Journal Pre-proof

Most Patient Education Materials on Shoulder Conditions from the American Academy of Orthopaedic Surgeons Exceed Recommended Readability Levels

Suleiman Y. Sudah, MD, Robert D. Faccone, BA, Joseph E. Manzi, MD, Gregory Kirchner, MD, David Constantinescu, Allen Nicholson, MD, Mariano E. Menendez, MD

PII: S2666-6383(22)00191-8

DOI: https://doi.org/10.1016/j.jseint.2022.09.004

Reference: JSEINT 669

To appear in: *JSES International*

Received Date: 22 August 2022

Accepted Date: 13 September 2022

Please cite this article as: Sudah SY, Faccone RD, Manzi JE, Kirchner G, Constantinescu D, Nicholson A, Menendez ME, Most Patient Education Materials on Shoulder Conditions from the American Academy of Orthopaedic Surgeons Exceed Recommended Readability Levels, *JSES International* (2022), doi: https://doi.org/10.1016/j.jseint.2022.09.004.

Most Patient Education Materials on Shoulder Conditions from the American Academy of Orthopaedic Surgeons Exceed Recommended Readability Levels

Suleiman Y. Sudah, MD[1]

Robert D. Faccone, BA[2]

Joseph E. Manzi, MD[3]

Gregory Kirchner, MD[4]

David Constantinescu[5]

Allen Nicholson, MD[6]

Mariano E. Menendez, MD[7]

1. Department of Orthopedics, Monmouth Medical Center, Long Branch, NJ, USA.
2. Department of Research, Alabama College of Osteopathic Medicine, Dothan, AL, USA
3. Department of Orthopedics, Lenox Hill Hospital, New York City, NY, USA
4. Department of Orthopedics, Penn State University, State College, PA, USA
5. Department of Orthopedic Surgery, University of Miami, Miami, FL, USA
6. Professional Orthopedic Associates, Tinton Falls, NJ, USA
7. Oregon Shoulder Institute, Southern Oregon Orthopedics, Medford, OR, USA

Corresponding author:

Suleiman Y Sudah, MD, Monmouth Medical Center, 50 Chelsea Ave, Long Branch, NJ 07740 USA. Tel/ Fax: 908-812-1383. E-mail: sudahslay@gmail.com

Conflicts of interest:

The authors, their immediate families, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

Institutional review board approval was not required for this study.

Most Patient Education Materials on Shoulder Conditions from the American Academy of Orthopedic Surgeons Exceed Recommended Readability Levels

Abstract

Introduction

A growing number of patients use the internet to learn about their conditions and management options, but there may exist a disconnect between the readability of online education materials and a patient's health literacy. This issue is of particular relevance for shoulder conditions, where even with traumatic injuries (e.g. clavicle fracture, shoulder dislocation), treatment is discretionary, directed primarily at quality of life, and therefore highly preference-sensitive. The purpose of this study was to utilize multiple readability algorithms to calculate the readability of the American Academy of Orthopedic Surgeons (AAOS) patient education materials pertaining to diseases and conditions of the shoulder.

Methods

Online patient education articles from the AAOS pertaining to diseases and conditions of the shoulder were reviewed. The articles were modified for analysis using Readability Pro and readability scores were computed using the following 9 algorithms: Flesch-Kincaid Grade Level, Flesch Reading Ease, Gunning Fog Index, Coleman-Liau Index, Simple Measure of the Gobbledygook Index (SMOG), Automated Readability Index, FORCAST, New Dale and Chall Index. A list of suggested word changes to improve the readability of included articles was compiled from Readable Pro. The average number of illustrations (images and/or videos) included per article was documented.

Results

Twenty eight articles were included for analysis. For each of the algorithms studied, the average scores were as follows: Flesch Kincaid Grade Level was 8.8±.8 [range 7.2-10.2]; recommended score: ≤ 8.0, Flesch Reading Ease 54.3±5.3 [range 45.3-64.1]; recommended score: ≥ 60, Gunning Fog 10.8±1.2 [range 8.3-13.1]; recommended score: ≤ 8.0, Coleman-Liau 11.2±.9 [range 9.2-12.9]; recommended score: ≤8.0, SMOG index 11.4±.8 [range 9.2-12.9]; recommended score: ≤ 8.0 , Automated Readability Index 8.4±.8 [range 6.9-10.0]; recommended score: ≤ 8.0, FORCAST 11.2±.4 [range 10.2-12.0]; recommended score: ≤ 9.0, and New Dale and Chall Index 5.8±.5 [range 4.9-7.2 recommended score: ≤ 6.0-6.9]. The average number of illustrations per article was 4.5±3.1 [range 1-14].

