'Prostate Cancer' Information on the Internet: Fact or Fiction?

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Key Words

Prostate cancer • DISCERN score • Health on the Net seal • Internet information quality • JAMA Benchmarks

Abstract

Background/Aims: In today's information era, patients often seek information regarding health using the internet. We assessed reliability and validity of internet information regarding 'prostate cancer'. **Methods:** Search term 'prostate cancer' used on Google website (June 2017). Critical analysis was performed on first 100 hits using JAMA benchmarks, DISCERN score, Health on the Net. **Results:** 33 500 000 hits returned. Top 100 hits were critically analyzed. Ten links [duplicate links (n = 7), book reviews (n = 1), dead sites (n = 2)] were excluded, therefore 90 were analyzed. Subcategories assessed included: commercial (53.33%), university/medical center (24.44%), government (13.33%); non-governmental/non-profit organizations (8.89%). Sub-type of information content assessed included: factual (74.44%), clinical trials (18.89%); stories (5.56%); question and answer (1.11%). Website rated as HONcode seal positive (14.44%) or seal negative (85.56%). Website content based on JAMA benchmarks: 0 benchmarks (4.44%), 1 benchmark (16.67%), 2 benchmarks (34.44%), 3 benchmarks (27.78%), 4 benchmarks (16.67%). DISCERN score rated: 'low' score (16–32) = 12 websites (13.33%), 'moderate' score (33–64 points) = 68 websites (75.56%),

'high' score (≥ 65 points) = 10 websites (11.11%). **Conclusion:** Critical assessment of 'Prostate Cancer' information on the internet, showed that overall quality was observed to be accurate, however majority of individual websites are unreliable as a source of information by itself for patients. Doctors and patients need to be aware of this 'quality vs quantity' discrepancy when sourcing PCa information on the internet.

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Introduction

Prostate cancer (PCa) is the second most common cancer in men worldwide [1]. In 2012, an estimated 14.1 million new cases of cancer were diagnosed worldwide, of which just over 1.1 million were PCa cases, accounting for about 8% of all new cancer cases and about 15% of cancers in men [2]. This makes PCa the 4th most prevalent cancer in both sexes combined, with almost 70% of all cases being diagnosed in more developed regions of the world [3].

Greater access to medical information provides patients with a valuable tool for self-education [4], and an opportunity for better-informed decision making and greater participation in overall care [5]. However, the reliability, validity, completeness and relevance of the

information may be questionable, since sources of information on the internet are varied and are largely unregulated. The result is that the quality of information that reaches the patient is inconsistent [6]. This is further supported by several studies of single medical conditions, which suggested deficiencies in the quality of Web-based health information [7].

Thus, we aimed to objectively assess the quality and validity of 'prostate cancer' information currently available on the internet, more specifically on the Google platform.

Materials and Methods

Search Strategy

The search term 'prostate cancer' was used (11th June 2017) on the Google search engine (www.google.com). The search was done using an updated browser of Internet Explorer Version 11 (most recent version with all available updates installed). The website itself was to be evaluated as part of the critical assessment and not just the landing page of the Google search results. Therefore, if further information was obtained elsewhere on the website via subheadings, links, or leading pages, this information retrieved was considered to be obtained as a result of being directed to it, either directly or indirectly, via the 'original' Google search. The study search was limited to the English language only.

Categorization

The websites reviewed were categorized based on: affiliation (commercial, university/medical center, non-profit organization, government), content type (medical facts, clinical trials, human interest stories, question and answer), and specialization of topic and content (website exclusively related to PCa or only part of website).

Quality Assessment Instruments

Several quality evaluation tools have been developed in order to assess health information using various criteria. Amongst the many tools available, we selected 3 different, validated evaluation tools for this specific study. These included the Health on the Net Foundation (HON) code [8, 9], the Journal of American Medical Association (JAMA) benchmarks [10] and the DISCERN tool [11].

HON code

HON is a non-profit organization based in Switzerland and founded in 1995. It is one of the first Uniform Resource Locator used as a guide to reliable sources of healthcare information on the internet. It proposes a voluntary 8-point code of conduct comprising 8 ethical principles: (authoritative; complementarity; privacy; attribution; justifiability; transparency; financial disclosure; advertising policy). Any website which complies with this code is granted permission to display the HON award-like badge on its website upon request. The certificate is valid for 1 year after which the website needs to be re-evaluated before obtaining re-certification. The HON code is the oldest quality evaluation tool being used to date [8, 9].

