

# Widely Accepted Credibility Criteria for Online Health-related Information Are Not Correlated with Content Quality of Stroke Webpages in Two Languages of Central and Eastern European Countries

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## ABSTRACT

**Background:** Finding accurate health-related information on the Internet may be a real challenge for users lacking the critical skills necessary to assess the validity of online content, even if they browse websites that are compliant with credibility criteria. The aim of the study was to check whether an overall high website credibility or compliance to any of the individual criteria for credibility are correlated/associated with a higher quality of health-related information on a sample of Romanian and Hungarian stroke-related websites. **Methods:** The cross-sectional study included a sample of 50 websites presenting stroke for the general population in Romanian and Hungarian language. The websites' compliance with 12 widely recognized credibility criteria, and the completeness and accuracy of the stroke-related articles found on the respective sites were systematically assessed by two independent evaluators applying a common evaluation procedure. **Results:** The mean value of the credibility score was 4.3 points (95% CI: 3.9–4.8), the mean value of the completeness score was 4.8 points (95% CI: 4.2–5.5), and the mean value of the accuracy score was 6.6 points (95% CI: 6.3–6.8). Correlation coefficients between the credibility score and completeness/accuracy score did not reach statistical significance (Spearman rho = 0.038, p = 0.793 and Spearman rho = 0.156, p = 0.278, respectively). With a few exceptions, the t-tests for independent sample comparison have shown no significant differences between websites that complied and those that did not comply with each individual credibility criterion. **Conclusions:** The mean credibility score of the Romanian and Hungarian stroke-related websites was poor and it was not correlated with neither completeness nor accuracy of the information displayed on the respective pages. With a few, practically irrelevant exceptions, compliance with individual credibility criteria was not associated with higher content quality on the investigated sample.

**Keywords:** stroke, credibility criteria, proxy quality indicators, health-related internet, consumer health

## INTRODUCTION

The Internet abounds in more or less scientifically validated health-related information.<sup>1</sup> Finding accurate health-related information on the Internet may be a real challenge for users lacking the critical skills necessary to assess the validity of online content.<sup>2</sup> To address this issue, several expert initiatives from Europe and North America have proposed lists of proxy quality indicators to help users in finding reliable health-related websites by indirectly estimating the scientific quality of the medical information based on more friendly cues.<sup>1,3</sup>

The Health on the Net Foundation (HON) is a non-governmental organization founded to encourage the dissemination of quality health information for patients and professionals, and the general public. The eight principles proposed by HON to improve health information available on the internet include: authority (medical advice to be provided only by medical professionals); complementarity (the information provided should support, not replace the patient-doctor relationship); privacy (users' personal information should be confidential); attribution and date (the source of information and the date of publication should be displayed); justifiability (claims regarding benefits of any treatment should be supported with adequate evidence); transparency (website owners should provide contact information); financial disclosure (website funding should be clearly identified); advertising policy (advertising as a source of funding should be explicitly disclosed, and advertising should be differentiated from other information).<sup>4</sup> These quality indicators are known under various labels such as 'credibility', 'general' and 'ethical' criteria. Similar or more complex consumer health orientation principles and tools were developed and promoted by the European Council (the eEurope2002 initiative)<sup>5</sup>, the Department of Public Health and Primary Care at Oxford University (the DISCERN Project),<sup>6</sup> the American Medical Association (the Silberg criteria),<sup>7</sup> and other medical or public entities. The core assumption of these initiatives is that "credibility constitutes the 'premier criterion' for evaluating online health information",<sup>2</sup> but its validity is hardly supported by the body of existing evidence in the field of consumer health.<sup>8,9</sup> Nevertheless, online credibility or quality criteria continue to be promoted, raising the possibility of users being persuaded to falsely believe that websites with a high compliance with credibility criteria must be scientifically accurate as well.

