A Comparative Analysis of Online Education Resources for Patients Undergoing Endoscopic Transsphenoidal Surgery

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■ OBJECTIVE: **Endoscopic transsphenoidal surgery has become the most commonly performed surgical procedure for pituitary tumor removal. As such, there are many patient-oriented educational materials on the technique available online for members of the public who desire to learn more about the surgery. It has been recommended that educational resources be written to the national average reading level, which in the United States is between sixth and seventh grade. This study assesses the reading level of the educational materials currently available online for endoscopic transsphenoidal surgery and determines whether these resources are written at a suitable comprehension level for most readers.**

■ METHODS: **Sixteen patient educational resources describing endoscopic transsphenoidal surgery were identified online and assessed using 4 standard readability assessments.**

■ RESULTS: **Patient educational resources written for endoscopic transsphenoidal surgery are written far above the recommended reading level of sixth grade.**

■ CONCLUSIONS: **The online educational resources written for patients about endoscopic transsphenoidal surgery are above the recommended reading level for patient education materials. Further revisions to simplify these resources on endoscopic transsphenoidal surgery are needed to ensure that most patients can comprehend this important material and make informed decisions about their health care.**

INTRODUCTION

The Internet has become a primary resource for health information for patients and others seeking general knowledge about medical procedures. The transition from the standard transbuccal, transseptal transsphenoidal surgery to the now more commonly performed endoscopic transsphenoidal surgery to remove pituitary tumors has led to a selection of online patient educational resources describing the procedure. Due to the technical specificity of the surgery, these patient resources about endoscopic transsphenoidal surgery often contain explanations that use sophisticated medical terminology. Because these educational materials are meant to aid patients without a medical background, it is important to consider whether the materials available online for endoscopic transsphenoidal surgery are easily comprehended by most readers.

A 2006 U.S. Department of Education study indicates that only 12% of English-speaking adults are considered to have proficient health literacy, whereas 36% have basic or below basic health literacy (10). In an attempt to make online medical resources more accessible to those with low health literacy, it is recommended that educational, patient-based medical documents be written at a sixth to seventh grade reading level (2, 12). It is the goal of this study to assess the readability of currently available online endoscopic transsphenoidal surgery resources to assure maximal patient understanding of the procedure.

METHODS

Educational resources written specifically for patients planning to undergo transsphenoidal surgery for pituitary tumor removal were identified using a Google search with the key term endoscopic transsphenoidal surgery. The search yielded 16 documents from professional medical websites discussing endoscopic

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transsphenoidal surgery (see **Table 1** for a list of resources and their sponsoring institutions) (3).

Each resource was then subjected to 4 readability tests to determine the average grade level of the educational material. The readability tests completed for each resource included Fry Readability Graphical Analysis, SMOG Grading, Gunning FOG Index, and Flesch Reading Ease (12, 14). Each test was completed by hand, as suggested by the U.S. Department of Health and Human Services (TOOLKIT on using readability formulas) for each of the 16 resources (14).

The four readability tests were selected based on their suggested use by U.S. Department of Health and Human Services (12, 14). Readability tests are normally used as a guide for determining approximate reading difficulty rather than absolute grade level, thus 4 separate tests were used to determine an average reading difficulty on each of the 16 educational resources. Each test uses slightly different criteria to produce a grade level, allowing different aspects of the educational writing to be taken into account. Fry Graphical Analysis determines grade level of a particular text by plotting the number of sentences against the number of syllables averaged across three 100-word sections (**Figure 1**) (8, 14). The SMOG Grading formula uses the number of polysyllabic (>2 syllables) words within 30 sentences (spread across the text) to determine the grade level using the following formula (14):

$$Grade\ level = \sqrt{Polysyllabic\ count} + 3.$$

The Gunning FOG Index uses yet a different set of criteria, assigning a grade level using a formula based on average sentence length and percentage of polysyllabic words in the text (9):

$$Grade\ level = 0.4 \times \left(\left(\frac{Number\ of\ words}{Number\ of\ sentences} \right) + 100 \times \left(\frac{Polysyllabic\ count}{Number\ of\ words} \right) \right).$$

Finally, the Flesch Reading Ease uses a formula relying on average sentence length and the average number of syllables per word. Rather than assigning an exact grade level to the text, the Flesch Reading Ease gives a score between 0 and 100 using the following formula:

$$Reading\ ease = 206.835 - (1.1015 \times ASL) - (84.6 \times ASW),$$

where ASL, average sentence length; ASW, average number of syllables per word.

Higher scores on the Flesch Reading Ease test indicate an easier reading level (**Table 2**) (14).

The 4 readability tests were completed by hand to avoid possible errors with readability computer programs. To use readability computer programs, texts must be altered to ensure that the computer program can correctly identify appropriate sentence breaks in unclear sections such as bullet pointed lists (a common feature in patient educational materials). As each readability test is fairly simple, it can be more efficient to complete the tests by hand, removing the need to alter each text to be compatible with computer programs. In addition, completion of readability tests

Table 1. Readability Scores for Patient-Based Online Resources for Endoscopic Transsphenoidal Surgery

	Readability Grade Level Assessment			
Resource	**Fry**	**SMOG**	**FOG**	**Average**
Mayfield Clinic and Spine Institute	13	12	12.9	12.6
Johns Hopkins Medicine	13	12	13.6	12.9
Saint John's Health Center	+17	17	26.7	20.2
Clinical Center, National Institutes of Health	12	10	10.8	10.9
Neurosurgical Associates, PC	12	11	12.1	11.7
National Institute for Clinical Excellence	16	14	16.1	15.4
University of Rochester Medical Center	13	13	14.1	13.4
Emory Healthcare	+17	14	16.3	15.8
University of Washington Medicine	+17	13	14.6	14.9
Pituitary Disorders Education and Support	15	14	15.8	14.9
Brain Institute, Oregon Health and Science University	16	14	15.8	15.3
Capital Health Nova Scotia	11	12	12.7	11.9
University of Wisconsin Hospitals and Clinics Authority	7	8	8.6	7.9
Buffalo Neurosurgery Group	+17	15	18.3	16.8
EndocrineWeb	12	12	13.6	12.5
American Cancer Society	11	12	13.1	12

Fry, Fry Readability Graphical Analysis; SMOG, SMOG Grading; FOG, Gunning FOG Index.