



Original Article

Readability of Italian Websites Dealing with Renal Disease: Do We Need an Improvement?

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Abstract

Introduction: The use of health information is expanding; however, individuals need a certain level of ability to interpret and deal with online health information from the Internet. We assessed the readability of online Italian information regarding renal disease.

Methods: We selected academic, commercial, and non-profit reality websites giving information about renal disease, by "nefrologia" (nephrology) and "dialisi" (dialysis) as search words on the Bing search engine. The readability was evaluated using Visual SEO Studio calculating the Flesch-Vacca score (1972 formula), the Flesch-Vacca score (1986 formula), and the Gulpease score.

Results: The websites were classified in commercial websites (n=11), scientific societies and institutional websites (n=4), health care professional websites (n=3), information websites (n=3) and patients' association websites (n=5). The median value of the Vacca 72 score was 33, the Vacca 86 score was 54, and the Gulpease score 74, with a wide variability. The highest readability scores were detected by calculating the Gulpease index in healthcare professionals' and patients' association websites. On the contrary, the lowest scores were computed using the Vacca 72 index in information and healthcare professional websites. We detected a correlation between the three scores, especially between the two Vacca ones. The three scores evaluated demonstrated an essential overlap in the five groups of websites.

Conclusion: Evaluation of the readability of content on renal disease on websites written in Italian gives extensive results and does not appear to consider health literacy. Intervention aimed at simplifying the language of a website dealing with renal disease is desirable.

KeyWords: Internet use, Literacy, Health, Comprehension, Kidney diseases

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Introduction

The use of health information is globally expanding; however, individuals need a certain level of ability to interpret and deal with online health information from the Internet. To prevent and control non-communicable diseases (NCDs) throughout all life stages, the World Health Organization (WHO) suggests that health literacy (HL) is an essential factor. In people suffering NCDs, lower use of preventive healthcare services, poor adherence to prescribed medication, difficulty communicating with healthcare professionals (HCPs), and poorer knowledge about disease processes and self-management skills are responsible for increased adverse events.¹⁻³

The Centers for Disease Control and Prevention defines personal HL as "*the degree to which individuals can find, understand, and use information and services to inform health-related decisions and actions for themselves and others*", and organizational HL as "*the degree to which organizations equitably enable individuals to find,*

understand, and use information and services to inform health-related decisions and actions for themselves and others".⁴ Therefore, HL should be evaluated by looking at two sides, who is understanding and who is giving the information.

Websites are a source of information for patients, the latter could collect data about their diseases regarding identification, management and treatment.

Low HL is associated with poorer knowledge of the disease processes and therapeutic regimens, of the benefit of the medications' assumption, and inability to manage the disease.⁵

Digitalization has become an important part of modern healthcare, and digital health literacy (eHL) is increasing in importance to promote informed health decisions and healthy behaviors. eHL describes the use of digital technologies to search for, acquire, comprehend, appraise, communicate, apply and create health information. eHL should improve quality of life and could be applied to all



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contexts of healthcare.⁶

Readability is a measure of how easy a piece of text is to read. It encompasses various factors, including complexity, familiarity, legibility, and typography. When assessing readability, formulas typically consider elements such as sentence length, syllable density, and word familiarity.

Readable content is crucial for the user's experience. Accessible content builds trust with your audience, making it essential for effective communication. To the best of our knowledge, no study has assessed web-based Italian health information on renal disease to date. Therefore, this study aimed to assess the readability of online Italian information regarding renal disease.

Methods

Ethics or Institutional Review Board approval was not required, as this study was done using websites on the internet and did not involve any patient consent or contact. We aimed to evaluate only Italian websites; therefore, our methodology consisted of searching for "nefrologia" (nephrology) and "dialisi" (dialysis) on the Bing search engine from January 2024 to June 2024. The reason for using Bing was that the search engine was offering artificial intelligence Copilot, using Bing and Copilot offers a powerful combination of real-time information and intelligent assistance, such a combination could help people in understanding complex topics quickly and clearly and translate and summarize documents.

All authors arbitrarily evaluated the websites appearing on the first 40 pages given by the Internet for both search terms.

Commercial websites were selected considering these aspects: a) security and reliability checking that the website's address starts with "https://" and that a padlock icon is in the address bar. This indicates that the communication between your browser and the site is encrypted and secure; b) reviews and reputation; c) contact information knowing that a legitimate site must have clear and easily accessible contact information (physical address, phone number, email); d) domain and design checking that the site's URL is spelled correctly, typos, low-quality images, or an amateur design are often signs of a fraudulent site; e) usability and navigation.

