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Evaluation of treatment risks and the quality of information contained within the websites of specialist orthodontists

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Objective: To evaluate the treatment risks and the quality of information contained within the websites of specialist orthodontists in Australia.
Methods: The term 'specialist orthodontic practice' was entered into three internet search engines. Websites satisfying inclusion and exclusion criteria were evaluated for orthodontic treatment risk information against nine common treatment risks. For website reliability and quality, the DISCERN instrument was used along with the HON (health on the net) seal certification; and for readability, the Flesch Reading Ease (FRE) Test was applied.
Results: Of the 105 websites that met the inclusion and exclusion criteria, 4.8% reported all nine risks. No risks were reported by 17.1%. Relapse (64.8%) was the most common risk recorded on websites, followed by 'pain/discomfort' (63.8%). Root resorption was reported by 5.7%. The requirement for life-long retention was indicated by 22.9% of the websites and 57.1% gave advice on sports mouthguard wear. The proposed benefits of orthodontic treatment were outlined by 85.7%. The mean (standard deviation [SD]) overall DISCERN score was 43.78 (SD 6.49; range 17–59). No website displayed the HON Seal certification. The mean FRE Score was 51.71 (SD 10.19; range 30.1–74.7).
Conclusions: Information regarding orthodontic treatment risks contained within specialist orthodontic practice websites appears deficient. Websites were of variable reliability, quality and readability. Further development of specialist orthodontists' websites is required to ensure the delivery of accessible, reliable and understandable evidence-based information to patients.
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Introduction

The World Wide Web is a provider of easily accessible health information.[1] Material found on the Internet is not generally subject to regulation or peer review and can be posted by any individual or organisation.[2] As a result, this may lead to the placement and availability of erroneous information.[3] In addition, health information may be ineffectual if it is beyond the understanding and ability of the reader.[4,5]

The Internet is increasingly being used as an information source by individuals considering or undergoing dental or orthodontic treatment.[5] More than one-third of dental patients have researched their condition or treatment online.[6] Almost 50% of dentists have been approached by patients to discuss information that has been found on the Internet.[7] Many validated tools or instruments have been used to evaluate the quality and readability of healthcare websites.[2,8] Commonly used tools include the DISCERN instrument, the LIDA Instrument, the HON (health on the net) seal, the Journal of the American Medical Association (JAMA) benchmarks and the Flesch Reading Ease (FRE) Test.[9-13]

These tools have been applied to evaluate the quality and readability related to 'orthodontic information' on the Internet regarding treatment

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modalities, retention, extractions, oral hygiene and fixed appliances, pain, lingual orthodontics, adult orthodontics, cleft lip and palate, orthognathic surgery, and practice websites.[1-3,14-22] Past studies, however, have shown variability in the reliability, accuracy, usability, accessibility and readability of 'orthodontic information'.

The Dental Board of Australia has published guidelines regarding the ethical advertising and display of information by dental professionals.[23] All information regarding dental services should be accurate and honest. Dental professionals have a duty to provide factual and balanced information in order to facilitate valid consent. Any form of advertising produced by dental professionals appearing to mislead the public may result in that professional being subject to proceedings and patients suffering harm and treatment disappointment.[24]

Although it has recognised benefits, orthodontic treatment exposes the patient to risks of hard and soft tissue damage, treatment failure and orthodontic relapse.[24,25] It is essential that any prospective patient is informed of his/her particular risks of undertaking (or not undertaking) treatment before an informed decision can be made. One potential source to aid effective communication regarding risk may be via the websites of specialist orthodontists, where prospective patients can be directed for reliable and easily accessible information.[2]

Currently, there appears to be little published information regarding orthodontic treatment risks and the quality of information contained within the websites of specialist orthodontists in Australia.

The aims, therefore, of the present study were to evaluate:

- Information regarding treatment risks and
- The reliability, quality and readability of information displayed within the websites of specialist orthodontists in Australia.

Material and methods

Search strategy

The three most commonly used online search engines (www.google.com.au, www.yahoo.com.au and www.bing.com.au) in Australia were selected for the study.[26,27] The term 'specialist orthodontic practice' was entered into each of the search engines and the top hundred websites in each were identified. Each website was assessed and only those that were identified as the website of a specialist orthodontic practice located in Australia and confirmed as 'belonging' to an Australian Health Professional Regulation Agency (AHPRA) registered specialist orthodontist were subjected to analysis. Websites of 'mixed practices' (that is, practices not offering orthodontic services only) were excluded.

