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Content and Quality of Websites for Patients With Chronic Kidney Disease: An Environmental Scan

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Abstract

Background: Although numerous websites for patients with chronic kidney disease (CKD) are available, little is known about their content and quality.

Objective: To evaluate the quality of CKD websites, and the degree to which they align with information needs identified by patients with CKD.

Methods: We identified websites by entering "chronic kidney disease" in 3 search engines: Google.com (with regional variants for Australia, Canada, the United Kingdom, and the United States), Bing.com, and Yahoo.com. We included the first 50 unique English-language sites from each search. We evaluated website content using a 30-point scale comprising 8 priority content domains identified by patients with CKD (*understanding CKD, diet, symptoms, medications, mental/physical health, finances, travel*, and *work/school*). We used standardized tools to evaluate usability, reliability, and readability (DISCERN, HONcode, LIDA, Reading Ease, and Reading Grade Level). Two reviewers independently conducted the search, screen, and evaluation.

Results: Of the 2093 websites identified, 115 were included. Overall, sites covered a mean (SD) of 29% (17.8) of the CKD content areas. The proportion of sites covering content related to *understanding CKD, symptoms*, and *diet* was highest (97%, 80%, and 72%, respectively). The proportion of sites covering *travel, finances*, and *work/school* content was lowest (22%, 12%, and 12%, respectively). The mean (SD) scores for DISCERN, LIDA and HONcode were 68% (14.6), 71% (14.4), and 75% (17.2), respectively, considered above average for usability and reliability. The mean (SD) Reading Grade Level was 10.6 (2.8) and Reading Ease was 49.8 (14.4), suggesting poor readability.

Conclusions: Although many CKD web sites were of reasonable quality, their readability was poor. Furthermore, most sites covered less than 30% of the content patients identified as important for CKD self-management. These results will inform content gaps in internet-accessible information on CKD self-management that should be addressed by future eHealth web-based tools.

Abrégé

Contexte: Bien qu'il existe de nombreux sites Web s'adressant aux patients atteints d'insuffisance rénale chronique (IRC), on en sait peu sur leur qualité et sur la pertinence de leur contenu.

Objectifs: Évaluer la qualité de sites Web traitant de l'IRC et vérifier s'ils sont en phase avec les besoins d'information formulés par les patients.

Méthodologie: Nous avons répertorié des sites Web en entrant *chronic kidney disease* (insuffisance rénale chronique) dans trois moteurs de recherche, soit Google.com (et ses variantes régionales australienne, canadienne, britannique et étatsunienne), Bing.com et Yahoo.com. Ont été inclus les 50 premiers sites en anglais s'affichant sur chacun. Le contenu a été évalué avec une échelle en 30 points englobant huit domaines d'intérêt cités par les patients atteints d'IRC, soit *Understanding CKD* (comprendre l'IRC), *Diet* (régime alimentaire), *Symptoms* (symptômes), *Medications* (médicaments), *Mental/Physical*

Health (santé physique/mentale), *Finances* (finances), *Travel* (voyage) et *Work/School* (travail/études). Des outils normalisés (DISCERN, HONcode, LIDA, Flesch Reading Ease, Flesch-Kincaid Reading Grade Level) ont été employés pour évaluer la convivialité, la fiabilité et la lisibilité des contenus. Deux examinateurs ont procédé à la recherche, au triage et à l'évaluation des sites de façon indépendante.

Résultats: Des 2 093 sites répertoriés, 115 ont été inclus. Dans l'ensemble, ceux-ci couvraient les domaines d'intérêt à 29 % (17,8) en moyenne. La compréhension de l'IRC (97 %), les symptômes (80 %) et le régime alimentaire (72 %) se sont révélés les sujets abordés par une plus grande proportion des sites évalués. Les voyages (22 %), la situation financière (12 %) et le travail/les études (12 %) constituaient quant à eux les sujets les moins couverts. Les scores moyens pour DISCERN (68 % [14,6]), LIDA (71 % [14,4]) et HONcode (75 % [17,2]) se sont avérés au-dessus de la moyenne pour la convivialité et la fiabilité. Le score moyen au *Reading Grade Level* était de 10,6 (2,8) et celui du *Reading Ease* était de 49,8 (14,4), suggérant une faible lisibilité.

Conclusion: Bien que la qualité de plusieurs sites Web traitant de l'IRC se soit révélée satisfaisante, leur lisibilité était faible. De plus, la plupart couvraient moins de 30 % du contenu jugé important par les patients dans l'autogestion de la maladie. Ces résultats mettront en lumière les lacunes de l'information accessible sur internet quant à l'autogestion de l'IRC; lacunes qui devraient être comblées par les futurs outils de santé en ligne.

Keywords

chronic kidney disease, online, internet, websites, self-management

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What was known before

Patients often visit websites to access health information; however, little is known about the content and quality of online information available for patients with chronic kidney disease (CKD). Previous work has highlighted gaps in quality and reported poor readability; these studies have primarily focused on appraising some quality measures, including readability, in a limited number of websites. A comprehensive evaluation of both content and quality of information on websites is needed.

What this adds

Our study provides an assessment of local and international CKD website quality and summarizes the availability of information content areas identified as important by patients with CKD. This study highlights content and quality gaps in internet-accessible information on CKD that should be addressed by future web-based tools.

Introduction

Chronic kidney disease (CKD) affects approximately 10% of adults in Canada and contributes to significant morbidity, mortality, and health care expenditures.[1] The trajectory of CKD progression may be improved by lifestyle modifications, such as diet and blood pressure management, and as a result, there is considerable interest in encouraging patients to self-manage aspects of their lifestyle, medical treatments, and symptom monitoring and management, with the goal of slowing disease progression.[2-4] Numerous websites have been developed to support patient education for CKD; however, little is known about the content and quality of these websites, or the extent to which they address information needs identified by patients. Previous

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work evaluating CKD websites was limited to first page search results, is out-of-date, or was limited in scope (focusing on a small number of unique websites or limited to a specific geographic region or interest area such as living donor transplantation).[5-10]

The main objectives of this environmental scan were to (1) identify and evaluate CKD website quality (usability, reliability, and readability), and (2) summarize CKD content relative to self-management needs identified by CKD patients in our prior work.[11]

Methods

Search Strategy

Given the diversity in websites and data, an environmental scan was determined to be the optimal method to synthesize knowledge regarding the content and quality of websites for patients with CKD. We consulted with a medical library specialist at the University of Calgary to finalize our search strategy and search terms. We systematically searched the 3 most popular English-language search engines: Google™, Bing™, and Yahoo™.[12] To account for potential geographic variation in search results, we included regional variants for the leading search engine, Google, which accounted for 71% of desktop and 89% of mobile traffic worldwide in the year preceding data collection.[12] We searched "chronic kidney disease" in each of the search engines: Google.com (four separate searches with preferences set to Australia, Canada, the United Kingdom, and the United States), Bing.com, and Yahoo.com. "Chronic kidney disease" is a term commonly used by patients in website searches.[5] In search engines, each search term is treated as a distinct keyword; therefore, while the search would prioritize sites with all 3 terms (and particularly those sites that repeat the key word[s]), it would also include sites with an individual term. Thus, "kidney disease" would capture the majority of sites, and inclusion of "chronic" would provide additional specificity.

Web traffic data, including Alexa Rank, was collected alongside the search and screen using a free chrome plug-in, SEOquake, which reports search engine optimization metrics for each website listed in the search results in the 3 search engines used in this study.[13] Alexa rank is a metric of global website popularity relative to all other websites available and is calculated based on daily website traffic and page views over a 3-month period.[14]

Inclusion and Exclusion Criteria

We included only English-language websites. Websites that had nonfunctional links, required subscription to access content, or were discussion forums, blogs, scholarly journals or news articles were excluded. Eligible websites were recorded in a spreadsheet for further evaluation.

Website Screening

Two reviewers (M.D.S. and S.G.) independently searched and screened websites in September 2018 for inclusion. We followed the Canadian Agency for Drugs and Technologies in Health guidelines[15] for systematically searching the internet. Websites were reviewed in descending order until 50 unique, eligible websites were identified from each search engine (ie, we did not include subsites of URLs already cataloged), or until at least 200 sites were screened for eligibility in each search. Websites were included if both reviewers agreed on their inclusion; conflicts and uncertainty were resolved by discussion and involvement of a third reviewer (B.R.H.).

Website Review and Data Extraction

The review occurred in 2 phases: (1) quality (usability, reliability, and readability) and (2) assessment of CKD content. Phase 1 was completed independently by 2 reviewers (M.D.S. and S.G.) for all sites. For Phase 2, each website was reviewed by 1 reviewer (divided equally between reviewers).

Phase 1: Quality assessment (usability, reliability, and readability). We assessed eligible sites for quality using the validated DISCERN,[16,17] Health on the Net (HON) Code of Conduct,[18] and MinervaLIDAtion (LIDA)[19] instruments. These tools are freely available online and have been used extensively to evaluate health website quality.[20-28]

The DISCERN tool includes 16 questions that evaluate reliability and quality of written health information. Similar to Lutz et al,[5] we used the DISCERN tool without the 7-item subscale related to treatment choices, as treatment choices for CKD (dialysis, transplant) were not the focus of our review. Each question was rated on a 5-point Likert scale; the minimum overall score (excluding the treatment subscale) was 9 and the maximum was 45. Higher scores indicate greater quality and reliability. The DISCERN tool was originally developed for a "consumer," rather than academic audience, although it has been used primarily by academic researchers to appraise written health information.[29]

The HONcode includes 14 questions that evaluate 8 overarching principles relating to justifiability, transparency, and financial disclosure, among other items. Each question is rated as present (1)/absent (0), with higher scores indicating greater compliance with HONcode standards. The HON Foundation has provided official certification for qualified websites since 1995 and the code is broadly known as an ethical standard for health websites.[30]

The LIDA instrument is a tool both to guide the development of and to evaluate health websites. The LIDA instrument includes 41 questions that assess accessibility, usability, and reliability. We used the LIDA instrument without the

accessibility subscale, as the online accessibility checker tool is no longer available and some of the questions are not applicable to more recent website development advancements. For the usability and reliability sections, each question is rated on a 3-point scale; the minimum overall score for these sections is 0 and the maximum is 81. Higher scores indicate greater usability and reliability.