Conclusion

The readability of most patient education materials from the AAOS pertaining to diseases and conditions of the shoulder is higher than recommended across a variety of algorithms. Efforts to revise the readability of online education materials are important to facilitate shared-decision making, particularly in practice settings where most decisions are preference-sensitive.

Level of Evidence: Education Methodology Study; Analysis of Materials

Keywords: readability, health literacy, AAOS, shoulder, patient education materials, grade level

The internet has become an increasingly popular source of health information. According to recent data, more than 80% of orthopedic patients utilize the internet to learn about their conditions and treatment options prior to physician consultation [4, 5, 10, 11]. Despite improved access to written education materials, there may exist a disconnect between the readability of these resources and a patient's health literacy. This is especially problematic as low health literacy has been linked to poor patient outcomes, increased healthcare costs, and overutilization of emergency rooms [3, 6, 21, 23, 28].

The ability to understand written text is a critical component of health literacy. A patient's reading skills are measured in terms of grade level, where "functional illiteracy" is equated to zero- to fifth-grade reading skills and "marginal literacy" is equated to sixth- to eight-grade reading skills [12]. According to a recent survey study, nearly 50% of the adult US population is functionally or marginally illiterate [13, 14]. Moreover, substantial limitations in health literacy have been shown to exist among the elderly, unemployed, and those of lower socioeconomic status [25].

In 2010, the Plain Language Initiative was implemented in an attempt to equalize care. This initiative set forth guidelines to ensure agencies use clear communication in order to help their users find, understand, and apply the information to meet their health needs [18]. The guidelines are based upon writing for a specific audience, organization of information, word choice, brevity, and conversational voice.

Numerous agencies including the National Institutes of Health (NIH), Centers for Disease Control (CDC), and American Medical Association (AMA) recommend that health materials be written at or below the fourth to eighth grade reading level [8, 15, 27, 29]. Despite this, multiple studies have shown that the readability level of online orthopedic education materials remains above these levels [2, 7, 20, 22, 26].

The purpose of this study was to utilize multiple readability algorithms to calculate the readability of the American Academy of Orthopedic Surgeons (AAOS) patient education

materials pertaining to diseases and conditions of the shoulder. We hypothesize that the majority of these articles are written above the eighth grade reading level.

Methods

Online patient education articles from the AAOS pertaining to diseases and conditions of the shoulder were reviewed in June 2022 [9]. The article topics included for analysis were:

Arthritis of the Shoulder

Biceps Tendinitis

Biceps Tendon Tear at the Shoulder

Brachial Plexus Injuries

Burners and Stingers

Chronic Shoulder Instability

Clavicle Fracture (Broken Collarbone)

Common Shoulder Injuries

Complex Regional Pain Syndrome (Reflex Sympathetic Dystrophy)

Dislocated Shoulder

Erb's Palsy (Brachial Plexus Birth Palsy)

Frozen Shoulder

Joint Replacement Infection

Nerve Injuries

Rotator Cuff Tears

Rotator Cuff Tears: Frequently Asked Questions

Scapula (Shoulder Blade) Fractures

Scapula (Shoulder Blade) Disorders

Shoulder Impingement/Rotator Cuff Tendinitis

Shoulder Injuries in Throwing Athlete

Shoulder Joint Tear (Glenoid Labrum Tear)

Shoulder Pain and Common Shoulder Problems

Shoulder Separation

Shoulder Trauma (Fractures and Dislocations)

SLAP Tears

Sternoclavicular (SC) Joint Disorders

Thoracic Outlet Syndrome

Upper Extremity Limb Length Discrepancy

The articles were modified to remove any images, figures, citations, references, copyright notices, disclaimers, or hyperlinks and converted to plain text in Microsoft Word as previously described [1, 22, 24]. Analysis of the reformatted articles was performed using Readable Pro and the following readability scores were obtained (Table 2):