Assessment criteria

A data collection form was designed and applied to all websites satisfying inclusion and exclusion criteria. Each website was checked for the presence of the following nine risks described by publicly available relevant resources on the websites of two national orthodontic societies.[28,29]

- Pain/discomfort
- Demineralisation/white spot lesions
- Root resorption
- Periodontal/gingival damage
- Devitalisation
- Breakage and what to do in the event of emergency
- Enamel/restorative damage
- Treatment delay and
- Relapse

In addition, each website was checked regarding advice related to the:

- Benefits of orthodontic treatment
- Wear of sports mouthguards and
- Requirement for 'life-long' retention.

Quality assessment tools

The selected websites were evaluated using three validated assessment tools.

The DISCERN instrument has been developed to help users of consumer health information judge the quality of written information about treatment choices.[9,30] It also gives health providers a useful screening mechanism to evaluate the content of their websites. It was rigorously developed and has become a standardised index to examine health care information.[31] The tool is a reliable 16-point questionnaire, each question scored from 1 to 5

depending on how well the website adheres to the specific criteria (1 = poor; 3 = moderate; 5 = high). Reliability is assessed in questions 1–8 (section 1), treatment choices in questions 9–15 (section 2), and question 16 is a summary question that provides an overall rating (Table I).

The DISCERN manual contains detailed information for each question, as well as instructions and examples to facilitate easy evaluation.[32] Based on their scores, websites are categorised into five groups:

- Between 16 and 26 is very poor
- Between 27 and 38 is poor
- Between 39 and 50 is fair
- Between 51 and 62 is good and
- Greater than 63 is excellent.

The Health on the Net Foundation (HON) is a not-for-profit, internationally-recognised organisation promoting the provision of useful and reliable medical and health information on the Internet.[33] Healthcare website producers are required to formally apply for HON membership and must not display the HON Seal badge (Figure 1) on their website until it has been certified.[12]

Websites must strictly adhere to the following principles for certification and periodic re-certification:

- Authorship (Qualifications of the authors displayed)
- Complementarity (Support, not replace or undermine, the doctor-patient relationship)
- Privacy (Uphold the confidentiality of personal information submitted to the website)
- Attribution (Specify the sources of published information)
- Justifiability (Support claims related to outcome and performance)
- Transparency (Clear presentation and accurate email contact details)

Figure 1. The HONcode/Hon Seal badge or logo (reproduced with kind permission from HON Foundation)[12]

Table I. The DISCERN Instrument.

SECTION 1. Is the 'publication' reliable?
1. Are the aims clear?
2. Does it achieve its aims?
3. Is it relevant?
4. Is it clear what sources of information were used to compile the publication (other than the author or producer)?
5. Is it clear when the information used or reported in the publication was produced?
6. Is it balanced and unbiased?
7. Does it provide details of additional sources of support and information?
8. Does it refer to areas of uncertainty?
SECTION 2. How good is the quality of information on treatment choices?
9. Does it describe how each treatment works?
10. Does it describe the benefits of each treatment?
11. Does it describe the risks of each treatment?
12. Does it describe what would happen if no treatment is used?
13. Does it describe how the treatment choices affect overall quality of life?
14. Is it clear that there may be more than one possible treatment choice?
15. Does it provide support for shared decision-making?
SECTION 3. Overall rating of the publication
16. Based on the answers to all of the above questions, rate the overall quality of the publication as a source of information about treatment choices

- Financial Disclosure (Information regarding the website's financial backing) and
- Advertising policy (Clear differentiation between advertising and editorial subject matter).

