%) for question 12 and 53 (76.8%) websites for question 13. Although most websites did suggest alternative treatments, they did not mention the impact of no treatment option being used. Furthermore, while the benefits and risks of treatments were often detailed, their impact on the overall quality of life was not explicitly stated.

Question 14 investigates whether more than one treatment choice is described by the website. The websites had a mean score of 3.8 (SD = 1.4), with scores ranging from 1.0 to 5.0. Commercial websites, for the most part, did not discuss possible alternatives while some health portal and practitioner websites did make mention of them. Forty-four websites (64.7%) mentioned non-DHSSs such as pharmaceutical medications and surgical procedures for pain management.

Question 15 assesses whether the publication provides support for shared decision-making. It asks whether the publication encourages patients to consult a healthcare practitioner regarding their treatment options. In general, practitioner websites scored well while commercial websites did poorly on this question. The mean score for question 15 was 3.5 (SD = 1.5), with scores ranging from 1.0 to 5.0 across websites.

**3.4.3. Question 16: Overall rating of the publication**

Question 16 evaluates the overall quality of the website based on the ratings from questions 1 to 15. The websites varied in their overall quality, with 35 websites (50.7%) scoring 3.0 or less, and 25 websites

(36.8%) scoring 4.0 or more. The 68 unique websites from this study had a total mean of 3.3 (SD = 0.8) for their overall quality. In general, most commercial websites scored poorly, while practitioner and health portals scored well. Lower scores can be primarily attributed to the lack of discourse on uncertainties of research findings, effects of treatments on quality of life, alternatives to DHSs for pain management, support for shared decision-making, as well as the lack of literature references and additional sources of support.

#### 4. Discussion

The present study assessed the quality of websites containing DHS consumer health information for pain management. Following the assessment of eligible websites using the DISCERN instrument, it was found that a high degree of variability in the quality of information exists. Across 68 unique websites, the majority successfully outlined the benefits of DHSs and accomplished their stated goals, but they frequently fell short of describing how the treatment affects one's overall quality of life or the effects of not receiving treatment. The highest-scoring websites were generally practitioner and health portal websites, and the lowest were commercial websites. These findings indicate that many of the evaluated websites were of low quality, emphasizing the need for patients to effectively identify reliable online resources on using DHSs for pain. This can be particularly difficult for patients with limited health literacy who report difficulty comprehending medical jargon and physician recommendations.<sup>28</sup> HCPs can aid these patients by being aware of how they communicate health-related information and recommendations to them in a manner that assures patients understand how to navigate the online world. Effective patient-physician interaction and knowledge exchange between healthcare providers, patients, and their families play a crucial role in promoting successful self-care and management.<sup>29</sup> Additionally, given that patients have easy and frequent Internet access, our findings emphasize the need for HCPs to be aware of the quality of the online information patients may encounter, read, and use to inform their health decisions. This can allow them to support and guide patients toward reliable and high-quality online resources about using DHSs for pain management.

##### 4.1. Comparative literature

To date, and our knowledge, no studies have assessed the quality of online DHS consumer health information about pain; however, it is worth comparing our study's findings to that of similar, published research.

###### 4.1.1. Online health information about pain

Several studies have explored the quality of online consumer health information about pain. One study that evaluated the quality of online consumer information about lower back pain found that the quality was poor across the websites assessed and discouraged consumers' use of the internet as a source of information unless the websites were evaluated for evidence-based information.<sup>24</sup> A few studies investigated the quality of online health information about chronic pain, with results indicating an overall low to moderate quality for the websites assessed.<sup>30–34</sup> One study that assessed the quality of 27 websites with information about chronic pain found that they were generally of poor quality.<sup>33</sup> In particular, the authors found that the information lacked clarity, lacked support from evidence-based research, or contained biased information for commercial gain.<sup>33</sup> Another study looked at the quality of frequently accessed websites with information regarding back pain.<sup>34</sup> The results of this study indicated that compared to government and medical websites, which were considered reliable sources of information, commercial websites lacked sources of evidence to support their claims.<sup>34</sup> Other research studies focused on evaluating the quality of consumer health information related to complementary and alternative medicine for treating pain.<sup>35,36</sup> One of these studies discovered that the quality of web-