Using a 2-step verification process, the websites were then assessed for the HON Code of Conduct (HONcode) quality certification [8, 9]. Firstly, each site was manually checked for the HON seal to determine certification status. If the website displayed the HONcode badge (seal), its current validity was further counter-checked by clicking on the active and dynamic badge. This leads to a page on the HON servers, containing the website's actual certificate which displays the initial certification date as well as the current validity status. Both these parameters were recorded for study purposes.

JAMA Benchmarks

The JAMA benchmarks are another widely used quality evaluation tool. In a JAMA article in 1997, Silberg et al. [10] proposed a set of criteria designed to assess and evaluate the quality of health information on the internet. These benchmarks are namely: authorship of medical content, attribution of source of information, disclosure of ownership of webpage and any conflict of interest and currency of posted content.

Each website was evaluated to determine if they met the JAMA benchmark criteria [10]. The 4 criteria covered in this validation process are: authorship, attribution, currency, and disclosure. Authorship requires that authors and contributors names, affiliations and credentials are displayed on the website. Attribution refers to effective referencing of all content of the website. Currency requires that the website include dates of when the content was first posted and when was the last update. Disclosure demands that the website's ownership and any potential conflict of interest are stated as well as any sponsorship or advertising. These scores were assessed by the authors and recorded accordingly.

DISCERN Criteria

DISCERN is a valid and reliable 16-point questionnaire to aid health consumers and information providers in evaluating the quality of health information on any website they wish to evaluate. It was launched in 1998 and created by the Division of Public Health and Primary Care at Oxford University, London [11]. It is comprised of 3 distinct set of questions: Section 1 (questions 1–8) assesses reliability; section 2 (questions 9–15) focuses on the quality of information about treatment choices; section 3 (question 16) provides an overall quality rating of the publication independent of the previous 15 questions. Each question is then scored on a range from 1 (definite NO) to 5 (definite YES). A score of 2–4 is a range given in cases which the criterion is partially met to some extent. The maximum total score for all 16 questions is 80, and the quality of each website is classified as high (≥ 65 points), moderate (33–64 points), or low (16–32 points). As with the validation tools above, scoring and grading was performed on all sites retrieved.

Results

The Google search returned 33,500,000 hits, the first 100 of which were critically analyzed (table 1). Ten websites were excluded due to being duplicate links (7 websites), dead links (2 websites) or book previews (1 web-

Table 1. Critical analysis of the first 100 hits, using the search term: 'prostate cancer', using the Google search engine (performed June 2017)

