# An Evaluation of The Quality and Readability of Online Information Regarding Foreign Bodies of the Ear, Nose and Throat

Tsz Ki Ko, Denise Jia Yun Tan, Ka Siu Fan

Submitted to: JMIR Formative Research
on: December 15, 2023

# *Table of Contents*

**Original Manuscript** ..... **5**
**Supplementary Files** ..... **35**
Figures ..... **36**
Figure 1 ..... **37**
Figure 2 ..... **38**
Figure 3 ..... **39**
Multimedia Appendixes ..... **40**
Multimedia Appendix 0 ..... **41**

# An Evaluation of The Quality and Readability of Online Information Regarding Foreign Bodies of the Ear, Nose and Throat

Tsz Ki Ko[1*] MBChB, BSc; Denise Jia Yun Tan[1*] MBChB, BSc; Ka Siu Fan[2] MBBS, BSc

[1]Department of Surgery Royal Stoke Hospital Stoke GB
[2]Department of Surgery Royal Surrey County Hospital Guildford GB
[*]these authors contributed equally

**Corresponding Author:**
Tsz Ki Ko MBChB, BSc
Department of Surgery
Royal Stoke Hospital
Newcastle Road
Stoke
GB

## *Abstract*

**Background:** Foreign body inhalation, ingestion and insertion account for 11% of emergency admissions under Ear, Nose, and Throat (ENT). Children are disproportionately affected, and urgent intervention may be needed to maintain airway patency and prevent blood vessel occlusion. High-quality, readable online information could help reduce poor outcomes from foreign bodies.

**Objective:** To determine the quality and readability of available online health information relating to foreign bodies.

**Methods:** Six search phrases were queried using the Google Search Engine. For each search term, the first 30 results were captured. Websites in the English language and displaying health information were included. The provider and country of origin were recorded. The modified thirty-six-item Ensuring Quality Information for Patients (EQIP) tool was used to assess information quality. Readability was assessed using a combination of tools: Flesch Reading Ease Score (FRES), Flesch-Kincaid Grade Level (FKGL), Gunning-Fog Index (GFI), and Simple Measure of Gobbledygook (SMOG).

**Results:** After removal of duplicates, 73 websites were assessed, with the majority originating from from the United States (63%). Overall, the quality of the content was of moderate quality, with a median EQIP score of 21 (IQR 18-25, max 29) out of a maximum possible score of 36. Precautionary measures were not mentioned on 40% of websites and 30% did not identify disc batteries as a risky foreign body. Red flags necessitating urgent care were identified on 95% of websites, with 89% advising patients to seek medical attention and 38.4% advising on safe foreign body removal. Readability scores (FRES: 12.4 years; FKGL: 6.2; GFI: 6.5; SMOG: 5.9) showed most websites (56%) were below the recommended 6th-grade level.

**Conclusions:** The EQIP score suggests that information quality should be improved to provide patients and parents with clear information to help identify high-risk foreign bodies such as disc batteries and magnets, while providing guidance for removal of low-risk foreign bodies. Readability should also be optimised to 6th-grade/12-years-old literacy level where possible. Future research should focus on strategies for improving information quality and readability of information on websites appearing on the first page of search results. Clinical Trial: nil

(JMIR Preprints 15/12/2023:55535)
DOI: https://doi.org/10.2196/preprints.55535

## Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✔ **Please make my preprint PDF available to anyone at any time (recommended).**
Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.
Only make the preprint title and abstract visible.
No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**
Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain v
Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in <a href="http

# Original Manuscript

## Abstract

### Background

Foreign body inhalation, ingestion and insertion account for 11% of emergency admissions for Ear, Nose, and Throat (ENT) conditions. Children are disproportionately affected, and urgent intervention may be needed to maintain airway patency and prevent blood vessel occlusion. High-quality, readable online information could help reduce poor outcomes from foreign bodies.

### Objective

To evaluate the quality and readability of available online health information relating to foreign bodies.

### Methods

Six search phrases were queried using the Google search engine. For each search term, the first 30 results were captured. Websites in the English language and displaying health information were included. The provider and country of origin were recorded. The modified thirty-six-item Ensuring Quality Information for Patients (EQIP) tool was used to assess information quality. Readability was assessed using a combination of tools: Flesch Reading Ease Score (FRES), Flesch-Kincaid Grade Level (FKGL), Gunning-Fog Index (GFI), and Simple Measure of Gobbledygook (SMOG).

### Results

After the removal of duplicates, 73 websites were assessed, with the majority originating from the United States (63%). Overall, the quality of the content was of moderate quality, with a median EQIP score of 21 (IQR 18-25, max 29) out of a maximum possible score of 36. Precautionary measures were not mentioned on 40% of websites and 30% did not identify disc batteries as a risky foreign body. Red flags

necessitating urgent care were identified on 95% of websites, with 89% advising patients to seek medical attention and 38.4% advising on safe foreign body removal. Readability scores (FRES: 12.4 years; FKGL: 6.2; GFI: 6.5; SMOG: 5.9) showed most websites (56%) were below the recommended 6th-grade level.

## Conclusion

The current quality and readability of information regarding foreign bodies is inadequate. More than half of the websites were above the recommended 6th-grade reading level and important information regarding high-risk foreign bodies such as disc batteries and magnets was frequently excluded. Strategies should be developed to improve access to high-quality information which informs patients and parents about risks and when to seek medical help. Strategies to promote high-quality websites in search results also have the potential to improve outcomes.



## Introduction

Foreign bodies in the upper respiratory and digestive tract account for approximately 11% of admissions to Ear, Nose, and Throat (ENT) emergency services [1]. Whilst most foreign bodies can be removed by emergency clinical staff on initial presentation

[2], challenging cases may require removal under general anaesthesia, particularly if the foreign body is lodged or impacted within the aerodigestive tract, nasal cavity, or ear canal [3]. While this is thought to primarily affect children [4], it also causes significant problems in adult populations [2]. For example, a recent systematic review of foreign bodies identified that adults represent a small, but significant proportion of foreign body cases presenting to emergency services [5]. Regardless of age, it is recommended that the identification of foreign bodies, of both organic and inorganic nature, be treated with a high degree of clinical suspicion to ensure safe and effective care [5].

With foreign body inhalation or insertion affecting children, much of its safety advice is aimed at educating the adults responsible to increase awareness and reduce risks and complications [6][7]. One of the primary goals would be to raise public awareness of recognising foreign bodies within the aerodigestive tract [8]. As the speed of response may be critical in such an event, educating the public on what to do is also a priority [8][9]. This approach to providing safety advice is underpinned by the principles of the Health Belief Model (HBM) [10], whereby important health-related actions are more likely to be taken when individuals are aware of both the benefits and steps of the action as well as the risks of [11]. The quality of foreign body-related safety advice is therefore central to this process [12].

With foreign bodies often presenting urgently, a layperson may turn to information on the Internet for immediate advice. As with other common conditions, a plethora of websites provide information and advice on the insertion, ingestion, or inhalation of foreign bodies; the quality of these websites may vary considerably, as demonstrated in other ENT studies [13,14]. The impact of information can be optimised if the content is readable, accurate, and easily comprehended by individuals [15].

The aim of this study was to assess the quality and readability of online safety advice regarding foreign body insertion, ingestion, and inhalation. A variety of tools have

been developed to assess the quality and readability of written information, so this study uses validated tools which have commonly been used in similar studies previously to allow greater comparability of results. For assessment of quality, the Ensuring Quality Information for Patients (EQIP) tool is a validated tool to assess written material quality, designed specifically for health professionals and researchers [16]. The Flesch Reading Ease Score (FRES) [17], Flesch-Kincaid Grade Level (FKGL) [18], Gunning-Fog Index (GFI) [19] and Simple Measure of Gobbledygook (SMOG) [18] are commonly-used readability scores which use different methods to estimate the literacy levels required to adequately understand the text.

