Readability of Patient-reported Outcome Measures in Anesthesiology

To the Editor:

Patient-reported outcome measures are important standardized survey tools in medicine. In anesthesiology, patient-reported outcome measures are used perioperatively to collect information about patients' health status, quality of life, and healthcare experiences.[1] As health care evolves, patient-reported outcome measures have the ability to enhance patient engagement and shared decision making, which could improve the safety and efficacy of anesthesia.[2]

Although there are many benefits of patient-reported outcome measures, low health literacy is a significant barrier to their effective use. The National Institutes of Health (Bethesda, Maryland) and other healthcare organizations recommend healthcare-related materials to be published at or below a sixth-grade reading level.[3] Recent studies in other fields have calculated many specialty-specific patient-reported outcome measures to be above the recommended complexity.[3] We examined patient-reported outcome measures commonly used in the perioperative setting in relation to health equity.

Eighteen patient-reported outcome measures were selected from those in a systematic review.[1] Three additional patient-reported outcome measures highly cited in anesthesia literature were also included.[4] The 21 patient-reported outcome measures evaluated are listed in table 1. Readability was assessed by a linguistics software (readable.com; Added Bytes, United Kingdom) using the Gunning Fog Index, Simple Measure of Gobbledygook (SMOG) Index, FORCAST Grade Level, and Flesch Reading Ease Score, indices used in previous readability studies and applicable to healthcare materials.[3] Each numerical score computed per index correlates to a reading grade level. Consequently, an average readability score of six denotes a reading grade level of sixth grade.

All 21 anesthesia patient-reported outcome measures analyzed had average readability scores above the sixth-grade level. The overall average readability was nine,

Table 1. Readability of Perioperative Patient-reported Outcome Measures

Perioperative PROM	Gunning Fog Readability Index	SMOG Readability Index	FORCAST Readability Index	FRES Grade Readability Index	Average Readability Index	SD of Readability Index
Bauer	10.87	9.58	12.58	13	12	2
BAI	4.34	7.84	11.31	8	8	3
BDI	7.44	8.79	8.83	7	8	1
EQ-5D	7.53	9.21	10.2	8	9	1
EVAN-G	10.64	9.85	11.24	11	11	1
Heidelberg	12.72	11.57	11.34	6	10	3
HADS	3.35	6.66	8.93	6	6	2
HUI3	9.88	11.06	10.26	8	10	1
LPPSq	9.45	9.35	11.24	11	10	1
PROMIS Global-10	8.23	8.84	10.06	8	9	1
PGWBI	4.92	6.99	8.59	6	7	2
QoR-9	7.90	8.34	10.73	8	9	1
QoR-15	7.71	8.31	11.47	8	9	2
QoR-40	5.48	7.21	10.08	7	7	2
SF-12	6.35	7.97	9.07	6	7	1
SF-36	4.35	7.64	8.86	6	8	2
STAI	6.06	7.49	9.53	7	8	1
WHODAS 2.0, 12-item	5.52	7.34	10.9	8	8	2
WHODAS 2.0, 36-item	4.37	6.87	10.76	8	8	3
WHOQOL-BREF	8.13	9.5	10.2	8	9	1
Zung SDS	5.91	8.18	9.03	7	8	1
Mean	7.20	8.50	10.25	8	9	

BAI, Beck's Anxiety Inventory; Bauer, Bauer Patient Satisfaction Questionnaire; BDI, Beck's Depression Inventory; EQ-D5, EuroQOL 5 Dimensions; EVAN-G, Evaluation du Vecu de l'Anesthesie Generale; FRES, Flesch Reading Ease Score; HADS, Hospital Anxiety and Depression Scale; Heidelberg, Heidelberg Peri-anaesthetic Questionnaire; HUI3, Hospital Anxiety and Depression Scale; LPPSq, Leiden Perioperative care Patient Satisfaction Questionnaire; PGWBI, Psychological General Well-Being Index; PROM, Patient-Reported Outcome Measure; PROMIS-10, Patient-Reported Outcomes Measurement Information System Global-10; QoR-9, Quality of Recovery-9 Questionnaire; QoR-15, Quality of Recovery-15 Questionnaire; QoR-40, Quality of Recovery-40 Questionnaire; SF-12, Short Form 12 Health Survey; SF-36, Short Form 36 Health Survey; STAI, State-Trait Anxiety Inventory; WHODAS-12, World Health Organization Disability Assessment Schedule 2.0, 12-item; WHODAS-36, World Health Organization Disability Assessment Schedule 2.0, 36-item; WHOQOL-BREF, World Health Organization Quality of Life-BREF; Zung, Zung Self-Rating Depression Scale.

corresponding to a ninth-grade reading level. The Hospital Anxiety and Depression Scale had the easiest readability at six, whereas the Bauer questionnaire had the most difficult at twelve. The average readability levels by patient-reported outcome measure are reported in table 1. Table 1 also shows the readability scores of each individual patient-reported outcome measure and the mean readability score and SD by index.