Scientific societies and institutional websites were selected based on the previous selection criteria and on the experience of the Italian nephrologists involved in the study. Only well-known websites created by national institutions were selected. On the contrary, websites of single healthcare professionals were excluded from the analysis.

Health care professionals' websites were selected based on the above-mentioned criteria and on source and authority. Authors evaluated if the site was reputable and if information about kidney diseases clearly identified the

authors and the list of references or sources.

Information websites included only two well-known websites: wikipedia and msdmanual. All the other websites were excluded

Patients' association websites included only associations well-known to the Italian nephrology community. We made only an exception to the website <http://malatidireni.it>, because all nephrologists agreed that information given could be considered reliable.

Finally, the readability scores of the websites left using Visual SEO Studio⁷ were analyzed.

Visual SEO Studio provides a set of reports on web performance and related work by evaluating several parameters. It is also possible to choose the language of the text that readers want to analyze. Each language has specific readability formulas. Being Italian websites the focus of our study, Visual SEO Studio calculated the Flesch-Vacca score (1972 formula) and the Flesch-Vacca score (1986 formula). In 1972 and 1986, Roberto Vacca e Valerio Franchina adapted the Flesch-Kincaid formula (FRES) formula to the Italian language.⁷ The latter is a readability test used to assess how easy or difficult a piece of English text is to read. It provides a numerical score that indicates the readability level. The FRES score ranges from 0 to 100. Higher scores indicate simpler and more readable text:

- 90–100: Very simple and easy to understand (suitable for primary school children).
- 80–90: Easy to read (like a simple conversation).
- 70–80: Fairly simple.
- 60–70: Basic high school level (easily understood by 13- to 15-year-olds).
- 50–60: Moderately difficult.
- 30–50: College level (challenging).
- 0–30: Very difficult (best understood by graduates) [<https://visual-seo.com/it/>].

In addition, the Gulpease score is the third index calculated by Visual SEO Studio.⁷ It was first defined in 1988 by the Gruppo Universitario Linguistico Pedagogico of Sapienza University of Rome. When Gulpease score is lower than 80 it means that the text could be challenging to understand for people having attended only primary school, when it is lower than 60 the text could be difficult to understand for people having attended only secondary school, and when it is lower than 40 the text could be difficult to understand for people having attended high school. The readability Scores should help readers to gauge the readability of contents.

Statistical Analysis

We conducted a descriptive analysis calculating median and range related to the output obtained by Visual SEO Studio for the following scores: Vacca 72, Vacca 86 and Gulpease. Median and range values were calculated considering the 26 websites included in this study.

Moreover, the websites were arbitrarily classified into the following groups: commercial websites, scientific societies and institutional websites, health care professional websites, information websites, and patients' association websites. We could not detect any government websites. Median and range were also calculated considering the five groups. The Spearman correlation coefficient was calculated to compare the different formulas. Finally, the spread of the values belonging to the three readability scores was compared graphically in the five website groups to evaluate the overlap of the values.

All statistical tests were two-tailed and *P* values less than 0.05 were considered statistically significant. Analyses were performed with SPSS for Windows (version 24.0, IBM Corp., Armonk, NY, USA).

Results

Using the search terms "nefrologia" (nephrology) and "dialisi" (dialysis), we could identify 26 websites. The websites were classified in commercial websites (*n*=11), scientific societies and institutional websites (*n*=4), health care professional websites (*n*=3), information websites (*n*=3) and patients' association websites (*n*=5). Considering all websites, the median value and range of the Vacca 72 score was 33 (range 0/84), the Vacca 86 score was 54 (range 16/100), and the Gulpease score was 74 (range 38/100). The variability of all scores was wide. **Table 1** shows readability scores of each website considered in this study. Median and range of readability scores calculated in the five groups of websites are shown in **Table 2**. The highest readability scores were detected by calculating the

Table 1. Readability scores (median and range) in each website considered in this study