Flesch Reading Ease

Flesch Kincaid Grade Level

Gunning Fog Score

Coleman Liau Index

SMOG Index

Automated Readability Index

Dale-Chall Readability Score

FORCAST Grade Level

Fry Grade Level

Each of these algorithms have been used extensively for analyzing the readability of patient education materials [2, 20, 26] and are based on the sample text's syllables, words, and sentences to varying degrees (Table 1). While there is no gold-standard readability scoring system, each of these formulas has been shown to strongly correlate and the use of multiple scores is recommended to increase the validity [1]. A list of suggested word changes to improve the readability of included articles was compiled from Readable Pro. The average number of illustrations (images and/or videos) included per article was documented.

Results

Twenty eight articles were included for analysis. For each of the algorithms studied, the average scores were as follows: Flesch Kincaid Grade Level was 8.8±.8 [range 7.2-10.2]; recommended score: ≤ 8.0, Flesch Reading Ease 54.3±5.3 [range 45.3-64.1]; recommended score: ≥ 60, Gunning Fog 10.8±1.2 [range 8.3-13.1]; recommended score: ≤ 8.0, Coleman-Liau 11.2±.9 [range 9.2-12.9]; recommended score: ≤8.0, SMOG index 11.4±.8 [range 9.2-12.9]; recommended score: ≤ 8.0 , Automated Readability Index 8.4±.8 [range 6.9-10.0]; recommended score: ≤ 8.0, FORCAST 11.2±.4 [range 10.2-12.0]; recommended score: ≤ 9.0, and New Dale and Chall Index 5.8±.5 [range 4.9-7.2 recommended score: ≤ 6.0-6.9]. The average number of illustrations per article was 4.5±3.1 [range 1-14]. Overall, the average FK score was 8.8 ± 0.8 [range 7.2-10.2], with only 21% [6 of 28] of articles at or below the eighth grade reading level (Figure 1). A comprehensive list of suggested word changes to improve the readability of these articles is provided in Table 3.

Discussion

Numerous agencies including the National Institutes of Health (NIH), Centers for Disease Control (CDC), and American Medical Association (AMA) recommend that patient education

materials be written at or below the fourth to eighth grade reading level [8, 15, 27, 29]. In the present analysis, we found that the current AAOS patient education materials pertaining to disease and conditions of the shoulder are not in accordance with these standards. Overall, the average Flesch Kincaid Grade Level [FK] score was 8.8 +/- 0.8 [range 7.2-10.2], with only 21% [6 of 28] of articles at or below the eighth grade reading level. FK score has been used to reflect the overall readability in multiple studies [1, 2, 20, 24]. Even so, the validity of reading scores is accomplished with the inclusion of multiple algorithms [1]. In our study, the readability of each article was higher than recommended by Readability Pro across each algorithm [19].

Roberts et al previously assessed the change in readability scores of AAOS patient education materials across all subspecialties[20]. In 2008, the mean FK grade level was 10.4, which significantly reduced to 9.3 in 2014 [20]. Although it is difficult to determine if this change represents a practical difference, this data suggests that some improvement in the readability of AAOS patient education resources has occurred.

Few studies have assessed the readability of patient education materials for shoulder conditions. In 2018, the readability of 6 patient education brochures provided by the American Shoulder and Elbow Surgeons [ASES] was assessed. Topics included arthritis and total shoulder replacement, arthroscopy of the shoulder and elbow, rehabilitation of the shoulder, rotator cuff tendonitis and tears, tennis elbow, and the unstable shoulder. It was found that the brochures were written well above the eighth grade level, ranging in difficulty from a grade level of 13.4 to 15.3 [22]. More recently, the readability of online patient education materials for shoulder arthroplasty provided by the top 25 orthopedic institutions was assessed. Overall, the mean FK

score was 9.5 and only 16% of institutions included online material at or below the 8 the grade level [24]. The findings from these studies suggest that the readability of patient education materials differs by the source and topic of information. Therefore, while our study implies that the shoulder articles from the AAOS website may be more inclusive to patients [lower average FK score] when compared to the information provided by ASES brochures and top academic centers, these comparisons should not be made given the differences in topic number and distribution. However, it is important to recognize that the majority of patient educational materials for shoulder conditions provided by these outlets are likely not suitable for the majority of readers in the United States [8, 16]. It is therefore prudent to understand the components of the readability scores and means for improvement.

