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Tinnitus information online – does it ring true?

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Abstract

Objective. To assess, using standardised tools, the quality and readability of online tinnitus information that patients are likely to access.

Methods. A standardised review was conducted of websites relating to tinnitus and its management. Each website was scored using the DISCERN instrument and the Flesch Reading Ease scale.

Results. Twenty-seven unique websites were evaluated. The mean DISCERN score of the websites was 34.5 out of 80 (standard deviation = 11.2). This would be considered 'fair' in quality. Variability in DISCERN score between websites was high (range, 15–57: 'poor' to 'very good'). Website readability was poor, with a mean Flesch Reading Ease score of 52.6 (standard deviation = 7.7); this would be considered 'difficult' to read.

Conclusion. In general, the quality of tinnitus websites is fair and the readability is poor, with substantial variability in quality between websites. The Action on Hearing Loss and the British Tinnitus Association websites were identified as providing the highest quality information.

Main Article

Mr R M McKearney takes responsibility for the integrity of the content of the paper

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Introduction

Tinnitus is a common health condition that has a marked impact upon some individuals' quality of life.[1] Tinnitus affects approximately 10 per cent of the UK population, with 4 out of 10 sufferers considering the condition to be moderately or severely annoying.[2]

Patients attending an ENT clinic will commonly use the internet to research their condition, but little is known about the quality of the information available or its readability.[3] Patients who access online health information are unlikely to use academic or medical databases, but rather online search engines. Entering the term 'tinnitus' into the most widely used internet search engine, Google, currently produces 5.62 million search results (February 2018). Some patients place significant credence on the online information they find,[4] and do not necessarily discuss this information with their clinician.[5] It is therefore clearly important for clinicians to be aware of the types and quality of information that patients may access. The present study aimed to assess the quality and readability of tinnitus information accessible to patients on the internet.

The percentage of UK households with internet access has increased from 10 per cent in 1998 to 90 per cent in 2017, with 80 per cent of adults using it daily or almost daily.[6] The internet is used by some individuals to access online information related to health. Diaz *et al.*[5] conducted a survey of 1000 randomly selected primary care patients. Of the 512 respondents, 54 per cent reported having accessed online health information. Of these, 60 per cent reported that they considered the online information to be equal to or surpass the information provided by their general practitioner. Notably, 59 per cent of respondents did not discuss this online information with their general practitioner.

The impact of patients utilising online healthcare information is not fully known, although it is possible to speculate over the potential advantages and limitations. Potential benefits include enabling patients to take a more active role in managing their health, promoting autonomy and enabling them to make more well-informed decisions regarding their treatment.[7] The internet can provide support to patients through online fora and through the provision of details of group support meetings.[8] Information of poor quality may misinform patients, potentially leading to anxiety, stress and unnecessary visits to their general practitioner.[9,10] Despite these limitations, it is postulated that online health information can serve patients in a positive manner, especially if its use is guided by clinicians.[11]

Patients with ENT conditions have been shown to readily access online health information prior to attending appointments. Tassone *et al.*[3] surveyed 535 ENT outpatients prior to their clinic appointment. Sixty-four per cent ($n = 344$) had internet access, and, of those, 18 per cent had accessed the internet to seek information about their condition. In a similar study of parents of children visiting an ENT specialist,[4] 30 per cent of the 501 respondents had accessed online health information prior to their appointment, 26 per cent of whom reported that the online information accessed had influenced their management decisions regarding their child's care.

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$$\text{FRE} = 206.835 - 1.015\left(\frac{\text{total number of words}}{\text{total number of sentences}}\right) - 84.6\left(\frac{\text{total number of syllables}}{\text{total number of words}}\right)$$

Fig. 1. The Flesch Reading Ease (FRE) score, as calculated by word processing software Microsoft Word. The formula provides a method of objectively assessing the readability of a text. Adapted from Flesch.[13]

Despite the notable use of online health information by ENT patients, much remains unknown about the quality of the information available and its readability. One study by Pothier[12] measured the readability of online information in relation to 'glue ear' using the Flesch Reading Ease score. The Flesch Reading Ease score is an objective, quantitative test of readability (how easy a text is to read).[13,14] Pothier found the level of readability of the material to be 'difficult' to 'very difficult', placing it above the reading age of the average UK adult.[12]

A study by Kieran *et al.*[15] sought to evaluate the accountability and quality of online information on tinnitus. The assessment of accountability comprised four criteria that contributed to an accountability score: authorship, attribution, disclosure and currency. A sample of 90 websites (30 from 3 separate search engines) was initially obtained using the search term 'tinnitus'. The authors used their own 10-point Tinnitus Information Value scale to assess the 39 websites they reviewed. Kieran *et al.*[15] found the mean Tinnitus Information Value score to be 5 out of 10. The accountability score of the websites was very low (2 out of 7), with 27 out of 39 websites omitting the name of the author of the information. The Tinnitus Information Value scale is not validated, and its narrow range may cause it to have a ceiling and/or floor effect, making differentiation between website quality at the ends of the scale less meaningful.