No	HON code seal	JAMA benchmark	DISCERN score (16–80)	Categorization/affiliation	Website exclusive to PCa/partly exclusive	Sub-type/content	Website link	Excluded from study
1	No	3	51	commercial	exclusive	medical facts	http://www.medicalnewstoday.com/articles/150086.php	
2	No	3	60	commercial	exclusive	medical facts	https://en.wikipedia.org/wiki/Prostate_cancer	
3	Yes	4	60	commercial	exclusive	medical facts	http://www.medicinenet.com/prostate_cancer/article.htm	
4	Yes	1	40	commercial	partly	medical facts	http://www.webmd.com/prostate-cancer/default.htm	
5	No	3	59	university or medical center	exclusive	medical facts	https://www.cancer.org/cancer/prostate-cancer.html	
6	No	0	51	non-profit organization	exclusive	medical facts	https://www.pcf.org/0/prostate-cancer-symptoms/	
7	No	2	53	non-profit organization	exclusive	medical facts	https://www.cancerresearchuk.org/about-cancer/prostate-cancer	
8	No	0	28	commercial	exclusive	medical facts	http://about-cancer.cancerresearchuk.org/about-cancer/prostate-cancer/symptoms	Duplicate link
9	No	0	28	commercial	exclusive	medical facts	http://www.prostate.org.au/awareness/general-information/what-you-need-to-know-about-prostate-cancer/	
10	No	3	51	government	exclusive	medical facts	https://www.cancer.gov/types/prostate	
11	No	2	56	non-profit organization	exclusive	medical facts	https://seer.cancer.gov/statfacts/html/prost.html	Duplicate link
12	No	2	56	non-profit organization	exclusive	medical facts	https://prostatecanceruk.org/prostate-information/about-prostate-cancer	
13	No	4	67	commercial	exclusive	medical facts	http://emedicine.medscape.com/article/1967731-overview	
14	Yes	4	61	non-profit organization	exclusive	medical facts	http://www.mayoclinic.org/diseases-conditions/prostate-cancer/basics/definition/condition-20029597	
15	No	2	62	government	exclusive	medical facts	http://www.nhs.uk/Conditions/Cancer-of-the-prostate/Pages/Introduction.aspx	
16	No	2	63	university or medical center	exclusive	medical facts	http://www.cancer.net/cancer-types/prostate-cancer	
17	Yes	2	51	commercial	partly	medical facts	http://www.health24.com/medical/prostate	
18	No	1	59	university or medical center	exclusive	medical facts	http://www.urologyhealth.org/urologic-conditions/prostate-cancer	
19	No	2	35	commercial	partly	medical facts	http://www.express.co.uk/life-style/health/778884/prostate-cancer-symptoms-seven-signs	
20	No	3	67	commercial	exclusive	medical facts	http://www.prostatecancerfoundation.co.za/cape/index.php/	
21	Yes	4	72	commercial	exclusive	medical facts	http://www.healthline.com/health/prostate-cancer	
22	Yes	3	60	commercial	exclusive	medical facts	https://patient.info/health/prostate-cancer-leaflet	
23	No	3	43	government	exclusive	medical facts	https://www.cdc.gov/cancer/prostate/index.htm	
24	No	1	23	commercial	partly	clinical trials	https://www.sciencedaily.com/news/health_medicine/prostate_cancer/	
25	Yes	3	58	government	exclusive	medical facts	https://ghr.nlm.nih.gov/condition/prostate-cancer	
26	No	3	61	government	exclusive	medical facts	https://nhs.uk/health/prostatecancer/prostatecancerdefined/01.html	
27	No	2	38	government	exclusive	medical facts	https://medlineplus.gov/prostatecancer.html	
28	No	4	76	non-profit organization	exclusive	medical facts	https://www.nccn.org/patients/guidelines/prostate/	
29	No	1	61	university or medical center	exclusive	medical facts	http://www.cancercenter.com/prostate-cancer/	
30	No	3	35	university or medical center	partly	medical facts	http://www.nature.com/pean/index.html	
31	No	2	65	commercial	exclusive	question and answer	http://www.prostatecancer.ca/	
32	No	2	34	non-profit organization	partly	medical facts	http://www.cansa.org.za/mens-health/	
33	No	1	50	university or medical center	exclusive	medical facts	https://www.ucsfhealth.org/conditions/prostate_cancer/	
34	No	2	28	commercial	partly	human interest stories	http://www.rd.com/health/conditions/prevent-prostate-cancer/	
35	No	2	55	university or medical center	exclusive	medical facts	https://my.clevelandclinic.org/health/articles/prostate-cancer-basics	
36	No	1	29	commercial	partly	clinical trials	http://www.onclive.com/specialty/prostate-cancer	
37	No	2	29	commercial	exclusive	clinical trials	http://www.renalandurologynews.com/prostate-cancer/section/618/	
38	Yes (Expired)	3	73	non-profit organization	exclusive	medical facts	http://www.cancer.ca/en/cancer-information/cancer-type/prostate-cancer/prevention	
39	No	1	56	non-profit organization	exclusive	medical facts	https://zerocancer.org/	
40	No	2	37	commercial	exclusive	clinical trials	http://www.bbc.com/news/health-40131381	
41	No	2	27	commercial	partly	clinical trials	http://www.cancertherapyadvisor.com/prostate-cancer/section/4402/	
42	No	1	47	non-profit organization	exclusive	medical facts	http://www.macmillan.org.uk/information-and-support/prostate-cancer	
43	No	1	57	commercial	exclusive	medical facts	https://www.radiologyinfo.org/en/info.cfm?pg=pros_cancer	
44	No	1	51	commercial	exclusive	medical facts	https://uk.movement.com/mens-health/prostate-cancer	
45	Yes	4	63	commercial	exclusive	medical facts	https://labtestsonline.org/understanding/conditions/prostate/	
46	No	4	39	university or medical center	exclusive	clinical trials	http://www.aunet.org/guidelines/early-detection-of-prostate-cancer-(2013-reviewed-and-validity-confirmed-2015)	Duplicate link
47	No	3	49	commercial	exclusive	medical facts	http://www.cancer.org.au/about-cancer/types-of-cancer/prostate-cancer.html	
48	No	0	28	commercial	partly	human interest stories	http://www.nydailynews.com/life-style/best-fight-prostate-cancer-understanding-article-1.3223985	
49	No	0	28	commercial	partly	human interest stories	http://www.health.com/prostate-cancer	