## Methodology

Google, the most widely used English language search engine, was used to identify websites [20]. Only Google was used as previous studies returned similar results when multiple search engines were used [21]. As it is not possible to capture all possible search terms used by the public, Google Trends was used to assess and select the six most popular search terms based on their relative popularities: “Object in ear”,” Object in the nose”, “Object in the throat”, “Ear foreign body”, "Nose foreign body” and "Throat foreign body”. Only the first thirty results were captured for each search term as most users do not view beyond the first page [22]. As the Google search location setting affects results presented, searches were carried out with the country set as Australia, Canada, the United Kingdom, and the United States of America, which are the countries with the highest number of native English speakers. This does not restrict results to websites from other countries from being displayed and instead provides results representative of what English-speaking users would search and find.

### Eligibility and assessment

Eligibility criteria are listed in Table 1. All websites providing health information or advice regarding foreign bodies/objects in the ear, nose, or throat were included. Health information was included if it was in a written format and intended for the

general public or patient demographic. Websites that were primarily video-based, or locked behind paywalls were excluded. Non-English language websites were excluded because the intention of the study was to assess the information available to English speakers and because the two researchers were not capable of making an assessment of quality and readability in other languages. Websites intended for healthcare professionals and academic journal articles were also excluded. Duplicate hyperlinks were removed prior to assessment. Websites were assessed independently by two authors (TKK & DJYT) in accordance with our previous ENT-focused EQIP study [23]. The senior author (KSF) provided supervision of assessments and input for any scoring discrepancies.

**Table 1**. Eligibility Criteria

| Inclusion Criteria | Exclusion Criteria |
|---|---|
| Written health information<br>Health information relating to foreign bodies.<br>Written in the English language. | Video-based information<br>Information which mentions foreign bodies but is focused on a different health or other issue.<br>Content aimed at healthcare professionals or academics.<br>Non-English content |

## The Modified EQIP Tool

The thirty-six-item EQIP tool was used to evaluate each website. This is widely considered to be a robust means of examining both the content, and the design of health-related advice [15], as well as considering the needs of carers or parents within this process [15]. To assess the quality of content, the use of EQIP will therefore seek to highlight the current quality of safety advice regarding foreign bodies at this time. For each item, a “Yes”, “No”, or “N/A” contributed to one or zero points. The EQIP tool is comprised of three domains: Content, Identification and Structure. The Content domain provided information on the main topic and the relevant management (items 1-18). The Identification domain evaluates the production details, including authorship, publication date, and bibliography (items 19-24). The Structure domain

(items 25-36) examines website usability and overall presentation.

## Readability assessment

Apart from EQIP's structure domain, the readability of each website may be assessed using validated scoring systems: Flesch Reading Ease Score, Flesch-Kincaid Grade Level, and Gunning-Fog Index. Following previous literature, these scores were calculated using an online tool [24]. Only the plain text in the article content was assessed, without figures, images, or legends. The calculated results included the number of education years required for correlating literacy level [24]. FRES utilises the average sentence length in words to assess its readability, calculated by 206.835 − (1.015 x total words/total sentences) − (84.6 x total syllables/total words). This average number of words with higher scores represents easier readability [17]. FKGL is developed for the same purpose but uses the number of syllables in its sentences, calculated by (0.39 x total words/total sentences) + (11.8 x total syllables/total words) − 15.59. GFI similarly assesses readability that focuses on complexity, and factors in words with three or more syllables [15]. This is calculated as (0.4 x words/sentences) + (100 x complex words/words). As FKGL and GFI both correspond to the reading level with the amount of education, it is interpreted inversely: higher scores will indicate higher difficulty or literacy required [19]. Moreover, the study included the use of the Simple Measure of Gobbledygook (SMOG) readability score, which focuses on polysyllabic words alone [18]. The lack of a gold standard in assessing readability meant that this set of readability tools was validated for a comprehensive assessment and known to be widely applicable across different domains [16].

## Data collection and additional assessments

Website demographic details were recorded, including the country and type of source. Content from non-governmental organisations that oversee public health was classified as "Charity/Non-Governmental Organisations". Other non-profit groups included patient-led ("Patient Group") and professional-led ("Professional Society").

All for-profit organisations were classified as “Industry/Private”.

Any acute advice or foreign body removal methods were recorded in detail. The discussion of specific foreign bodies, morbidity or mortality rates was recorded. Any disclaimers on websites to seek formal assessment by a healthcare professional were also noted.

## Statistical Analysis

The use of SPSS (IBM, version 25) software data analysis to analyse data. The descriptive values in the form of mean, median, interquartile range, and aggregated scores were demonstrated where applicable. EQIP and readability scores were analysed with a one-way analysis of variance (ANOVA) between subgroups. An alpha level of $p<0.05$ was considered statistically significant.

## Patient and public involvement

There was no patient or public involvement in any part of this study.

## Search Outcome

720 websites in total were identified. 73 websites remained for analysis after the removal of duplicates and websites that did not meet inclusion criteria. The PRISMA flowchart for the inclusion of websites qualifying for analysis is shown in Figure 1.

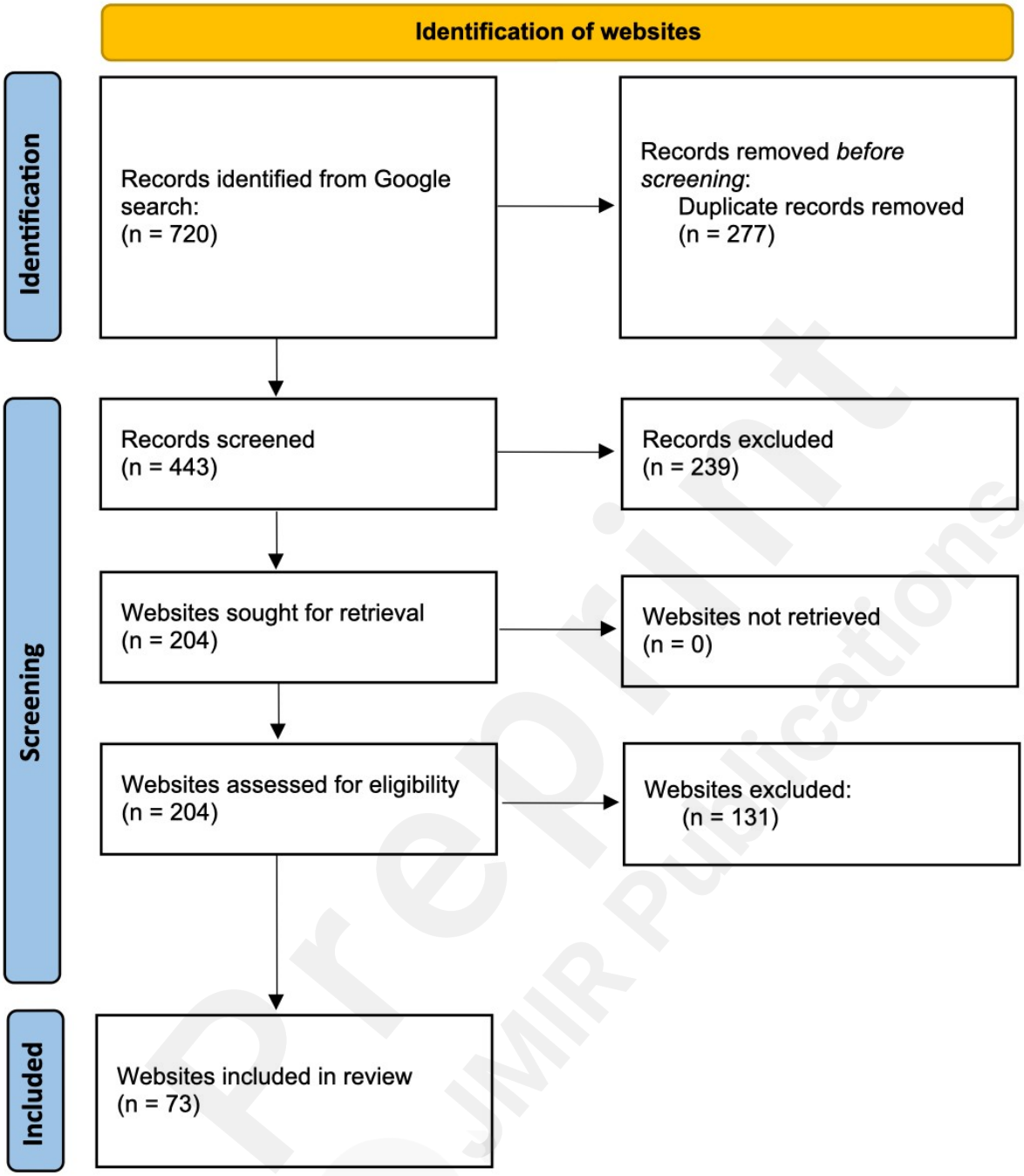



**Figure 1.** Flow diagram illustrating the stages of the website search process. Records were excluded during screening due to not being focused on foreign bodies (n=210), use of video or images with no text (n=20) and being aimed at an academic or professional, rather than general, audience (n=19).