Readability was assessed using the Flesch Reading Ease (FRE) scale and Flesch-Kincaid Reading Grade Level (FKRGL).[31-33] Similar to other studies[5,9,10] we imported 200 to 400 words from each site into Microsoft Word and assessed the text using the readability statistics function, which reports both the FRE and FKRGL scales (MS Word 10, Microsoft Inc., Redmond, Washington). Both scales are calculated using word length, number of syllables per word, and number of words per sentence. FKRGL is reported as a numerical grade level and FRE is scored on a scale of 0 to 100, with lower scores suggesting poor readability. In general, a grade 6 reading level is recommended for patient education materials.[34]

Phase 2: Assessment of CKD content. We assessed all sites for specific content areas relating to information needs identified by CKD patients and their caregivers from a National CKD self-management study.[11] Content areas included overarching categories of *understanding CKD, diet, symptoms, medications, finances, mental/physical health, travel*, and *work/school*. Several subcategories were identified under each broad category, resulting in 30 content areas in total.

We also categorized websites according to the audience(s) the site appeared to be tailored to (patient-focused, clinician-focused, or both) and by site type as follows: (1) academic/professional (universities, hospitals, and research centers); (2) nonprofit organizations, foundations, and charities; (3) commercial and pharmaceutical companies; and (4) other.

Rater Calibration

The 2 reviewers independently screened a convenience sample of 20 consecutive websites using the inclusion and exclusion criteria. After 2 rounds (40 websites), good agreement was achieved ($\kappa = 0.92$). Following the website screening activity, the 2 reviewers piloted the evaluation process by independently applying the assessment instruments to 5 randomly selected CKD sites. This process familiarized the reviewers to the instruments and identified interpretive differences for further discussion. Scoring differences were resolved by discussion. The reviewers conducted 3 sequential pilots (15 websites total). Following the first round, the percent agreement for the CKD content checklist was >90% and by the third round was ≥90% across all instruments (LIDA = 93.1%, $\kappa = 0.52$; HONcode = 97.7%, $\kappa = 0.81$; DISCERN = 90%, $\kappa = 0.68$).

Data Synthesis/Analysis

We used descriptive statistics (mean [percentage], SD, frequencies) to summarize quality and content scores. Scores demonstrating greater than 20% difference between raters were reviewed a second time and a final score was assigned by consensus. We reported the mean of the 2 raters' results for scores with differences of less than 20%.

Results

Search Results and Website Characteristics

A total of 2093 sites were identified by the 2 reviewers (Figure 1). After ineligible sites and duplicates were removed from individual searches, 115 websites were eligible and included in the evaluation. The most common reasons for exclusion were duplicate websites, academic journals, and news articles. The number of websites identified in each search engine and the number of search engines each site appeared in are summarized in Figure 2. There was overlap in website identification across each of the searches, with some websites appearing in more than 1 search engine; however, only approximately 35% of websites were repeatedly identified in more than 3 search engines and 41% of websites appeared in a single search engine only. Websites were primarily targeted to a patient (56%) or patient and clinician audience (39%) and the majority of sites were developed by academic/professional centers (universities, hospitals, and research centers) (39%), followed by commercial and pharmaceutical companies (30%), nonprofit organizations, foundations and charities (29%), and other/unknown (1%).

CKD Content

Overall, sites covered a mean (SD) of 29% (17.8) of the 30 identified CKD content areas (Tables 1 and 2). The proportion of sites covering at least 1 content topic related to *understanding CKD, symptoms*, and *diet* was the highest (97%, 80%, and 72% respectively), and approximately half included content on *mental/physical health* (53%) and *medications* (52%). The proportion of sites covering *travel, finances*, and *work/school* content was low (22%, 12%, and 12%, respectively). There were a number of patient-identified information needs found in less than 10% of websites. This included those related to *diet* (options for eating out, practical tools for diet tracking), *mental and physical support* (screening tools for depression, how to communicate with others about mental health), *finances* (cost considerations for medications, food etc), *travel* (accessing health care abroad, what to bring), and *work and school* (supports and considerations for returning to work/retraining, how to discuss potential limitations with employer or school, and what should be disclosed and to whom). When stratified by website category (academic/professional, commercial/pharmaceutical, nonprofit/charity) or website audience (patient, clinician, both), there

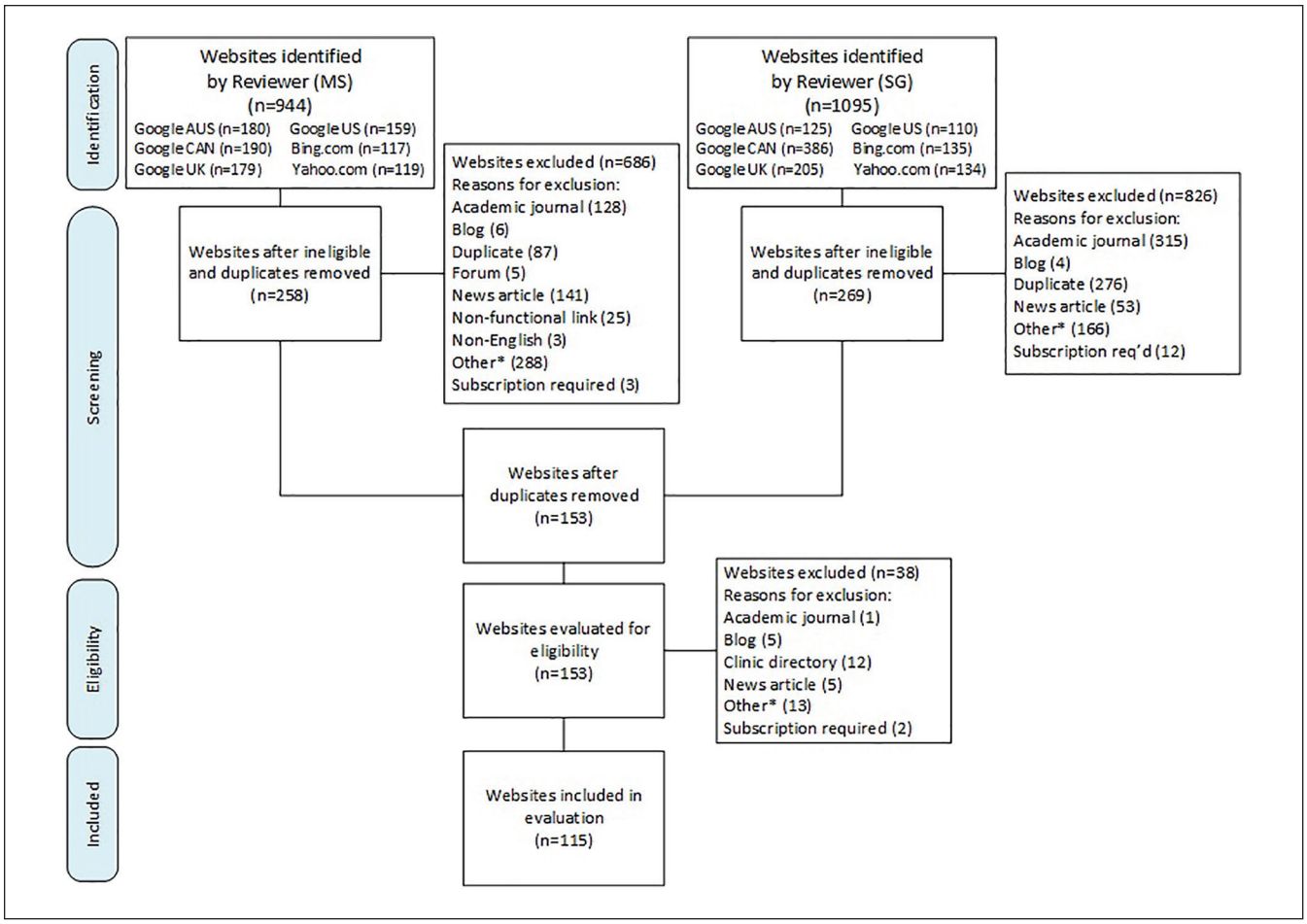

Figure 1. CKD website review PRISMA flow diagram.
Note. CKD = chronic kidney disease.
[a]Other includes pdf documents, videos, clinic directories, veterinary clinics, practice guidelines, books, project descriptions.

was minimal difference in the proportion of content topics covered by websites (Supplemental Table 1).

The top 10 websites covering the greatest proportion of CKD content areas were Davita (93.3%), National Kidney Foundation (76.7%), Fresenius Kidney Care (66.7%), Kidney Foundation of Canada (63.3%), Kidney Care UK (60%), Manitoba Renal Program (60%), National Institute of Diabetes and Digestive and Kidney Diseases (60%), Renal Support Network (60%), The Renal Association (60%), Life Options (56.7%), and NHS Inform (56.7%).

Website Quality (Reliability, Usability, and Readability)

Most websites demonstrated moderate to high reliability and usability (Table 3); however, there was considerable variability across all websites, with scores as low as 35% in some cases. There was little variability when comparing mean scores of each instrument. The mean (SD) DISCERN score was 68.1% (14.6), LIDA was 71.0% (14.4), and HONcode was 74.6% (17.2). Although there was only slight variation in most scores, 2 usability measures were comparatively low across all sites: engagability (57%) and currency of presented information (51%). There was considerable variation in readability across all websites; the mean (SD) FKRGL was grade 10.6 (2.8) and FRE was 49.8 (14.4), suggesting poor readability. When stratified by website category (academic/professional, commercial/pharmaceutical, nonprofit/charity) or website audience (patient, clinician, both), there was minimal difference in quality scores across most quality metrics (Supplemental Table 1). The DISCERN, HONcode, and LIDA Reliability scores were slightly higher for websites geared toward a clinician audience; however, there were only 3 clinician-specific websites included in our evaluation. Readability did not differ based on website category or audience.