There may be several ways to improve the readability of written patient education materials. Previous studies have suggested that shorter words, using more concise sentence structure, using fewer words per paragraph, and providing more visual material may aid in lowering the readability score [28]. The article with the highest FK score (10.2) in our study was related to joint replacement infection. Several issues pertaining to word density and writing style were associated with this article. Specifically, 32% of the sentences contained more than 30 syllables and 52% of sentences contained more than 20 syllables. This represents a significant area for improvement given the fact that highly readable content is often associated with roughly 6% of sentences containing less than 30 syllables and roughly 12% of sentences with less than 20 syllables. Additionally, 47 words used in this article were classified as “hard words”. While the poor readability of this article may be due to the intrinsic complexity of periprosthetic infection, readability may be improved by substituting exhaustive explanations related to anatomic

184 references, procedural steps, and implant design materials with brief descriptions [24]. It is
185 important to note that this article did include a total of 3 images. The use of visual supplementary
186 material in the form of pictures and videos has been shown to improve readability and has been
187 cited as a missed opportunity to increase health literacy [17, 24]. However, despite an average
188 number of 4.5 illustrations per article, the overall readability score was still higher than
189 recommended for included articles in our study. This may suggest that the complexity of
190 shoulder topics is high and that significant improvements in readability are unable to be achieved
191 with the incorporation of illustrations alone. As such, emphasis should be placed on improving
192 sentence structure and writing style in addition to the incorporation of visual supplementary
193 material.
194
195 Our study is not without limitations. The formulas used to generate readability scores are
196 determined based upon syllable and character counts in each word, sentence, and paragraph.
197 Therefore, readability scores may be misleading in instances where short but unfamiliar medical
198 terms are used or in cases where short sentences are presented with complex ideas. For example,
199 although the word “arthroplasty” has the same number of syllables as “joint replacement”, the
200 latter may be easier to understand for the general public. Yet, based on syllable count, both
201 words would contribute equally to the readability score. Additionally, each of the algorithms
202 used are unable to evaluate the effect of supplementary visual aids or reader comprehension on
203 the readability score. Therefore, despite a relatively high average number of illustrations used per
204 article in our study, the readability scores may be inflated. Finally, the reading level of the
205 AAOS target population may be different than that of the general patient population. Therefore,

although our findings suggest that the readability of these resources is higher than the national recommendations, they may be relevant to this specific audience of readers.

Conclusion

The readability of most patient education materials from the AAOS pertaining to diseases and conditions of the shoulder is higher than recommended across a variety of algorithms. Efforts to revise the readability of online education materials are important to facilitate shared-decision making, particularly in practice settings where most decisions are preference-sensitive.

References

1. Badarudeen S, Sabharwal S. Assessing readability of patient education materials: current role in orthopaedics. Clin Orthop Relat Res 2010;468(10):2572-80. doi:10.1007/s11999-010-1380-y
2. Badarudeen S, Sabharwal S. Readability of patient education materials from the American Academy of Orthopaedic Surgeons and Pediatric Orthopaedic Society of North America web sites. J Bone Joint Surg Am 2008;90(1):199-204. doi:10.2106/JBJS.G.00347
3. Baker DW, Parker RM, Williams MV, Clark WS, Nurss J. The relationship of patient reading ability to self-reported health and use of health services. Am J Public Health 1997;87(6):1027-30.
4. Beall MS, 3rd, Beall MS, Jr., Greenfield ML, Biermann JS. Patient Internet use in a community outpatient orthopaedic practice. Iowa Orthop J 2002;22:103-7. no doi
5. Beall MS, 3rd, Golladay GJ, Greenfield ML, Hensinger RN, Biermann JS. Use of the Internet by pediatric orthopaedic outpatients. J Pediatr Orthop 2002;22(2):261-4. no doi

6. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. Ann Intern Med 2011;155(2):97-107. doi:10.7326/0003-4819-155-2-201107190-00005

7. Beutel BG, Danna NR, Melamed E, Capo JT. Comparative Readability of Shoulder and Elbow Patient Education Materials within Orthopaedic Websites. Bull Hosp Jt Dis (2013) 2015;73(4):249-56. no doi

8. Centers for Disease Control and Prevention Simply Put: a guide for creating easy-to-understand materials.; 2009. https://www.cdc.gov/healthliteracy/pdf/simply_put.pdf.