## Results

*EQIP performance and demographics*

The breakdown of individual EQIP is illustrated in Supplementary Table 1. The overall median EQIP score was 21 with a maximum score of 29 (IQR 18-25). General EQIP data property is shown in Table 2 and the distribution of EQIP score is shown in Figure 2. The 75th percentile of the total EQIP score is 25 or above, achieved by 18 websites. These websites were considered high-scoring.

| | **Content** | **Identification** | **Structure** | **Overall EQIP** |
|---|---|---|---|---|
| **Median:** | 11 | 3 | 8 | 21 |
| **Minimum:** | 3 | 0 | 4 | 11 |
| **Maximum** | 15 | 6 | 10 | 29 |
| **Quartile 1:** | 9 | 2 | 7 | 18 |
| **Quartile 3:** | 13 | 4 | 8 | 25 |
| **IQR:** | 4 | 2 | 1 | 7 |
| **99th Percentile** | 15 | 5 | 10 | 29 |

Table 2 shows the median, minimum, maximum, and interquartile range (IQR) for the websites included, disaggregated for the Content, Identification and Structure domains of EQIP. The IQR shows considerable variation in the overall EQIP as well as the Content domain.

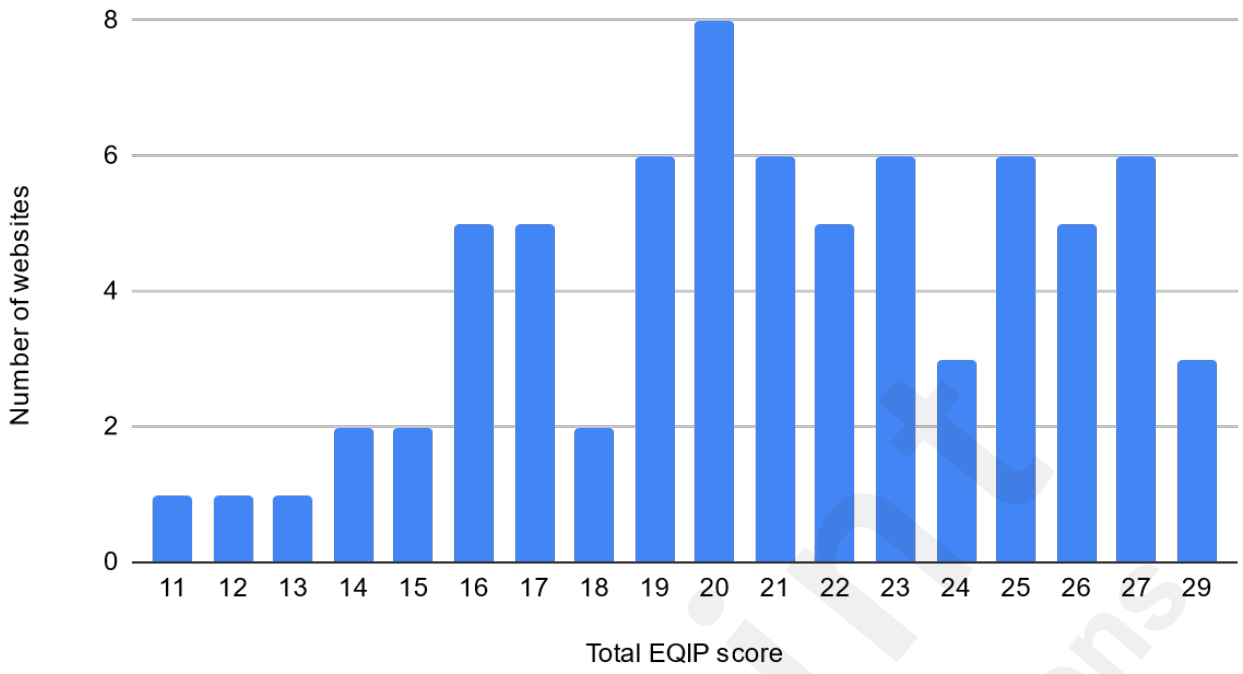



**Figure. 2**. Total EQIP score across overall websites assessed.

Sixty-three percent of websites originated from the USA, with a median EQIP score of 21. This was followed by Australian (n=10; median EQIP=21.5) and Canadian (n=9; median EQIP=23) websites. Australia-based websites (n=10) had the widest IQR of 7.75. One website originated from India, with an EQIP score of 26.

The most common source of information was Industry (n=21; 28.8%) and Government/ Health departments (n=15; 20.5%), with median EQIP scores of 21 and 23 respectively. Charity/Non-government organisations (n=2; 2.7%), on the other hand, had the lowest median EQIP score of 17.5 (Table 3).

**Table 3**. Descriptive analysis of websites grouped by country of origin and source of information

| | Articles n (%) | IQR | Median EQIP |
|---|---|---|---|
| Country | | | |
| India | 1 (1.4%) | 0 | 26.0 |

| | | | |
|---|---|---|---|
| Canada | 9 (12.3%) | 5 | 23.0 |
| Australia | 10 (13.7%) | 7.75 | 21.5 |
| USA | 46 (63%) | 5.75 | 21.0 |
| UK | 7 (9.6%) | 7 | 19.0 |
| Source of information | | | |
| Professional society (non-profit groups of healthcare professionals) | 11 (15.1%) | 6 | 24 |
| Government/Health Department | 15 (20.5%) | 7 | 23 |
| Patient group (primarily serve patients, such as Patient.info) | 1 (1.4%) | 0 | 23 |
| Hospital (any organisation that provides hospital care) | 11 (15.1%) | 5 | 22 |
| Industry (for-profit organisation within the medical industry, including clinics) | 21 (28.8%) | 8 | 21 |
| News Service (both primary and secondary news articles that are not written for professionals) | 2 (2.7%) | 0 | 20 |
| Academic centre (academic institutions) | 10 (13.7%) | 4 | 19.5 |
| Charity/Non-Governmental Organisation (oversee a broader demographic, like Red Cross and WHO) | 2 (2.7%) | 1.5 | 17.5 |

*EQIP: content data*

Overall content data median EQIP score was 11/18 (61%), with a maximum score of 15 (83%). All high-scoring websites met the requirements for Items 1, 2, 3, 4, 7, and 9. Most websites also mentioned alert signs that the patient may detect (Item 14) and provided coverage of all relevant issues for the topic (Item 18). However, many websites (93%; n=68) failed to address the medical intervention costs and insurance issues (Item 15).

*EQIP: identification*

The overall median score for the identification section obtained was 3/6 (50%), with a maximum score of 6/6 (100%; Table 2). Over 70% of the websites included Items 19,

20, 21. However, almost all websites (99%, n=72) failed to fulfil Item 24. The only website that included Item 24 had the highest EQIP of 29, achieved by *Healthdirect* from Australia. While there is no significant difference in overall EQIP score between different sources of information, the EQIP scores specifically for the identification domain showed significant differences.

