



Readability Assessment of Internet-Based Patient Education Materials Related to Acoustic Neuromas

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Introduction

The objectives of this study were to assess the readability of Internet-based patient education materials related to acoustic neuromas (AN-IPEMs) by 4 widely validated readability indices, to evaluate scores against the existing sixth grade recommended reading level suggested by various national organizations, and to compare the readability scores of patient education materials (PEMs) produced by professional organizations, clinical practices, hospitals, and miscellaneous sources. The readability indices used were Flesch Reading Ease (FRE), Flesch-Kincaid Grade Level (FKGL), Simple Measure of Gobbledygook (SMOG), and Gunning Frequency of Gobbledygook (GFOG).

Methods

AN-IPEMs from 67 websites (9 professional societies, 33 clinical practices, 19 hospitals, and 6 miscellaneous) were assessed by FRE, FKGL, SMOG, and GFOG. Scores were then evaluated against national recommendations by one-tailed t tests and against each other using one-way ANOVAs.

Results

The average FKGL, SMOG, and GFOG scores were all significantly higher than the recommended sixth grade reading level suggested by the USDHHS (p<0.0001, single sample one-tailed t test). Zero percent of the articles, by FKGL, SMOG, and Gunning FOG scores, had a reading level equal to or below the sixth grade reading level. The FKGLs also varied between the various sources at a significant level (p=0.01 one-way ANOVA independent samples). The average FKGLs of clinical practices and professional society AN-IPEMs were significantly higher than the average FKGLs of miscellaneous AN-IPEMs (p=0.05 one-tailed t-test assuming unequal variances) and hospitals AN-IPEMs (p=0.05 one-tailed t-tests assuming unequal variances).

Table 1: Sources of AN-IPEMs			
Professional Societies (n=9)	Clinical Practices (n=33)	Hospital (n=19)	Miscellaneous (n=6)
National Library of Medicine/National Institutes of Health (NLM-NIH)	Chicago Dizziness and Hearing	New York Presbyterian Hospital	MacMillan Cancer Support
Acoustic Neuroma Association (ANA)	Mayfield Clinic	University of California San Diego Health System	Acoustic Neuroma Tumor and Int Group
International Radiology Association (IRA)	Scott Base Institute	University of California Los Angeles Neurosurgery	Becker Health Ch
National Health Service (NHS)	Neurosurgical Medical Clinic, Inc.	Johns Hopkins University of Maryland Medical Center	Vivacy Inc.
Vestibular Disorders Association (VDA)	California Ear Institute	University of California San Francisco	FreeMD
National Institute on Deafness and Other Communication Disorders (NID-CD)	Wilson Ear Clinic	Penn State Hershey	About.com
Acoustic Neuroma Association of NY (ANAN)	Tokido Ear, Nose, Throat	University of California Irvine	
British Acoustic Neuroma Association (BANA)	Vanderbilt Bill Wilkerson Center	University of Virginia Health System	
American Hearing Research Foundation (AHRF)	Princeton Brain and Spine Care	University of Pittsburgh	
	The Center for Hearing and Balance Disorders	University of Washington Health	
	Tampa Bay Hearing and Balance Center	University of Florida	
	Chesapeake Clinic	Department of Health Harvard Medical School	
	Thos Neurosciences Institute	University of California Brain Tumor Center	
	Neurosurgical Consultants, Pennsylvania	New York University Langone Medical Center	
	Sacramento Ear, Nose, Throat Facial Plastic Surgery	St. John Providence Health System	
	Colorado Cyberknife	Mayo Clinic	
	340 Dupree Balance		
	Ear Institute of Chicago, LLC		
	Ear Associates and Rehabilitation Services, Inc.		
	Taylor McAdam Bell Neuroscience Institute		
	Florida Hearing Care Center		
	Dr. Ghoreyeb		
	Gamma Knife of Spokane		
	Columbus Cyberknife		
	The Center for Minimally Invasive Neurosurgery		
	Dr. Hain		
	Dr. Fritsch		
	Dr. Maxson		
	Dr. Schoenstadt		
	Dr. Kaban		
	New York Eye and Ear Infirmary		

Table 3: Categorization of reading difficulty by grade level and FRES			
Grade level	Easy to read	Average difficulty	Difficult
FRES	<= 6 ^a	7-8 ^a	>= 9 ^a
Percentage of AN-IPEM articles falling within each category	0 (0%)	1 (1.5%)	66 (98.5%)
Caption: Modified from Wilson, M. (2009). Readability of patient education materials used for low-income populations. Clin Nurs Spec 2009; 23(1):8. FRES=Flesch Reading Ease Score			