Readability has been defined as 'the ease of understanding due to the style of writing'.[34]

The FRE Test is a commonly used and reliable readability formula that may be applied to a website to determine the level of readability via a recorded score.[13] An abstract of 200–500 words from each included website is imported into an online FRE calculator (www.readabilityformulas.com). The readability rating is based on the average number of syllables per word and the average number of words per sentence. The text of the website is rated on a 100 point FRE scale. The higher the score, the easier the text is to read. Scores of:

- 90–100 are 'very easy' (understandable by an 11-year-old child)
- 80–89 are 'easy'
- 70–79 are 'fairly easy'
- 60–69 are 'standard' (understandable by a 13–15-year-old child)
- 50–59 are 'fairly difficult'
- 30–49 are 'difficult'
- 0–29 are 'very difficult' (understandable by a university graduate).

Statistical analysis

All data were collected by a single investigator and recorded in Microsoft Office Excel spreadsheets (Microsoft, DC, USA) and analysed using IBM SPSS Statistics, Version 25.0 software (IBM Corp., NY, USA). Descriptive statistics were applied and are presented here in text, graphic and tabular form. Repeat measurements of recorded data were carried out on 30 randomly selected websites. Intra-examiner agreement was determined using Cronbach's Alpha Test.

Results

Following screening and the application of inclusion and exclusion criteria, a total of 105 websites were identified and evaluated (Figure 2). Intra-examiner agreement was 'good' (0.89) for DISCERN scores. Five (4.8%) websites reported all nine risks (Table II).

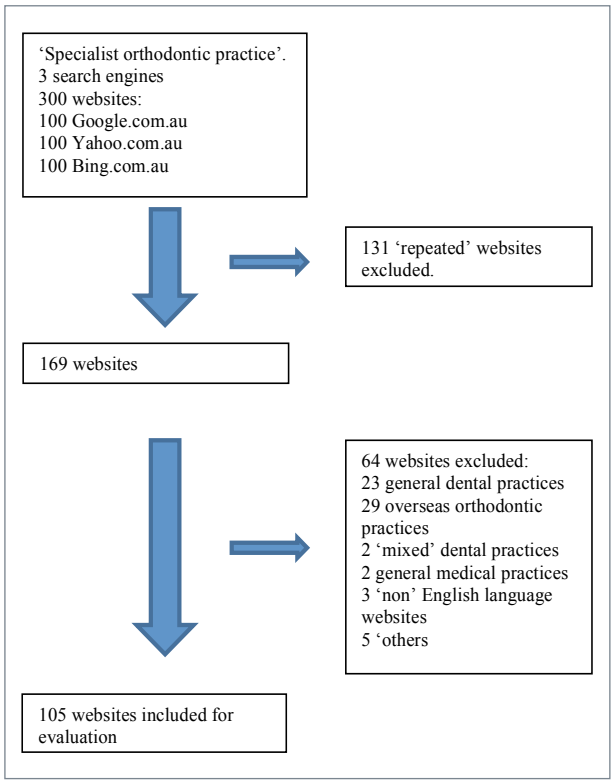


Figure 2. Flowchart showing website selection.

Eighteen (17.1%) websites did not report any risks. The most commonly reported risk was relapse, reported by 68 (64.8%) websites, followed by 'pain/discomfort', reported by 67 (63.8%). Root resorption (5.7%) was the least reported risk (Table III). The requirement for life-long retention was indicated by 24 (22.9%) websites with 60 (57.1%) giving advice on sports mouthguard wear. The proposed benefits of orthodontic treatment were recorded by 90 (85.7%) websites.

Table IV shows that the mean overall DISCERN score was 43.78 (SD 6.49; range 17–59) and the mean overall rating (question 16) of the websites was 2.9/5 (SD 0.528; range 1–4). No website was categorised as 'excellent' (Table V). No website displayed the HON Seal certification. The mean FRE score was 51.71 (SD 10.19; range 30.1–74.7). Table VI shows the distribution of evaluated websites by FRE category.

Discussion

The Internet has transformed the way prospective and current patients access health information, understand their conditions and make decisions regarding their healthcare.[5] Almost 80% of Australian Internet users

Table II. Number of reported risks per website (N = 105).