*EQIP: structure*

The median score obtained for the structure domain was 8/12 (66%), and the highest score obtained was 10/12 (83%). All websites scored for Items 25, 27, 28, 29, 30, 32 and 33. 52% of the websites failed to achieve Items 31 and 35.

*Top EQIP scoring websites*

Only 3 websites (median EQIP score 29) fulfilled the EQIP cut-off score for the 99th percentile. Two of these were produced by *Healthdirect*, a Government website based in Australia, and the *Royal College of Emergency Medicine Learning*, a professional society website based in the UK.

*Readability assessment*

Overall, the websites' average FRES and FKGL scores were 63.9 (37.6-81.7) and 6.2 (3.90-11.0), respectively. These scores reflect an average reading age of 12.4 years old. Forty-one (56%) websites achieved the recommended 6$^{th}$ grade or below readability level (Figure 3). The FRES did not have statistically significant differences between countries.

Readability scores demonstrated statistically significant differences across sources of information: the GFI (p=0.024) and SMOG (p=0.029). In addition, the Pearson correlation showed no correlation between overall EQIP scores and the readability of website content.

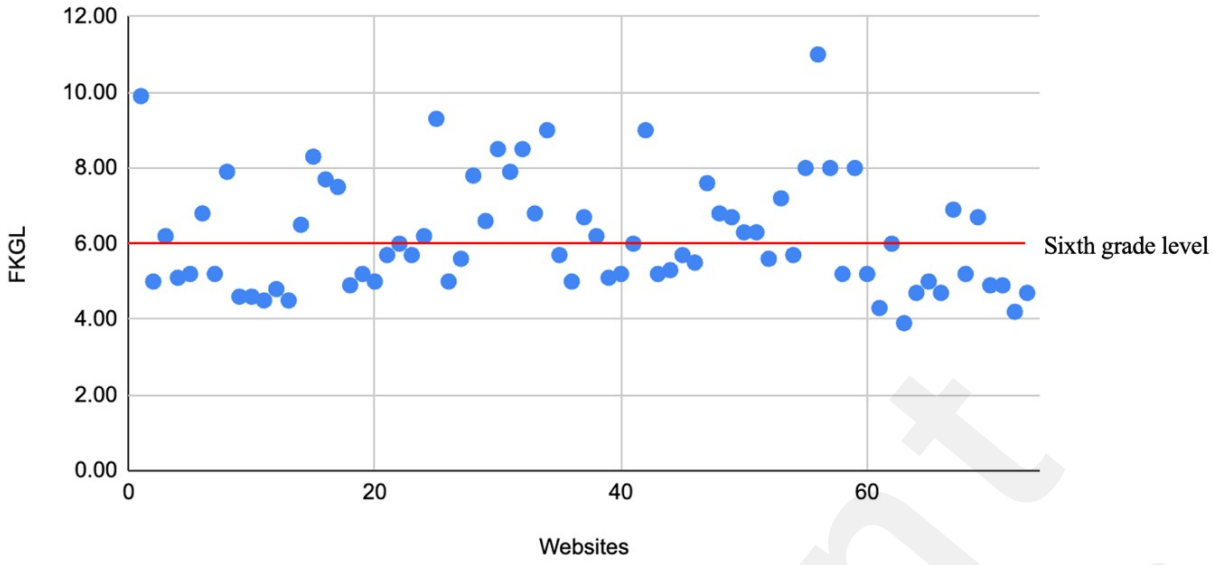



**Figure. 3.** Scatterplot analysis of FKGL scores; only three websites are at or below the recommended reading level (red line).

*Additional information*

Ninety-five percent (n = 69) of the websites mentioned the different types of FB, with disc battery being the most mentioned (n=51; 69.9%), followed by toys (n=30; 41.1%), peas/beans/nuts (n=28; 38.4%), insect (n=28; 38.4%), and bead (n=25; 34.2%). Only 14 (19.2%) websites mentioned magnets. Different removal methods have been discussed by 82% (n = 60) of the websites. FB removal by instruments was most mentioned (n=44; 60.3%), whereas endoscopic removal was least mentioned (n=9; 12.3%). Most websites 89% (n=65) provided patients with acute advice by advising them to seek immediate medical attention. 38.4% (n=28) advised patients to try and remove FB by themselves if safe to do so. Fewer than 10% of websites included first-aid measures, such as backslaps, encouraging coughing, and the Heimlich manoeuvre. Only 1 website discussed the mortality rate of FB and 6 websites mentioned overall complication rates.

## Discussion

This was the first study to evaluate online information available to patients regarding foreign bodies in the aero-digestive tract using validated tools like EQIP and various readability assessments [25]. The main finding suggests that the available information is of only moderate quality, with a median EQIP score of 21 (IQR 18-25, max 29). This is significantly lower than the maximum possible EQIP score of 36 [26]. The IQR of 7 indicates high variability in the quality of easily accessible foreign body information. The readability scores (FKGL: 6.2; GFI: 6.5; SMOG: 5.9; FRES: 12.4 years) suggested that the information was generally at the recommended 6th-grade reading level.

## Evaluation of Quality of Health Information

Although this is the first study on foreign bodies, previous studies investigating the quality of information on ENT conditions have also found online information to be of moderate or poor quality. A study of 295 websites offering information on rhinoplasty conducted by Shamil et al. [27] found a median EQIP score of only 17, which the authors noted may lead to unrealistic expectations among patients about the potential outcomes of rhinoplasty. More recent study by the same group found a median EQIP score of 20 when investigating the quality of online information relating to cosmetic injectable fillers [14]. The authors found that although the websites included (n = 172) did provide some information on the risks of fillers, the majority of websites failed to disclose major risks. It may be that the EQIP scores for information regarding elective, cosmetic procedures are lower than the present study (median EQIP=21) due to the urgent nature of foreign bodies and the desire to present information which could help with rapid decision-making.

In contrast to these studies, which investigated common elective procedures, the

urgent nature of foreign bodies means that financial considerations are unlikely to influence the presentation of information. Furthermore, it appears that commercial interests are not the key driver of a reduction in information quality: similarly poor content quality was seen in other infective conditions that affect airways, such as tonsillitis (median EQIP 19) [28] and COVID (median EQIP 17.8) [39]. This suggests that moderate and poor-quality information is likely the norm for ENT-related complaints regardless of its commercial influences.

To analyse the quality of information relating to foreign bodies in greater detail, the inclusion of specific guidance was also considered. Precautionary measures are an important aspect of foreign body guidance because they can prevent the occurrence of foreign body events in the first place [30]. For example, information about age-appropriate toys for young children can help to prevent ingestion, insertion and inhalation of small parts [31]. However, only 60% of the websites included in the present study contained any information on precautionary measures, suggesting this is a potential area for improvement and greater awareness. Clear advice about keeping small, ingestible objects out of reach of children and buying age-appropriate toys should be a priority for foreign body information [30].

Certain foreign bodies, such as peas, seeds, magnets, and disc batteries are particularly common [32]. Disc batteries specifically present a serious risk as the short distance between both faces of the battery can lead to electrical circuits being formed through tissue, leading to burns, perforations, and fistulations. It is recommended that button batteries lodged in the oesophagus are removed immediately, although they pose less of a threat when they enter the stomach due to the reduced risk of circuit formation with tissues [29]. Given its importance, this is inadequately reflected in the website cohort as only 70% mentioned it. Alternatively, peas are commonly inserted and were only mentioned in 38% of websites. If peas are not removed promptly from the nose, they can swell [33] which most websites failed to mention. Similarly, magnets are known to cause pressure necrosis but were only mentioned by 19% of websites

included in the study.

This highly varied discussion in risky foreign bodies suggests that items perceived to be particularly hazardous (e.g. batteries) receive more focus than 'safer' items like peas, seeds, and magnets. Without adequate emphasis on the high level of hazard to health, this may mislead patients or carers about potentially serious foreign body insertion. As well as the low prevalence of some risk factors in the online literature, there was also a lack of description of the complications caused by these foreign bodies and the management of these complications if they occur. Management approaches for complications were also absent in the majority (63%) of websites. Information should differentiate between cases where X-rays are suggested, such as disc battery or magnet ingestion, and those cases where the child is asymptomatic or has ingested a radio-translucent object [34].