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No	HON code seal	JAMA benchmark	DISCERN score (16–80)	Categorization/affiliation	Website exclusive to PCa/partly exclusive	Sub-type/content	Website link	Excluded from study
50	No	1	35	university or medical center	exclusive	clinical trials	http://www.health.harvard.edu/topics/prostate-cancer	
51	No	1	54	university or medical center	exclusive	medical facts	https://steman.wustl.edu/treatment/cancer-types/prostate/our-approach/	
52	No	2	34	university or medical center	exclusive	medical facts	https://www.ferring.co.za/therapeutic-areas/urology/prostate-cancer	
53	No	3	46	commercial	exclusive	clinical trials	https://www.theguardian.com/society/2017/jun/03/prostate-cancer-therapy-study-abiraterone	
54	No	3	33	non-profit organization	exclusive	medical facts	https://radiopaedia.org/articles/prostate-carcinoma-1	Duplicate link
55							https://radiopaedia.org/articles/prostate-cancer-staging-1	
56	No	4	70	university or medical center	exclusive	medical facts	http://uioweb.org/guideline/prostate-cancer/	
57	No	2	33	commercial	exclusive	human interest stories	http://www.wral.com/expert-opinion-on-prostate-cancer-screening-shifts-to-more-testing-16753079/	
58	No	2	62	university or medical center	exclusive	medical facts	https://www.nice.org.uk/guidance/eg175	
59							https://pathways.nice.org.uk/pathways/prostate-cancer	Duplicate link
60	No	2	51	commercial	exclusive	medical facts	http://www.medbroadcast.com/condition/getcondition/prostate-cancer	
61	No	4	38	university or medical center	exclusive	clinical trials	https://www.omim.org/entry/176807	
62	No	1	20	commercial	exclusive	clinical trials	http://www.naturalnews.com/prostate_cancer.html	
63	No	3	49	commercial	exclusive	medical facts	https://www.statnews.com/2017/05/04/prostate-cancer-research-psa/	
64	No	4	55	commercial	exclusive	clinical trials	https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/prostate-cancer-screening	
65	No	4	54	university or medical center	exclusive	medical facts	https://academic.oup.com/jeem/article/86/8/3467/2848333/The-Endocrinology-of-Prostate-Cancer	
66	No	2	40	university or medical center	exclusive	medical facts	https://clicks.co.za/health/conditions/article-view/prostate-cancer	Dead Link
67							http://bestpractice.bmj.com/best-practice/monograph/254.html?g=w_bmj_bp	
68	No	0	30	university or medical center	exclusive	medical facts	http://www.odessaregionalmedicalcenter.com/services/prostate-cancer/	
69	No	2	57	government	exclusive	medical facts	http://www.bccancer.bc.ca/health-professionals/professional-resources/cancer-management-guidelines/genitourinary/prostate	
70	No	4	56	commercial	exclusive	medical facts	https://www.uptodate.com/contents/screening-for-prostate-cancer	
71							http://hcamidwest.com/service/prostate-cancer	Dead Link
72	No	2	42	commercial	exclusive	clinical trials	http://www.dailymail.co.uk/health/article-4495464/Prostate-cancer-vaccine-provide-cure-study-finds.html	
73	No	4	45	non-profit organization	exclusive	clinical trials	https://elifesciences.org/articles/09207	
74	No	2	31	commercial	exclusive	medical facts	http://indianexpress.com/article/lifestyle/health/nanotech-based-test-can-predict-prostate-cancer-risk-better-4698039/	
75	No	2	47	commercial	exclusive	human interest stories	http://www.menshealth.com/health/winning-the-prostate-cancer-war	
76	No	3	36	commercial	exclusive	clinical trials	https://news.utexas.edu/2017/06/06/starving-prostate-cancer-with-what-you-eat-for-dinner	
77	Yes	4	70	commercial	exclusive	medical facts	http://www.emedicinehealth.com/prostate_cancer/article_em.htm	
78	No	3	42	commercial	exclusive	medical facts	http://www.9news.com/news/buddy-check9-prostate-cancer/447172764	
79	No	2	46	commercial	exclusive	medical facts	http://www.prevention.com/health/4-things-all-women-should-know-about-prostate-cancer	
80	No	3	36	commercial	exclusive	medical facts	http://edition.cnn.com/2017/04/11/opinions/prostate-screening-change-brawley/index.html	
81	No	4	62	commercial	exclusive	medical facts	https://www.tri-kobe.org/nccn/guideline/urological/english/prostate.pdf	
82	No	2	68	commercial	exclusive	medical facts	http://www.onhealth.com/content/1/prostate_cancer	
83	No	2	25	commercial	partly	human interest stories	http://www.stuff.co.nz/national/health/93558013/waikato-community-raises-25k-for-nz-prostate-cancer-foundation	
84							https://books.google.co.za/books?id=Bg6ZbqhhoUC&pg=PA1&lpq=PA1&dq=prostate+cancer&source=bl&ots=vjkrigXyZ&sig=zPPXCEIJRU55bA9jg08clXYU8&hl=en&sae=X&ved=0ahUKEwjf6ud67XUAIXqAMAKHW9mCs44UBD0AQHLMUAU#v=onepage&q=prostate%20cancer&f=false	Book Review
85	No	2	35	commercial	exclusive	medical facts	https://www.wko.co.ke/243133-revealed-why-black-men-die-prostate-cancer-compared-whites-find-details.html	