The top 10 websites for each quality metric are included in Table 4. There was some variability in the websites achieving the highest quality scores across each quality metric; however, several sites scored in the top 10 across

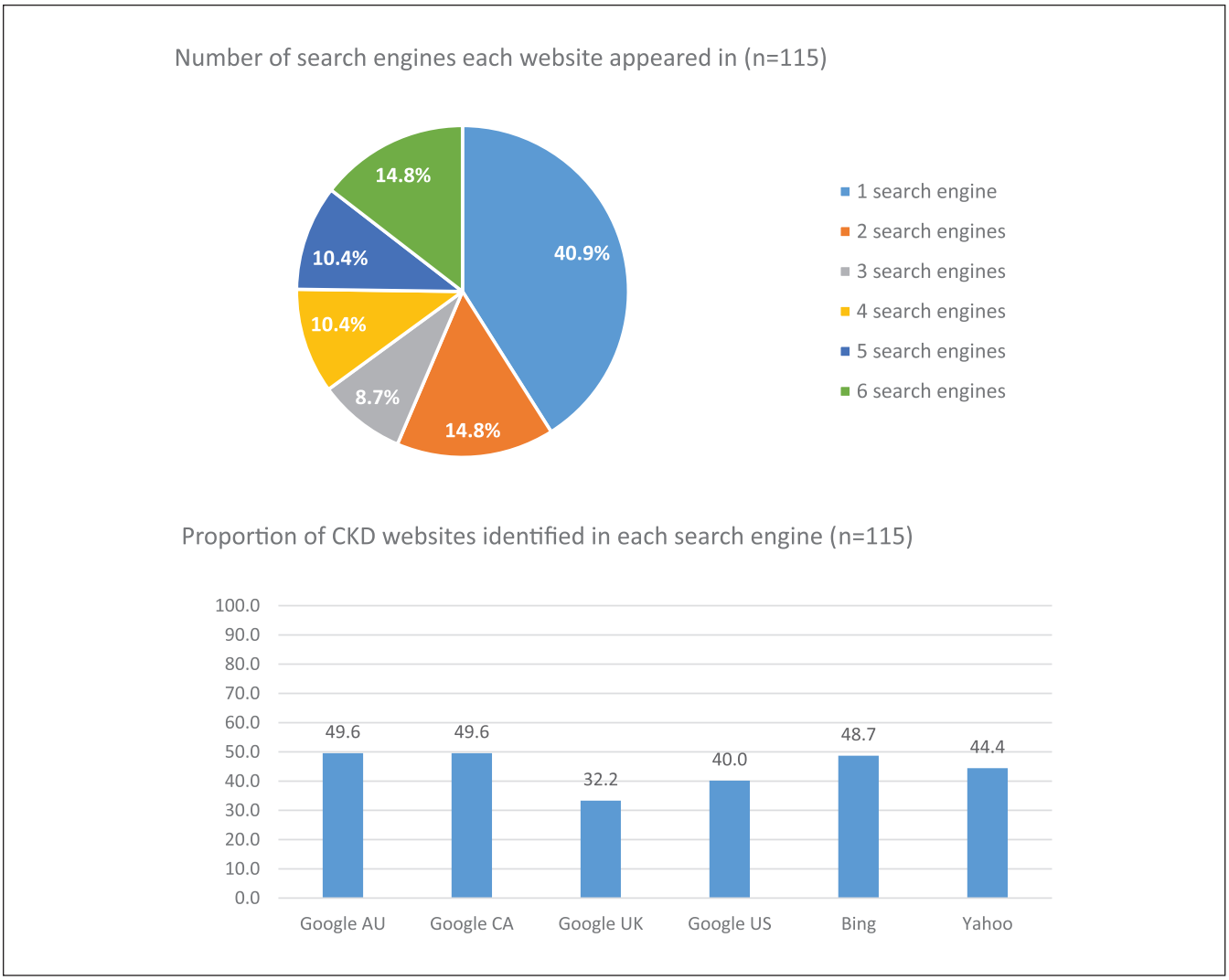

Figure 2. Search engine results.
Note. CKD = chronic kidney disease.

Table 1. Proportion of Websites Addressing Specific CKD Content (n = 115).

Patient-identified information needs	n (%)
Understanding CKD	
Basic information about CKD, what causes it, how to assess risk, understanding eGFR	107 (93.0)
Basic information about kidneys/kidney function	93 (80.9)
How to slow progression of CKD	88 (76.5)
What to expect as CKD progresses and overall implications on lifestyle	61 (53.0)
Websites with at least 1 topic covered	111 (96.5)
Symptoms	
What are the symptoms of CKD, what causes them	89 (77.4)
What to expect as CKD progresses	61 (53.0)
Considerations for comorbidities and impact of treatments for other conditions	27 (23.5)
How to manage symptoms, and when to seek help	24 (20.9)
Websites with at least 1 topic covered	92 (80.0)

(continued)

Table 1. (continued)

Patient-identified information needs	n (%)
Diet	
Information about diet/nutritional requirements, what types of changes need to be made	81 (70.4)
How to identify renal friendly/unfriendly foods	41 (35.7)
How to make modifications to prepared or ethnic foods	11 (9.6)
Practical tools for diet tracking	10 (8.7)
Options for eating out, including considerations for those with diabetes	6 (5.2)
Websites with at least 1 topic covered	83 (72.2)
Mental & Physical Support	
Physical wellness—exercise/activities to slow progression, potential restrictions	49 (42.6)
Mental wellness, specifically related to isolation, depression	34 (29.6)
Emotional/social support resources and peer support (eg, online peer support, face-to-face, etc)	27 (23.5)
How to communicate with others about mental health	12 (10.4)
Screening tools for depression	7 (6.1)
Websites with at least 1 topic covered	61 (53.0)
Medications	
Common medications for CKD, their indications, side effects to watch for, and long-term effects	59 (51.3)
How to manage side effects, interactions between medications (traditional and alternative) for other illnesses/conditions	14 (12.2)
Websites with at least 1 topic covered	60 (52.2)
Travel	
Things to consider regarding travel and CKD, potential limitations	22 (19.1)
Insurance	13 (11.3)
Accessing health care abroad	10 (8.7)
What to bring	7 (6.1)
Websites with at least 1 topic covered	25 (21.7)
Finances	
Resources and potential short- and long-term expenses, considerations relating to reduced workforce participation, medication/insurance coverage	14 (12.2)
Cost considerations (medications, equipment, food etc)	4 (3.5)
Websites with at least 1 topic covered	14 (12.2)
Work and School	
Accommodating the work/school environment	13 (11.3)
How to discuss potential limitations with employer/school	9 (7.8)
Supports and considerations for returning to work/retraining	6 (5.2)
What should be disclosed and to whom (HR, teacher etc)	4 (3.5)
Websites with at least 1 topic covered	14 (12.2)

Note. CKD = chronic kidney disease.

multiple quality metric categories (including American Kidney Fund, Kidney Care UK, Medical news Today, My Doctor, Family Doctor, MyHealth Alberta, UpToDate, and Very Well Health).

Website Traffic

There was considerable variability in website traffic measured using Alexa Rank. The Alexa Rank ranged from 5 (Wikipedia) to 14.4M (Kidney Support Network). Websites with the highest traffic (Table 5) tended to be general health websites offering information on multiple medical conditions. One exception was the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), which ranked second overall for website traffic in our results (Alexa Rank 153). Most websites with the highest web traffic covered less than 40% of content topics (ranging from 6.7% [Wiki How] to 60% [NIDDK]), had quality scores above 70% in most cases (ranging from 44.4 [Medical Dictionary] to 100 [WebMD, Mayo Clinic, Medical News Today]), and readability ranged from grade 6.7 (NIDDK) to grade 14.5 (Wikipedia).

Discussion

We completed a comprehensive review of CKD websites to evaluate their quality as well as content relative to 8 overarching information needs identified by CKD patients in our

Table 2. Website details including audience, rank, content and quality (n=115).