9. Diseases & Conditions of The Shoulder; https://orthoinfo.aaos.org/en/diseases--conditions/?bodyPart=Shoulder. [Accessed June 11 2022].

10. Koenig S, Nadarajah V, Smuda MP, Meredith S, Packer JD, Henn RF, 3rd. Patients' Use and Perception of Internet-Based Orthopaedic Sports Medicine Resources. Orthop J Sports Med 2018;6(9):2325967118796469. doi:10.1177/2325967118796469

11. Krempec J, Hall J, Biermann JS. Internet use by patients in orthopaedic surgery. Iowa Orthop J 2003;23:80-2. no doi

12. McCray AT. Promoting health literacy. J Am Med Inform Assoc 2005;12(2):152-63. doi:10.1197/jamia.M1687

13. National Center for Education Statistics. A First Look at the Literacy of America's Adults in the 21st Century. Washington, DC: U.S. Dept. of Education; 2006:28.

14. National Center for Education Statistics. Adult Literacy in America: A First Look at the Results of the National Adult Literacy Survey. Washington, DC: U.S. Dept. of Education; 1993

15. National Cancer Institute Making health communication programs work; 2004. https://www.cancer.gov/publications/health-communication/pink-book.pdf.

16. National Institutes of Health Office of Communications and Public Liaison Clear & simple; 2015. https://www.nih.gov/institutes-nih/nih-office-director/office-communications-public-liaison/clear-communication/clear-simple.

17. Parsa A, Nazal M, Molenaars RJ, Agrawal RR, Martin SD. Evaluation of Hip Preservation-related Patient Education Materials From Leading Orthopaedic Academic Centers in the United States and Description of a Novel Video Assessment Tool. J Am Acad Orthop Surg Glob Res Rev 2020;4(6). doi:10.5435/JAAOSGlobal-D-20-00064

18. plainlanguage.gov; 2010. https://www.plainlanguage.gov/law/. [Accessed June 17 2022].

19. Readability formulas; 2022. https://readable.com/features/readability-formulas/.

20. Roberts H, Zhang D, Dyer GS. The Readability of AAOS Patient Education Materials: Evaluating the Progress Since 2008. J Bone Joint Surg Am 2016;98(17):e70. doi:10.2106/JBJS.15.00658

21. Schillinger D, Grumbach K, Piette J, Wang F, Osmond D, Daher C, et al. Association of health literacy with diabetes outcomes. JAMA 2002;288(4):475-82. doi:10.1001/jama.288.4.475

22. Schumaier AP, Kakazu R, Minoughan CE, Grawe BM. Readability assessment of American Shoulder and Elbow Surgeons patient brochures with suggestions for improvement. JSES Open Access 2018;2(2):150-4. doi:10.1016/j.jses.2018.02.003

23. Shlobin NA, Huang J, Lam S. Health Literacy in Neurosurgery: A Scoping Review. World Neurosurg 2022. doi:10.1016/j.wneu.2022.07.023

24. Stelzer JW, Wellington IJ, Trudeau MT, Mancini MR, LeVasseur MR, Messina JC, et al. Readability assessment of patient educational materials for shoulder arthroplasty from top academic orthopedic institutions. JSES Int 2022;6(1):44-8. doi:10.1016/j.jseint.2021.08.004

25. Svendsen MT, Bak CK, Sorensen K, Pelikan J, Riddersholm SJ, Skals RK, et al. Associations of health literacy with socioeconomic position, health risk behavior, and health status: a large national population-based survey among Danish adults. BMC Public Health 2020;20(1):565. doi:10.1186/s12889-020-08498-8

26. Wang SW, Capo JT, Orillaza N. Readability and comprehensibility of patient education material in hand-related web sites. J Hand Surg Am 2009;34(7):1308-15. doi:10.1016/j.jhsa.2009.04.008