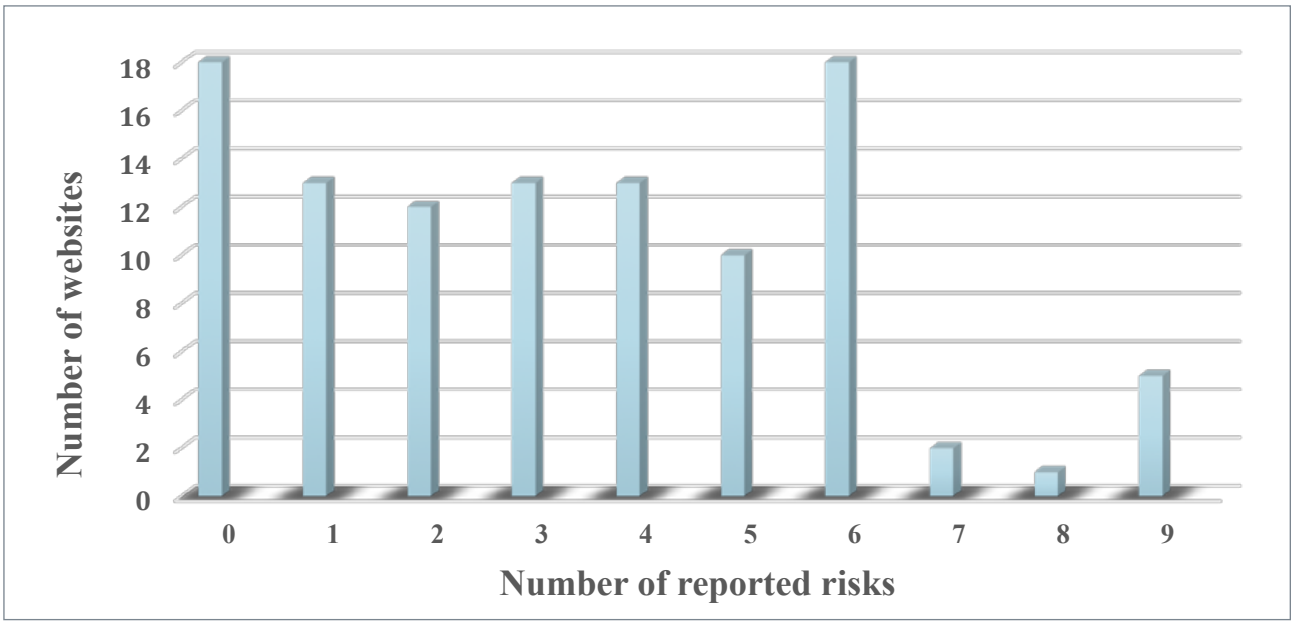


Table III. Number of websites reporting individual risks (N = 105).