Table 1. Critical analysis of the first 100 hits, using the search term: 'prostate cancer', using the Google search engine (performed June 2017)

No	HON code seal	JAMA benchmark	DISCERN score (16–80)	Categorization/affiliation	Website exclusive to PCa/partly exclusive	Sub-type/content	Website link	Excluded from study
86	No	3	39	commercial	exclusive	clinical trials	https://healthtalk.com/starve-prostate-cancer-cells-with-this-snack/	
87	No	3	43	commercial	exclusive	clinical trials	https://medicalxpress.com/news/2017-06-abiraterone-metastatic-prostate-cancer-growth.html	
88	Yes	3	40	commercial	exclusive	medical facts	http://www.news-medical.net/news/20170609/New-diagnostic2a0test-uses-machine-learning-to-accurately-detect-aggressive-prostate-cancer.aspx	
89	No	1	52	university or medical center	exclusive	medical facts	https://www.mskcc.org/nomograms/prostate	
90	Yes	3	51	government	exclusive	medical facts	https://www.andrologyaustralia.org/prostate-problems/prostate-cancer-diagnosis/	
91	No	2	54	non-profit organization	exclusive	medical facts	https://www.cancer.ie/cancer-information/prostate-cancer#hash.r6ZD147N.dbbs	
92	Yes	3	64	commercial	exclusive	medical facts	https://www.drugs.com/condition/prostate-cancer.html	
93	No	2	30	university or medical center	exclusive	clinical trials	http://www010.sun.ac.za/vivus/vivus-2-may-2016/excellence/large-study-targets-prostate-cancer-in-african-men.html	
94	No	3	69	university or medical center	exclusive	medical facts	http://healthcare.utah.edu/huntsmancancerinstitute/cancer-information/cancer-types-and-topics/prostate-cancer.php	
95	No	1	57	university or medical center	exclusive	medical facts	http://www.hopkinsmedicine.org/brady-urology-institute/specialties/conditions-and-treatments/prostate-cancer/	
96	No	3	55	commercial	exclusive	medical facts	http://www.innerbody.com/diseases-conditions/prostate-cancer	
97	No	2	56	university or medical center	exclusive	medical facts	http://www.emedicinehealth.com/prostate_cancer/viewer_comments_em-101.htm	Duplicate link
98	No	2	56	university or medical center	exclusive	medical facts	http://www.prostatecancer-riskcalculator.com/assess-your-risk-of-prostate-cancer	
99	No	2	62	commercial	exclusive	medical facts	http://www.merckmanuals.com/home/kidney-and-urinary-tract-disorders/cancers-of-the-kidney-and-genitourinary-tract/prostate-cancer	
100							http://www.merckmanuals.com/home/kidney-and-urinary-tract-disorders/cancers-of-the-kidney-and-genitourinary-tract/prostate-cancer	Duplicate link