Considering that poor-quality medical information may have adverse consequences for patients' decisions, particularly with regard to critical conditions such as stroke,<sup>10,11</sup> the

objective of this study was to test whether an overall high website credibility or compliance with any of the individual criteria for credibility are correlated/associated with a higher quality of health-related information on a sample of Romanian and Hungarian stroke-related websites.

## MATERIAL AND METHODS

The cross-sectional study included a sample of 50 websites presenting stroke for the general population in Romanian and Hungarian language. Google searches were performed using "accident vascular cerebral" (Romanian for stroke) and "stroke" as search terms in April 2018. The links listed on the search engine's results page were checked for eligibility based on a set of inclusion and exclusion criteria, saved in a local database, and evaluated following a rigorous methodology. The websites' compliance with 12 widely recognized credibility criteria, and the completeness and accuracy of the stroke-related articles found on the respective sites were systematically assessed by two independent evaluators applying a common evaluation procedure. The exact steps and assessment methods are described in detail in previously published papers by Nădășan *et al.*<sup>12,13</sup>

Credibility, completeness, and accuracy scores were calculated and reported on a decimal scale. Scores ranging from 0 to 2 points were characterized as very poor, from 2.1 to 4 as poor, from 4.1 to 6 as average, from 6.1 to 8 as good, and from 8.1 to 10 as very good. Compliance with the 12 individual credibility criteria was calculated as percentage. Compliance was considered very poor from 0 to 20%, poor from 21 to 40%, average from 41 to 60%, good from 61 to 80%, and very good from 81 to 100%. The t-test for independent samples was applied to check whether websites complying with each individual credibility criteria had higher quality ratings, and depending on the normality of the data. Pearson or Spearman correlation tests were applied to test the correlation between the credibility score on one hand and the completeness and accuracy scores on the other. All statistical analyses were performed in SPSS (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). The threshold value for statistical significance was set at  $\alpha = 0.05$ .

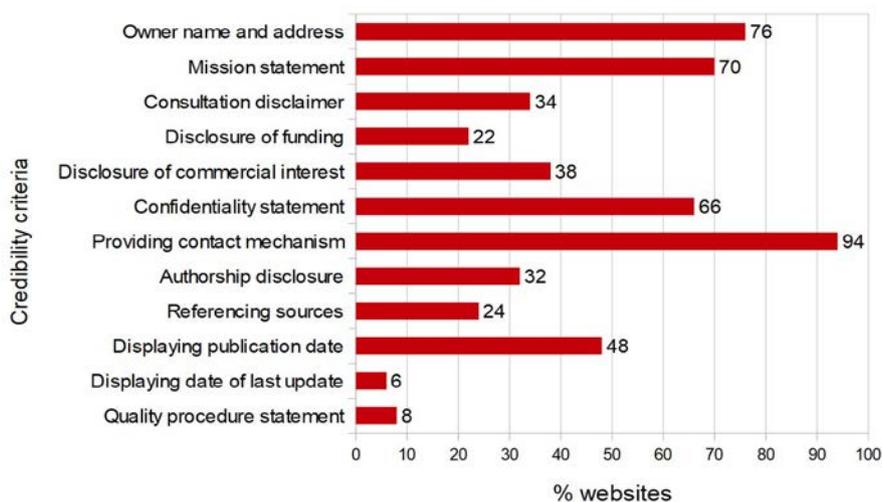
## RESULTS

Descriptive statistics of the 50 websites included in the sample are presented in Table 1.

The mean value of the credibility score was 4.3 points (95% CI: 3.9–4.8), the mean value of the completeness score was 4.8 points (95% CI: 4.2–5.5), and the mean value of the accuracy score was 6.6 points (95% CI: 6.3–6.8).

**TABLE 1.** General characteristics of the websites included in the sample

General characteristics		n	%
Site ownership	Foundation, NGOs	5	10
	Health care provider	15	30
	Commercial company	21	42
	Not identifiable	9	18
Main goal of the site	Educational	33	66
	Commercial	17	34
Site format	Medical or general web-portal	23	46
	Electronic publication	11	22
	Online shop	16	32
Medical paradigm of the site	Conventional medicine	36	72
	Alternative or mixed approach	14	28

**FIGURE 1.** Stroke-related websites' compliance with credibility criteria

The websites' compliance with each of the examined credibility criteria is represented in Figure 1.