Assessing the quality of websites used by patients is challenging, not least because of the lack of consensus on how this task is best achieved. A systematic review by Eysenbach *et al.*[16] identified 79 studies, whereby the authors systematically searched for online healthcare information and assessed it quantitatively. Eysenbach *et al.* considered the best studies to be ones that used demonstrably reliable evaluation tools. Two of the studies evaluated used the DISCERN instrument to assess online information.[17] The DISCERN instrument is a standardised assessment tool created by an expert panel (including clinicians and leaders in health information) to assess the quality of written health information. It has been shown to have a high degree of validity and suitable inter-observer agreement.[18,19]

With a significant proportion of patients likely to be accessing online health information and using it to inform their treatment decisions, it is important for clinicians to be aware of what information is available to patients online, in order to better counsel them and guide them towards resources of known quality.[3,5] Whilst the DISCERN instrument has been used to examine the quality of tinnitus information accessed by general practitioners online,[20] no study to date appears to have used a validated assessment tool, such as the DISCERN instrument, to carry out an in-depth assessment of the quality of online health information that would be typically accessible to patients on the subject of tinnitus and its management. The present study used a standardised method with validated tools to identify and examine websites likely to be accessed by patients with tinnitus.

Materials and methods

Systematic search

Websites containing information on tinnitus and its management were systematically identified. The three most commonly used search engines on desktops, tablets and consoles are: Google (www.google.co.uk), Bing (www.bing.com/?cc=uk), and Yahoo (uk.yahoo.com), which have a combined market share of 96.6 per cent.[21] These three search engines were used to identify the websites for review.

In order to find a representative sample of websites that patients with tinnitus might access, the first 15 websites were taken from each search engine, using both the search terms 'tinnitus' and 'noise in ears', giving a total of 90 potential websites for analysis. This approach was expected to capture at least 95 per cent of any 'click throughs' to websites in the results, whilst keeping the sample constrained.[22] The online searches were carried out on 12th August 2015. The information quality and readability assessments were conducted over the subsequent month.

Links that were sponsored advertisements were excluded because these are unlikely to be used.[23] Other websites excluded from analysis included: websites inaccessible to the general public, non-English-language websites, and websites containing no written content or content irrelevant to the subject of tinnitus management.

Information quality assessment

The quality of the information provided by each website was assessed using the DISCERN instrument, which is available without charge online.[17] It consists of 16 separate criteria, each assessing a different aspect of quality considered an essential feature of good quality information, and includes a score for overall quality. Each of these criteria are rated on a scale from 1 to 5 (except question 2, for which the scale is 0 to 5) and the scores are summed. This gives a total score range of 15 (poor) to 80 (very good). The DISCERN instrument is divided into three main sections assessing: the reliability of the information, information relating specifically to treatment choices, and the assessor's global rating of the publication as a whole. Detailed instructions for how to accurately score each criterion are provided by the DISCERN handbook, to promote consistency between assessors.[17]

In order to assess the inter-observer reliability of the website assessments using the DISCERN instrument, a random sample of 15 websites was selected for a blinded second assessor to score independently. The level of inter-observer reliability was then evaluated.

Readability assessment

The level of readability for each website was assessed using the Flesch Reading Ease score.[13] This was calculated in Microsoft™ Word software using the formula shown in Figure 1.