site), leaving a total of 90 websites for further evaluation and critical appraisal. Majority (79/90) of the websites were exclusive to PCa in terms of content displayed.

When assessing for the categories returned, more than half ($n = 48$, 53.33%) were commercial websites. A further 22 websites were affiliated to universities or medical centers and accounted for almost another quarter (24.44%). Eight government websites made up 8.89% of the websites, with the remaining 13.33% of websites being affiliated to non-profit organizations ($n = 12$). By far, the majority of websites ($n = 67$) contained medical information of a factual nature (74.4%), with clinical trials ($n = 17$) accounting for 18.89%.

In terms of quality and validity of information, the HONcode seal was displayed on only 14.44% of websites ($n = 14$), while the remaining 85.56% of websites ($n = 76$) did not have any evidence of certification by the HON (fig. 1). JAMA benchmarks were only fully met by 16.67% of websites ($n = 15$). A further 25 websites (27.78%) achieved 3 out of 4 benchmarks. Most websites ($n = 31$, 34.4%) met 2/4 JAMA benchmarks and 15 (16.67%) of websites only achieved 1 JAMA benchmark and 4 (4.44%) did not achieve any benchmarks (fig. 2).

Application and scoring utilizing the DISCERN criteria revealed 10/90 websites (11.11%) that achieved a 'high' score (≥ 65 points), with the highest score by any website being 76 (out of a potential maximum of 80). A moderate score (33–64 points) was obtained by 75.56% of websites ($n = 68$), and the remaining 12 websites (13.33%) achieved a low score (16–32) (fig. 3).

The four overall best performing websites (Table 1. Link numbers 21, 77, 28, 38), either meeting criteria or coming close to having concurrent HON Positive; JAMA 4/4 &; DISCERN ≥ 65 points included two websites particularly (Link numbers 21 & 77), with HONcode seal positive, JAMA benchmarks 4/4 and more specifically have very high DISCERN scores (≥ 70 out of 80)."

Amongst the websites with the poorest validation scores (table 1. Link numbers 9, 49, 68, 24, 62), 3 links have no JAMA benchmarks, no HONcode seal, and relatively low DISCERN score (16–32), while 2 other links have only 1 JAMA benchmark, no HONcode seal and a very low DISCERN score.

Discussion

Health information is one of the most sought after topics on the internet [12]. Access to internet worldwide has rapidly evolved since the advent of this information plat-

Fig. 1. HONcode seal.

Fig. 2. JAMA Benchmarks.

Fig. 3. JAMA Benchmarks.

form. According to the International Telecommunication Union Facts and Figures 2016 report, just under 3.5 billion (3.48 billion) individuals were estimated to be using

the internet worldwide. This figure has increased from 1.15 billion or 17.6% from the previous decade [13]. The Internet world stats online website quotes an impressive 3.79 billion internet users as at 31 March 2017, which at 49.7% just falls short of half of the global population. This represents a growth of 936% since the turn of the millennia in 2000 [14]. As a result of the rapid expansion of the internet, both in terms of users and to the volumes of information available online, it has become the single largest source of information worldwide [6]. Health information has also seen an exponential increase in accessibility online and has become an increasingly important source of health-related information for patients [7].

A recent study found that 75% of people who go online seek health information and also that 75% in a health crisis use the internet to aid in decision-making [15]. Steinberg et al. [16] reported that approximately 56% of PCa patients seek health information online. While, Valero-Aguilera et al. [17] found that only 11.2% of patients in the study population reported using the internet as a source of health information. This variation may be explained by discrepancies in terms of age, demographics, and other socio-economic factors. These variations in the findings of the select studies mentioned above, amongst many others [18–21], support the view that generalization cannot be made with regard to internet use for health information, as this is highly dependent on the particular study population assessed.