sites providing consumer health information about neck pain was variable, with commercial websites achieving the lowest scores, matching our findings.<sup>36</sup> Another study found that websites containing consumer health information about back pain scored poorly on questions about the uncertainty of information, the effects of no treatment being rendered, and how treatment choices would impact the overall quality of life.<sup>35</sup> The results of the present study matched these findings, as the previously mentioned questions had some of the lowest mean scores compared to the other items on the DISCERN instrument. There were also studies that investigated the quality of online consumer health information for pain management in relation to cannabis use.<sup>37,38</sup> The results of these investigations indicated that online information about using cannabis to treat and manage pain was biased and of poor quality.<sup>37,38</sup> One of these studies assessed the quality of consumer health information on 33 websites which sold cannabis. All of those websites were considered commercial sites, and akin to our findings, those sites were of low quality with an overall mean rating of 2.4 (SD = 0.7).<sup>37</sup> In particular, this study found that websites scored poorly on questions related to uncertainties in research evidence for cannabis use, risks associated with cannabis use, and the impact of cannabis use on quality of life.<sup>37</sup> It also found that websites scored poorly on the question that assessed whether alternatives to cannabis were discussed, with a mean score of 1.94 (SD = 0.53), unlike the mean score of 3.8 (SD = 1.4) obtained in the present study. Utilizing the DISCERN instrument, several studies revealed a recurring absence of discussions about the risks associated with specific therapies across the examined websites. Moreover, these websites provided inadequate information about the potential consequences of leaving pain untreated, lacked discussions surrounding the uncertainties of treatment options, and failed to mention their potential impact on the patients' overall quality of life.

###### 4.1.2. Online health information about DHSs

Several studies have also assessed the quality of online DHS information as it relates to other conditions. Prior studies have used the DISCERN instrument to evaluate the quality of online DHS consumer health information about weight loss and fatigue.<sup>23,39</sup> They concluded that the quality of websites being accessed by patients varied based on the DISCERN scores they obtained. The overall scores that these studies obtained were 2.72 (SD = 0.99) and 3.1 (SD = 0.9), respectively. Although our study's overall mean score was slightly higher at 3.3 (SD = 0.8), the quality of health information was still highly variable across websites. Similar to the present study, both studies found that their respective subset of websites largely communicated their goals and described the benefits of the treatments listed well, however, they poorly explained how treatment affects overall quality of life and the consequences of choosing not to receive treatment.<sup>23,39</sup> Using the DISCERN tool, a study evaluated the quality of online websites that offered information about the herbal plant *Eurycoma Longifolia*, for which the root extracts have traditionally been used to treat pain.<sup>40,41</sup> The results revealed a strikingly low overall quality, with an average score of 1.07 (SD = 0.51).<sup>40</sup> Similar to the current study, this research identified deficiencies in discussing areas of uncertainty, with a mean score of 1.05 (SD = 0.23). However, in contrast to our study, it also revealed shortcomings in addressing alternative treatment options, obtaining a score of 1.02 (SD = 0.16).<sup>40</sup> Researchers in another study selected 13 common herbal products and assessed the quality of 50 top websites for each of them on factors such as clinical and safety information.<sup>42</sup> A total of 1179 websites were evaluated in this study. The results indicated that less than 8% included information on potential harmful effects, less than 3% had evidence-based sources to support their claims, and only 10.5% recommended consulting a healthcare practitioner before using the products.<sup>42</sup> The findings from these studies highlight the variability and poor quality of online websites for consumer health information on DHS use for various conditions. These findings reinforce the need for healthcare providers to proactively guide patients to access high-quality websites.