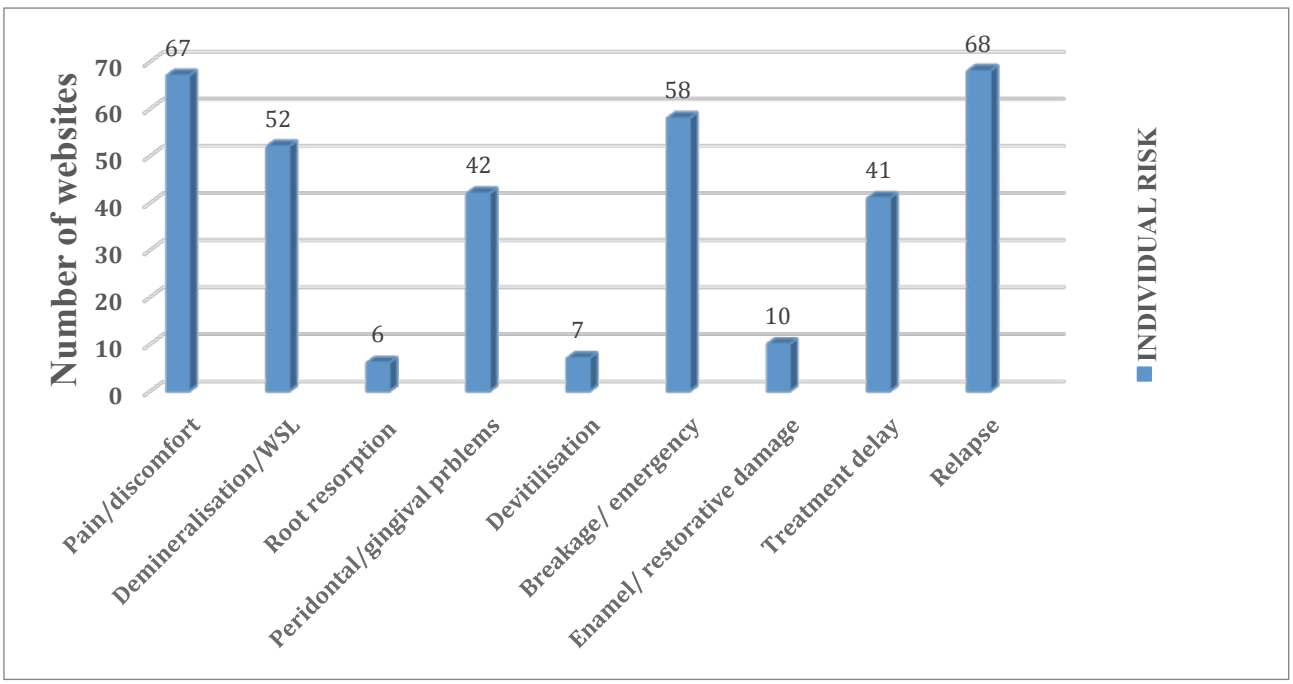


Table IV. DISCERN scores for reliability, quality of information and overall rating score (N=105).

	Reliability score (maximum score: 40/40)	Quality of information score (maximum score: 35/35)	Rating score (maximum score: 5/5)	Overall score (maximum score: 80/80)
Question	Q 1-8	Q 9-15	Q 16	Q 1-16
Mean score (SD)	21.66 (3.26)	19.22 (3.21)	2.90 (0.52)	43.78 (6.49)
Range	9-31	7-28	1-4	17-59

KEY. SD: standard deviation

seek health information online and so the quality and readability of this information is important.[5,35] The presented study is the first to report orthodontic treatment risks and the quality of information contained within the websites of specialist orthodontic practices in Australia.

The three search engines used in the study 'cover' 99% of all searches by Internet users in Australia.[26,27] The use of additional search engines, therefore, is unlikely to change the results. A total of 105 specialist orthodontic practice websites were identified and included in the study. Previously published investigations on the quality of online orthodontic information assessed between 13 and 200 websites.[1-3,14-22] Only two of the studies appeared to have included 'orthodontic practice' websites only.[16,22] It is not clear, however, whether previous evaluations involved the websites of specialist orthodontists (as determined by that country's regulatory body for dental professionals) only. In the present study, only those websites of specialist orthodontists located in Australia, and where the orthodontist(s) was identified as a registered specialist by the regulatory body overseeing dentistry (AHPRA), were evaluated. Websites of 'mixed practices' (that is, practices not offering orthodontic services only) were excluded, which mirrored a study conducted by researchers in the UK.[16]

The decision to undertake (and continue) orthodontic treatment is based on an individually tailored risk-benefit analysis.[24] The High Court of Australia in Rogers v Whitaker (1992) 175 CLR 479 and Rosenberg v Percival (2001) 205 CLR 434 determined that in providing information to patients there is a duty to warn of material risks inherent in any proposed treatment.[36,37] The Dental Board of Australia has stated that a failure to disclose the health risks of treatment contravenes National Law, and all information (risks *and* benefits) must be presented in a manner that is accurate, balanced and not misleading.[23]

The treatment risks considered for evaluation were chosen from publicly available resources on the websites of the British Orthodontic Society (which a previous study identified as a balanced, consistent, and evidence-based informative display) and the Australian Society of Orthodontists.[3,28,29]

Table V. % Distribution of websites by DISCERN category (N = 105).