The results of the t-test for independent samples regarding the differences in quality scores of the websites complying vs. not-complying with each of the individual credibility criteria are presented in Table 2.

Correlation statistics between credibility scores on one hand and completeness and accuracy scores on the other hand are presented in Table 3, both for the sample as a whole ( $N = 50$ ) and for the two language sub-samples separately.

## DISCUSSIONS

The credibility of the stroke-related information on Romanian and Hungarian websites was poor (4.3 points) and was consistent with the results of previously published

studies about the credibility of Romanian health-related websites.<sup>14,15</sup> This low level of compliance with accepted credibility criteria might indicate that site owners are not aware of the ethical expectations regarding health-related websites or might not be motivated to comply with them. While compliance was very good or good with certain criteria (providing contact information, displaying the owner's name and address, the mission statement, and the confidentiality declaration), some of the crucially important criteria for medical websites (mentioning the author's name and credentials, referencing the sources of the information, and displaying the date of the last update) were poorly observed or almost totally ignored.

Overall, we found no significant differences between websites that complied and those that did not comply with each individual credibility criterion as far as completeness and accuracy of the stroke-related information on Roma-

**TABLE 2.** Completeness and accuracy scores of compliant vs. non-compliant websites by individual credibility criterion (full sample, N = 50)

Credibility criteria	Compliance	Completeness score (mean)	p value	Accuracy score (mean)	p value
Owner name and address	No	5.5	0.245	6.1	0.049*
	Yes	4.6		6.7	
Mission statement	No	5.3	0.325	6.5	0.878
	Yes	4.6		6.6	
Consultation disclaimer	No	4.4	0.070	6.4	0.204
	Yes	5.7		6.8	
Disclosure of funding	No	4.8	0.778	6.6	0.486
	Yes	5.0		6.4	
Disclosure of commercial interest	No	4.9	0.903	6.4	0.179
	Yes	4.8		6.9	
Confidentiality statement	No	4.7	0.830	6.2	0.047*
	Yes	4.9		6.7	
Providing contact mechanism	No	6.3	0.258	5.7	0.095
	Yes	4.7		6.6	
Authorship disclosure	No	4.8	0.907	6.5	0.486
	Yes	4.9		6.7	
Referencing sources	No	4.7	0.529	6.6	0.455
	Yes	5.2		6.4	
Displaying publication date	No	4.8	0.892	6.9	0.012**
	Yes	4.9		6.2	
Displaying date of last update	No	4.7	0.054*	6.5	0.765
	Yes	7.3		6.7	
Quality procedure statement	No	4.7	0.282	6.3	0.054*
	Yes	6.0		7.4	

\* p values with marginally statistical significance; \*\* p values with statistical significance

nian and Hungarian websites are concerned. Although the analysis revealed one statistically significant difference (displaying publication date,  $p = 0.012$ ) and three more criteria with marginally significant p values (owner's name and address,  $p = 0.049$ ; confidentiality statement,  $p = 0.047$ ; and quality procedure statement,  $p = 0.054$ ), their practical significance remains uncertain because the dif-

ferences in quality ratings were small and, at best, may be considered as indicators of a relative superiority but not as predictors of good or very good completeness or accuracy scores. Furthermore, the present study has shown that credibility scores did not correlate with completeness/accuracy scores on the examined Romanian and Hungarian stroke-related websites. This finding suggests that compli-

**TABLE 3.** Correlation statistics showing the relationship between site credibility and content quality scores of the Romanian and Hungarian stroke-related websites