When considering the advice and suggestions to resolve a foreign body event, websites tended to avoid advising self-management in favour of seeking professional medical assistance. Basic first aid measures such as backslaps, encouraging coughing, and the Heimlich manoeuvre [31] were mentioned in fewer than 10% of websites, while the vast majority (89%, n = 65) advised patients to seek immediate medical attention. This provision of caution advice may be useful in less acute presentations but, in cases of emergencies, having easily accessible first-aid information may save lives while awaiting medical attention to arrive.

As well as limited advice about first aid, only 38.4% (n = 28) of websites advised patients to try to remove foreign bodies themselves. Where discussed, this was stipulated to only do so when deemed safe. Part of the reason for this low figure may be due to difficulties in conveying when self-management is deemed safe [30] and that the information provider does not want to be held liable for the consequences of failed attempts. A standardised guideline or checklist produced by ENT specialists could be a way to provide reliable information on this subject. This could be released with an

open licence and sent directly to those websites which appear in the top Google results for common search terms. Another issue raised by the present research is whether the top Google search results reflect the highest-quality information available. As well as improving the quality of information, there is the potential for future research and practice to focus on adjusting search engine algorithms to promote better quality health information to higher positions in the results using artificial intelligence technologies.

Notably, the majority of websites (95%) provided information identifying “red flags” in a problematic foreign body event. This appropriately reflects the urgent nature of the emergency and at least provides the public with some interim advice while awaiting the attendance of a trained healthcare professional. Similarly, for incidents that are not immediately life-threatening, providing adequate information may assist with the self-triage process [35]. However, 52% of websites failed to provide balanced information about the benefits and risks of interventions to remove or treat foreign bodies, which could lead to patients inappropriately seeking medical intervention with potential iatrogenic complications, or failing to seek intervention when it is recommended.

Encyclopaedias, like Wikipedia, are often highly ranked across search engine results but, these were not included in our search. The most relevant Wikipedia article, *"Foreign Body Aspiration"* [36], contains useful information but its technical terminologies may be poorly aligned with the search terms used in this study. Research has shown [37] that Wikipedia can be a good source of health information if there is a concerted effort by those with sufficient knowledge and ability to edit the contents. However, patients should treat freely-editable websites with extra caution as laypersons will not be able to distinguish between high and low-quality Wikipedia entries. There does not appear to be any previous literature that has investigated EQIP scores for Wikipedia articles providing ENT information, but in studies into other health information, Wikipedia articles have performed similarly in terms of EQIP

scores to other sources [38].

## Evaluation of Readability of Health Information

Overall, the websites were of an appropriate literacy level to accommodate the varied literacy levels of the public. Three of the readability measures (FRES, FKGL, and GFI) accounted for the average sentence length, the number of words and the number of syllables per word to calculate a numerical measure of readability. Based on a recommended readability level of 11-12 years (6th grade) for health literature [15], the majority of websites (56%) were at or below this level but the mean FRES score was above it (12.4 years), with an average FKGL of 6.2. While the mean FRES was slightly above target, this can represent a generally acceptable range of readability of this content. Additionally, there was no correlation between readability and quality scores, suggesting that both high- and low-quality content were being produced at a generally acceptable readability level. This is comparable with previous studies which have shown a poor correlation between EQIP and readability measures [39].

## Limitations and further recommendations

Several limitations should be considered when interpreting this study. Firstly, the study was limited in scope to English language results and might not be representative of online advice on foreign bodies globally. Translational tools were avoided as their accuracy may influence the flow, content, and readability of content in other languages which would misrepresent the original content. Similarly, many eligible web pages were not captured within the first 3 pages of results, but this maintains validity as patients are unlikely to read beyond. Results also only represent a cross-sectional assessment as results are subject to change and are tailored to individual users' locations and search histories [40]. These tools were chosen as they were validated but their generalisability may still be affected by the subjective interpretation of assessors [41].

The FRES tool has been criticised for its reliance on the length of words as a means of

calculating readability [42]. When considering health-related literature, there may be long words that would be well-known to patients researching their condition, such as neuroblastoma, which raises the FRES score even though they do not impair readability. Therefore, this study utilises a combination of metrics to draw conclusions based on generalised readability scores, taking into account the number of sentences, words, and syllables.

Any future research and practice should focus on ways to improve the quality and readability of online information relating to foreign body insertion, ingestion, and inhalation. It would be beneficial to produce guidance for those writing online information containing the key risks posed by foreign bodies and providing clear guidance about when foreign body removal at home is safe and when further medical advice should be sought. To produce this guidance, an expert panel of ENT specialists should be consulted. The aim of this guidance should be to increase understanding in the community of how to recognise and deal with problematic foreign bodies. There is potential to improve the readability of the available online information using artificial intelligence technologies such as ChatGPT, which can write and rewrite the information in a variety of registers including simple English.

## Conclusion

This was the first study to investigate the quality and readability of online information about foreign body insertion, ingestion and inhalation using validated tools (EQIP and FRES). The main conclusions of the study were that most websites were of inadequate quality but generally had acceptable readability scores for public use. To improve the timely presentation and management of foreign bodies, the quality and readability of information available online should be improved to enable patients or family members to understand the risks presented by foreign bodies and when to take action. In particular, information should be provided about red flag foreign bodies such as disc batteries in all cases and precautionary measures to prevent foreign body events. Future research should focus on ways in which foreign body health information which

ranks highly on internet searches can be made high-quality and readable, such as through the dissemination of a standardised information pack produced by ENT professionals.

## References

1. Garg J, De Castro F, Puttasidiah P. Ear, Nose, and Throat Foreign Bodies in the Paediatric Population: Did the COVID-19 Lockdown Change Anything?. Cureus. 2022 Aug 11;14(8).

2. Birk M, Bauerfeind P, Deprez PH, Häfner M, Hartmann D, Hassan C, Hucl T, Lesur G, Aabakken L, Meining A. Removal of foreign bodies in the upper gastrointestinal tract in adults: European Society of Gastrointestinal Endoscopy (ESGE) Clinical Guideline. Endoscopy. 2016 Feb 10:489-96.

3. Sugawa C, Ono H, Taleb M, Lucas CE. Endoscopic management of foreign bodies in the upper gastrointestinal tract: a review. World journal of gastrointestinal endoscopy. 2014 Oct 10;6(10):475.

4. Leinwand K, Brumbaugh DE, Kramer RE. Button battery ingestion in children: a paradigm for management of severe pediatric foreign body ingestions. Gastrointestinal Endoscopy Clinics. 2016 Jan 1;26(1):99-118.

5. Sehgal IS, Dhooria S, Ram B, Singh N, Aggarwal AN, Gupta D, Behera D, Agarwal R. Foreign body inhalation in the adult population: experience of 25,998 bronchoscopies and systematic review of the literature. Respiratory Care. 2015 Oct 1;60(10):1438-48.

6. Altokhais TI, Al-Saleem A, Gado A, Al-Qahtani A, Al-Bassam A. Esophageal foreign bodies in children: Emphasis on complicated cases. Asian journal of surgery. 2017 Sep 1;40(5):362-6.

7. Orsagh-Yentis D, McAdams RJ, Roberts KJ, McKenzie LB. Foreign-body ingestions of young children treated in US emergency departments: 1995–2015. Pediatrics. 2019 May 1;143(5).

8. Rashid F, Davies L, Iftikhar SY. Magnetised intragastric foreign body collection and autism: an advice for carers and literature review. Autism. 2010 Mar;14(2):139-45.

9. Kodituwakku R, Palmer S, Prosad Paul S. Management of foreign body ingestions in children: button batteries and magnets. British journal of nursing. 2017 Apr 27;26(8):456-61.