	Vacca 72	Vacca 86	Gulpease
	Median (Range – min/max)	Median (Range – min/max)	Median (Range min/max)
Commercial websites			
https://nephrocare.it	34(0/61)	53(24/81)	71(45/100)
https://alleatiperlasalute.it	35(0/66)	57(26/87)	91(51/100)
https://nefrocenter.it	33(0/68)	54(6/87)	67.5(38/100)
https://centrodialisiscilia.com	23.5(0/28)	44.5(23/51)	74(52/100)
https://nephros.it	21.5(10/33)	45.5(36/56)	100(87/100)
https://ambulatori.it	24(0/38)	44(22/57)	53(47/62)
https://www.freseniusmedicalcare.it	26(0/54)	47(22/74)	60(41/100)
https://mykidneyjourney.baxteritalia.it/it/dialysis	42(0/64)	59.5(25/82)	64.5(43/100)
https://www.diaverum.it/it/it/home	38(0/63)	61(13/82)	100(52/100)
https://www.educazionenutrizionale.granapadano.it	38(0/68)	57(4/88)	58(44/100)
https://www.bbraun.it/it.html	35(0/67)	56(0/86)	75(42/100)
Scientific societies and institutional websites			
https://sinaltaly.org	40(3/73)	60(28/93)	74(48/100)
https://fondazioneitalianadelrene.org	31(0/54)	52(0/75)	65(46/100)
http://www.nephromeet.com/web/eventi/nephromeet/index.cfm	32.5(14/46)	53(37/68)	67(50/100)
https://www.ospedalebambinogesu.it	34(0/84)	56(8/100)	87(56/100)
Health care professionals' websites			
https://sianitalia.it	30(18/36)	51(35/58)	64(46/85)
https://iltuoinfermiere.it	30(22/38)	51(46/59)	81(57/100)
https://dimensioneinfermiere.it	28(4/47)	51(30/68)	98.5(52/100)
Information websites			
https://www.msdmanuals.com/it-it/casa/patologie-delle-vie-urinarie-e-dei-reni	34(1/74)	54(26/94)	58(43/100)
https://it.wikipedia.org/wiki/Emodialisi	30(0/71)	51(0/90)	70(41/100)
https:// wikipedia.org/wiki/Dialisi_peritoneale	20(0/71)	41(0/90)	60(25/100)
Patients' association websites			
https://www.aned-onlus.it	30.5(0/53)	51(0/74)	60(47/100)
https://www.renopolisticco.it	10(0/44)	34(2/66)	83(49/100)
https://emodializzati.it	40(31/61)	61(54/79)	89(59/100)
http://malatidireni.it	30(0/56)	48(2/77)	52(37/100)
https://www.ladialisiperitoneale.it	34.5(0/65)	53.5(0/83)	78.5(38/100)

Table 2. Readability scores (median and range) in the five groups of websites considered in this study

	Commercial websites	Scientific societies and institutional websites	Health care professionals' websites	Information websites	Patients' association websites
Vacca 72	35	36	29	30	34
Median (Range – min/max)	(0/68)	(2/84)	(4/47)	(0/74)	(0/65)
Vacca 86	56	57	51	50	55
Median (Range – min/max)	(17/88)	(26/100)	(30/68)	(22/94)	(16/83)
Gulpease	77	74	93	64	81
Median (Range – min/max)	(38/100)	(46/100)	(46/100)	(43/100)	(38/100)

Gulpease index in health care professionals' and patients' associations' websites. On the contrary, the lowest scores were computed using the Vacca 72 index in information and healthcare professional websites. The Spearman correlation coefficient between the different formulas was significant being much higher when Vacca 72 and Vacca 86 scores were compared and much lower when Gulpease score was matched with the other two (Table 3). The three scores evaluated demonstrated an important overlap in the five groups of websites (Figures 1, 2 and 3).

Discussion

Readability is a concern in online resources from different medical disciplines.⁸⁻¹³ Our study is the first to evaluate the readability of Italian World Wide Web sites dealing with renal disease. Our results show that the Gulpease index was higher than the Vacca 86 and Vacca 72 scores, and median values appeared to be higher than 80 in 8 out of 26 websites (30.7%), whilst the Vacca 86 index was never higher than 70 and exceeded 60 only in two cases. Surprisingly, information websites could not be considered easily readable, with the three indices being the lowest. Considering the two Vacca scores, all websites were deemed not easy to read for less educated individuals; in contrast, the Gulpease index classified healthcare professional and patients' association websites as understandable by less educated individuals. The same index defined sufficiently readable commercial and scientific societies and institutional websites. Unfortunately, the high variability in scores within categories needs to be taken into consideration. This means that not all content on different websites can be understood by people with educational levels of grades 6-8, which is now recommended. This problem should be emphasized, if the aim of websites dedicated to raising patients' knowledge is to improve practical applicability. On the other hand, due to the lack of a gold standard, it is challenging to precisely define readability in Italian websites dealing with renal disease. National health authorities should consider this problem and provide government websites informing the general population how to identify, manage, and treat renal disease. It is even more important if we consider the relevant overlap of the readability indexes in the five groups of websites evaluated in this study. The spread of these well-recognized

Table 3. Spearman correlation coefficients of the results calculated with the different three formulas for all website

	Vacca 72	Vacca 86	Gulpease
Vacca 72	1.000	0.893 ($P<0.0001$)	0.134 ($P<0.0001$)
Vacca 86	0.893 ($P<0.0001$)	1.000	0.284 ($P<0.0001$)
Gulpease	0.134 ($P<0.0001$)	0.284 ($P<0.0001$)	1.000

readability indexes is too wide. It underlines that the content should be carefully adapted to the recommended patient educational level.