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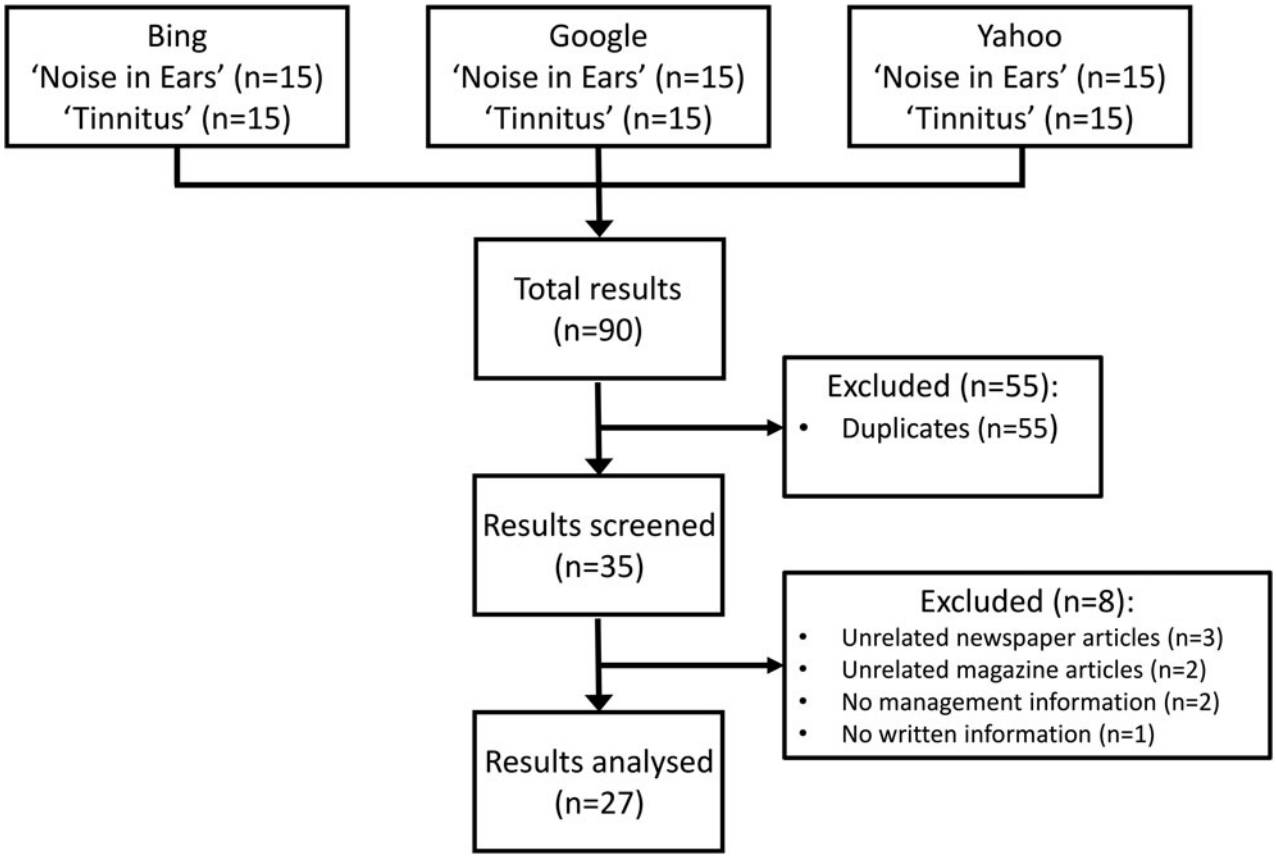


Fig. 2. Flow chart of search results, showing steps of excluding duplicate and irrelevant results.

The Flesch Reading Ease score takes factors such as the number of words per sentence and the number of syllables per word into account to give a score from 0 to 100, with a high-scoring text being more easily understood than one with a low score. A text with a score of 71–100 is considered 'easy' to read, with the average 11-year-old able to read it with ease. A score of 61–70 is considered of 'standard' difficulty, with children aged 13–15 years being able to read it clearly. A text with a score of 60 or below is considered 'difficult' to read.[24]

Statistical methods

A priori statistical tests were performed using IBM® SPSS software, version 24. The effect of the search term used ('tinnitus' or 'noise in ears') on DISCERN and Flesch Reading Ease scores was assessed by an independent samples two-tailed student's *t*-test on results not duplicated between search terms. The effect of website ranking in the search engine results list, and of correlation between DISCERN and Flesch Reading Ease scores, were assessed by calculation of Spearman's rank correlation coefficients. Inter-observer reliability between assessors using the DISCERN instrument was assessed by calculating Cohen's kappa with quadratic weighting for a random sample of 15 websites rated blindly and independently by a second assessor, in a manner similar to the DISCERN instrument's validation study.[18]

Results

Websites analysed

Of the initial sample of 90 results (15 for each of the 2 search terms, giving 30 from each of the 3 search engines), 35 unique websites were identified. The remaining 55 results were duplicates of the 35 unique websites and were excluded. A further 8 of the 35 remaining unique websites were excluded from analysis because they did not contain any information relating to tinnitus management (3 online newspaper articles, 2 online magazine articles, 2 standard webpages and 1 webpage with no written information), leaving 27 unique relevant websites remaining for analysis (Figure 2).

