FONBAYS:
A Simple Method for Enhancing Readability of Patient Information

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The importance of addressing the gap between document readability and the reading skills of patients is common knowledge. This gap presents a barrier to enhancing health literacy. Limited health literacy is associated with health beliefs that contradict evidence-based practices, under and inappropriate utilization of health services, patient non-compliance, poorer self-efficacy, increased hospitalization, and poorer health outcomes. Patients who are better informed have improved health literacy. Closing the gap between the difficult readability of health information and the reading skills of health care consumers has important implications for cost containment since most chronic diseases are preventable and treatable. Though a large body of literature proves that health information is difficult to read, what the literature lacks are tools for medical educators, practitioners, and researchers that would aid them in writing simply and clearly. The purpose of this paper is to describe a method to enhance readability that is used at the Drew University Center for Cross-cultural Epidemiologic Studies. We use this method, known as FONBAYS, to improve the readability of existing information as well as to guide development of new information that is easy to read.
Key words: health literacy, readability, readability simplification

Introduction

During the 1990's, literature on the readability of documents used in health care grew substantially. The growing number of reports, in part, was catalyzed by results of the National Adult Literacy Survey (NALS). The NALS revealed overwhelming rates of limited literacy skills in the general population that promulgated concern in the medical community about the quality and utility of written patient information. In their analysis of these data, Kirsch, et al. reported that 40 to 44 million adults were functionally illiterate and could not perform basic reading tasks required to function in society; 50 million adults were marginally literate and could only perform basic reading tasks. In summary, reading skills are deficient in 46% to 51% of adult U.S. citizens.[1,2] Note that this high percentage does not include data on non-U.S. citizens residing in the U.S.

The NALS and the readability literature legitimized what has been known among practicing physicians for some time: a huge gap exists between the readability of health information materials and the reading skills of the patients they are meant to inform. Difficult-to-read health information has little utility for enhancing knowledge and can contribute to poor health by acting as a barrier to understanding chronic disease prevention, self-efficacy, compliance with treatment regimens, and how to negotiate complex healthcare delivery systems.[3]

The importance of addressing this readability/literacy skills gap is underlined by the potential for cultural health beliefs to contradict evidence-based practices and result in under- and inappropriate utilization of health services as well as patient non-compliance. Informing populations from different cultures requires information that is easy-to-read and understand. This is particularly important for vulnerable immigrant populations who are likely to be limited in English proficiency and have limited literacy skills in their native languages. Moreover, an easy to read sentence in English is likely to be translated into an easier to read text in another language. They are at especially high risk for poor self-efficacy, increased hospitalization, and poor health outcomes.[4-6]

Though the literature on readability makes suggestions for improvement, it has not provided concrete tools for medical educators, practitioners, and researchers that would help them to write simply and clearly for patients. The purpose of this paper is to describe a method that has been used at the Drew University Center for Cross-cultural Epidemiologic Studies for improving the readability of existing and new health-related information and for developing instruments such as surveys that are very easy to read.

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Readability Simplification Methods

The process of enhancing readability consists of three steps: 1) readability assessment, 2) readability simplification (e.g. FONBAYS method),[3] and 3) attention to "write-ability" (using a style of writing that ensures sentences use common words are easily understood).

Readability Assessment

There are over 40 readability formulas available. We recommend two estimates of readability: the Flesch-Kincaid Formula (F-K) and the Flesch Reading Ease Index (FREI).[7,8] Both formulas are available on commercial readability software programs. This makes them readily accessible to nearly anyone interested in assessing the readability of text at no additional cost. Importantly, the use of computer software to assess readability reduces the work time required, eliminates human error inherent in manual calculation, and requires little training.[9] As with all readability methods, the F-K and FREI methods provide scores based on the average number of syllables per word and the average number of words per sentence. The F-K method rates text at a U.S. school grade level. The FREI method rates text on a 100-point scale: the higher the score, the easier it is to read the document. Table I displays the correlation between the scores for these two methods and the reading difficulty rating for the scores. The F-K and FREI formulas have been shown to be highly correlated with other commonly used readability assessment methods.[10] Table II provides instructions for setting up a computer to allow readability statistics to be shown as a dialogue box after doing a spell check using the Microsoft Word © program.

Readability Simplification: The FONBAYS Method

Since readability is a function of the number of words per sentence and the number of syllables per word, most difficult-to-read texts contain long run-on sentences that use multi-syllabic words. Furthermore, these long sentences tend to be compound or complex sentences that contain two or more simple sentences, or clauses, linked together.

Simple sentences and clauses express a single thought, question, request, command, or exclamation. They contain one subject and object and a finite verb that, together, present one idea. They may form part of a sentence (as in a compound sentence) or constitute a whole simple sentence.