These days, the Internet is commonly used to obtain health information and, consequently, increase knowledge. It has been reported that more than 50% of people commonly ask the Internet to find health information.¹⁴ Our results show that most online resources for renal diseases seem inadequate for people with a low educational level.

Internet searching is one of the most common sources of information used by the general population.¹⁵ However, some concerns exist about publishing inaccurate, incomplete, or outdated information.¹⁶ The great majority of medical terminologies in health-related articles require a high level of reading comprehension, and patients with insufficient health literacy can have difficulty understanding information. Difficulties in understanding could lead to wrong health decisions.¹⁷ We arbitrarily classified the websites selected into five categories, and most websites were included in the commercial group. Often, search engines cooperate with sponsors' links; thus, some companies pay to appear at the top of the result list for a particular search keyword, which could lead to a bias and then impact the real use of the content. Moreover, although the aim of this study was not the assessment of different websites, but merely to evaluate their readability, it should be underlined that in Italian websites, authorship is not always mentioned, as well as citations, and this could highly influence the quality and reliability of the website's content. Undoubtedly, websites need to be accurate and reliable. Still, the other essential aim should be that the content is understandable and readable, as well as for people with low levels of education. In the present study, most assessed websites were found to be challenging to read, as they required a reading capability level of high school and above. In 2004, Jaffery et al¹⁸

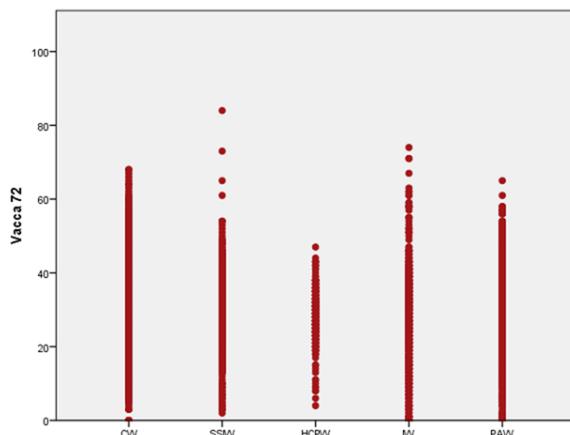


Figure 1. Distribution of the Vacca 72 readability scores in the five groups of websites. CW: commercial websites; SSIW: Scientific societies and institutional websites; HCPW: Health care professionals' websites; IW: Information websites; PAW: Patients' association websites.

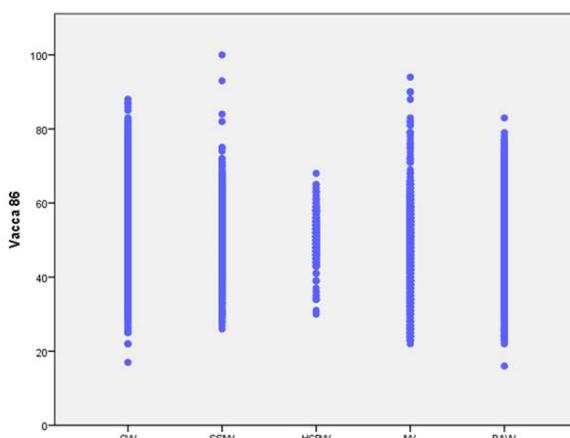


Figure 2. Distribution of the Vacca 86 readability scores in the five groups of websites. CW: commercial websites; SSIW: Scientific societies and institutional websites; HCPW: Health care professionals' websites; IW: Information websites; PAW: Patients' association websites.

evaluated chronic kidney disease (CKD) eHealth websites and concluded that they were written using language beyond the common public's reading comprehension. In 2015, Morony et al¹⁹ analyzed the readability of written material for CKD patients explaining their condition and concluded that the language used was above the average patient's literacy level.