27. Weiss BD. Health literacy. 2003.

28. Weiss BD. Health Literacy Research: Isn't There Something Better We Could Be Doing? Health Commun 2015;30(12):1173-5. doi:10.1080/10410236.2015.1037421

29. Weiss BD. How to bridge the health literacy gap. Family practice management 2014;21(1):14-8. no doi

Figure and Table Legends

Table 1. Formulas used to calculate the readability scores of included articles

Table 2. Individual readability scores for each of the 28 AAOS articles pertaining to disease and conditions of the shoulder

Table 3. Suggested word changes to improve the readability of included articles

Figure 1. Flesch Kincaid Grade Level for each of the 28 AAOS articles pertaining to disease and conditions of the shoulder

Flesch-Kincaid Grade Level	$(0.39 \times mean\ \#of\ syllables\ per\ word) + 11.8\ x\ mean\ \#\ of\ words\ per\ sentence)$
Flesch Reading Ease	$206.835 - (1.015 \times mean\ \#of\ words\ per\ sentence) - (84.6 \times mean\ \#\ of\ syllables\ per\ word)$
Gunning Fog Index	$0.4\left(\frac{mean\ \#\ of\ words}{mean\ \#\ of\ sentences} \times +100 \times \frac{mean\ \#\ of\ words\ \geq 3\ syllables}{mean\ \#\ of\ words}\right)$
Coleman-Liau Index	$\left(0.0588 \times \frac{mean\ \#\ of\ letters}{word}\right) - \left(0.296 \times \frac{mean\ \#\ of\ sentences}{100\ words}\right)$
Simple Measure of the Gobbledygook Index	$1.043 \times \sqrt{(\#\ of\ words\ with\ \geq 3\ syllables) \times \left(\frac{30}{\#\ of\ sentences}\right)} + 3.1291$
Automated Readability Index	$4.71\left(\frac{letters}{words}\right) + 0.5\left(\frac{words}{sentences}\right) - 21.43$
FORCAST	$20 - \left(\frac{\#\ of\ single\ syllable\ words\ in\ 150\ word\ sample}{10}\right)$
New Dale and Chall Index	$0.0496 \times \left(\frac{mean\ \#\ of\ words}{mean\ \#\ of\ sentences}\right) + 0.1579 \times \left(\frac{unfamiliar\ words}{mean\ \#\ of\ words}\right) + 3.6365$

Table 1.

	Flesch Reading Ease	Flesch Kincaid Grade Level	Gunning Fog Score	Coleman Liau Index	SMOG Index	Automated Readability Index	Spache Readability Score	Dale-Chall Readability Score	FORCAST Grade Level	Illustration/figures
Arthritis of the Shoulder	49.7	9.4	11.9	12.1	12.2	9.1	5.4	6.1	11.3	5.0
Biceps Tendinitis	49.8	8.9	9.8	11.9	10.7	8.3	5.2	6.2	12.0	7.0
Biceps Tendon Tear at the Shoulder	61.1	7.4	8.3	10.2	9.8	7.0	5.0	5.6	11.2	3.0
Brachial Plexus Injuries	50.0	9.9	12.6	11.9	12.6	9.8	5.8	6.5	11.4	10.0
Burners and Stingers	61.0	7.8	9.5	10.5	10.2	7.7	5.1	5.5	11.2	3.0
Chronic Shoulder Instability	49.2	9.1	10.7	12.3	11.3	8.7	5.1	5.7	11.6	4.0
Clavicle Fracture (Broken Collarbone)	63.0	7.2	9.2	10.0	10.2	6.9	4.8	4.9	10.6	6.0
Common Shoulder Injuries	55.1	8.2	10.0	11.8	10.8	8.2	5.0	5.3	11.4	1.0
Complex Regional Pain Syndrome (Reflex Sympathetic Dystrophy)	48.6	9.1	11.4	12.6	11.6	8.8	5.9	7.2	11.8	2.0
Dislocated Shoulder	56.4	8.0	9.0	11.0	10.0	7.5	4.8	5.2	11.1	1.0
Erb's Palsy (Brachial Plexus Birth Palsy)	62.6	7.8	10.1	9.4	10.7	7.3	5.1	5.5	10.5	4.0
Frozen Shoulder	53.3	8.4	9.8	12.0	10.6	8.4	5.2	5.8	11.8	7.0
Joint Replacement Infection	45.3	10.2	13.1	12.9	12.9	10.0	5.4	6.7	11.3	4.0
Nerve Injuries	64.1	8.0	10.2	9.2	10.7	7.6	5.0	4.9	10.2	2.0
Rotator Cuff Tears	57.5	8.2	10.7	10.5	11.3	7.7	5.1	5.4	10.9	14.0
Rotator Cuff Tears: Freuqently Asked Questions	53.8	9.5	12.4	10.6	12.3	8.7	5.7	5.5	10.7	2.0
Scapula (Shoulder Blade) Fractures	53.8	8.8	11.0	11.3	11.5	8.3	5.4	5.8	11.4	1.0
Scapula (Shoulder Blade) Disorders	51.1	9.1	12.0	11.8	12.2	8.7	5.4	6.3	11.3	5.0
Shoulder Impingement/Rotator Cuff Tendinitis	58.4	7.9	10.2	10.6	11.0	7.4	5.1	5.4	10.8	4.0