A compound or complex sentence contains more than one clause. Therefore, complex sentences present more than one idea and may, indeed, present many. The presentation of more than one idea in a sentence decreases comprehension, especially for poor readers. Therefore, readability may be im-

Table 1
CORRELATION BETWEEN FREI AND F-K SCORES AND LEVEL OF READING DIFFICULTY

Reading Ease Score	Level of Reading Difficulty	Grade Level
Less than 40	Very Difficult	Post Graduate
40-49	Difficult	College
50-59	Fairly Difficult	High School
60-69	Standard (Average)	8th - 9th Grade
70-79	Fairly Easy	7th
80-89	Easy to Read	5th - 6th
90-100	Very Easy to Read	3rd - 4th

Table 2
USING MICROSOFT WORD © TO ASSESS READABILITY

- Open a text document using Microsoft Word ©
- On the standard tool bar select the 'Tools' silo
- Select 'Options' at the bottom of the scrolled down menu
- Select the 'Spelling and Grammar' tab in the 'Options' dialogue box
- Select 'Show readability statistics' under the subheading 'Grammar'

When spell check is activated, readability statistics will be automatically displayed for an entire document or a segment of text that is highlighted

proved by splitting complex sentences into simple sentences that are more easily deciphered.

Clauses within complex sentences are linked by connector words. The most common connector words define the acronym F.O.N.B.A.Y.S: **f**or, **o**r, **n**or, **b**ut, **a**nd, **y**et, **s**o. Less frequently used connector words include since, to, on, with, by, and often. Table III gives the reader a step-by-step approach for using the FONBAYS method to improve readability scores. As an example, we apply our approach to readability assessment and readability simplification using the definition of the word "sentence" as found in *Webster's Collegiate Dictionary*,9th edition.

A sentence is a structurally independent grammatical unit of one **or** more words in speech **often** preceded **and** followed by pauses **and** in writing begun with a capital letter **and** ended with a period **or** other end punctuation.

F-K 16.0   FREI 00.0   (Very, Very Difficult to Read)

This is a very long sentence with many thoughts. The first step in simplification is identification of connector words or FONBAYS. These are highlighted in our example in the text box above. This very-difficult-to-read sentence contains six connector words. We then proceed to splice this complex sentence at or near the FONBAYS to create independent clauses. Convert independent clauses into simple sentences by capitalizing the first word and ending with a period or other punctuation. Whenever possible, the simple sentences should eliminate redundancy. Identify and remove free modifiers such as *therefore, consequently, importantly*, and *furthermore*. The same applies to words in parentheses. Removing them does not usually change the meaning of a sentence or clause. The result is a shorter sentence measured as easier to read when using readability formulas.

A paragraph made of clauses or sentences that are grammatically incorrect may result when the FONBAYS method is used. The idea at this stage is to separate the complex sentence into its simpler parts: sets of words that *eash represent one thought*. The importance of this is that persons with limited literacy skills tend to read one word at a time and negotiate one thought at a time. Applying FONBAYS to our example produces the text in the box below.

A sentence is a structurally independent grammatical unit of one or more words in speech. Often preceded **and** followed by pauses. In writing begun with a capital letter. Ended with a period. Ends with other end punctuation.

F-K 9.6   FREI 39.2   (Fairly Difficult)

Note that the readability score has been lowered the equivalent of six reading grade levels and modified from a graduate school level readability to one of high school readability. The complex sentence now resembles a paragraph made up of sets of words that need further modification.

Write-Ability

The analyst must use creative approaches to enhance the text's readability since, by definition, readability is influenced by ease-of-reading (readability score) and choice of words.

Edward Fry, creator of the Fry Readability Formula, warned of the dangers of applying formulas without taking into consideration the content of the text under evaluation.[11] Consider the following two sentences:

1. On Saturday morning, I watched cartoons with my kids.

2. Kids morning on cartoons Saturday I with watched my.

These two sentences have the same length, use the same number of words, have the same number of syllables and, indeed, use the exact same words. They have the same readability scores of F-K 4.9 and FREI 75.5. However, the second rendition exhibits extremely poor write-ability (extremely poor grammar). Thus, enhancing readability means creating easy-to-read text that also is easy to understand. The goal is to use words that are common to the target audience, keeping in mind that the most commonly used words in any language are mono and bi-syllabic. Using common *mono and bi-syllabic* words in our example, we are able to create sentences that are shorter and easier to read. In further modifying our sample, we construct simple sentences that are led by a subtitle.