Patient-reported outcome measures have become an important tool to measure not only vital outcomes such as mortality and postoperative complications but also postoperative symptoms that affect length of hospital stay, chronic health conditions, and cost of care.[5] Measuring these outcomes allows for better patient engagement and shared decision making, thus enhancing overall medical care.[2]

Recent readability studies in specialties such as otolaryngology have also reported the majority of their patient-reported outcome measures to be higher than recommended by healthcare organizations.[3] Furthermore, several readability studies found online patient education materials in anesthesia to be even less readable.[6,7] De Oliveira *et al.*[6,7] determined a 13th-grade reading level is required to understand most patient education materials in anesthesia. Other studies reported the reading level of patient-reported experience measures in regional anesthesia and neuraxial labor analgesia to be well above the sixth grade.

The complexity of healthcare reading materials poses a significant challenge for patients with lower health literacy, particularly in their ability to accurately complete patient-reported outcome measure questionnaires. Low health literacy disproportionately affects underserved populations, including minority groups, immigrants, and adults with lower education levels, further contributing to health disparities.[8] Low health literacy is also associated with poor health outcomes, including delayed diagnoses, inadequate self-management skills, and higher rates of chronic conditions.[9] Similarly, perioperative outcomes may be negatively affected.[10]

This study has several limitations. First, the Gunning Fog and SMOG indices were developed to analyze running narratives, rather than questionnaires, which may have affected readability scores.[3] Second, the algorithms are not designed to analyze complex medical terms, which may have also affected the readability scores.[3] Last, although a comprehensive literature search was conducted by the authors, it is possible that some validated anesthesia patient-reported outcome measures were not included in this study. However, inclusion of more would likely not have altered data enough to affect conclusions, because the average readability of patient-reported outcome measures in this study is at a ninth-grade level.

Developers of patient-reported outcome measure should consider performing readability analysis of text when designing questionnaires. And although these tools undergo a rigorous vetting before implementation, the authors would like to raise awareness of imperfections that exist. Improving the readability of these reporting tools could aid in improving data accuracy and health outcomes.

Competing Interests

The authors declare no competing interests.

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Authorship and Publication Matters: Comment

To the Editor:

The recent editorial on authorship and publication matters[1] among various problems of authorship addresses the question of escalating author counts in academic journals. The editorial indicates that between 1970 and 2010, the number of articles with 6 to 10 authors increased more than tenfold, and that multiauthorship (more than 10 authors) is now common, especially in major medical journals.[2] This phenomenon may reflect author inflation. I wondered whether the escalating author count is also common among anesthesia publications.

The recently published article identified the most influential original clinical articles that fomented important developments in anesthesiology over the past 50 yr.[3] Forty-five such studies (introducing a new drug or a new technique) were identified; 21 of them were published in 1965 to 1984, the other 24 during 1985 to 2007. Table 1 compares the author counts of these two groups and shows that the articles published two decades later reflect some increase in the number of authors per article, from 3.6 to 5.1. The change was especially noticeable for the number of articles with two authors (five 1965 to 1984 articles *vs.* one 1985 to 2007 article) and five authors (nil 1965 to 1984 articles *vs.* nine 1985 to 2007 articles). However, significant multiauthorship was not observed, with the top count not exceeding 11 authors. In addition, the rise in the average number of authors per article was 4.5-fold less than that reported for three major general medical journals.[4]

Multiathorship, whether it is attributable to collaboration or not, should not be considered as a sign of success. Each of the above-mentioned 45 articles represents a major success confirmed by decades of clinical practice. The success was achieved by a relatively small group of authors, both in 1965 to 1984 and 1985 to 2007.

Competing Interests

The author declares no competing interests.

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Table 1. Number of Authors among Anesthesia Articles Published in 1965 to 2007

		Number of Articles with 1, 2, 3, 4, 5, 6 or > 6 Authors, Respectively							
Years	Total Number	1	2	3	4	5	6	> 6	Authors per Article
1965 to 1984	21	0	5	8	5	0	2	1	3.6
1985 to 2007	24	0	1	3	4	9	5	2	5.1