Information quality

The mean DISCERN score of the 27 unique websites was 34.5 (range, 15–57; standard deviation (SD) = 11.2) (Figure 3). Based on a pre-existing categorisation of scores,[25,26] the mean DISCERN score of 34.5 would be considered to represent information of 'fair' quality. Of the 27 websites, 9 websites had a 'poor' quality score (range, 15–28), 12 websites had a 'fair' quality score (range, 29–41), 4 websites had a 'good' quality score (range, 42–54) and 2 websites had a 'very good' quality score (range, 55–67); no websites had an 'excellent' quality score (range, 68–80).

Readability

The mean Flesch Reading Ease score was 52.6 (SD = 7.7). Using a pre-existing categorisation of scores,[24] text of this score would be considered 'difficult' to read. The range of Flesch Reading Ease scores was 35.7–64.2, ranging from 'difficult' to 'standard' reading ease.

A summary table of DISCERN and Flesch Reading Ease scores for the 27 websites analysed is shown in Table 1 and in box-and-whisker plots in Figure 3.

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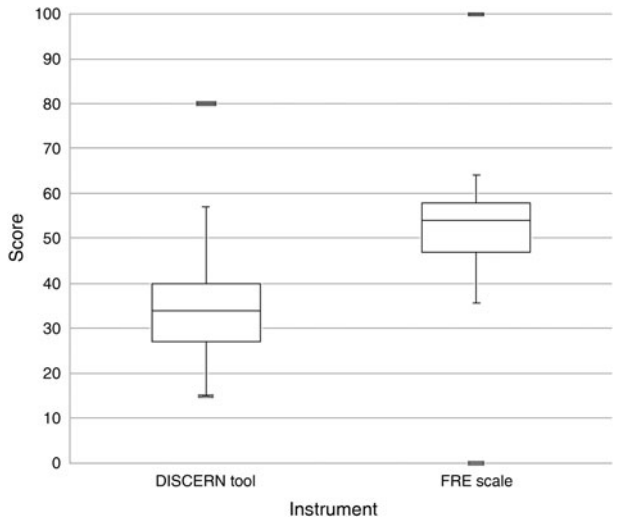


Fig. 3. Box-and-whisker plots for DISCERN and Flesch Reading Ease (FRE) scores for the 27 websites included in the analysis.

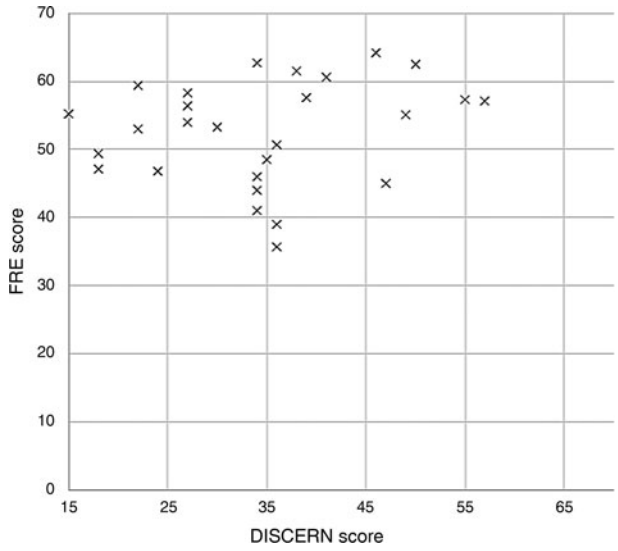


Fig. 4. Scatter chart of DISCERN score against Flesch Reading Ease (FRE) score. No significant correlation was detected (Spearman's r = 0.24, $p = 0.24$).