● = Reported
● = Not reported

					Understanding CKD				Diet						Symptoms				Medications			Mental & physical support			Finances		Travel			Work & school				LIDA								
Website name:	Website URL	Audience	Website category	Website rank based on web traffic (Alexa Rank)	Basic information about kidneys/kidney function	Basic information about CKD, causes, how to assess risk, understanding eGFR	How to slow CKD progression	What to expect as CKD progresses and overall implications on lifestyle	Information about diet/ nutritional requirements and what types of changes need to be made	How to identify renal friendly/unfriendly foods	How to make modifications to prepared or ethnic foods.	Options for eating out, considerations for those with diabetes.	Practical tools for diet/lab tracking.	What are the symptoms of CKD, what causes them	What to expect as CKD progresses	How to manage symptoms, and when to seek help.	Considerations for comorbidities and impact of treatments for other conditions	Common medications for CKD, their indications, side effects to watch for/long term effects of medications	How to manage side effects, interactions between medications (traditional and alternative) for other illnesses/ conditions.	Mental wellness, isolation, depression	Screening tools for depression	How to communicate with others about mental health	Emotional/social support, resources and peer support	Physical wellness, exercise, activities to slow progression, potential restrictions	Resources for potential short- and long-term expenses relating to CKD (reduced work)	Cost considerations (medications, insurance, equipment, food etc)	Things to consider regarding travel and CKD, potential limitations	Insurance	Accessing health care abroad	What to bring	Accommodating the work/school environment	Supports and considerations for returning to work/ retraining	How to discuss potential limitations with employer/ school	What should be disclosed and to whom (HR, teacher)	Proportion of content areas covered (%)	DISCERN (%)	Usability (%)	Reliability (%)	Total (%)	HONcode (%)	FRE (n/100)	FKRGL
Aboriginal Health Info Net	https://healthinfonet.ecu.edu.au/key-resources/resources/?kw=kidney&searchIn_title=Yes&joiner=OR&pagenum=Yes&sorter=Yes	Patient	Academic/professional (universities, hospitals, and research centers)	27 (24.1K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	10.0	77.8	76.9	75.9	76.5	78.6	39.1	12.7
American Association of Kidney Patients	https://aakp.org/ckdpredialysis-education/	Patient	Nonprofit organizations, foundations, and charities	93 (2.21M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	33.3	63.3	60.2	50.0	56.8	50.0	41.2	14.2
American Heart Association	http://www.heart.org/en/health-topics/diabetes/why-diabetes-matters/kidney-disease--diabetes	Both	Nonprofit organizations, foundations, and charities	24 (10.5K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	77.8	76.9	75.9	76.5	92.9	53.3	11.0
American Kidney Fund	http://www.kidneyfund.org/	Patient	Nonprofit organizations, foundations, and charities	54 (141K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	46.7	72.2	91.7	74.1	85.8	85.7	79.7	5.5
Australian Government Department of Health	http://health.gov.au/internet/main/publishing.nsf/Content/chronic-kidney	Both	Academic/professional (universities, hospitals, and research centers)	39 (46.8K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	75.6	68.5	75.9	71.0	82.1	33.2	15.6
BC Government	https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/bc-guidelines/chronic-kidney-disease	Both	Academic/professional (universities, hospitals, and research centers)	17 (7.76K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	30.0	78.9	68.5	61.1	66.0	75.0	13.1	17.1
BC Renal Agency	http://www.bcrenalagency.ca/health-professionals/clinical-resources/chronic-kidney-disease-(ckd)	Both	Academic/professional (universities, hospitals, and research centers)	94 (2.26M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	50.0	78.9	86.1	74.1	82.1	85.7	53.0	9.3
Better Health Victoria State Government	https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/kidney-failure	Patient	Academic/professional (universities, hospitals, and research centers)	33 (35.7K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	76.7	70.4	74.1	71.6	85.7	53.6	9.6
Bupa UK	https://www.bupa.co.uk/health-information/urinary-bladder-problems/chronic-renal-failure	Patient	Commercial and pharmaceutical companies	45 (77.3K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	26.7	80.0	80.6	70.4	77.2	89.3	58.7	8.8
CDC	https://www.cdc.gov/kidneydisease/basics.html	Both	Academic/professional (universities, hospitals, and research centers)	8 (2.20K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	16.7	77.8	81.5	85.2	82.7	89.3	57.5	9.2
CESPHN	https://www.cesphn.org.au/general-practice/help-my-patients-with/chronic-disease-management/chronic-kidney-disease	Both	Academic/professional (universities, hospitals, and research centers)	90 (2.02M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	6.7	61.1	74.1	59.3	69.1	53.6	28.6	15.0
Choosing Wisely	https://choosingwiselycanada.org/chronic-kidney-disease/	Both	Academic/professional (universities, hospitals, and research centers)	70 (669K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	67.8	68.5	63.0	66.7	53.6	67.7	7.2
CKD pathway	http://www.ckdpathway.ca/	Provider	Academic/professional (universities, hospitals, and research centers)	108 (6.34M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	16.7	81.1	80.6	75.9	79.0	67.9	37.6	14.2
Cleveland clinic	https://my.clevelandclinic.org/health/diseases/15096-kidney-disease-chronic-kidney-disease	Patient	Academic/professional (universities, hospitals, and research centers)	20 (9.24K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	10.0	70.0	81.5	77.8	80.2	100.0	58.0	8.2
CorHealth Ontario	https://www.corhealthontario.ca/resources-for-healthcare-planners-&-providers/quality-improvement-toolkits/chronic-kidney-disease-screening/Chronic-Kidney-Disease-Improving-screening-&-identification-of-CKD-for-adult-patients-in-Ontario	Provider	Academic/professional (universities, hospitals, and research centers)	107 (5.36M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	3.3	75.6	85.2	77.8	82.7	64.3	8.3	18.9

(continued)

Table 2. (continued)

● = Reported
● = Not reported

					Understanding CKD					Diet					Symptoms					Medications				Mental & physical support						Finances		Travel				Work & school					LIDA							
Website name:	Website URL	Audience	Website category	Website rank based on web traffic (Alexa Rank)	Basic information about kidneys/kidney function	Basic information about CKD, causes, how to assess risk, understanding eGFR	How to slow CKD progression	What to expect as CKD progresses and overall implications on lifestyle	Information about diet/ nutritional requirements and what types of changes need to be made	How to identify renal friendly/unfriendly foods	How to make modifications to prepared or ethnic foods.	Options for eating out, considerations for those with diabetes.	Practical tools for diet/lab tracking.	What are the symptoms of CKD, what causes them	What to expect as CKD progresses	How to manage symptoms, and when to seek help.	Considerations for comorbidities and impact of treatments for other conditions	Common medications for CKD, their indications, side effects to watch for/long term effects of medications	How to manage side effects, interactions between medications (traditional and alternative) for other illnesses/ conditions.	Mental wellness, isolation, depression	Screening tools for depression	How to communicate with others about mental health	Emotional/social support, resources and peer support	Physical wellness, exercise, activities to slow progression, potential restrictions	Resources for potential short- and long-term expenses relating to CKD (reduced work)	Cost considerations (medications, insurance, equipment, food etc)	Things to consider regarding travel and CKD, potential limitations	Insurance	Accessing health care abroad	What to bring	Accommodating the work/school environment	Supports and considerations for returning to work/ retraining	How to discuss potential limitations with employer/ school	What should be disclosed and to whom (HR, teacher)	Proportion of content areas covered (%)	DISCERN (%)	Usability (%)	Reliability (%)	Total (%)	HONcode (%)	FRE (n/100)	FKRGL
Davita	http://www.davita.com/kidney-disease/overview/stages-of-kidney-disease	Patient	Commercial and pharmaceutical companies	41 (49.9K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	93.3	74.4	92.6	75.9	87.0	78.6	57.8	9.6
Diabetes UK	https://www.diabetes.org.uk/Guide-to-diabetes/Complications/Kidneys_Nephropathy	Both	Nonprofit organizations, foundations, and charities	52 (104K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	63.3	81.5	75.9	79.6	78.6	64.0	8.0
DPC Education Center	http://www.dpcedcenter.org/chronic-kidney-disease	Patient	Nonprofit organizations, foundations, and charities	97 (2.63M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	53.3	65.6	75.9	74.1	75.3	82.1	58.0	9.9
Drugs.com	https://www.drugs.com/mcd/chronic-kidney-disease	Patient	Commercial and pharmaceutical companies	14 (3.16K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	30.0	70.0	72.2	74.1	72.8	100.0	44.6	11.6
eMedicine Health	https://www.emedicinehealth.com/chronic_kidney_disease/article_em.htm	Patient	Commercial and pharmaceutical companies	22 (10.1K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	36.7	63.3	77.8	79.6	78.4	100.0	46.2	11.4
Fairview	https://www.fairview.org/patient-education/86310	Both	Nonprofit organizations, foundations, and charities	37 (45.8K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	51.1	72.2	68.5	71.0	71.4	63.2	7.3
Family Doctor	https://familydoctor.org/condition/chronic-kidney-disease-ckd/	Both	Nonprofit organizations, foundations, and charities	40 (49.4K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	23.3	75.6	88.0	75.9	84.0	100.0	74.1	5.2
Fresenius Kidney Care	https://www.freseniuskidneycare.com/about-chronic-kidney-disease/stages/chronic-kidney-disease-ckd-stages	Patient	Commercial and pharmaceutical companies	62 (411K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	66.7	66.7	87.0	75.9	83.3	71.4	55.7	10.2
Fresenius Australia	https://www.fmc-au.com/community/articles/250-world-kidney-day-raising-awareness-for-chronic-kidney-disease	Both	Commercial and pharmaceutical companies	101 (2.96M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	55.6	74.1	66.7	71.6	60.7	36.2	12.3
Fresenius Medical Care	https://www.freseniusmedicalcare.com/en/patients-families/family-caregivers/	Both	Commercial and pharmaceutical companies	71 (769K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	20.0	62.2	88.9	75.9	84.6	75.0	52.9	9.9
Good To Go Insurance	https://www.goodtogoinsurance.com/medical-travel-insurance/chronic-kidney-disease	Patient	Commercial and pharmaceutical companies	69 (656K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	16.7	43.3	56.5	46.3	53.1	42.9	58.3	9.5
Guy's & St. Thomas Kidney Patients' Association	http://www.gsttkpa.org/	Patients	Nonprofit organizations, foundations, and charities	58 (208K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	10.0	62.2	76.9	70.4	74.7	57.1	57.6	8.7
HCA Healthcare	https://hcahealthcare.com/hl/?/Yes03Yes58/Lifestyle-Changes-to-Manage-Chronic-Kidney-Disease	Both	Commercial and pharmaceutical companies	56 (158K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	16.7	52.2	64.8	66.7	65.4	85.7	76.4	5.5
Health Care Siemens—Australia	https://www.healthcare.siemens.com.au/laboratory-diag0stics/assays-by-diseases-conditions/kidney-disease	Both	Commercial and pharmaceutical companies	72 (812K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	10.0	70.0	81.5	77.8	80.2	71.4	29.7	18.1
Health Direct Australia	https://www.healthdirect.gov.au/chronic-kidney-disease	Patient	Academic/professional (universities, hospitals, and research centers)	35 (44.1K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	81.1	76.9	88.9	80.9	92.9	52.4	10.2
Health Insight Nevada	https://healthinsight.org/nv-patients-family/498-chronic-kidney-disease	Both	Nonprofit organizations, foundations, and charities	87 (1.66M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	0.0	65.6	71.3	66.7	78.4	78.6	20.3	15.6
Health Line—CKD	https://www.healthline.com/health/chronic-kidney-disease	Patient	Nonprofit organizations, foundations, and charities	4 (529)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	20.0	67.8	74.1	74.1	74.1	96.4	50.1	8.8
HealthLink BC	https://www.healthlinkbc.ca/healthy-eating/early-chronic-kidney-disease	Patient	Academic/professional (universities, hospitals, and research centers)	48 (91.1K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	36.7	78.9	77.8	85.2	80.2	85.7	63.8	7.6

(continued)

Table 2. (continued)