In dialyzed patients, educational levels are an important parameter to consider and people with low educational levels have lower emotional well-being.²⁰ This association could push patients with low educational levels to look for information on several websites to improve their health status. However, our results show that websites contain texts requiring a certain level of education. We cannot exclude that too complex information could even worsen the quality of life of these patients. Moreover, it seems that information from institutional websites is scarce, and this could decrease the level of awareness of

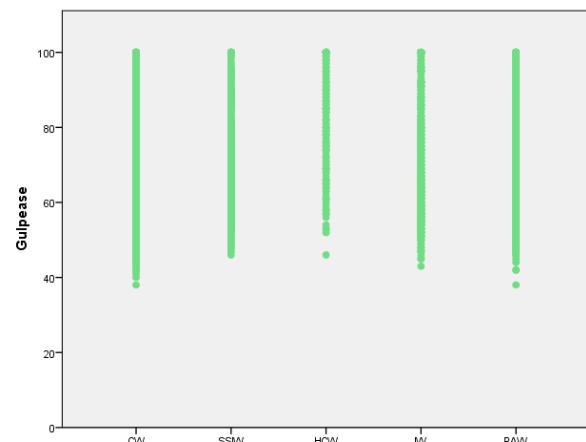


Figure 3. Distribution of the Gulpease readability scores in the five groups of websites. CW: commercial websites; SSIW: Scientific societies and institutional websites; HCPW: Health care professionals' websites; IW: Information websites; PAW: Patients' association websites.

people with kidney disease. We think that there is a need to continually focus on the Internet sources for a better readability of the available content; moreover, Italian patients should also be educated regarding obtaining health information only from reliable websites such as government health agencies and reliable medical institutions, such as scientific societies. It is necessary to increase the number of Italian web-based tools designed for people with renal disease and their family caregivers, as well as to address communication and decision-making about the condition.

Increasing patients' knowledge is necessary to improve shared decision-making healthcare pathways. In healthcare, effective communication is based on HL. People should base their decisions on information that can be easily found, understood and used. Readability is an objective measurement in terms of difficulty in reading a text, and its evaluation could be considered as an indirect measure of patients' ability to understand health information. Therefore, the relationship between health literacy and readability involves clear communication, well-informed choices about health and achievable outcomes. Patients with limited HL struggle to follow self-care and medical advice.² Improving HL increases comprehension between patients and healthcare professionals, leading to better clinical outcomes.²¹ Our results highlight that websites managed by nurses performed better, as the Gulpease index shows.

Limitations

The main limitation of this study is that we included only Italian language websites; on the other hand, we wanted to investigate websites dedicated to Italian-speaking people, who are around 60 million. This means that immigrants who do not speak Italian cannot get health information from Italian websites, but they need to understand Italian doctors who mainly speak Italian. By using readability

formulas, we are not sure we are assessing readability with the best methods. However, languages have changed, and old terms are substituted for new ones. The fact that some of the formulas use the number of syllables to gauge the difficulty of reading suggests that these tools may have shortcomings; in fact, some medical words could be short, but regardless of the length of the word, they could be challenging to understand.

Definition of searched information was mainly based on subjective opinion of authors involved in the study. In our study, objective inclusion and exclusion criteria such as word count and content topics are missing therefore reproducibility and bias cannot be ensured. On the other hand, information was evaluated by health care professionals dealing with clinical practice and therefore knowing what patients need to know and understand about kidney disease.

Besides, we did not compare the scores with a gold standard, which is still undefined.

Finally, the method used for readability evaluation did not account for visual information.

Conclusion

Evaluating the readability of content on renal disease on websites written in Italian gives wide results. In several cases, information available on the internet is beyond a minimal literacy level for patients. Interventions aimed at simplifying the language are desirable to increase readability and streamline information for patient education about renal disease. These could contribute to improved renal disease management, as patients' education would be enhanced and a better decision would be reached.

Through clear explanations, healthcare professionals and patients must understand and be aware of the origin of data, data usage, risk of bias, performance, and uncertainties to obtain safe and ethical information that could be applied in clinical practice.²²

Health care professionals should be conscious about information reported in websites and ready to advise which ones are the best and to explain the ones with low readability, for improving patients' knowledge.

Authors' Contribution

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Formal analysis: Alessio Di Maria, Emanuele Di Simone, Alfredo De Giorgi, Fabio Fabbian.

Funding acquisition: Fabio Fabbian.

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Methodology: Emanuele Di Simone, Raul Mancini, Alfredo De Giorgi, Laura Maria Scichilone, Simone Nicoletti.

Resources: Laura Maria Scichilone.

Project administration: Emanuele Di Simone, Marco Di Muzio, Fabio Fabbian.

Software: Alessio Di Maria, Fabio Fabbian, Emanuele Di Simone, Alfredo De Giorgi,

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Writing-review & editing: Emanuele Di Simone, Marco Di Muzio, Fabio Fabbian.

Competing Interests

All authors declare they have no conflict of interest.

Ethical Approval

Ethics or Institutional Review Board approval was not required, as this study was done using websites on the internet and did not involve any patient consent or contact.

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