Sample/Variables	Spearman's/Pearson's rho	p value
Full sample (N = 50)		
Credibility vs. Completeness Score	0.038	0.793
Credibility vs. Accuracy Score	0.156	0.278
Romanian language sub-sample (N = 25)		
Credibility vs. Completeness Score	0.056	0.789
Credibility vs. Accuracy Score	0.236	0.256
Hungarian language sub-sample (N = 25)		
Credibility vs. Completeness Score	0.327	0.110
Credibility vs. Accuracy Score	-0.125	0.550

ance with credibility criteria may not be a true indicator of the quality of medical information. This observation has important practical implications because credibility criteria have been promoted by several expert bodies as a simple and dependable method, which enables users with no specific training in science or medicine to identify accurate and trustworthy online health-related information sources. If, as implied by our study, compliance with credibility criteria is not a reliable predictor of scientific accuracy of health-related information, then, consumer health experts should stop recommending credibility criteria as a tool to detect accurate health information.

These findings are in line with the conclusions of several studies that have investigated the relationship between credibility and content quality on samples that included websites addressing other medical topics both in Romanian,<sup>12,13,16,17</sup> as well as in English.<sup>3,18,19</sup> In one of the earliest studies that tested the association of credibility and content quality on English-language health-related websites, Griffiths and Christensen have found that none of the content quality measures correlated with the JAMA-Silberg accountability score.<sup>18</sup> In a more comprehensive study including 121 websites presenting information on five common health topics, Kunst *et al.* have discovered that website credibility criteria have only a weak or at best moderate correlation with the accuracy of information and concluded that apparently credible websites may not necessarily provide more accurate information.<sup>19</sup> A meta-analysis of English-language websites on various topics such as social phobia, bipolar disorders, pathological gambling, cannabis, alcohol and cocaine addiction, has failed to show the HON label as a predictor of good content quality websites, suggesting that the HON credibility criteria are more related to the ethical dimension of online health communication than to the scientific quality of the information conveyed.<sup>8</sup> The authors of another study examining the quality of information about prehospital care of venomous snake bites on the English internet consider that the observed lack of correlation between the accuracy of the information and two credibility indicators (HON and JAMA) represents a reason of concern, since online health-seekers relying on these tools may be exposed to potentially harmful misinformation.<sup>9</sup>

### Strengths and limitations

To the best of our knowledge, this is the first study assessing the association of credibility criteria with the quality of stroke-related information for users of Romanian and Hungarian websites. The results of the study bring an ad-

dition to the debate surrounding reliability/unreliability of some widely known indirect predictors of online health-related information quality by reporting results based on the assessment of a new topic in Central and Eastern European languages.

The main limitations of the study consist in some constraints intrinsic to internet research that may have a sensible impact on the replicability of the results (search results are highly dependent on the choice of search engine, search terms, time of the query etc.). The influence of the evaluators' biases was proactively addressed by: selecting medical doctors or medical students as evaluators, providing the evaluators with detailed instructions regarding the evaluation procedures, performing two independent assessments of the websites' content, systematically checking the interrater agreement, and performing a third, consensus evaluation whenever was necessary. The use of Google as the only search engine in our study may be regarded as a limitation, but considering that up to 97% of Romanians use Google as their search engine, this methodological decision should not be of concern.<sup>20</sup> Even if the sample of included sites is small, this should not be taken as a limitation, because the majority of users access only websites included on the first page of the Google search results.<sup>21</sup> Finally, since our study included only a sample of Romanian and Hungarian websites about stroke, the results cannot be extrapolated to other medical topics or other languages.

### CONCLUSIONS

The mean credibility score of the Romanian and Hungarian stroke-related websites was poor and it was not correlated with neither completeness nor accuracy of the information on the respective webpages. With a few, practically irrelevant exceptions, compliance with individual credibility criteria was not associated with higher content quality on the investigated sample.

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### CONFLICT OF INTEREST

Nothing to declare.

