



Original Contribution

# Readability evaluation of Internet-based patient education materials related to the anesthesiology field<sup>☆</sup>



Gildasio S. De Oliveira Jr. MD, MSCI (Assistant Professor)<sup>a,\*</sup>,  
Michael Jung BS (Medical Student)<sup>b</sup>, Kirsten J. Mccaffery PhD (Associate Professor)<sup>c</sup>,  
Robert J. McCarthy PharmD (Research Professor)<sup>a</sup>,  
Michael S. Wolf PhD, MPH (Professor)<sup>d</sup>

<sup>a</sup>Department of Anesthesiology, Feinberg School of Medicine, Northwestern University, Chicago, IL 60611, USA

<sup>b</sup>Feinberg School of Medicine, Northwestern University, Chicago, IL 60611, USA

<sup>c</sup>Faculty of Medicine, The University of Sydney, Chicago, IL 60611, USA

<sup>d</sup>Department of Medicine, Feinberg School of Medicine, Northwestern University, Chicago, IL 60611, USA

Received 12 February 2014; accepted 17 February 2015

## Keywords:

Readability;  
Anesthesiology;  
Websites

## Abstract

**Study Objective:** The main objective of the current investigation was to assess the readability of Internet-based patient education materials related to the field of anesthesiology. We hypothesized that the majority of patient education materials would not be written according to current recommended readability grade level.

**Setting:** Online patient education materials describing procedures, risks, and management of anesthesia-related topics were identified using the search engine Google (available at [www.google.com](http://www.google.com)) using the terms *anesthesia*, *anesthesiology*, *anesthesia risks*, and *anesthesia care*.

**Design:** Cross-sectional evaluation.

**Interventions:** None.

**Measurements:** Assessments of content readability were performed using validated instruments (Flesch-Kincaid Grade Formulae, the Gunning Frequency of Gobbledygook, the New Dale-Chall Test, the Fry graph, and the Flesch Reading Ease score).

**Main Results:** Ninety-six Web sites containing Internet patient education materials (IPEMs) were evaluated. The median (interquartile range) readability grade level for all evaluated IPEMs was 13.5 (12.0–14.6). All the evaluated documents were classified at a greater readability level than the current recommended readability grade,  $P < .001$ . Readability grades were not significantly different among different IPEM sources. Assessment by the Flesch Reading Ease test classified all but 4 IPEMs as at least fairly difficult to read.

<sup>☆</sup> Funding: Department of Anesthesiology, Northwestern University.

\* Corresponding author at: Department of Anesthesiology, Northwestern University, 241 East Huron St, F5-704, Chicago, IL, USA. Tel.: +1 312 472 3573. E-mail address: [g-jr@northwestern.edu](mailto:g-jr@northwestern.edu) (G.S. De Oliveira).

**Conclusions:** Internet-based patient education materials related to the field of anesthesiology are currently written far above the recommended readability grade level. High complexity of written education materials likely limits access of information to millions of American patients. Redesign of online content of Web sites that provide patient education material regarding anesthesia could be an important step in improving access to information for patients with poor health literacy.  
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## 1. Introduction

Healthy literacy is defined by the Institute of Medicine by “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate decisions” [1]. It has been estimated that approximately 40% of the US population have inadequate health literacy [2]. Because poor health literacy has been repeatedly associated with poor patient outcomes [3-5], strategies to improve access and understanding of medical information by patients with inadequate health literacy are largely needed.

The Internet is currently the most used source of health-related information by surgical patients [6]. Because 50% of patients leave their doctor’s office with a poor understanding of their diagnosis [7], Internet-based patient education materials are commonly used by patients in an effort to understand risks associated with medical and/or surgical interventions. In addition, optimal understanding of risk by patients is a necessary step to assure a valid informed consent process [8,9].

The National Institute of Health, US Department of Health and Human Services, and American Medical Association recommend that the readability level of patient education materials needs to be written at or below the sixth grade level to be effectively understood by the American public [10]. Other specialties have examined the readability of Internet-based patient education materials with varying results [11-13]. In contrast, the readability content of Internet-based patient education materials in the anesthesiology field has yet to be determined. Improvement in the readability of online education materials could provide better understandability of the risks and benefits of anesthesiology-related health information to millions of American patients.

The main objective of the current investigation was to assess the readability of Internet-based patient education materials related to the field of anesthesiology. We hypothesized that the majority of patient education materials would not be written according to current recommended readability grade levels.

## 2. Materials and methods

On October 3, 2013, online patient education materials describing procedures, risks, and management of anesthesia-related topics were identified using the search engine Google

(available at [www.google.com](http://www.google.com)). The key word “anesthesia” was typed, and the first 200 Web pages from the generated list were examined for patient-related articles discussing anesthesia concepts. Articles were excluded if they were not patient education materials, if they were written in a language different from English, if they were described mainly in a graphic or table form, or if the article content had less than 30 sentences. The above procedure was then repeated for the terms *anesthesiology*, *anesthesia care*, and *anesthesia risks*. Additional articles meeting inclusion and exclusion criteria were added to the database.

The available information from each Web site that met inclusion criteria was stored as single Microsoft Word (Microsoft, Redmond, WA) files. Following the same recommended methodology used previously to evaluate readability of medial information [14,11], additional text that was not pertinent to patient education such as information to guide Web site navigation, copyright notices, disclaimers, author contact, survey questionnaires, references, Web site resource locators (URLs), address, and telephone numbers was deleted to prevent them from altering the readability scores. In addition, editing of the sentences to remove colons and semicolons was performed as recommended by Flesch [15].

The readability of a text is determined as the education level a person completed to understand the written material. We used the Flesch-Kincaid Grade Formulae, Gunning Frequency of Gobbledygook, New Dale-Chall Test, and Fry graph to access the readability grade for included documents. These methods have been validated for assessment of readability and have been used as described in the literature [15]. The average readability grade of the 4 tests was obtained. A score from 0 to 12 reflects a precollege grade level; 13-16 corresponds to a college level; and scores greater than 16, to a graduate degree level. In addition, we also examined the texts using the Flesch Reading Ease, which generates a score from 0 to 100 corresponding to reading ease, with lower values corresponding to difficult text (0-30 for very difficult, 30-50 for difficult, 50-60 for fairly difficult, 60-70 for standard, 70-80 for fairly easy, 80-90 for easy, and 90-100 for very easy).

Readability scores of the Flesch-Kincaid Grade Formulae, Gunning Frequency of Gobbledygook, and New Dale-Chall Test were analyzed using the software package Readability Studio Professional Version 2012.1 for Windows (Oleander Software Ltd, Vandalia, OH). Subgroup analysis was performed comparing the readability scores from different sources of Web site (academic and professional society,

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