• = Reported
• = Not reported

					Understanding CKD				Diet					Symptoms				Medications		Mental & physical support					Finances		Travel			Work & school				LIDA						
Website name:	Website URL	Audience	Website category	Website rank based on web traffic (Alexa Rank)	Basic information about kidneys/kidney function	Basic information about CKD, causes, how to assess risk, understanding eGFR	How to slow CKD progression	What to expect as CKD progresses and overall implications on lifestyle	Information about diet/ nutritional requirements and what types of changes need to be made	How to identify renal friendly/unfriendly foods	How to make modifications to prepared or ethnic foods.	Options for eating out, considerations for those with diabetes.	Practical tools for diet/lab tracking.	What are the symptoms of CKD, what causes them	What to expect as CKD progresses	How to manage symptoms, and when to seek help.	Considerations for comorbidities and impact of treatments for other conditions	Common medications for CKD, their indications, side effects to watch for/long term effects of medications	How to manage side effects, interactions between medications (traditional and alternative) for other illnesses/ conditions.	Mental wellness, isolation, depression	Screening tools for depression	How to communicate with others about mental health	Emotional/social support, resources and peer support	Physical wellness, exercise, activities to slow progression, potential restrictions	Resources for potential short- and long-term expenses relating to CKD (reduced work)	Cost considerations (medications, insurance, equipment, food etc)	Things to consider regarding travel and CKD. potential limitations	Insurance	Accessing health care abroad	What to bring	Accommodating the work/school environment	Supports and considerations for returning to work/ retraining	How to discuss potential limitations with employer/ school	What should be disclosed and to whom (HR, teacher)	Proportion of content areas covered (%)	DISCERN (%)	Usability (%)	Reliability (%)	Total (%)	HONcode (%)	FRE (n/100)	FKRGL
Health Services Executive	https://www.hse.ie/eng/health/az/c/chronic-kidney-disease/	Both	Academic/professional (universities, hospitals, and research centers)	36 (45K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30.0	67.8	75.9	83.3	78.4	78.6	58.3	9.4
Health&	https://healthand.com/au/topic/general-report/chronic-kidney-disease	Patient	Commercial and pharmaceutical companies	88 (1.93M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10.0	61.1	86.1	74.1	82.1	85.7	42.3	11.8
Healthwise—Sask Health online	https://www.healthwise.net/saskhealthlineonline/Content/StdDocument.aspx?DOCHWID=aa65427	Patient	Academic/professional (universities, hospitals, and research centers)	53 (113K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30.0	80.0	74.1	94.4	80.9	78.6	69.4	6.5
Info KID	https://www.infokid.org.uk/chronic-kidney-disease-ckd	Patient	Academic/professional (universities, hospitals, and research centers)	85 (1.58M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	20.0	65.6	81.5	63.0	75.3	64.3	69.8	7.2
Jama	https://jamanetwork.com/journals/jama/fullarticle/2524193	Both	Academic/professional (universities, hospitals, and research centers)	21 (9.32K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	16.7	71.1	78.7	83.3	80.2	92.9	43.5	11.4
Kidney ABC (Tongshantang Hospital)	http://www.kidneyabc.com/ckd/*	Patient	Commercial and pharmaceutical companies	64 (492K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	20.0	41.1	71.3	44.4	62.3	32.1	59.8	7.7
Kidney Care UK	https://www.kidneycareuk.org/about-kidney-health/conditions/ckd/	Patient	Nonprofit organizations, foundations, and charities	91 (2.02M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	60.0	83.3	94.4	77.8	88.9	71.4	48.5	12.2
Kidney Cares Community (Tongshantang Hospital)	http://www.kidney-cares.org/ckd-treatment/*	Patient	Commercial and pharmaceutical companies	82 (1.23M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	20.0	35.6	67.6	46.3	60.5	42.9	43.4	12.1
Kidney Disease (Tongshantang Hospital)	http://www.renaldiseases.org/ckd/*	Patient	Commercial and pharmaceutical companies	104 (3.64M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	20.0	40.0	74.1	51.9	66.7	42.9	41.8	13.1
Kidney Disease Symptoms (Tongshantang Hospital)	http://www.kidney-symptom.com/chronic-kidney-disease/*	Patient	Commercial and pharmaceutical companies	81 (1.21M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	20.0	40.0	68.5	50.0	62.3	42.9	53.1	9.1
Kidney Disease Treatment Center (Tongshantang Hospital)	http://www.kidney-support.org/ckd/*	Patient	Commercial and pharmaceutical companies	99 (2.77M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	20.0	40.0	68.5	50.0	62.3	42.9	41.8	12.7
Kidney Failure (Tongshantang Hospital)	http://www.kidneyfailureweb.com/ckd/*	Patient	Commercial and pharmaceutical companies	76 (962K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	26.7	40.0	70.4	53.7	64.8	39.3	37.7	12.7
Kidney Foundation of Canada	https://www.kidney.ca/kidney-disease	Patient/ caregiver	Nonprofit organizations, foundations, and charities	73 (846K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	63.3	70.0	88.9	51.9	76.5	64.3	47.1	11.4
Kidney Health Australia	https://kidney.org.au/your-kidneys/detect/kidney-disease/stages-of-chronic-kidney-disease-787	Both	Nonprofit organizations, foundations, and charities	68 (617K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	53.3	73.3	90.7	81.5	87.7	78.6	39.1	12.2
Kidney Patient Guide	http://www.kidneypatientguide.org.uk/financial.php	Patient	Nonprofit organizations, foundations, and charities	95 (2.39M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	50.0	79.4	86.1	72.2	81.5	92.9	56.4	9.2
Kidney Research UK	https://www.kidneyresearchuk.org/health-information/chronic-kidney-disease	Patient	Nonprofit organizations, foundations, and charities	74 (869K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	20.0	66.7	79.6	63.0	74.1	78.6	50.7	11.0
Kidney School	https://www.kidneyschool.org/	Both	Nonprofit organizations, foundations, and charities	98 (2.71M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36.7	70.0	84.3	59.3	75.9	64.3	71.4	7.1

(continued)

Table 2. (continued)

● = Reported
● = Not reported

Website name:	Website URL	Audience	Website category	Website rank based on web traffic (Alexa Rank)	Understanding CKD: Basic information about kidneys/kidney function	Understanding CKD: Basic information about CKD, causes, how to assess risk, understanding eGFR	Understanding CKD: How to slow CKD progression	Understanding CKD: What to expect as CKD progresses and overall implications on lifestyle	Diet: Information about diet/ nutritional requirements and what types of changes need to be made	Diet: How to identify renal friendly/unfriendly foods	Diet: How to make modifications to prepared or ethnic foods.	Diet: Options for eating out, considerations for those with diabetes.	Diet: Practical tools for diet/lab tracking.	Symptoms: What are the symptoms of CKD, what causes them	Symptoms: What to expect as CKD progresses	Symptoms: How to manage symptoms, and when to seek help.	Symptoms: Considerations for comorbidities and impact of treatments for other conditions	Medications: Common medications for CKD, their indications, side effects to watch for/long term effects of medications	Medications: How to manage side effects, interactions between medications (traditional and alternative) for other illnesses/ conditions.	Mental & physical support: Mental wellness, isolation, depression	Mental & physical support: Screening tools for depression	Mental & physical support: How to communicate with others about mental health	Mental & physical support: Emotional/social support, resources and peer support	Mental & physical support: Physical wellness, exercise, activities to slow progression, potential restrictions	Finances: Resources for potential short- and long-term expenses relating to CKD (reduced work)	Finances: Cost considerations (medications, insurance, equipment, food etc)	Travel: Things to consider regarding travel and CKD, potential limitations	Travel: Insurance	Travel: Accessing health care abroad	Travel: What to bring	Work & school: Accommodating the work/school environment	Work & school: Supports and considerations for returning to work/ retraining	Work & school: How to discuss potential limitations with employer/ school	Work & school: What should be disclosed and to whom (HR, teacher)	LIDA: Proportion of content areas covered (%)	LIDA: DISCERN (%)	LIDA: Usability (%)	LIDA: Reliability (%)	LIDA: Total (%)	HONcode (%)	FRE (n/100)	FKRGL
Kidney Services China (Tongshantang Hospital)	http://www.kidneyservicechina.com/stage-3-ckd/*	Patient	Commercial and pharmaceutical companies	96 (2.41M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	23.3	40.0	64.8	25.9	51.9	39.3	47.3	11.2
Kidney Support Network	http://ksn.org.au/	Patient	Nonprofit organizations, foundations, and charities	114 (14.4M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	48.9	77.8	51.9	69.1	50.0	51.1	9.2
Kidney Treatment (Tongshantang Hospital)	http://www.kidney-treatment.org/ckd/*	Patient	Commercial and pharmaceutical companies	84 (1.49M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	13.3	40.0	63.0	31.5	52.5	32.1	35.4	16.2
Kidney Wales	https://www.kidneywales.cymru/about-kidney-disease/what-is-kidney-disease/stages-chronic-kidney-disease/	Patient	Nonprofit organizations, foundations, and charities	113 (13.9M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	16.7	64.4	75.0	57.4	69.1	57.1	58.6	9.0
Kids Health	https://kidshealth.org/en/parents/chronic-kidney-disease.html	Both	Nonprofit organizations, foundations, and charities	25 (10.7K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	23.3	75.6	89.8	81.5	87.0	85.7	50.2	10.7
Lab Tests Online	https://labtestsonline.org/conditions/kidney-disease	Both	Commercial and pharmaceutical companies	32 (31.1K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	20.0	81.1	74.1	74.1	74.1	100.0	48.9	10.9
Life Line Screening	https://www.lifelinescreening.com/screening-services/chronic-kidney-disease-screening	Patient	Commercial and pharmaceutical companies	59 (293K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	6.7	65.6	82.4	66.7	77.2	64.3	36.3	10.8
Life Options	https://lifeoptions.org/learn-about-kidney-disease/	patients	Nonprofit organizations, foundations, and charities	60 (404K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	56.7	70.0	81.5	59.3	74.1	67.9	84.2	4.5
London Health Sciences	http://www.lhsc.on.ca/Patients_Families_Visitors/Renal/AdjustingtoKidneyDisease/Travel/index.htm	Both	Academic/professional (universities, hospitals, and research centers)	51 (103K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	50.0	75.6	85.2	74.1	81.5	71.4	42.9	11.7
Long Island kidney and hypertension	http://www.kidneyandhypertensioncare.com/chronic-kidney-disease.php	Patient	Academic/professional (universities, hospitals, and research centers)	112 (13.4M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	10.0	53.3	52.8	57.4	54.3	53.6	47.5	11.4
Manitoba Renal Program	http://www.kidneyhealth.ca/wp/kidney-disease/	Both	Academic/professional (universities, hospitals, and research centers)	105 (4.62M)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	60.0	73.3	63.0	55.6	60.5	64.3	55.1	9.7
Mayo clinic	https://www.mayoclinic.org/diseases-conditions/chronic-kidney-disease/symptoms-causes/syc-20354521Yes	Both	Nonprofit organizations, foundations, and charities	7 (1.24K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	46.7	77.8	76.9	77.8	77.2	100.0	48.9	10.5
Med Broadcast	https://medbroadcast.com/condition/getcondition/chronic-renal-failure	Patient	Commercial and pharmaceutical companies	44 (67.5K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	40.0	61.1	63.9	48.1	58.6	75.0	37.0	11.4
Medical Dictionary	https://medical-dictionary.thefreedictionary.com/kidney+disease	Unknown	Commercial and pharmaceutical companies	6 (636)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	40.0	65.6	52.8	44.4	50.0	67.9	35.0	13.1
Medical News Today	https://www.medicalnewstoday.com/articles/172179.php	Both	Commercial and pharmaceutical companies	10 (2.61K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	33.3	83.3	68.5	72.2	69.8	100.0	48.4	10.3
Medicine Net	https://www.medicinenet.com/script/main/art.asp?articlekey=30944	Patient	Commercial and pharmaceutical companies	11 (2.86K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	50.0	77.8	71.3	77.8	73.5	100.0	45.2	12.0
Medline Plus	https://medlineplus.gov/chronickidneydisease.html	Patient	Academic/professional (universities, hospitals, and research centers)	13 (3.12K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	20.0	74.4	62.0	72.2	65.4	92.9	72.5	5.9
MedScape	https://emedicine.medscape.com/article/238798-overview	Clinician	Academic/professional (universities, hospitals, and research centers)	9 (2.47K)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	16.7	77.8	72.2	77.8	74.1	96.4	29.8	13.8