10. Janz NK, Becker MH. The health belief model: A decade later. Health education quarterly. 1984 Mar;11(1):1-47.

11. Green EC, Murphy EM, Gryboski K. The health belief model. The Wiley encyclopedia of health psychology. 2020 Sep 2:211-4.

12. Lucerna A. Foreign Body Insertions: A Review. Treating patients who present with foreign body insertions requires a nonjudgmental and open-minded approach. Emergency Medicine. 2017;49(7):315-9.

13. Kwan L.Y., Yip H.C., Tan S., Fan K.S. A quality assessment of online patient information regarding tonsillitis using the EQIP tool. International Journal of Pediatric Otorhinolaryngology, 2022 159:111224. doi:10.1016/j.ijporl.2022.111224

14. Shamil E., North A.S., Fan K.S., D'Souza H., Kaladjiska M., & D'Souza A. (2022) The Quality of Online Information on Cosmetic Injectable Fillers: Current Status. Facial Plast Surg.38(2):124-130. doi: 10.1055/s-0041-1741502.

15. Szabó P, Bíró É, Kósa K. Readability and comprehension of printed patient education materials. Frontiers in Public Health. 2021 Nov 30;9:725840.

16. Sabaté LR, Diego L. Are we offering patients the right medicines information? A retrospective evaluation of readability and quality in online patient drug information. European Journal of Hospital Pharmacy. 2021 May 1;28(3):144-8.

17. Eleyan D, Othman A, Eleyan A. Enhancing software comments readability using flesch reading ease score. Information. 2020 Sep 7;11(9):430.

18. Grabeel KL, Russomanno J, Oelschlegel S, Tester E, Heidel RE. Computerized versus hand-scored health literacy tools: a comparison of Simple Measure of Gobbledygook (SMOG) and Flesch-Kincaid in printed patient education materials. Journal of the Medical Library Association: JMLA. 2018 Jan;106(1):38.

19. Christanti V, Naga DS, Benedicta C. Measuring Reading Difficulty Using Lexile Framework And Gunning Fog Index. Jurnal Teknik dan Ilmu Komputer. 2017 Mar 20.

20. Nuti SV, Wayda B, Ranasinghe I, Wang S, Dreyer RP, Chen SI, Murugiah K. The use of google trends in health care research: a systematic review. PloS one. 2014 Oct 22;9(10):e109583.

21. Raptis DA, Sinanyan M, Ghani S, Soggiu F, Gilliland JJ, Imber C. Quality assessment of patient information on the management of gallstone disease in the internet – A systematic analysis using the modified ensuring quality information for patients tool. HPB, 2019 Dec; 21(12): 1632–1640.

22. Verma M, Kishore K, Kumar M, Sondh AR, Aggarwal G, Kathirvel S. Google search trends predicting disease outbreaks: an analysis from India. Healthcare

524 informatics research. 2018 Oct 31;24(4):300-8.
525
526 23. Tan DJY, Ko TK, Fan KS. The Readability and Quality of Online Patient
527 Information on Nasopharyngeal Carcinoma: A Quantitative Content Analysis. JMIR
528 Formative Research. 25/10/2023:47762 (forthcoming/in press)
529
530 24. Huang G, Fang CH, Agarwal N, Bhagat N, Eloy JA, Langer PD. Assessment of
531 online patient education materials from major ophthalmologic associations. JAMA
532 ophthalmology. 2015 Apr 1;133(4):449-54.
533
534 25. Moult B, Franck LS, Brady H. Ensuring quality information for patients:
535 development and preliminary validation of a new instrument to improve the quality of
536 written health care information. Health expectations. 2004 Jun;7(2):165-75.
537
538 26. Ghani S, Fan KS, Fan KH, Lenti L, Raptis D. Using the ensuring quality
539 information for patients tool to assess patient information on appendicitis websites:
540 systematic search and evaluation. Journal of Medical Internet Research. 2021 Mar
541 26;23(3):e22618.
542
543 27. Shamil E, Scenza GD, Ghani SA, Fan KS, Ragulan S, Salem J, Šurda P, D'Souza
544 AR. A quality assessment of online patient information regarding rhinoplasty. Facial
545 Plastic Surgery. 2021 Sep 28;38(05):530-8.

546 28. Kwan LY, Yip HC, Tan S, Fan KS. A quality assessment of online patient
547 information regarding tonsillitis using the EQIP tool. International Journal of Pediatric
548 Otorhinolaryngology. 2022 Aug 1;159:111224.

549 29. Fan KS, Ghani SA, Machairas N, Lenti L, Fan KH, Richardson D, et al. COVID-
550 19 prevention and treatment information on the internet: a systematic analysis and
551 quality assessment. BMJ Open [Internet]. 2020 Sep 1 [cited 2020 Oct

12];10(9):e040487.Availablefrom:https://bmjopen.bmj.com/content/10/9/e040487

30. Montana A, Salerno M, Feola A, Asmundo A, Di Nunno N, Casella F, Manno E, Colosimo F, Serra R, Di Mizio G. Risk management and recommendations for the prevention of fatal foreign body aspiration: Four cases aged 1.5 to 3 years and mini-review of the literature. International journal of environmental research and public health. 2020 Jul;17(13):4700.

31. Lluna J, Olabarri M, Domènech A, Rubio B, Yagüe F, Benítez MT, Esparza MJ, Mintegi S. Recommendations for the prevention of foreign body aspiration. Anales de Pediatría (English Edition). 2017 Jan 1;86(1):50-e1.

32. Lou ZC. Analysis of nasal foreign bodies in 341 children. The Journal of Laryngology & Otology. 2019 Oct;133(10):908-12.

33. Gregori D, Salerni L, Scarinzi C, Morra B, Berchialla P, Snidero S, Corradetti R, Passali D, ESFBI Study Group. Foreign bodies in the upper airways causing complications and requiring hospitalization in children aged 0–14 years: results from the ESFBI study. European Archives of Oto-Rhino-Laryngology. 2008 Aug;265:971-8.

34. Green SS. Ingested and aspirated foreign bodies. Pediatrics in review. 2015 Oct 1;36(10):430-7.

35. Guazzo E, Burns H. Paediatric inhaled airway foreign bodies: An update. Australian Journal of General Practice. 2019 Apr;48(4):171-4.

36. Wikipedia. Foreign Body Aspiration. 2023 Feb 08. [Cited 2022 Oct 12]. https://en.wikipedia.org/wiki/Foreign_body_aspiration

37. Weiner SS, Horbacewicz J, Rasberry L, Bensinger-Brody Y. Improving the quality of consumer health information on Wikipedia: case series. Journal of Medical Internet Research. 2019 Mar 18;21(3):e12450.

576 38. Engelmann J, Fischer C, Nkenke E. Quality assessment of patient information on
577 orthognathic surgery on the internet. Journal of Cranio-Maxillofacial Surgery. 2020 Jul
578 1;48(7):661-5.

579 39. Jo JH, Kim EJ, Kim JR, Kim MJ, Chung JW, Park JW. Quality and readability of
580 internet-based information on halitosis. Oral surgery, oral medicine, oral pathology
581 and oral radiology. 2018 Mar 1;125(3):215-22.

582 40. Salehi S, Du JT, Ashman H. Use of Web search engines and personalisation in
583 information searching for educational purposes. Information Research: An
584 International Electronic Journal. 2018 Jun;23(2):n2.

585 41. Vågenes H, Pranić SM. Analysis of the quality, accuracy, and readability of patient
586 information on polycystic ovarian syndrome (PCOS) on the internet available in
587 English: a cross-sectional study. Reproductive Biology and Endocrinology. 2023
588 Dec;21(1):1-0.

589 42. Mousa GA, Elamir EA, Hussainey K. The effect of annual report narratives on the
590 cost of capital in the Middle East and North Africa: A machine learning approach.
591 Research in International Business and Finance. 2022 Dec 1;62:101675.