Table 1. Summarised DISCERN and Flesch Reading Ease scores*

Instrument scores	Number of websites
DISCERN score	
– Poor (15–28)	9
– Fair (29–41)	12
– Good (42–54)	4
– Very good (55–67)	2
– Excellent (68–80)	0
Flesch Reading Ease score	
– Difficult (0–60)	22
– Standard (61–70)	5
– Easy (71–100)	0

*Using previously published categorisations for the scores.[24–26]

Information quality and readability association

No statistically significant correlation was found between information quality (DISCERN) and readability (Flesch Reading Ease) scores (Spearman's r = 0.24, $p = 0.24$). A scatter plot of DISCERN scores against Flesch Reading Ease scores is shown in Figure 4.

Inter-observer reliability

Quadratic-weighted kappa showed moderate agreement between the two independent raters ($\kappa = 0.69$, 95 per cent confidence interval (CI) = 0.50–0.88). This is slightly greater than that reported by Charnock *et al.*[18] for an expert panel when validating the DISCERN instrument ($\kappa = 0.53$, 95 per cent CI = 0.48–0.59), and is greater than their stated level for acceptable agreement ($\kappa = 0.4$). This finding provides reassurance that the DISCERN instrument was used in a reliable manner.

Search terms used

Of the 27 unique websites, 11 appeared using both search terms and 16 appeared for one search term only. The mean DISCERN score when using the search term 'tinnitus' was 36.8 (SD = 10.2) and for 'noise in ears' was 29.9 (SD = 9.8). The mean Flesch Reading Ease score for 'tinnitus' was 51.8 (SD = 8.5) and for 'noise in ears' was 53.2 (SD = 7.7). When comparing websites produced using each search term, excluding duplicates, there was no statistically significant difference in DISCERN score ($t(14) = 1.004$, $p = 0.33$) or Flesch Reading Ease score ($t(14) = 1.085$, $p = 0.29$).

Discussion

Online tinnitus information likely to be accessed by patients is most commonly and on average 'difficult' to read and only of 'fair' information quality, as assessed by standardised tools.[13,17] The information ranged from 'standard' to 'difficult' in terms of readability, and from 'poor' to 'very good' in terms of information quality. Readability was not significantly correlated with information quality. These factors are of potential significance to clinicians discussing and guiding patient access to online health information relating to tinnitus.

Kieran *et al.*[15] used their own Tinnitus Information Value scale to rate websites on the subject of tinnitus. The mean score was 5 (range, 0–10), the midpoint of the range of possible scores. This score appears potentially slightly higher than that of websites evaluated in this study using the DISCERN instrument, with the mean score of 34.5 being lower than the midpoint (47.5) of the possible range of DISCERN scores (range, 15–80). However, as the two evaluative tools used differ considerably, with the DISCERN instrument being a universal health information assessment tool and the Tinnitus Information Value being non-validated and tinnitus-specific, a direct comparison is difficult to make. Similarly to Kieran *et al.*,[15] this study found that the quality of information between websites was highly variable.

The DISCERN tool has previously been used to evaluate information relating to tinnitus accessed by general practitioners. Fackrell *et al.*[20] assessed the quality of online information sources used by general practitioners to guide their management decisions and help counsel patients. They used the DISCERN instrument to evaluate the top 10 information sources used by general practitioners to read about tinnitus, as previously identified by El-Shunnar *et al.*[27] The mean

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DISCERN score of these 10 websites was 47.0 (extrapolated from the average score per question provided by the authors). This score is unsurprisingly greater than the mean DISCERN score of the publically accessible websites identified using search engines in this study (34.5), as the websites assessed by Fackrell *et al.* were identified as being the sources of information on tinnitus most commonly consulted by general practitioners.[27] However, a score of 47.0 would still only be considered 'good', and suggests that information quality could be improved further to allow sources to reach the 'very good' and 'excellent' score categories.

Many other studies have assessed the quality of online patient information within areas of clinical practice other than tinnitus. For example, Som and Gunawardana assessed online patient information relating to chemotherapy, and obtained a mean DISCERN score of 56.1 (SD = 8.8), with a wide range of scores (41–69).[28] Cajita *et al.*[29] evaluated online patient information pertaining to heart failure. The mean DISCERN score was 46.0. Both of these studies report a mean DISCERN score higher than that obtained in this study. This could reflect the differences in methodology between studies, or simply chance variation. Alternatively, this finding may represent differences in public awareness and funding for different conditions and associated publically accessible online information. There may also be more commercial websites targeting patients with tinnitus, which have been reported to have lower quality information.[15] Suggestions to improve the quality and readability of patient-accessible information include the award of accreditation by third-party organisations.[30]

Health literacy (the ability to apply one's literacy skills to health information) varies widely between patients and is a key social determinant of an individual's health.[31,32] The present study found that using the search term 'noise in ears' produced websites with slightly lower information quality and slightly higher readability than using the search term 'tinnitus', however these differences were not statistically significant. The readability of information is a key determinant of how well it is understood. The mean readability of the websites using the Flesch Reading Ease score was 52.6 (range, 35.7–64.2). Text of this score would be rated as 'difficult' to read and equates approximately to the reading standard of a 15–18 year old.