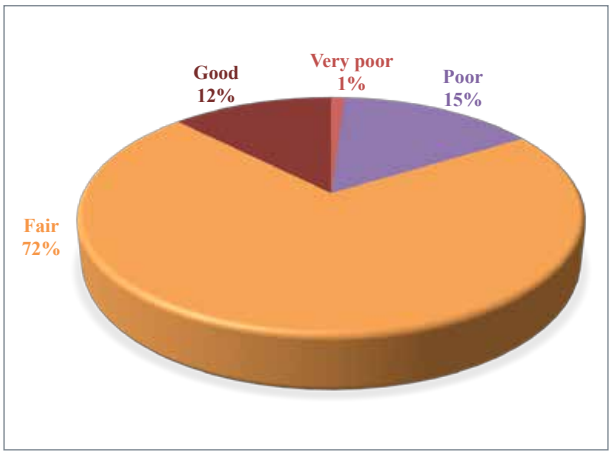
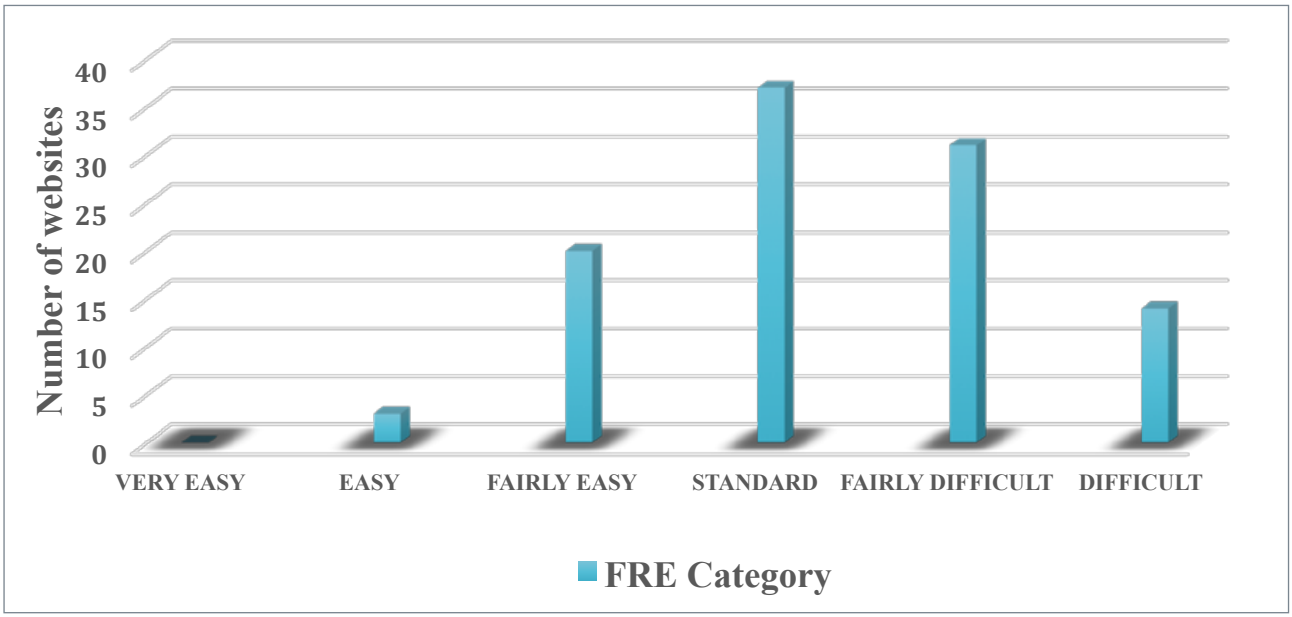


Table VI. Distribution of evaluated websites by FRE category (N = 105).



Five (4.8%) websites reported all nine risks. This compares with a UK study that reported 6 out of 30 assessed websites which 'listed risks of treatment'.[16] Eighteen (21%) websites did not report any risks while 90 (85.7%) websites reported the proposed benefits of orthodontic treatment.

The most common risk reported by websites was orthodontic relapse. Research currently indicates that life-long retention is required to minimise the likelihood of relapse, but the requirement for lifelong retention was indicated in only 22.9% of websites.[38,39] Root resorption was the least reported risk despite evidence that 48–66% of 'orthodontically' treated teeth undergo root resorption of up to 2 mm.[40] Advice on sports mouthguard wear was contained within 60 websites. Sports mouthguard wear is considered essential to minimise the risk of traumatic dental injuries during contact sport.[41]

