

The readability of online English and Spanish patient education materials on orthopedic anesthesia.

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BACKGROUND

- With most orthopedic surgeries amenable to various anesthetic options, related online patient education materials (PEMs) should be easily retrievable, comprehensive, and readable by the general population.
- PEMs written at a higher than recommended reading level limit patients’ access to crucial health information.
- Multiple federal agencies currently recommend that PEMs be written at a **6th to 8th grade reading level** to be adequately understood by patients.
- Language barriers represent an additional complexity in terms of the accessibility of PEMs.
- This study describes and compares the readability levels of online PEMs available in English and Spanish for anesthesia related to orthopedic surgeries, with a focus on total hip, knee and shoulder joint replacement.

METHODS

- Six pairs (English and Spanish) of search terms were entered into Google and used to identify relevant online PEMs (Table 1).
- Results for English search terms were analyzed for readability using the Flesch Reading Ease (FRE), Fry Graph (FG), Simple Measures of Gobbledygook (SMOG) Index, and Gunning Fog Index (GFI) scores.
- Spanish search terms were analyzed using the Fernandez-Huerta Reading Ease (FHRE), the Gilliam-Peña-Mountain Grade Level (GPMGL), the Spanish SMOG (SOL), and Indice de Legibilidad de Flesch-Szigriszt (INFLESZ) scores.

Table 1. Search Terms.

Search Term Number	Abbreviation	English	Spanish
1	GA/RA	“general and regional anesthesia for orthopedic surgery”	"anestesia general y local para cirugía ortopédica”
2	GA/NA	“general and neuraxial anesthesia for orthopedic surgery”	"anestesia general y neuroaxial para cirugía ortopédica"
3	Nerve block	“nerve block for orthopedic surgery”	“bloqueo nervioso para cirugía ortopédica”
4	Knee replacement	"knee replacement anesthesia"	"reemplazo de rodilla anestesia"
5	Shoulder replacement	"shoulder replacement anesthesia"	"reemplazo del hombro anestesia"
6	Hip replacement	"hip replacement anesthesia"	"reemplazo de cadera anestesia"

GA, general anesthesia
RA, regional anesthesia
NA, neuraxial anesthesia

RESULTS

English	Spanish
180 websites retrieved (117 unique), 30 per search term (Table 2) - Mean/median FRE, FG and GFI scores corresponded to college-level material - The mean/median SMOG score reflected a 10th grade reading level	146 websites retrieved (131 unique), 30 per search term except for searches on GA/NA (n=8) and nerve blocks (n=18) (Table 2) - Mean/median FHRE, GPMGL, and SOL scores corresponded to 10th-12th grade reading levels - The mean/median INFLESZ scores reflected “Difficult”/“Normal” readability levels

Table 2. Composite results for all unique English and Spanish-language websites aggregated across search terms.

English (n=117)								
	Flesch Reading Ease Score	Fry Graph	SMOG	Gunning-Fog Index	Average Words per Sentence	Average Syllables per Word	Sentence Count	Word Count
Median (IQR)	48.30 (57.30-40.20)	15.00 (15.00-14.00)	10.90 (11.90-9.50)	14.60 (16.00-12.70)	14.70 (16.80-12.40)	1.70 (1.80-1.60)	59.00 (87.00-36.00)	752.00 (1283.00-561.00)
Mean (SD)	48.37 (9.86)*	14.32 (0.81)*	10.94 (1.48)	14.66 (1.99)	14.78 (2.75)	1.80 (0.24)	73.96 (41.79)	1026.92 (565.39)
Below 8th Grade [%]	18.80	0.00	4.27	0.00	N/A	N/A	N/A	N/A
Above 8th Grade [%]	81.20	100.00	95.73	100.00	N/A	N/A	N/A	N/A
Spanish (n=131)								
	Fernandez-Huerta Reading Ease	Gilliam-Peña-Mountain Grade Level	SOL	INFLESZ	Average Words per Sentence	Average Syllables per Word	Sentence Count	Word Count
Median (IQR)	59.79 (63.46-54.28)	10.00 (11.00-9.00)	10.40 (11.70-9.55)	55.17 (58.69-50.09)	14.53 (16.79-12.12)	2.20 (2.24-2.16)	72.00 (132.00-42.50)	1107.00 (1854.50-646.00)
Mean (SD)	57.71(6.57)*	10.34 (1.98)*	10.75 (1.41)	52.99 (6.66)	15.44 (3.37)	2.22 (0.08)	136.79 (113.89)	1913.47 (1544.80)
Below 8th Grade [%]	48.09	23.66	0.76	N/A	N/A	N/A	N/A	N/A
Above 8th Grade [%]	51.91	76.34	99.24	N/A	N/A	N/A	N/A	N/A

Simple Measures of Gobbledygook (SMOG), Spanish SMOG (SOL), and Indice de Legibilidad de Flesch-Szigriszt (INFLESZ); Independent t-tests significant (*) for Flesch Reading Ease versus Fernandez-Huerta Reading Ease scores and for Fry Graph versus Gillam-Pena Mountain Grade Level scores (both p<0.001); SMOG versus SOL scores were not significant (p=0.44).



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CONCLUSIONS

- English and Spanish-language PEMs describing anesthesia for orthopedic surgery are written at **far higher reading levels than recommended**.
- Elevated reading levels prevent PEMs from being easily understood by English and Spanish-speakers alike, and therefore hinder patients from being properly informed on their options in anesthesia.
- The lack of readable online information written in Spanish on general and neuraxial anesthesia may make it more difficult for Spanish-speaking orthopedic patients to make informed decisions regarding their anesthetic care, potentially leading to adverse outcomes.
- The lack of Spanish-language materials on peripheral nerve blocks may restrict Spanish-speakers’ understanding of available pain management choices.

CLINICAL RELEVANCE

PEMs continue to be written at higher reading levels than recommended, therefore calling for clearer standards to ensure that online health information is equally readable and comprehensive across multiple languages.

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