Table 4: Categorization of reading difficulty by FKGL, SMOG, and GFOG scores			
Grade level	Easy to read	Average difficulty	Difficult
Percentage of AN-IPEM articles falling within each category (FKGL)	<= 6 ^a	7-8 ^a	>= 9 ^a
Percentage of AN-IPEM articles falling within each category (SMOG score)	0 (0%)	8 (11.9%)	59 (88.1%)
Percentage of AN-IPEM articles falling within each category (GFOG score)	0	0	67 (100%)
Caption: FKGL=Flesch-Kincaid Grade Level; SMOG=Simple Measure of Gobbledygook; GFOG=Gunning Frequency of Gobbledygook			

Table 2: Statistical analyses of AN-IPEMs by categorical source					
	Count	Average FRES (±1 SD)	Average FKGL (±1 SD)	Average SMOG score (±1 SD)	Average GFOG score (±1 SD)
Professional Societies	9	38.7 (±8.6)	12.1 (±1.6)	13.7 (±1.3)	14.5 (±1.7)
Clinical Practices	33	37.2 (±8.4)	12.3 (±1.6)	13.9 (±1.2)	14.8 (±1.8)
Hospitals	19	41.3 (±11.4)	11.0 (±1.3)	14.3 (±1.4)	15.1 (±2.3)
Miscellaneous	6	44.1 (±12.2)	10.9 (±1.3)	13.8 (±1.2)	15.0 (±1.7)
Caption: FRES=Flesch Reading Ease Score; FKGL=Flesch-Kincaid Grade Level; SMOG=Simple Measure of Gobbledygook; GFOG=Gunning Frequency of Gobbledygook; SD=Standard Deviation					
*The FKGL varied between the various sources at a significant level (p<0.01 one-way ANOVA independent samples). The clinical practices average FKGL was significantly higher than the miscellaneous average FKGL (p=0.02 one-tailed t-test assuming unequal variances) and the hospitals average FKGL (p=0.05 one-tailed t-test assuming unequal variances) and the miscellaneous average FKGL (p=0.05 one-tailed t-test assuming unequal variances).					
*For each AN-IPEM category, the average Gunning FOG and the average SMOG score was significantly higher than the average FKGL at a significant level (p<0.05 one-tailed t-test assuming unequal variances). Besides for clinical practices (p=0.01 one-tailed t-test assuming unequal variances), no significant differences existed between the average Gunning FOG and the average SMOG score for each category AN-IPEM.					

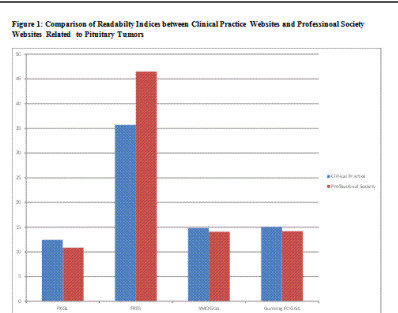


Figure 1: Comparison of Readability Indices between Clinical Practice Websites and Professional Society Websites Related to Pituitary Tumors

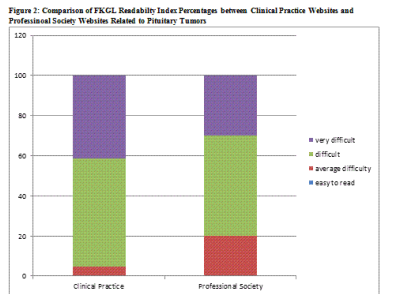


Figure 2: Percentage of pituitary tumor articles falling into FKGL categories, separated by clinical practices and professional societies. FKGL=Flesch-Kincaid Grade Level

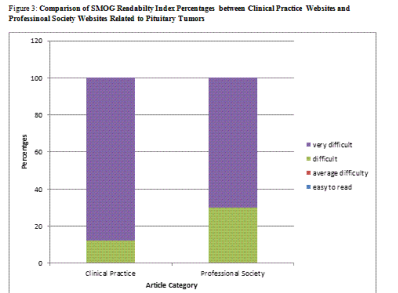


Figure 3: Percentage of pituitary tumor articles falling into SMOG categories, separated by clinical practices and professional societies. SMOG=Simple Measure of Gobbledygook

Conclusions

AN-IPEMs are written at a level significantly higher than that suggested by national recommendations. Keeping the reading level of IPEMs at or below the sixth-grade may improve understanding of this disease and its management for acoustic neuromas.

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