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Short Communication

Gender-affirming vaginoplasty online resources exceed patient health literacy: A readability analysis

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ARTICLE INFO

Article history:

Received 16 December 2023

Accepted 4 April 2024

Available online 7 April 2024

Keywords:

Health literacy

Healthcare disparities

Health services for transgender persons

Vaginoplasty

Patient educational resources

Readability

ABSTRACT

Purpose: Ensuring that educational materials geared toward transgender and gender-diverse patients are comprehensible can mitigate barriers to accessing gender-affirming care and understanding postoperative care. This study evaluates the readability of online patient resources related to gender-affirming vaginoplasty.

Methods: Online searches for vaginoplasty were conducted in January 2023 using two search engines. The readability scores of the top ten websites and their associated hyperlinked webpages were derived using ten validated readability tests.

Results: A total of 40 pages were assessed from the vaginoplasty searches. The average reading grade level for all the webpages with relevant educational materials was 13.3 (i.e., college level), exceeding the American Medical Association's recommended 6th grade reading level.

Conclusion: Complex patient resources may impede patients' understanding of gender-affirming vaginoplasty. Online patient edu-

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cation resources should be created that are more accessible to patients with diverse reading comprehension capabilities.

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Transgender and gender-diverse (TGD) patients face many obstacles to obtaining surgical care. This includes the limited number of surgeons performing gender-affirming surgeries, the skewed geographic distributions of these surgeons, and systemic and provider-level bias and discrimination.¹ Together, these barriers may cause TGD patients to increasingly rely on internet sources for information regarding gender-affirming procedures.²

Health literacy may be a barrier to accessing vaginoplasty given its complexity. The American Medical Association (AMA) recommends publishing patient information at or below a 6th grade reading level. Despite these recommendations, prior research has shown that online patient resources for GAS are consistently written at levels too complex for many patients to understand.³ As such, we sought to examine the readability of vaginoplasty educational materials geared toward TGD patients.

Online searches of two search engines, Google (Mountain View, CA, USA) and Microsoft Bing (Redmond, WA, USA), were performed in January 2023 using the term “vaginoplasty.” The top 10 most popular hits shared between the two search engines that provided patient-oriented information on vaginoplasty were included in the study. For each of these hits, additional educational pages that were hyperlinked from the original page were also assessed. Sponsored pages, advertisements, professional bios, and other pages without patient educational materials were excluded. Cookies and location services were disabled prior to searches to reduce the risk of bias in the results. The readability scores were derived for ten validated tests using Readability Studio Professional Edition (Oleander Software version 2020, Vandalia, OH, USA): Coleman-Liau, Flesch-Kincaid, Flesch Reading Ease (FRE), FORCAST, Fry, Gunning Fog, New Dale-Chall, New Fog Count, Raygor Estimate, and Simple Measure of Gobbledygook. No IRB approval was necessary due to the sole inclusion of publicly available data.

The top 10 websites from the Google and Bing searches are displayed in [Table 1](#). Seven of the parent sites were from large academic centers or from the American Society of Plastic Surgeons. An additional 30 webpages were gathered from hyperlinked webpages on the 10 parent sites, yielding a total of 40 webpages for further analysis. The number of webpages varied by parent site due to the quantity of hyperlinked articles, ranging from 13 hyperlinked webpages on Wikipedia and one hyperlinked webpage each from University Hospitals, Johns Hopkins, Healthline, and WebMD.

The average reading grade level for all webpages with relevant educational materials was 13.3, which is equivalent to a college reading level. The readability levels ranged from 10.1 to 16 across the various tests. None of the websites had a mean reading grade level at the recommended level of 6th grade or below.

Table 1
Aggregate readability grade level scores.

Test	N	Mean reading grade score	Minimum	Maximum
Coleman-Liau	40	13.2	10.3	16.4
Flesch-Kincaid	40	12.6	8	18.7
FORCAST	40	11.8	10.3	13.6
Fry	31	16	10	17
Gunning Fog	40	15.3	9.7	19
New Dale-Chall	40	13.2	9.5	16
New Fog Count	40	10.1	5.4	17.7
Raygor Estimate	29	14	9	17
Simple Measure of Gobbledygook	40	14.6	10.6	19

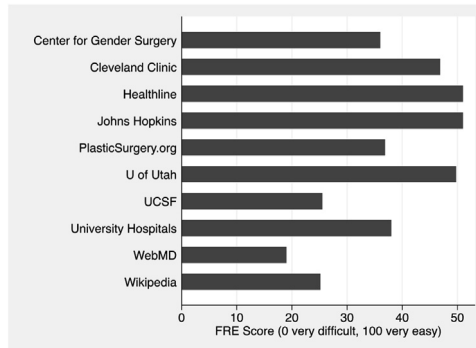


Figure 1. Mean Flesch Reading Ease score by website (“plain English” 60+).

(Submitted Separately).

Abbreviations: FRE, Flesch Reading Ease; U of Utah, University of Utah; UCSF, University of California, San Francisco.

The FRE test uses sentence and syllable length to calculate readability. In this model, a score of 80–90 represents a 6th grade reading level, and a score of 60–70 represents 8th or 9th grade and is considered plain English. Scores of 50–60 correspond to 10th to 12th grade reading levels and scores of 30–50 to college reading levels; these ranges are termed “fairly difficult” and “difficult”, respectively. Fig. 1 displays the mean FRE scores for each website. When evaluating the webpages by parent site, the mean article by FRE score of every parent site was deemed “fairly difficult”, “fairly difficult/difficult”, or “difficult”. None of the websites had an FRE score that is considered plain English (60 and above).

The results of this study highlight that 10 of the most popular online resources for patients seeking gender-affirming vaginoplasty are written above recommended reading levels. The articles were, on average, written at high school or college reading levels. Nearly all of the individual 40 articles reviewed would be too complex for many patients to fully comprehend.

While online resources may serve as important information sources for patients interested in gender-affirming vaginoplasty, usage of internet sources may be hindered for those with limited health literacy or English proficiency. Reduced health literacy may complicate obtaining informed consent, understanding a surgery’s associated risks and benefits, and adhering to preoperative and post-operative instructions.⁴ The consequences of limited health literacy can be severe and can contribute to worsened outcomes and health disparities.⁴

Though this analysis was limited to the readability of online resources provided in text format, the findings of this study represent an opportunity to improve the accessibility of patient education materials for gender-affirming vaginoplasty. Suggestions to improve readability could include using short sentences, selecting familiar words, and using a conversational style tone.⁵ Medical jargon should be limited and explained when necessary. Articles should also indicate their readability levels to aid patients in identifying resources that may be more appropriate for them.⁵ Finally, TGD patients should ideally be included in the development of education materials and their feedback should be solicited. The authors hope this study will herald creation of online patient education resources that are more accessible to patients of varied reading levels.

Funding information

The authors received no funding in support of this project.

Ethical approval

Not required.

Declaration of competing interest

The authors have no conflicts of interest to report.

CRedit authorship contribution statement

Amitai S. Miller: Data curation, Investigation, Writing – original draft. **Shawheen J. Rezaei:** Formal analysis, Visualization, Writing – original draft. **Oren Ganor:** Conceptualization, Supervision, Writing – review & editing.

Acknowledgment

None.

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