Readability of online educational materials for brainstem implants: An assessment

Beyin sapı implantları için çevrimiçi eğitim materyallerinin okunabilirliği: Bir değerlendirme

Mustafa Said Tekin[1], Yaşar Kemal Duymaz[2]

[1] Department of Ear Nose and Throat, Faculty of Medicine, Medipol Mega Hospital, Medipol University

[2] Division of Ear Nose and Throat, Ümraniye Training and Research Hospital, Health Sciences University

Abstract

Aim: This study aimed to assess the readability of online patient education materials related to brainstem implants and to determine how comprehensible these materials are for patients and their families.

Methods: Using Google Search with the term "auditory brainstem implant", the first 50 websites were identified and categorized into two: Hospital and General Information Websites. Non-educational texts were removed from each site, and readability was assessed using six established readability tests. The readability scores for the texts were automatically calculated using a dedicated online tool.

Results: Overall, all websites were found to have a high level of readability, surpassing the recommended 6th-grade reading level suggested by the American Medical Association. No significant difference was found between the readability scores of hospitals and general information websites.

Conclusions: The online patient education materials concerning brainstem implants typically exceed the recommended reading levels, which may hinder patients and their families from fully understanding these materials. There's a need for health professionals and institutions to strike a balance between scientific accuracy and readability to cater to a broader audience and make their materials more accessible.

Keywords: Auditory brain stem implants; patient education; readability; teaching materials

Öz

Amaç: Bu çalışma, beyin sapı implantlarıyla ilgili çevrimiçi hasta eğitim materyallerinin okunabilirliğini değerlendirmeyi ve bu materyallerin hastalar ve aileleri için ne kadar anlaşılabilir olduğunu belirlemeyi amaçlamaktadır.

Yöntemler: "Odyolojik beyin sapı implantı" terimi ile Google Arama kullanılarak ilk 50 web sitesi belirlendi ve iki kategoriye ayrıldı: Hastane ve Genel Bilgi Web Siteleri. Her siteden eğitimle ilgili olmayan metinler kaldırıldı ve okunabilirlik, altı kurulu okunabilirlik testi kullanılarak değerlendirildi. Metinlerin okunabilirlik puanları, özel bir çevrimiçi araç kullanılarak otomatik olarak hesaplandı.

Bulgular: Genel olarak, tüm web sitelerinin okunabilirlik seviyesi yüksek bulundu ve Amerikan Tıp Birliği'nin önerdiği 6. sınıf okuma seviyesini aştı. Hastane ve genel bilgi web sitelerinin okunabilirlik puanları arasında anlamlı bir fark bulunmadı.

Sonuçlar: Beyin sapı implantlarıyla ilgili çevrimiçi hasta eğitim materyalleri, genellikle önerilen okuma seviyelerini aşmaktadır, bu da hastaların ve ailelerinin bu materyalleri tam olarak anlamalarını engelleyebilir. Sağlık profesyonellerinin ve kurumların, daha geniş bir kitleye hitap etmek ve materyallerini daha erişilebilir kılmak için bilimsel doğruluk ve okunabilirlik arasında bir denge kurmaları gerekmektedir.

Anahtar Sözcükler: Hasta eğitimi; işitsel beyin sapı implantları; okunabilirlik; öğretim gereçleri

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Yazışma yazarı/Corresponding author

Mustafa Said Tekin
Medipol Üniversitesi,Tıp Fakültesi, Medipol Mega Hastanesi, Kulak Burun Boğaz Kliniği, İstanbul, Türkiye.
E-mail: msaidtekin@gmail.com

ORCID
Mustafa S. Tekin: 0000-0002-7051-4926
Yaşar K. Duymaz: 0000-0002-4887-4677

INTRODUCTION

Education and information play a critical role in the success of medical treatments and interventions (1). In this context, it is crucial for patients and their families to have a comprehensive understanding of medical processes. Particularly in recent years, with the increased accessibility of medical information via the Internet, the significance of online patient education materials has become even more pronounced (2).

In the field of Otorhinolaryngology (ENT), complex procedures such as brainstem implants not only represent a physiological intervention for patients but also carry an associated psychological burden. Therefore, it is crucial that patient education materials not only convey scientifically accurate information but are also presented at a level that patients can readily understand.

The brainstem implant is a procedure performed to restore hearing ability in patients with hearing loss (3). However, the intricacies of this procedure, accompanied by its inherent risks and benefits, necessitate that patients have access to accurate information. Especially for such complex interventions, patients need clear and comprehensible information to actively participate in the decision-making process and make informed choices regarding their treatment.

In this study, we aimed to evaluate the readability levels of online patient education materials related to brainstem implants, determining the extent to which these materials are comprehensible for patients and their families.