A sentence is:
a unit of grammar with one or more words
it can be preceded by pauses
it can be followed by pauses
it starts with a capital letter
it ends with a period
it can end in other punctuation
F-K 3.6   FREI 83.0   (Very Easy to Read)

The original complex very-difficult-to-read sentence has been simplified to have a fourth grade reading level difficulty.

One important aspect of improving readability (not just the readability score) is to make the format of the document reader friendly. We recommend using 12- to 14- pica size type in a font that has more space between letters such as Bookman Old Style or Century Gothic. Bulleting key points enhances ease of reading and aids poor readers who tend to read one word at a time and process one thought at a time. Note that when bulleting, periods may omitted. However, when assessing readability the period should be added to cue the readability program that the set of words constitutes a sentence.

The final rendition of the original sentence may then be:

<div style="border:1px solid black;">

A sentence:
- Is a unit of grammar with one or more words.
- It can be preceded by pauses.
- It can be followed by pauses.
- It starts with a capital letter.
- It ends with a period.
- It can end in other punctuation.

F-K 3.2   FREI 83.0 (Very Easy to Read)

</div>

Discussion

Populations living in poverty, the uninsured, racial/ethnic minorities, persons over the age of 65, and the chronically ill are vulnerable populations that experience high rates of chronic disease, morbidity, and early mortality. However, they are least apt to benefit from written health communication despite having the greatest need. This is because they are likely to have limited educational attainment, limited literacy skills and/or diminished reading skills because of impaired cognitive function associated with chronic disease and/or aging.[12]

Within the structure of health care quality assurance, groups such as the Joint Commission for Accreditation of

Table 3

NINE STEPS TO READABILITY ENHANCEMENT USING THE FONBAYS METHOD

1. **Identify compound sentences**
   - A compound sentence has multiple clauses and, therefore, contains more than one thought.
   - A clause is a simple sentence that links with another clause to make a complex sentence.
   - The goal is to separate compound sentences into clauses that are easier to read and contain a single idea.

2. **Identify and separate compound sentences into clauses**
   - Separate clauses at the words **f**or, **o**r, **n**or, **b**ecause, **a**nd, **y**et, **s**o (FONBAYS).
   - Separate sentences at colons and semi-colons.

3. **Identify and reduce compound clauses**
   - Compound clauses have more than one subject or object .
   - Separate subjects or objects into separate clauses.

4. **Eliminate free modifiers or convert them into a clause**
   - These words do not form the basic structure of a sentence.
   - Omitting them does not change the meaning of the sentence.
   - They may kept if they represent a clause.
   - They are separated from the rest of the sentence by a comma or commas.

   *Example: **Born to wealthy parents,** he was able to pursue his career without financial worries.*

5. **Remove elements in parentheses**
   - These are elements that are not part of the basic sentence structure.
   - They may be omitted without changing the meaning of the sentence.
   - They may be converted into an independent clause.

6. **Write an independent clause using each clause element**
   - Make a simple complete sentence.
   - May result in repetition of some sentence elements.
   - Some repetition is good for enhancing comprehension.

7. **Identify clauses that may fit under one sub-heading**

8. **List similar clauses under one sub-heading**
   - *Example: Benefits to Society.*
   - Bullet independent clauses under sub-headings.

9. **Convert bullet into a vision friendly size and style**
   Use 12' or 14 Pica Bookman Old Style font.
   Use 12 or 14 Pica Century Gothic Style font.

The readability of these instructions is F-K Formula 7.4   FREI 62.2 (Fairly easy to read)

Health Organizations (JCAHO) and the National Committee on Quality Assurance (NCQA) have issued guidelines for measuring comprehension levels of patient information.[13] Moreover, several qualitative and survey studies on research of non-participation by racial/ethnic minorities have cited lack of information and inability to understand information about research projects as key barriers to research participation.[14] These findings contradict one of the most important edicts of the *Belmont Report* on conducting research with human subjects, which mandates that research participants receive comprehensible information.

The FONBAYS method for simplifying the readability of text is a useful tool not only for simplifying text that already exists but also as a guide to developing new health related information. Teaching medical and graduate students this easy approach may help future generations of providers communicate better with their patients, improve their health literacy, and, ultimately, improve their health outcomes. We have also used the FONBAYS method in survey research to ensure easy-to-read items with minimal variation in readability.[15] One limitation of this method is that older Microsoft Word © programs have a readability ceiling of 12 for the F-K method. Newer versions measure readability up to grade 17. However, since the goal is to simplify reading to below the sixth grade level, this is not a barrier to the use of the approach proposed here. A second potential limitation is the ability of the educator to write clearly. Here practice and assessing the validity of writing samples using focused discussion groups or intensive cognitive interviewing methods may help.

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