Three methods were used to assess the quality and readability of online health information. The DISCERN tool provides a comprehensive assessment. Although no one tool is considered superior, DISCERN is user-friendly and has been shown to have good internal consistency when compared with other tools such as JAMA.[18,42] It is particularly valuable for those with learning difficulties and 'poor English' skills.[1,43] The mean overall DISCERN score in the present study was 'fair' (43.78). This compares with mean overall DISCERN scores of 28.9 to 51.7 found in studies that evaluated lingual orthodontics, practice websites and orthodontic treatment modalities.[1,14,22] No website evaluated in the present study, however, was categorised as 'excellent'. The highest and lowest scores of 59 and 17 compare with 64 and 21 found in a study that evaluated orthognathic surgery information on the Internet.[18] The mean overall rating (question 16) of the websites included in the current study was 2.9. This is within the range of 1.95 to 3.9 found in studies evaluating the quality of orthodontic and oral medicine information contained in websites.[2,14,18,44-46] Providing evidence-based, balanced and up-to-date information on 'areas of uncertainty', how each treatment 'works', the benefits and risks of treatment and support for shared-decision making will increase DISCERN scores. Healthcare website designers also need to provide accurate information on the outcome if no treatment was undertaken.

Although a 'quicker' method to assess quality, the HON Seal certification does not appear to be commonly used.[6,44] A study evaluating adult orthodontics and a study assessing orthodontic treatment modalities found only one website displaying the Hon Seal badge.[1, 2] No website displayed the HON Seal badge in the present study.

Purported reasons for the absence of the Seal badge include:

- Healthcare website designers may not be aware of its existence
- An application process is necessary to obtain it and
- A fee for certification and recertification is required.[2,33]

The overall readability of websites included in the present study was considered as 'fairly difficult', with an average FRE score of 51.71. This compares with an average FRE score of 53.96 to 68.6 found in previous studies evaluating the readability of orthodontic-related information on the Internet.[1-3,15,17] The present results compare more favourably, however, with the average FRE score (47.54) found in a study that evaluated Australian online information on 12 common general health conditions.[5]

Research has shown that 44% of Australians have low literacy skills.[47] It is vital that health information should be presented at a readability level that facilitates the wide range of literacy skills found in the general population and use terminology that is readily understood by the target audience.[23,30] This is an essential step in achieving health literacy.[30] The present study, however, found that online orthodontic information contained within the websites of specialist orthodontists in Australia was written at a significantly higher 'difficulty' level than the recommended grade 8 benchmark (10–11 years).[30] This may render the information ineffectual if it is beyond the ability of the reader.[5]

A limitation of the present study may be that evaluation was undertaken by one investigator. This is similar to previous studies that evaluated the quality of 'orthodontic information' contained within websites.[2,22] The two-month period between repeat measurements of recorded data, however, may minimise memory bias and intra-examiner agreement was good. An additional limitation may include the cross-sectional nature of the design. Websites were viewed at two single time-points. The World Wide Web is an ever-changing environment with websites

continuously updating content. Investigating the long-term nature of changes in website quality over time will require regular review.[15]

The findings of the present study indicated that information regarding orthodontic treatment risks contained within specialist orthodontic practice websites appeared deficient and that websites were of variable quality and readability. Absent, inaccurate or poor quality information contained within specialist orthodontist websites may result in the practitioner being subjected to legal proceedings and patients suffering harm and treatment disappointment.[25]

As the quality of online 'orthodontic information' has been found to vary, it is suggested that an effort be made by the orthodontic profession to provide patient access to evidence-based Internet resources that are accurate, balanced and easily understandable by the reader/viewer. Further research, however, is still required on how to communicate online information most effectively to patients.[48] One potential source of delivery of reliable information (including information related to orthodontic treatment risk) may be via the websites of specialist orthodontists to which prospective and current patients can be directed. This may be done in collaboration with colleagues and with guidance from national orthodontic societies. It will require input from patients and further education of healthcare providers on the delivery of healthcare information. In addition, designers of specialist orthodontist websites may need to incorporate the use of validated tools such as DISCERN, the HON Seal and FRE Test in website development and updates.

Conclusions

- Information relating to orthodontic treatment risks on orthodontic specialist websites appeared to be deficient.
- Websites evaluated via the DISCERN, the HON Seal and FRE Test tools were found to vary in reliability, quality and readability.
- Further development of specialist orthodontists' websites is required to ensure the delivery of accessible, reliable and understandable evidence-based information to patients.

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