#### 4.2. Implications for practice and research

The variable quality of online websites containing information on DHS use for pain management can have detrimental consequences for consumers who cannot distinguish between high-quality and low-quality information. Research has indicated that patients with low health literacy are more likely to use and trust health information from online sources compared to information from healthcare professionals.<sup>43,44</sup> Furthermore, when using online health resources, individuals with low health literacy tend to use less reliable resources such as blogs, social media, or celebrity webpages over medical websites.<sup>43</sup> This stresses the importance of establishing effective communication between HCPs and patients on using the Internet as a source of health information and identifying high-quality resources so that patients can make informed health decisions that improve rather than compromise their health outcomes. HCPs should be aware of the varying quality of online DHS information for pain management, as highlighted by our findings, so they can caution patients about low-quality information and direct them to high-quality sources. However, this can be difficult considering that many HCPs lack an understanding of DHSs and therefore do not discuss them with their patients.<sup>13,14</sup> With the growing utilization of the Internet as a source of health information, there is an increased need to educate HCPs about DHSs and the variable quality of information about them online. This can allow patients to better rely on HCPs for guidance on effectively navigating these resources. Since the DISCERN instrument only assesses the quality of online consumer health information and cannot provide insight into their accuracy, future research is warranted which focuses on this area using a similar approach to a study that assessed the accuracy and readability of online health information for patients with pancreatic cancer<sup>45</sup>, as an example.

#### 4.3. Strengths and limitations

A strength of our study was the use of the DISCERN instrument since it has been found to be valid and reliable in assessing the quality of consumer health information. Another strength was performing the data search across four different English-speaking countries, which allowed for a more internationally representative sample of websites. Additionally, running a pilot test enabled us to uniformly apply the DISCERN instrument across different assessors. Due to the dynamic nature of the internet, one limitation of our study includes the fact that the information assessed is prone to change over time, which may result in different findings if replicated in future searches. Furthermore, to our knowledge, no literature exists which provides the most common search terms used by patients at this intersection of health topics; if alternative phrases were searched, this may have also led to results differing from the ones found by our present study. Additionally, since we excluded non-English language websites, it still remains unclear whether our findings can be generalized to information found on non-English websites.

#### 4.4. Conclusion

This study assessed the quality of online DHSs consumer health information for treating and/or managing pain. The DISCERN scores for the eligible websites were highly variable, with high-scoring websites largely consisting of health portals and practitioner websites and low-scoring websites overwhelmingly being commercial websites. Most websites effectively stated and achieved their claims and described treatment benefits. However, they fared poorly in describing any uncertainties and risks, the effect of not seeking treatment, and the impact of treatments on the overall quality of life. This variability in quality highlights the importance for healthcare providers to be educated on these matters and provide sufficient support in helping patients identify high-quality online resources on using DHSs for pain management. Future work is warranted which assesses the accuracy of information provided by these websites.

#### Acknowledgments

JYN was awarded a Research Scholarship and an Entrance Scholarship from the Department of Health Research Methods, Evidence and Impact, Faculty of Health Sciences at McMaster University.

#### CRedit authorship contribution statement

**Jeremy Y Ng:** Methodology, Conceptualization, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. **Sahar Popal:** Data curation, Formal analysis, Writing – review & editing. **Sathurthika Selvanayagam:** Data curation, Formal analysis, Writing – review & editing.

#### Conflict of interests

JYN is an editorial board member of the journal but the membership had no bearing on the review process or decision. The authors declare that they have no competing interests.

#### Funding

None.

#### Ethical statement

This study involved a search and review of publicly available online information only; it did not require ethics approval or consent to participate.

#### Data availability

All relevant data are included in this manuscript.

#### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.imr.2023.100996](https://doi.org/10.1016/j.imr.2023.100996).

Supplement 1. Individual DISCERN instrument scores for each eligible website.

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