592

593 **Supplementary Table 1:** Aggregated EQIP performance breakdown of websites

594

595

| Item | Yes (n, %) | No (n, %) | N/A (n, %) |
|---|---|---|---|
| Content Data [1. Initial definition of which subjects will be covered] | 71 (97%) | 2 (3%) | 0 (0%) |
| Content Data [2. Coverage of the previously defined subjects (NA if the answer is “no” for item 1)] | 71 (97%) | 0 (0%) | 2 (3%) |
| Content Data [3. Description of the medical problem/treatment/procedure] | 68 (93%) | 5 (7%) | 0 (0%) |
| Content Data [4. Definition of the purpose of the interventions] | 60 (82%) | 13 (18%) | 0 (0%) |
| Content Data [5. Description of treatment alternatives (conservative management)] | 54 (74%) | 19 (26%) | 0 (0%) |
| Content Data [6. Description of the sequence of the interventions and surgical procedure] | 45 (62%) | 28 (38%) | 0 (0%) |
| Content Data [7. c] | 46 (63%) | 27 (37%) | 0 (0%) |
| Content Data [8. Description of the quantitative benefits to the patient] | 20 (27%) | 53 (73%) | 0 (0%) |
| Content Data [9. Description of the qualitative risks and complications] | 59 (81%) | 14 (19%) | 0 (0%) |
| Content Data [10. Description of the quantitative risks and complications] | 35 (48%) | 38 (52%) | 0 (0%) |
| Content Data [11. Addressing quality-of-life issues] | 21 (29%) | 52 (71%) | 0 (0%) |
| Content Data [12. Description of how complications are handled] | 27 (37%) | 46 (63%) | 0 (0%) |
| Content Data [13. Description of the precautions that the patient may take] | 43 (59%) | 30 (41%) | 0 (0%) |
| Content Data [14. Mention of alert signs that the patient may detect] | 69 (95%) | 4 (5%) | 0 (0%) |

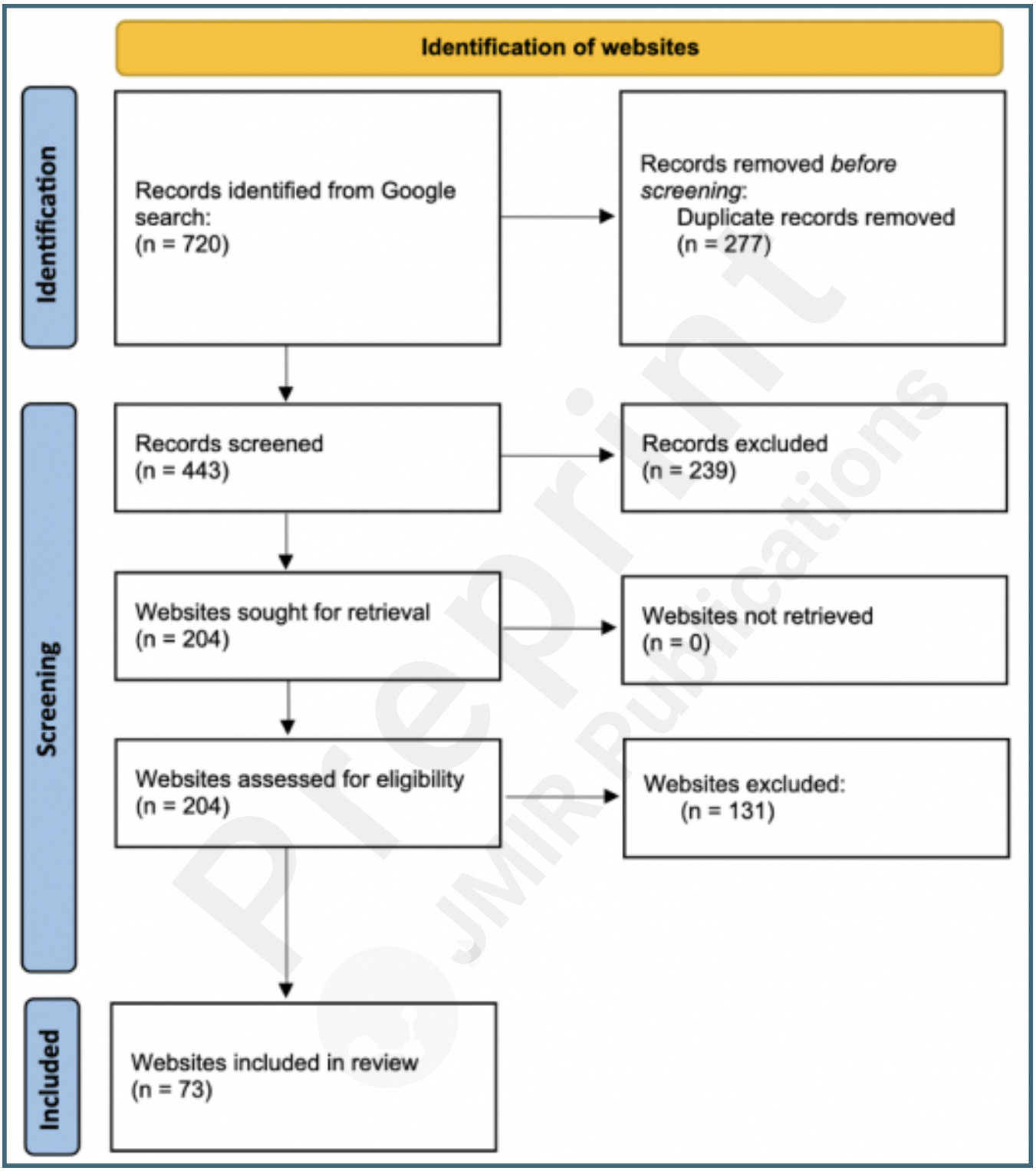
| | | | |
|---|---|---|---|
| Content Data [15. Addressing medical intervention costs and insurance issues] | 5 (7%) | 68 (93%) | 0 (0%) |
| Content Data [16. Specific contact details for hospital services (NA if not hospitals)] | 7 (10%) | 4 (5%) | 62 (85%) |
| Content Data [17. Specific details of other sources of reliable information/support] | 41 (56%) | 32 (44%) | 0 (0%) |
| Content Data [18. Coverage of all relevant issues for the topic (summary item for all content criteria)] | 39 (53%) | 34 (47%) | 0 (0%) |
| Identification [19. Date of issue or revision] | 53 (73%) | 20 (27%) | 0 (0%) |
| Identification [20. Logo of the issuing body] | 65 (89%) | 8 (11%) | 0 (0%) |
| Identification [21. Names of the persons or entities that produced the document] | 54 (74%) | 19 (26%) | 0 (0%) |
| Identification [22. Names of the persons or entities that financed the document] | 8 (11%) | 65 (89%) | 0 (0%) |
| Identification [23. Short bibliography of the evidence-based data used in the document] | 27 (37%) | 46 (63%) | 0 (0%) |
| Identification [24. Statement about whether and how patients were involved/consulted in the document's production] | 1 (1%) | 72 (99%) | 0 (0%) |
| Structure data [25. Use of everyday language and explanation of complex words or jargon] | 72 (99%) | 1 (1%) | 0 (0%) |
| Structure data [26. Use of generic names for all medications or products (NA if no medications described)] | 6 (8%) | 1 (1%) | 66 (90%) |
| Structure data [27. Use of short sentences (<15 words on average)] | 73 (100%) | 0 (0%) | 0 (0%) |
| Structure data [28. Personal address to the reader] | 63 (86%) | 10 (14%) | 0 (0%) |
| Structure data [29. Respectful tone] | 73 (100%) | 0 (0%) | 0 (0%) |
| Structure data [30. Clear information (no ambiguities or | 71 | 2 (3%) | 0 (0%) |

| | | | |
|---|---|---|---|
| contradictions)] | (97%) | | |
| Structure data [31. Balanced information on risks and benefits] | 35 (48%) | 38 (52%) | 0 (0%) |
| Structure data [32. Presentation of information in a logical order] | 72 (99%) | 1 (1%) | 0 (0%) |
| Structure data [33. Satisfactory design and layout (excluding figures or graphs; see next item)] | 70 (96%) | 3 (4%) | 0 (0%) |
| Structure data [34. Clear and relevant figures or graphs (NA if absent)] | 13 (18%) | 0 (0%) | 60 (82%) |
| Structure data [35. Inclusion of a named space for the reader's notes or questions] | 7 (10%) | 66 (90%) | 0 (0%) |
| Structure data [36. Inclusion of a printed consent form contrary to recommendations (NA if not from hospitals)] | 0 (0%) | 11 (15%) | 62 (85%) |