(continued)

Table 2. (continued)

• = Reported
• = Not reported

					Understanding CKD				Diet					Symptoms				Medications			Mental & physical support					Finances		Travel					Work & school				LIDA						
Website name:	Website URL	Audience	Website category	Website rank based on web traffic (Alexa Rank)	Basic information about kidneys/kidney function	Basic information about CKD, causes, how to assess risk, understanding eGFR	How to slow CKD progression	What to expect as CKD progresses and overall implications on lifestyle	Information about diet/ nutritional requirements and what types of changes need to be made	How to identify renal friendly/unfriendly foods	How to make modifications to prepared or ethnic foods.	Options for eating out, considerations for those with diabetes.	Practical tools for diet/lab tracking.	What are the symptoms of CKD, what causes them	What to expect as CKD progresses	How to manage symptoms, and when to seek help.	Considerations for comorbidities and impact of treatments for other conditions	Common medications for CKD, their indications, side effects to watch for/long term effects of medications	How to manage side effects, interactions between medications (traditional and alternative) for other illnesses/ conditions.	Mental wellness, isolation, depression	Screening tools for depression	How to communicate with others about mental health	Emotional/social support, resources and peer support	Physical wellness, exercise, activities to slow progression, potential restrictions	Resources for potential short- and long-term expenses relating to CKD (reduced work)	Cost considerations (medications, insurance, equipment, food etc)	Things to consider regarding travel and CKD. potential limitations	Insurance	Accessing health care abroad	What to bring	Accommodating the work/school environment	Supports and considerations for returning to work/ retraining	How to discuss potential limitations with employer/ school	What should be disclosed and to whom (HR, teacher)	Proportion of content areas covered (%)	DISCERN (%)	Usability (%)	Reliability (%)	Total (%)	HONcode (%)	FRE (n/100)	FKRGL
Merck Manuals—professional (MSD)	https://www.merckmanuals.com/professional/genitourinary-disorders/chronic-kidney-disease/chronic-kidney-disease	Clinician	Commercial and pharmaceutical companies	31 (27.8K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	33.3	82.2	73.1	75.9	74.1	82.1	14.0	16.2
Merck Manuals-consumer (also MSD)	https://www.merckmanuals.com/en-ca/home/kidney-and-urinary-tract-disorders/kidney-failure/chronic-kidney-disease-ckd	Patient	Commercial and pharmaceutical companies	30 (27.7K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30.0	71.1	69.4	70.4	69.8	82.1	33.9	12.9
Mount Sinai	https://www.mountsinai.org/health-library/diseases-conditions/chronic-kidney-disease	Both	Academic/professional (universities, hospitals, and research centers)	29 (24.9K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	40.0	76.7	63.9	64.8	64.2	75.0	73.4	6.2
My Doctor	http://www.mydr.com.au/health-images/chronic-kidney-disease	Patient	Commercial and pharmaceutical companies	46 (83.7K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	50.0	82.2	75.9	70.4	74.1	100.0	58.4	9.6
My Kidney	https://www.mykidney.org/home.aspx	Patient	Academic/professional (universities, hospitals, and research centers)	100 (2.81M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36.7	65.6	63.9	40.7	56.2	53.6	65.0	8.0
My VMC	https://www.myvmc.com/diseases/kidney-disease-chronic-renal-failure/	Both	Academic/professional (universities, hospitals, and research centers)	50 (93.9K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30.0	75.6	77.8	85.2	80.2	96.4	47.6	11.5
MyHealth Alberta	https://myhealth.alberta.ca/Health/pages/conditions.aspx?hwid=aa65427	Patient	Academic/professional (universities, hospitals, and research centers)	26 (11.5K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	43.3	83.3	77.8	81.5	79.0	85.7	67.7	6.8
NIDDK	https://www.niddk.nih.gov/health-information/kidney-disease/chronic-kidney-disease-ckd	Both	Academic/professional (universities, hospitals, and research centers)	2 (153)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	60.0	80.0	73.1	79.6	66.0	82.1	69.1	6.7
National Kidney Center	http://www.nationalkidneycenter.org/chronic-kidney-disease/	Patient	Nonprofit organizations, foundations, and charities	83 (1.25M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36.7	72.2	65.7	63.0	64.8	71.4	58.9	8.7
National Kidney Federation UK	https://www.kidney.org.uk/help-and-info/medical-information-from-the-nkf-/medical-info-ckd-info/	Patient	Nonprofit organizations, foundations, and charities	77 (981K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	40.0	68.9	77.8	70.4	75.3	78.6	60.6	9.3
National Kidney Foundation	https://www.kidney.org/atoz/content/about-chronic-kidney-disease	Both	Nonprofit organizations, foundations, and charities	42 (50.4K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	76.7	77.8	66.7	53.7	62.3	92.9	55.2	9.1
National Kidney Foundation of Illinois	http://www.nkfi.org/education/chronic-kidney-disease	Both	Nonprofit organizations, foundations, and charities	89 (2.01M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	26.7	62.2	75.9	64.8	72.2	67.9	53.2	9.5
Nephcure	https://nephcure.org/livingwithkidneydisease/what-is-kidney-disease/	Both	Nonprofit organizations, foundations, and charities	78 (1.0M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	50.0	74.4	51.9	37.0	46.9	75.0	49.6	10.7
Net Wellness	http://www.netwellness.org/healthtopics/kidney/kidneytreatment.cfm	Unknown	Nonprofit organizations, foundations, and charities	75 (912K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	26.7	73.3	83.3	81.5	82.7	75.0	36.2	13.6
NHS	https://www.nhs.uk/conditions/kidney-disease/symptoms/	Patient	Academic/professional (universities, hospitals, and research centers)	15 (3.36K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	50.0	74.4	77.8	79.6	78.4	92.9	62.4	8.7
NHS Inform	https://www.nhsinform.scot/illnesses-and-conditions/kidneys-bladder-and-prostate/chronic-kidney-disease	Patient	Academic/professional (universities, hospitals, and research centers)	47 (85.0K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	56.7	76.7	66.7	63.0	65.4	89.3	59.1	9.1

(continued)

Table 2. (continued)