## REFERENCES

1. Nădășan V. The Quality of Online Health-Related Information – an Emergent Consumer Health Issue. *Acta Medica Marisiensis*. 2016;62:408-421.
2. Cline RJ, Haynes KM. Consumer health information seeking on the Internet: the state of the art. *Health Educ Res*. 2001;16:671-692.
3. Fahy E, Hardikar R, Fox A, Mackay S. Quality of patient health information on the Internet: reviewing a complex and evolving landscape. *Australas Med J*. 2014;7:24-28.
4. Health On the NET. The HONcode Principles. Available at: <https://www.hon.ch/en/certification.html#principles> (1 August 2018)
5. Commission of the European Communities, Brussels. eEurope 2002: Quality Criteria for Health Related Websites. *J Med Internet Res*. 2002;4:E15.
6. The DISCERN Project. Available at: [http://www.discern.org.uk/background\\_to\\_discern.php](http://www.discern.org.uk/background_to_discern.php) (1 August 2018)
7. Silberg WM, Lundberg GD, Musacchio RA. Assessing, controlling, and assuring the quality of medical information on the Internet. *JAMA*. 1997;277:1244-1245.
8. Khazaal Y, Chatton A, Zullino D, Khan R. HON label and DISCERN as content quality indicators of health-related websites. *Psychiatr Q*. 2012;83:15-27.
9. Barker S, Charlton NP, Holstege CP. Accuracy of internet recommendations for prehospital care of venomous snake bites. *Wilderness Environ Med*. 2010;21:298-302.
10. Santana S, Lausen B, Bujnowska-Fedak M, Chronaki CE, Prokosch HU, Wynn R. Informed citizen and empowered citizen in health: results from an European survey. *BMC Fam Pract*. 2011;12:20.
11. Nădășan V. Should Critical Care Professionals Take Hoaxes/Rumours Seriously? *J Crit Care Med (Targu Mures)*. 2016;2:205-206.
12. Nădășan V, Roșca AN, Tarcea M, Ábrám Z, Mărușteri M. The Quality of Romanian Breast Cancer Websites: a Five-Year Longitudinal Assessment. *J Cancer Educ*. 2018;33:703-707.
13. Nădășan V, Moldovan O. The Completeness and Accuracy of Information about Coeliac Disease on the Romanian Websites. *Journal of Applied Quantitative Methods*. 2016;11:70-76.
14. Nădășan V, Ábrám Z. How credible are the Romanian health-related websites? A cross-sectional study. *Acta Medica Transilvanica*. 2016;21:1-4.
15. Nădășan V, Voidăzan S, Tarcea M, Ureche R. The quality of the information about influenza on the Romanian Internet. *Acta Medica Transilvanica*. 2011; 2:312-314.
16. Nădășan V, Vancea G, Georgescu PA, Tarcea M, Abram Z. The credibility, completeness and accuracy of information about first aid in case of choking on the Romanian Websites. *Journal of Applied Quantitative Methods*. 2011;6:18-26.
17. Nădășan V, Moldovan G, Tarcea M, Ureche R. Edified or confused? How complete and accurate is the information about vitamin B12 on the Romanian Websites? *Revista de Igienă și Sănătate Publică Timișoara*. 2011;61:49-57.
18. Griffiths KM, Christensen H. Quality of web based information on treatment of depression: cross sectional survey. *BMJ*. 2000;321:1511-1515.
19. Kunst H, Groot D, Latthe PM, Latthe M, Khan KS. Accuracy of information on apparently credible websites: survey of five common health topics. *BMJ*. 2002;324:581-582.
20. Statcounter. Available at: <http://gs.statcounter.com/search-engine-market-share/all/romania> (2 August 2018)
21. Granka LA, Joachims T, Gay G (2004) Eye-tracking analysis of user behavior in WWW search. Available at: [https://www.cs.cornell.edu/people/tj/publications/granka\\_etal\\_04a.pdf](https://www.cs.cornell.edu/people/tj/publications/granka_etal_04a.pdf) (1 Aug 2018)