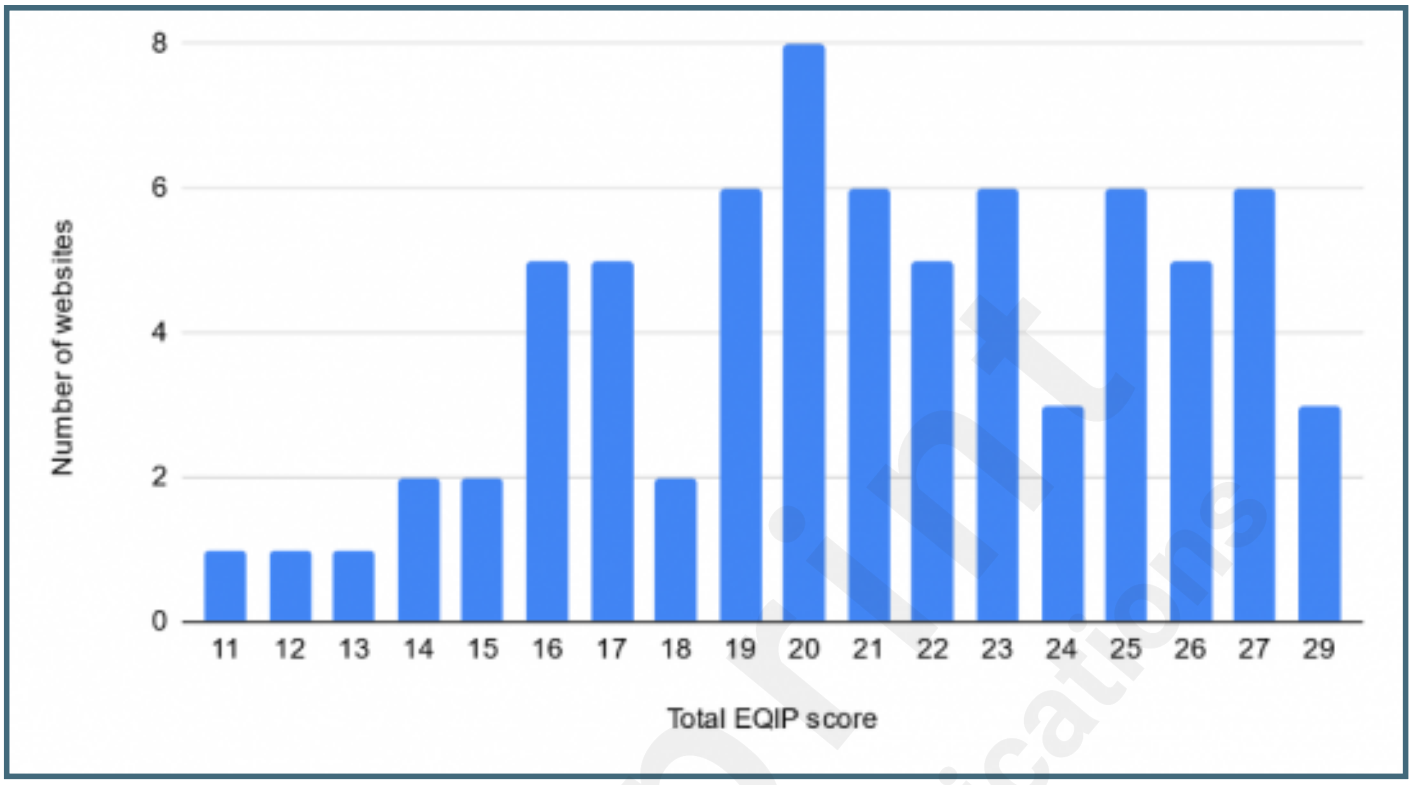
# Supplementary Files

# Figures

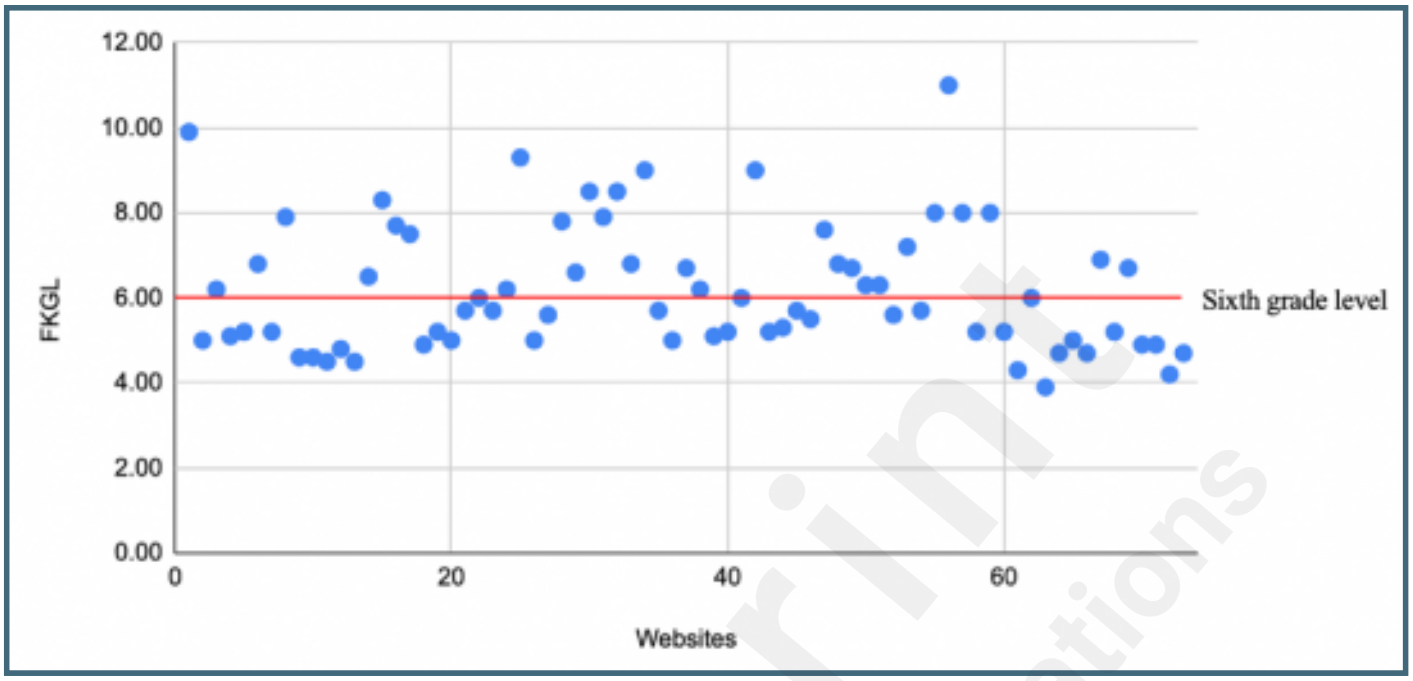
Flow diagram illustrating the stages of the website search process.



Total EQIP score across overall websites assessed.



Scatterplot analysis of FKGL scores; only three websites are at or below the recommended reading level (red line).



# Multimedia Appendixes

Supplementary Table 1: Aggregated EQIP performance breakdown of websites.
URL: http://asset.jmir.pub/assets/135433c142a0fa2d4d688cb5cd636a02.docx