Shoulder Injuries in Throwing Athlete	60.4	9.2	11.0	11.3	11.6	9.6	5.6	6.0	11.1	11.0
Shoulder Joint Tear (Glenoid Labrum Tear)	49.3	9.7	11.8	11.4	11.9	8.8	5.6	6.0	11.5	2.0
Shoulder Pain and Common Shoulder Problems	53.5	8.8	10.5	11.7	11.4	8.6	5.3	5.7	11.3	1.0
Shoulder Separation	48.2	10.1	12.5	11.5	12.5	9.2	5.4	6.3	11.1	3.0
Shoulder Trauma (Fractures and Dislocations)	45.4	9.6	10.8	12.7	11.7	9.0	5.5	6.5	11.8	4.0
SLAP Tears	55.0	8.7	10.7	11.2	11.3	8.3	5.3	5.8	11.3	7.0
Sternoclavicular (SC) Joint Disorders	52.8	9.3	11.8	11.3	12.1	8.9	5.4	6.1	10.8	5.0
Thoracic Outlet Syndrome	56.9	8.5	10.5	11.9	11.4	9.0	5.1	5.3	10.9	3.0
Upper Extremity Limb Length Discrepancy	55.7	8.8	11.4	10.7	11.9	8.2	5.3	5.4	10.5	5.0
Mean (SD)	54.3 (5.3)	8.8 (0.8)	10.8(1.2)	11.3 (0.9)	11.4 (0.8)	8.4 (0.8)	5.3 (0.3)	5.8 (0.5)	11.2 (0.4)	4.5 (3.2)

Table 2.

Term	Alternative
Abnormalities	Defects
Additionally	Also
Antibiotics	Medications
Arthroplasty	Joint replacement
Arthroscopically	With a small camera
Associated	Related
Capsolabral	Joint
Chlorhexidine	Wash
Colonization	Growth
Complications	Problems
Comprehensive	Complete
Considerations	Tips
Contaminated	Polluted
Corresponding	Related
Corticosteroid	Steroid
Degeneration	Breakdown
Differentiate	Separate
Disadvantages	Downsides
Discoloration	Color changes
Discrepancy	Difference
Dramatically	Greatly
Effectiveness	Power
Electrodiagnostic Studies	Nerve tests
Evaluate	Checked
Examination	Check
Familiarity	Experience with
Glenohumeral	Shoulder
Hemiarthroplasty	Partial joint replacement
Immediately	Right away
Immobilization	Casting, splinting
Immobilizer	Cast, sling, splint
Individual	Person, single

Instability	Imbalance
Laboratory	Lab
Miniaturized	Small
Modification	Change
Nonfunctioning	Nonworking
Occasionally	Sometimes
Overexertion	Over working
Particularly	Especially
Progressively	Gradually
Psychological	Mental
Pulmonologist	Lung specialist
Recommendations	Suggestions
Reconstructing	Rebuilding
Regeneration	Regrowth
Rehabilitation	Rehab
Satisfactory	Suitable
Sensitivity	Feeling
Significantly	Seriously
Spontaneously	On its own
Sterilization	Cleaning
Temporarily	Briefly
Underestimate	Misjudge
Visualization	Imaging

Table 3.