Evaluation of YouTube videos found that YouTube is an inadequate source of PCa information for patients, in terms of information content and the presence of bias [16]. In another study that focused on determining what patients seek from an internet site, it was determined that the information given was unsatisfactory, from a patient's perspective [22]. Patients would at times, be unable to acquire the critical information easily without being aided by their physician to the appropriate resources. The degree of coverage is highly variable and there is a deficiency in balance of evidence found on many sites [23].

However, a more recent study found an acceptable and 'encouraging' degree of quality and reliability of PCa information on the web using various quality tools (DISCERN; HONcode; JAMA benchmarks; the LIDA instrument; Automated Readability Index; and the Flesch-Kincaid readability tests). Although the limitations of this study was the isolated assessment of a select few popular websites which were amongst the 'top 10' hits on 3 of the most popular search engines [24].

Besides the internet, another related information source utilized by patients involve the use of Mobile Ap-

Fig. 4. A screen shot (Google trend) of the trend over time (January 2004 to December 2017) of searches performed for urological malignancies on the Google platform (Y-axis units: Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term, and a value of 50 means that the term is half as popular).

plications (Apps). This platform, like the internet in general, also requires more stringent validation and review to ascertain the reliability and quality of information sent out to patients with PCa [25].

When assessing for the patterns of search amongst all urological malignancies, PCa has been the commonest search term utilized (fig. 4) depicted by the Google Trends data [26], which shows that PCa searches were the most common since 2004 to present. In comparison to the other genitourinary cancers, PCa is searched for approximately 3 times more than bladder cancer, which is currently the second most popular amongst the urological tumors. Interest in testicular cancer (which from 2004 until 2006 was by far the second-most searched for on Google amongst the urological malignancies), has steadily declined over time and is now searched for at almost the same frequency as kidney cancer, which has almost always being the 4th most popular amongst the 4 cancers represented.

After assessing the websites using the pre-defined tools (table 1), we have found that the information available on the internet is not entirely reliable and complete

in itself as an independent source for health information on PCa. Overall 3 websites performed very poorly, demonstrating no JAMA benchmarks, no HONcode seal, and relatively 'low' DISCERN score. On the other hand, 2 websites were HONcode seal positive, JAMA benchmarks 4/4 and had 'high' DISCERN scores (≥ 65). Although most information presented is fairly accurate, it often lacks critical detail on key aspects, which could have negative impact on patient decisions regarding their condition, outcome and their treatment choices. However, the information may serve as a guide to empower patients to gain a better understanding into the condition.

In this internet-driven era, it is imperative that internet users validate information obtained with reliable sources. It also adds an extra dimension to the medical consultation in requiring doctors to assist patients in validating information obtained via the internet and guiding them towards the most reliable, reputable resources on the online domain.

Most of the studies evaluated in the literature had found that patients who utilize the internet as a source of health information, find it to be an effective tool to

supplement knowledge but not as a primary source of information [27–29]. One of the benefits of using multiple sources of health information is that patients are better able to equip themselves with the understanding of the nature of their illness and the various treatment modalities which may be available. By bringing this information to the consultation, it transforms the doctor-patient relationship and promotes patients to play a more active role in shared-decision making.

The study was limited to the English language only. Secondly, the internet and search engines are dynamic processes that constantly change. Therefore, the websites assessed in this investigation may not necessarily reflect the information available to patients at another point in time. Another limitation of this review would be the exclusion of all other search engines utilized in today's era, however for the purpose of this study, only 'Google' was utilized, since it is by far the commonest search engine used, with well over 3 billion searches daily [30].

Conclusion

In the evaluation and critical assessment of PCa information on the internet, using three different quality evaluation tools, the overall quality was observed to be accurate, however majority of individual websites are generally unreliable in itself as a source of information for patients. Healthcare professionals and their patients need to be acquainted with this 'quality vs. quantity' discrepancy when sourcing PCa information on the internet. This discrepancy is becoming a more important variable in the everyday counselling of the modern day patient with PCa.

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