MATERIAL AND METHODS

Utilizing the most commonly used search engine, Google Search, patient education materials related to brainstem implants were identified on June 14, 2023. The search term "auditory brainstem implant" was employed. Advanced search filters were set to include only the exact phrases and the English language. The first 50 websites were evaluated. Duplicative websites, academic journals, videos, and websites containing only graphics or tables were excluded from the study. Since this study did not involve human or animal subjects, ethical committee approval was not required.

The articles were divided into two categories: Hospital and General Information Websites. The 'Hospital' category included hospitals that provide treatment or surgical interventions for brainstem implants. The 'General Information Websites' were from non-clinical entities offering general public health information.

Each text was saved into separate Microsoft Word (version 2010; Microsoft, Redmond, WA) documents. Webpage navigations, copyright notices, disclaimers, author details, feedback surveys, links, website URLs, references, figures, tables, captions, addresses, and phone numbers or any other non-educational related texts were removed to prevent influencing the readability scores.

For each article, readability scores were assessed using the following tests: Flesch reading ease (FRE), Flesch–Kincaid grade level (FKGL), Gunning–Fog index (GFI), Simple Measure of Gobbledygook (SMOG), Coleman–Liau index (CLI), and Automated Readability Index (ARI). The readability scores for the texts were automatically calculated by transferring them to https://www.webfx.com/tools/read-able/.

Statistical Analyses

Mean, standard deviation, median, minimum, maximum value frequency, and percentage were used for descriptive statistics. The distribution of variables was checked with Kolmogorov-Simirnov Test. Independent Samples T Test was used for the comparison of quantitative data. Statistical Package for the Social Sciences software for Windows, version 28.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis.

RESULTS

The readability levels of all the websites were as follows: The average score for FRE (Flesch Reading Ease) was 42.0 ± 8.0. For FKGL (Flesch–Kincaid Grade Level), the average score was determined to be 12.6 ± 2.0. The Gunning FOG had an average value of 14.9 ± 2.2, SMOG recorded an average of 11.0 ± 1.6, CLI (Coleman–Liau Index) reported an average of 14.0 ± 1.2, and the ARI (Automated Readability Index) was established at 12.8 ± 2.4 (Table 1).

For the FRE (Flesch Reading Ease), the Hospital Group exhibited an average of 43.9 ± 10.0, in comparison to the General Information Websites Group's aver-

Table 1. Descriptive analysis of readability metrics for the assessed websites

	Min-Max	Median	Mean±SD
FRE	33.8 - 57.9	40.4	42.0 ± 8.0
FKGL	9.4 - 15.3	13.0	12.6 ± 2.0
Gunning FOG	11.4 - 18.1	15.2	14.9 ± 2.2
SMOG	8.5 - 13.5	11.4	11.0 ± 1.6
CLI	11.1 - 16.0	14.0	14.0 ± 1.2
ARI	9.3 - 16.0	13.2	12.8 ± 2.4

FRE: Flesch Reading Ease, FKGL: Flesch-Kincaid Grade Level, Gunning FOG: Gunning–Fog index, SMOG: Simple Measure of Gobbledygook, LI: Coleman–Liau index, ARI: Automated Readability Index, SD: Standard deviation, Min: Minimum, Max: Maximum

Table 2. Comparative analysis of readability metrics between hospital and general information websites

	Hospitals group		General information websites group		p
	Mean±SD	Median	Mean±SD	Median	
FRE	43.9 ± 10.0	41.1	40.2 ± 5.6	39.9	0.418 [t]
FKGL	11.9 ± 2.2	12.7	13.2 ± 1.7	13.5	0.229 [t]
Gunning FOG	14.4 ± 2.5	14.6	15.4 ± 2.0	16.2	0.292 [t]
SMOG	10.7 ± 1.8	11.1	11.4 ± 1.3	11.8	0.275 [t]
CLI	13.8 ± 1.7	14.0	14.1 ± 0.6	14.0	0.753 [t]
ARI	11.9 ± 2.5	12.2	13.7 ± 2.1	14.6	0.174 [t]