• = Reported
• = Not reported

					Understanding CKD				Diet					Symptoms				Medications		Mental & physical support					Finances		Travel				Work & school				LIDA						
Website name:	Website URL	Audience	Website category	Website rank based on web traffic (Alexa Rank)	Basic information about kidneys/kidney function	Basic information about CKD, causes, how to assess risk, understanding eGFR	How to slow CKD progression	What to expect as CKD progresses and overall implications on lifestyle	Information about diet/ nutritional requirements and what types of changes need to be made	How to identify renal friendly/unfriendly foods	How to make modifications to prepared or ethnic foods.	Options for eating out, considerations for those with diabetes.	Practical tools for diet/lab tracking.	What are the symptoms of CKD, what causes them	What to expect as CKD progresses	How to manage symptoms, and when to seek help.	Considerations for comorbidities and impact of treatments for other conditions	Common medications for CKD, their indications, side effects to watch for/long term effects of medications	How to manage side effects, interactions between medications (traditional and alternative) for other illnesses/ conditions.	Mental wellness, isolation, depression	Screening tools for depression	How to communicate with others about mental health	Emotional/social support, resources and peer support	Physical wellness, exercise, activities to slow progression, potential restrictions	Resources for potential short- and long-term expenses relating to CKD (reduced work)	Cost considerations (medications, insurance, equipment, food etc)	Things to consider regarding travel and CKD, potential limitations	Insurance	Accessing health care abroad	What to bring	Accommodating the work/school environment	Supports and considerations for returning to work/ retraining	How to discuss potential limitations with employer/ school	What should be disclosed and to whom (HR, teacher)	Proportion of content areas covered (%)	DISCERN (%)	Usability (%)	Reliability (%)	Total (%)	HONcode (%)	FRE (n/100)	FKRGL
NI Direct Government Services	https://www.nidirect.gov.uk/conditions/chronic-kidney-disease	Both	Academic/professional (universities, hospitals, and research centers)	34 (42.5K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	20.0	68.9	77.8	88.9	81.5	71.4	61.0	8.4
NICE Pathways UK	https://pathways.nice.org.uk/pathways/chronic-kidney-disease	Both	Academic/professional (universities, hospitals, and research centers)	28 (24.6K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30.0	87.8	80.6	79.6	80.2	82.1	33.9	13.2
NRS Healthcare	https://www.nrshealthcare.co.uk/articles/condition/chronic-kidney-disease	Patient	Commercial and pharmaceutical companies	63 (481K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	36.7	61.1	61.1	50.0	57.4	64.3	50.7	11.6
Ontario Renal Network	http://www.renalnetwork.on.ca/info_for_patients/kidney_disease/	Both	Academic/professional (universities, hospitals, and research centers)	109 (7.2M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	23.3	70.0	74.1	64.8	71.0	78.6	51.8	9.7
Patient	https://patient.info/doctor/chronic-kidney-disease-pro	Both	Nonprofit organizations, foundations, and charities	19 (9.02K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	40.0	84.4	75.9	79.6	77.2	100.0	51.5	9.9
PHN Central and Eastern Australia	https://www.cesphn.org.au/general-practice/help-my-patients-with/chronic-disease-management/chronic-kidney-disease	Both	Academic/professional (universities, hospitals, and research centers)	92 (2.02M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	3.3	58.9	64.8	59.3	61.7	53.6	26.6	17.4
Renal Support Network	http://www.rsnhope.org/kidney-disease-health-library/	Both	Nonprofit organizations, foundations, and charities	86 (1.62M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	60.0	58.9	66.7	53.7	62.3	60.7	54.0	9.6
Rexall	https://www.rexall.ca/articles/view/253/Chronic-Renal-Failure	Patient	Commercial and pharmaceutical companies	55 (146K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	30.0	61.1	67.6	55.6	63.6	60.7	46.3	12.1
Rogosin Institute	http://www.rogosin.org/patient-care/kidney-disease/chronic-kidney-disease	Both	Academic/professional (universities, hospitals, and research centers)	106 (4.65M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	6.7	58.9	74.1	44.4	64.2	57.1	41.2	11.9
Saskatoon Health Region	http://www.saskatoonhealthregion.ca/locations_services/Services/Kidney-Health/Pages/Chronic-Kidney-Disease-Clinic.aspx	Patient	Academic/professional (universities, hospitals, and research centers)	66 (537K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	23.3	73.3	67.6	68.5	67.9	85.7	51.2	10.3
Scottish Kidney Federation[a]	http://scotskidneyfederation.org/ckd-information.html	Patient	Nonprofit organizations, foundations, and charities	NA					•										•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	n/a	57.8	69.4	57.4	65.4	60.7	39.7	12.0
Shire Canada	https://www.shirecanada.com/patients/therapeutic-areas/chronic-kidney-disease	Patient	Commercial and pharmaceutical companies	103 (3.59M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10.0	57.8	69.4	57.4	65.4	60.7	39.7	12.0
St Agnes Surgery	http://www.stagnessurgery.com.au/chronic-kidney-disease.html	Patient	Academic/professional (universities, hospitals, and research centers)	110 (8.09M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	23.3	55.6	68.5	46.3	61.1	67.9	32.3	15.2
Standford Healthcare	https://stanfordhealthcare.org/medical-conditions/liver-kidneys-and-urinary-system/kidney-failure.html	Both	Academic/professional (universities, hospitals, and research centers)	38 (46.2K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10.0	66.7	73.1	57.4	67.9	67.9	46.4	9.8
Sunnybrook hospital	https://sunnybrook.ca/content/?page=intro-chronic-kidney-disease-treatment	Patient	Academic/professional (universities, hospitals, and research centers)	49 (93.8K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	13.3	75.6	79.6	64.8	74.7	75.0	38.0	9.4
The Renal Association	https://renal.org/information-resources/the-uk-eckd-guide/ckd-stages/	Clinician	Academic/professional (universities, hospitals, and research centers)	65 (520K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	60.0	82.2	75.0	72.2	74.1	82.1	39.9	13.5
The Royal Melbourne Hospital	https://www.thermh.org.au/health-professionals/clinical-services/nephrology/chronic-kidney-disease	Both	Academic/professional (universities, hospitals, and research centers)	61 (405K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	6.7	67.8	71.3	68.5	70.4	78.6	35.7	12.9

(continued)

Table 2. (continued)

• = Reported
• = Not reported

Website name:	Website URL	Audience	Website category	Website rank based on web traffic (Alexa Rank)	Understanding CKD: Basic information about kidneys/kidney function	Understanding CKD: Basic information about CKD, causes, how to assess risk, understanding eGFR	Understanding CKD: How to slow CKD progression	Understanding CKD: What to expect as CKD progresses and overall implications on lifestyle	Diet: Information about diet/ nutritional requirements and what types of changes need to be made	Diet: How to identify renal friendly/unfriendly foods	Diet: How to make modifications to prepared or ethnic foods.	Diet: Options for eating out, considerations for those with diabetes,	Diet: Practical tools for diet/lab tracking.	Symptoms: What are the symptoms of CKD, what causes them	Symptoms: What to expect as CKD progresses	Symptoms: How to manage symptoms, and when to seek help.	Medications: Considerations for comorbidities and impact of treatments for other conditions	Medications: Common medications for CKD, their indications, side effects to watch for/long term effects of medications	Medications: How to manage side effects, interactions between medications (traditional and alternative) for other illnesses/ conditions.	Mental & physical support: Mental wellness, isolation, depression	Mental & physical support: Screening tools for depression	Mental & physical support: How to communicate with others about mental health	Mental & physical support: Emotional/social support, resources and peer support	Mental & physical support: Physical wellness, exercise, activities to slow progression, potential restrictions	Finances: Resources for potential short- and long-term expenses relating to CKD (reduced work)	Finances: Cost considerations (medications, insurance, equipment, food etc)	Travel: Things to consider regarding travel and CKD, potential limitations	Travel: Insurance	Travel: Accessing health care abroad	Travel: What to bring	Work & school: Accommodating the work/school environment	Work & school: Supports and considerations for returning to work/ retraining	Work & school: How to discuss potential limitations with employer/ school	Work & school: What should be disclosed and to whom (HR, teacher)	LIDA: Proportion of content areas covered (%)	LIDA: DISCERN (%)	LIDA: Usability (%)	LIDA: Reliability (%)	LIDA: Total (%)	HONcode (%)	FRE (of 100)	FKRGL
Think Kidneys	https://www.thinkkidneys.nhs.uk/ckd/information-for-the-public/	Patient	Nonprofit organizations, foundations, and charities	102 (3.22M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	23.3	71.1	79.6	66.7	75.3	67.9	60.9	9.4
UC San Diego Health	https://health.ucsd.edu/specialties/nephrology/Pages/chronic-kidney-disease.aspx	Patient	Academic/professional (universities, hospitals, and research centers)	12 (2.95K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	43.3	78.9	75.9	70.4	74.1	75.0	45.7	11.1
UCSF Department of surgery	https://surgery.ucsf.edu/conditions--procedures/chronic-kidney-disease.aspx	Both	Academic/professional (universities, hospitals, and research centers)	18 (8.53K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	33.3	72.2	72.2	68.5	71.0	85.7	72.8	6.4
UNC Kidney Center	https://unckidneycenter.org/kidneyhealthlibrary/chronic-kidney-disease-1/	Both	Academic/professional (universities, hospitals, and research centers)	79 (1.07M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	40.0	66.7	70.4	59.3	66.7	71.4	56.8	9.3
UptoDate	https://www.uptodate.com/contents/chronic-kidney-disease-beyond-the-basics	Both	Commercial and pharmaceutical companies	16 (5.23K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	23.3	83.3	59.3	92.6	70.4	82.1	42.3	11.3
UW Health	https://www.uwhealth.org/health/topic/major/kidney-disease-chronic/aa65427.html	Patient	Academic/professional (universities, hospitals, and research centers)	43 (59.8K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	40.0	66.7	63.9	59.3	62.3	60.7	67.7	6.8
Very Well Health	https://www.verywellhealth.com/chronic-kidney-disease-overview-1132509	Patient	Nonprofit organizations, foundations, and charities	23 (10.4K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	43.3	86.7	84.3	85.2	84.6	100.0	42.3	13.1
Web MD	https://www.webmd.com/a-to-z-guides/understanding-kidney-disease-basic-information	Both	Commercial and pharmaceutical companies	5 (599)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	33.3	71.1	84.3	85.2	84.6	100.0	68.0	7.2
Welling Homeopathy	https://www.wellinghomeopathy.com/treatment-of-chronic-kidney-disease-ckd/	Patient	Commercial and pharmaceutical companies	67 (569K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	16.7	35.6	66.7	50.0	61.1	42.9	39.0	13.6
Western Nephrology	http://westneph.com/chronic-kidney-disease/	Both	Academic/professional (universities, hospitals, and research centers)	111 (11.8M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	10.0	52.2	74.1	40.7	63.0	64.3	38.2	12.8
Wiki How	https://www.wikihow.com/Create-a-Kidney-Diet-to-Reverse-Chronic-Kidney-Disease	Patient	Commercial and pharmaceutical companies	3 (179)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	6.7	68.9	74.1	85.2	77.8	78.6	58.3	8.9
Wikipedia	https://en.wikipedia.org/wiki/Chronic_kidney_disease	Both	Nonprofit organizations, foundations, and charities	1 (5)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	26.7	72.2	71.3	79.6	74.1	92.9	18.5	14.5
World Kidney Day	https://www.worldkidneyday.org/faqs/chronic-kidney-disease/	Patient	Nonprofit organizations, foundations, and charities	80 (1.13M)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	26.7	64.4	81.5	64.8	75.9	60.7	50.9	10.0
Your MD	https://www.your.md/condition/kidney-disease-chronic/	Patient	Commercial and pharmaceutical companies	57 (196K)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	46.7	73.3	82.4	79.6	81.5	75.0	60.7	8.1

Note. CKD = chronic kidney disease; FRE = Flesch Reading Ease; FKRGL = Flesch-Kincaid Reading Grade Level; eGFR = estimated glomerular filtration rate; CDC = Centers for Disease Control and Prevention; CESPHN = Central and Eastern Sydney Primary Health Network; DPC = Dialysis Patient Citizens; VMC = Virtual Medical Center; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; NHS = National Health Service.