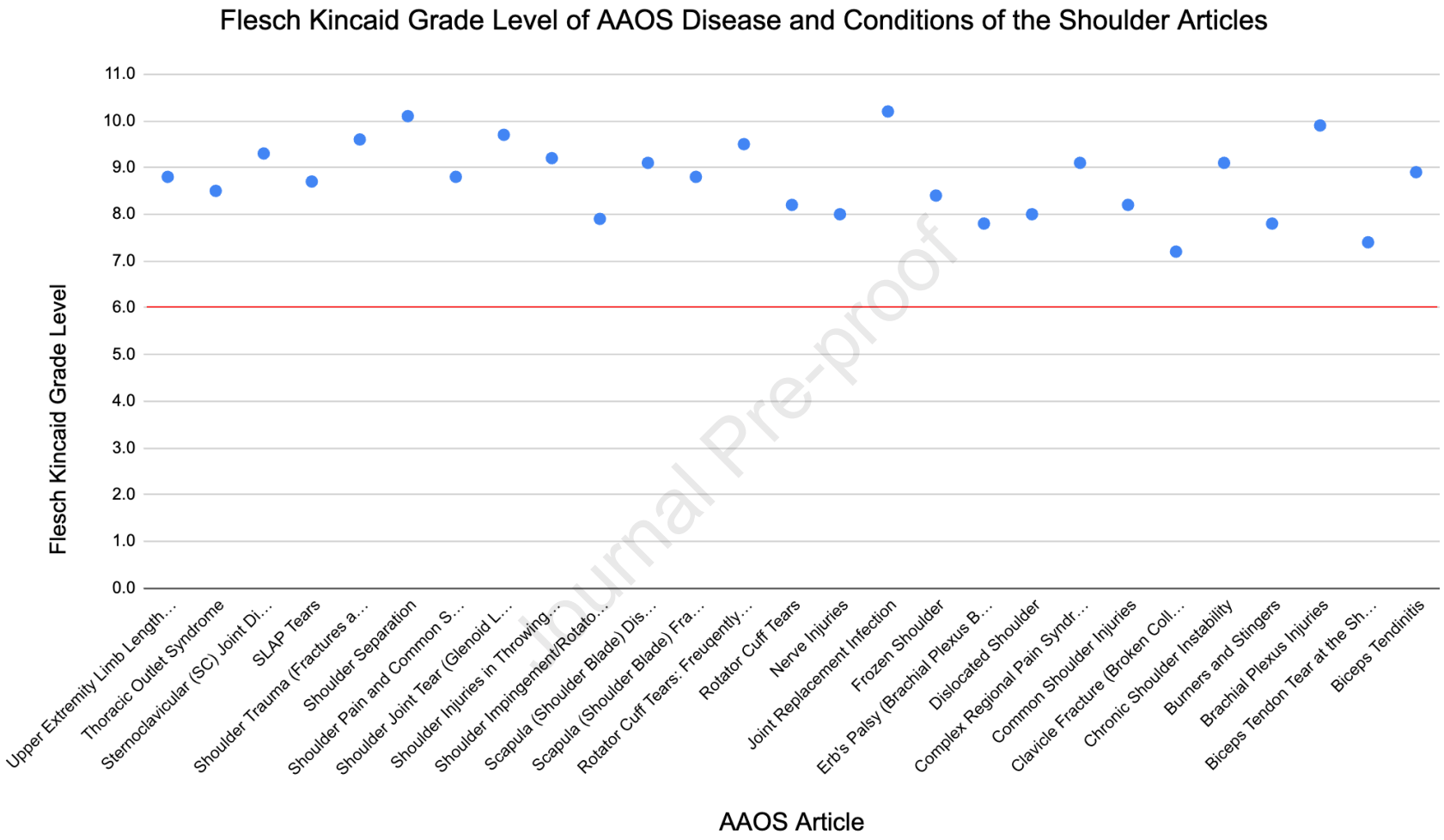

Figure 1.