[t]Independent Sample t test
FRE: Flesch Reading Ease, FKGL: Flesch-Kincaid Grade Level, Gunning FOG: Gunning–Fog index, SMOG: Simple Measure of Gobbledygook, LI: Coleman–Liau index, ARI: Automated Readability Index, SD: Standard deviation, Min: Minimum, Max: Maximum

age of 40.2 ± 5.6. The difference between the two groups was not statistically significant (p=0.418). Regarding the FKGL (Flesch–Kincaid Grade Level), the Hospital Group's average stood at 11.9 ± 2.2, while the General Information Websites Group demonstrated an average of 13.2 ± 1.7. The distinction between these groups was not found to be statistically significant (p=0.229). For the Gunning FOG, the Hospital Group's average was 14.4 ± 2.5, contrasting with the General Information Websites Group's average of 15.4 ± 2.0. This difference wasn't statistically significant (p=0.292). In the case of SMOG, the Hospital Group averaged 10.7 ± 1.8, whereas the General Information Websites Group averaged 11.4 ± 1.3, with no statistically significant difference (p=0.275). For the CLI (Coleman–Liau Index), the Hospital Group recorded an average of 13.8 ± 1.7, compared to the General Information Websites Group's average of 14.1 ± 0.6. The distinction was not statistically significant (p=0.753). Lastly, for the ARI (Automated Readability Index), while the Hospital Group presented an average of 11.9 ± 2.5, the General Information Websites Group's average was 13.7 ± 2.1. The variation between these entities was not deemed statistically significant (p=0.174) (Table 2).

DISCUSSION AND CONCLUSION

The readability of patient education materials related to brainstem implants is crucial for the efficacy of patient education and information. Our study evaluated the readability levels of patient education materials found in the top 14 websites accessed via Google Search. Our analysis determined that there was no significant difference in terms of FRE, FKGL, Gunning FOG, CLI, and ARI values between hospital and general information websites. However, all websites were observed to be of a high level in terms of readability.

The American Medical Association has suggested that the 6th-grade reading level is the ideal standard for patients and their families to access medical information (4,5). Nonetheless, our research indicated that the materials presented on brainstem implants do not

align with this recommended level. This is particularly concerning for hospital websites, which directly serve the purpose of treatment and surgical intervention and hence should be comprehensible for patients.

Previous literature reported that materials related to otolaryngology also exceeded the 6th-grade reading level. Sax et al. evaluated online patient education materials targeted at patients' parents left with hearing screening tests. They concluded that the readability of online materials was much more challenging than recommended levels. Provider-oriented websites were found to have more challenging readability than patient-oriented sites. They consequently suggested a revision of all online materials (6). Another study examining online information related to tinnitus reported that all 134 websites were far from the suggested readability level (7). Kong and colleagues focused on the readability of online tracheostomy care patient education materials. They discerned that the online materials substantially exceeded the recommended reading level, with professional websites being less readable than patient-oriented ones (8). A study examining online patient education materials related to idiopathic subglottic stenosis categorized websites into Professional-targeted and Patient-targeted. Overall, the websites' readability levels were found to be above the recommended levels, with patient-targeted websites being more readable (9). Research into online materials related to parathyroidectomy concluded that none of the materials met the recommended reading level (10). This study similarly reveals a consistent trend in the domain of brainstem implants. This might indicate that medical informational materials are generally written at higher reading levels.

Many websites utilize intricate terminology and expressions requiring specialization, aiming to provide scientific accuracy and detailed information. This underscores the necessity to strike a balance between readability and scientific precision. Providing information that parents and patients find challenging to comprehend does not yield effective patient education and information.

Readability scores do not evaluate a website's scientific accuracy. Future studies should incorporate criteria that assess the scientific accuracy and the currency of such materials. Nevertheless, this study distinctly illustrates that educational materials concerning brainstem implants typically do not meet recommended readability levels. This implies that patients and their families might struggle to understand these materials. Thus, there is an imperative need for health professionals to advocate for these materials to be written in more comprehensible language.

This study has several limitations. Firstly, it is based solely on searches via the Google Search engine. Therefore, the findings cannot be generalized for the entire internet as results from other popular search engines weren't considered. Secondly, the search was limited to the English language, implying that educational materials in other languages weren't evaluated in this study. Thirdly, only the first 50 websites were taken into account, which means other potentially valuable and relevant sites might have been overlooked. Fourthly, readability scores do not evaluate a website's scientific precision. Lastly, websites are dynamic entities, continuously updated. Thus, the outcomes of this study represent the information as of its date, and websites might have been updated or changed subsequently.

The readability of patient education materials concerning brainstem implants is crucial for patients to better comprehend their treatment processes and make informed decisions. This study demonstrates that the majority of popular online materials exceed the recommended reading levels, suggesting a prevalent trend across general medical informational materials. The complexity of these medical informational materials might stem from efforts to maintain scientific accuracy and provide detailed information. However, the necessity for these materials to be comprehensible to patients and their families underscores the imperative to strike a balance between scientific precision and readability. The primary goal of patient education and information is not merely to provide knowledge but to effectively convey it. Therefore, health professionals and institutions should curate their materials to cater to a broad audience and revise them as needed.

Conflict-of-interest and financial disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

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