[a]Website became unavailable during evaluation.

*Website link no longer accessible on 9 July 2019.

Table 3. Mean Quality and Readability Assessment Scores for Reviewed Sites (n = 115).

Measurement	Mean score % (±SD)
DISCERN	
Are the aims clear?	79.0 (7.9)
Does it achieve its aims?	73.0 (10.6)
Is it relevant?	70.0 (11.4)
Is it clear what sources of information were used to compile the publication (other than the author or producer)?	62.4 (19.3)
Is it clear when the information used or reported in the publication was produced?	63.5 (20.4)
Is it balanced and unbiased?	66.1 (14.4)
Does it provide details of additional sources of support and information?	68.3 (19.6)
Does it refer to areas of uncertainty?	62.5 (13.6)
Overall rating of the publication	67.9 (14.6)
DISCERN total score	68.1 (14.6)
LIDA	
Usability measures	
Clarity	77.3 (10.9)
Consistency	82.4 (10.9)
Functionality	79.2 (7.6)
Engagability	57.1 (14.7)
Currency	50.9 (14.8)
Reliability measures	
Conflicts of interest	86.4 (14.2)
Content production	63.9 (20.4)
LIDA total score	71.0 (14.4)
HON code	74.6 (17.2)
FRE	Mean FRE (±SD) 49.8 (14.4)
FKRGL	Mean Grade (±SD) 10.6 (2.8)

Note. FRE = Flesch Reading Ease; FKRGL = Flesch-Kincaid Reading Grade Level.

prior work.[11] Of the 115 websites included, we found that they were of reasonably high quality, as assessed using validated instruments. However, their mean reading grade level was grade 11, much higher than recommended for a general patient audience, and information related to *travel, finances*, and *work/school* in particular was very limited.

We found considerable variation in content covered across all websites, with the majority of websites including information on less than 30% of the information needs expressed by patients as important for self-management.[11] Information related to *understanding CKD, symptoms*, and *diet* were included across most of the websites; however, content related to *travel, finances*, and *work/school* considerations was particularly lacking and, where available, was not tailored to a Canadian audience. Our review also highlighted deficiencies in content related to mental health, including screening tools for depression and strategies to communicate with others about mental health, and content related to dietary and self-management needs, such as practical tools for tracking diet and laboratory data and guidance on eating in restaurants. In addition, the website content was often difficult to navigate and required considerable time searching for the topics listed in our content checklist.

We also found considerable variability in website traffic measured using Alexa Rank, with the highest ranking (correlating to the greatest traffic) being general health websites and not specific to CKD. In fact, the websites with the highest traffic covered less than 40% of the content areas and information needs identified by patients with CKD. Furthermore, both quality and readability were similar irrespective of the website category or audience.

While previous CKD website reviews focused on quality and readability assessment,[5,10] a recent evaluation[35] of CKD mobile applications available in the Apple Store, Google Play, and 360 Mobile Assistant included a review of content topics identified as important to CKD self-management.[36] Similar to our review, Lee et al found that most of the mobile applications contained less than 60% of the information topics assessed and found considerable content gaps relating to managing medications (11.8% of apps), engaging and sustaining social support (6.4% of apps), and maintaining social and occupational roles (0% of apps).[35] These findings reveal a consistent need to improve the comprehensiveness of content relating to patient-identified self-management information needs across all eHealth platforms.

When compared with earlier studies,[5,10] our evaluation revealed some improvement in website quality, particularly with regard to referencing the source of content and discussing areas of uncertainty, although this finding could be due to the larger number of websites evaluated in our review. Readability, however, continues to be a significant issue with the majority of sites written for a grade 10, or higher, audience. Weiss[34] recommends that written health information be targeted to a grade 6 audience to ensure that patients with a range of health literacy are able to understand presented information. Similar to other studies appraising CKD websites,[5,10] we found that most CKD websites had a reading grade level greater than the 10th grade, or rated "difficult" to "very difficult." As patient-focused health resources are increasingly developed for and accessed from an online environment,[37] this finding highlights the ongoing need to reduce the complexity of online health information and improve the accessibility of the language used.

Strengths of our study include a broad search methodology and inclusion of 1 popular search engines encompassing results from Australia, Canada, the United Kingdom, and the United States. We used 3 different measures of usability and reliability, with 2 reviewers completing the evaluation independently. The 2 reviewers also independently measured readability using 2 different methods for all sites.

Table 4. Top 10 Websites According to Quality Criteria[a].

Overall rank	DISCERN (%)	LIDA		Readability	
		Usability (%)	Reliability (%)	Flesch reading ease	Flesch-Kincaid reading grade level
1	NICE Pathways UK (87.78)	Kidney Care UK (94.4)	Health Wise Saskatchewan (94.4)	Life Options (84.2)	Life Options (4.5)
2	Very Well Health (86.67)	Davita (92.6)	UpToDate (92.6)	American Kidney Fund (79.7)	Family Doctor (5.2)
3	Patient (84.44)	American Kidney Fund (91.7)	NI Direct Government Services (88.9)	HCA Healthcare (76.4)	American Kidney Fund (5.5)
4	Medical News Today (83.33)	Kidney Health Australia (90.7)	Health Direct Australia (88.9)	Family Doctor (74.1)	HCA Healthcare (5.5)
5	UpToDate (83.33)	Kids Health (89.8)	Very Well Health (85.2)	Mount Sinai (73.4)	Medline Plus (5.9)
6	MyHealth Alberta (83.33)	Kidney Foundation of Canada (88.9)	Web MD (85.2)	UCSF Department of Surgery (72.8)	UCSF Department of Surgery (6.4)
7	Kidney Care UK (83.33)	Fresenius Medical Care (87)	CDC (85.2)	Medline Plus (72.5)	Health Wise Saskatchewan (6.5)
8	Merck Manuals—Professional (82.22)	Kidney Patient Guide (86.1)	HealthLink BC (85.2)	Kidney School (71.4)	NIDDK (6.7)
9	My Doctor (82.22)	BC Renal Agency (86.1)	My Virtual Medical Center (85.2)	Info KID (69.8)	MyHealth Alberta (6.8)
10	The Renal Association (82.22)	Health& (86.1)	Wiki How (85.2)	Health Wise Saskatchewan (69.4)	UW Health (6.8)

Note. CDC = Centers for Disease Control and Prevention; NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases.
[a]HON Code—12 websites scored 100.0%: Cleveland Clinic; Drugs.com; eMedicine Health; Family Doctor; Lab Tests Online; Mayo Clinic; Medical News Today; Medicine Net; My Doctor; Patient; Very Well Health; WebMD.

Table 5. Top 10 Websites According to Website Traffic (Alexa Rank).

Website name	Website rank based on web traffic (Alexa Rank)	Proportion of content areas covered (%)	DISCERN (%)	LIDA		HON code (%)	Readability	
				Usability (%)	Reliability (%)		Flesch reading ease	Flesch–Kincaid reading grade level
Wikipedia	1 (5)	26.7	72.22	71.3	79.6	92.9	18.5	14.5
NIDDK	2 (153)	60.0	80	73.1	79.6	82.1	69.1	6.7
Wiki How	3 (179)	6.7	68.89	74.1	85.2	78.6	58.3	8.9
Health Line–CKD	4 (529)	20.0	67.78	74.1	74.1	96.4	50.1	8.8
Web MD	5 (599)	33.3	71.11	84.3	85.2	100.0	68.0	7.2
Medical Dictionary	6 (636)	40.0	65.56	52.8	44.4	67.9	35.0	13.1
Mayo clinic	7 (1240)	46.7	77.78	76.9	77.8	100.0	48.9	10.5
CDC	8 (2200)	16.7	77.78	81.5	85.2	89.3	57.5	9.2
MedScape	9 (2470)	16.7	77.78	72.2	77.8	96.4	29.8	13.8
Medical News Today	10 (2610)	33.3	83.33	68.5	72.2	100.0	48.4	10.3

Note. NIDDK = National Institute of Diabetes and Digestive and Kidney Diseases; CKD = chronic kidney disease; CDC = Centers for Disease Control and Prevention.

Our study does, however, have limitations. We limited our review to English-language websites, and although we screened >2000 websites and included 115 in our evaluation, our search terms were limited to "chronic kidney disease" so it is possible we inadvertently missed CKD websites that did not include these terms, although these are the terms most commonly used by patients with CKD.[5] In addition, websites may change rapidly over time and the content and quality may change as websites are updated and new content and features are added; therefore, the results are reflective of the website content and quality at the time of our review.

Our study provides a comprehensive review of CKD websites and includes regional variants within the search strategy, allowing broad identification and evaluation of international sites. Our results highlight the lack of tailored, comprehensive online information for CKD, and identify specific information and quality gaps in need of attention. These results will inform content gaps in internet-accessible information on CKD self-management that should be addressed by future eHealth web-based tools.

Ethics Approval and Consent to Participate

Not applicable, as this study did not involve human subjects or information.

Consent for Publication

All authors consent to the publication of this study.

Authors' Note

The results presented in this article have not been published in whole or part elsewhere.

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Author Contributions

All authors in this study have contributed to this article and approve of this submission. M.D.S., S.G., and B.R.H. contributed to the study design and drafted the article. All authors contributed to the design and provided critical revisions to this article.

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Supplemental Material

Supplemental material for this article is available online.

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