A cross-sectional study of 251 healthcare websites with information on 12 common conditions found the mean Flesch Reading Ease score to be 47.5.[33] This suggests that health information text is generally 'difficult' to read and has slightly worse readability compared to the websites identified in the present study (Flesch Reading Ease score of 52.6). Healthcare information needs to be written in a style that is accessible to the majority of people. With almost a quarter of adult US citizens reading at or below the level expected of a 10–11 year old, the American Medical Association has advised healthcare information providers to write their material at this level or below in order to widen accessibility to healthcare information.[34]

The readability of health information may act as a barrier to those with less education, and further compound the healthcare inequalities already experienced by these members of society. Simple measures to improve the clarity of language, as promoted by the Plain English Campaign,[35] will allow greater and fairer access to healthcare information.

Clinical implications

Many patients seek online information to find out more about their health condition and help guide their decisions regarding treatment choices. Clinicians who treat patients with tinnitus should be aware that the quality and readability of online information is highly variable, and that many patients do not discuss with their clinician the online information that they have read.[5]

Directing patients towards information sources of known quality will help them make better-informed treatment decisions. The two websites with the highest DISCERN scores in this study were published by Action on Hearing Loss and the British Tinnitus Association.[36,37] Although both websites had a Flesch Reading Ease score of 57 (considered 'difficult' to read), they scored higher than the mean Flesch Reading Ease score for all websites in this study (52.6).

Clinicians should be aware of the importance of writing healthcare information in a manner accessible to all patients. Tools to assess readability may be used in conjunction with a clear writing style to ensure that patients of all backgrounds have access to high quality information.

Limitations

As the searches were conducted on a computer with a UK Internet Protocol address, there may be a predisposition for search engines to identify UK-based websites. Additionally, patients and clinicians from other parts of the world may use more localised search engines, potentially limiting the applicability of the presented findings to those regions. Whilst no non-English-language websites were identified in our English-language searches, information sources exist in a variety of languages, and may not have the same characteristics as those assessed here.

Although the rating of information quality between assessors using the DISCERN instrument has been shown to have a good degree of inter-observer agreement, the scoring process still requires some subjective assessor input.[17] Whilst the DISCERN instrument evaluates a wide variety of factors that contribute towards information quality,[17] there are factors not considered, such as the factual content of the information, how current the information is and readability.

Although the Flesch Reading Ease formula is able to objectively provide information on readability, its approach of calculating a single value from only the numbers of words, syllables and sentences is a reductionist take on a complex psycholinguistic process. Whilst this is a suitable proxy, it does not capture all dimensions of the readability of a text.

Finally, the internet allows easier access to both publish new information and update pre-existing information compared to print media. Over time, this study's findings will inevitably become less reflective of currently published information as the information available online gradually changes. Beyond their contemporary utility, this study's results will also serve as a point of comparison for future assessments.

Conclusion

Online tinnitus information likely to be accessed by patients is most commonly and on average 'difficult' to read and only of 'fair' information quality, as assessed by standardised tools. With most online resources rated as such, there is substantial room for improvement. Both the DISCERN and Flesch Reading Ease scores were highly variable, reflecting the range of information that can be accessed by patients with tinnitus online. Readability was not significantly correlated with information quality.

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Clinicians who counsel patients with tinnitus should be aware of these findings, especially in the context of the number of patients who access online information to make decisions regarding their treatment and the likelihood that they may not discuss this information with their clinician.

- Patients commonly use the internet to research their health condition
- This study evaluated the quality and readability of information that patients with tinnitus are likely to access
- Generally, the quality of the websites assessed was fair and the readability was poor
- Information quality varies substantially between websites

The two best sources of online information identified by this study were published by Action on Hearing Loss and the British Tinnitus Association. Authors of patient information may use tools to evaluate readability and information quality, such as the DISCERN instrument, in order to widen access to quality healthcare information.

Competing interests. None declared

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