Radiology Report Readability: An Opportunity for Adding Value to Patients

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Traditional Radiology Report

- Written for readers with medical training
- Contains medical jargon
- Contains technical terminology
Radiology Report in Patient-Centered Era

1. Access
2. Comprehension
3. Appraisal
4. Application

Patient portals

How much can patients understand reading radiology reports?

Health literacy
Purpose

To determine average reading level of radiology reports across all subspecialties and all imaging modalities
Material and Methods

1. HIPPA Compliant
   - Institutional Review Board Exempt

2. Study period: March 1, 2017 – March 31, 2017
   - Location: Quaternary-care academic hospital

3. Material: All radiology reports finalized during the study period
   - Extracted from the institution’s RIS system (Analytical Informatics, Baltimore, MD)

4. Readability indices were determined using Readability Studio (Oleander Software, Ltd., Vandalia, Ohio)
   - Reading grade level and reader age were determined using Flesch-Kinkaid score, Flesch reading scale, FORCAST, Cunning Fog and Smog. Scores were reported as averages*.

*For further details on readability indices used in the study please see the reference slide at the end of the presentation
Analysis

• Analyzed radiology reports were segmented by subspecialties and imaging modalities

Subspecialties

• Abdominal Imaging, Breast Imaging, Cardiothoracic Imaging, Community Radiology, Emergency Radiology, Interventional Radiology, Neuroradiology, Nuclear Medicine, Musculoskeletal Radiology, Pediatric Radiology

Modalities

• CT, MRI, ultrasound, radiographs, interventional radiology studies and fluoroscopy, mammograms, nuclear medicine studies, bone density
Results

Total number of analyzed radiology reports: 55,920

- Mammograms: N=5,142
- Nuclear medicine studies: N=1,687
- IR studies and fluoroscopy: N=1,094
- Bone density: N=348
- Computed tomography: N=12,341
- MRI: N=6,320
- Ultrasound: N=5,110
- Radiographs: N=23,878
The average adult literacy level in the U.S. corresponds to the 7-8th grade
*The average adult literacy level in the U.S. corresponds to the 7-8th grade
## Significance of high readability levels of radiology reports

**For patients**

- Precludes the majority of the U.S. adults from understanding the information
- Multimedia reports with hyperlinked “lay” explanation and annotated images can improve comprehension

**For stakeholders**

- Nuanced granularity of radiology reports for imaging is important for comparison, clinical decision making and insurance coverage
- Replacing terminology with simpler expressions can negatively affect coding, billing, research and teaching

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*The initiatives to meet patients’ readability needs must be balanced so that interests of other stakeholders are not neglected*
Our initiatives to enhance the value of radiology reports

1. **Access**
   - Increase radiology enrollment
   - Identify and remove barriers

2. **Comprehension**
   - Add annotated images
   - Avoid abbreviations
   - Decrease vagueness

3. **Appraisal**
   - Info-RADS
   - Consultations with radiologists

4. **Application**
   - Incidental findings management
   - Enroll in lung cancer screening program
To become truly patient centered, radiologists must move beyond traditional “business as usual” reports and find new ways to help patients access, comprehend, appraise and apply the valuable information contained within our reports.

Thank you!
<table>
<thead>
<tr>
<th>Readability Metric</th>
<th>Information about this metric</th>
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<tbody>
<tr>
<td>Flesch-Kinkaid Reading Ease</td>
<td>Mathematical formula using the average number of syllables per word and the average number of words per sentence for a 100-word block of text. Results range from 1 to 100 (1=very complicated to read, 100=very easy to read). Most readability resources recommend writing for the 60 to 70 range. The scores can be matched to school levels: 90-100= 5th grade, 90-80=6th grade, 70-80=7th grade, 60-70=8th grade, 50-60=10-12th</td>
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<tr>
<td>Flesch-Kincaid Grade Level</td>
<td>Same formula as for Flesch-Kinkaid Reading Ease, but expresses results in academic grade levels. 7-8th grade is said to capture 80% of adults in the U.S.</td>
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<tr>
<td>FORCAST</td>
<td>In a sample text of 150 words the number of single syllabus words (N) is counted and then divided by 10 (N/10). The grade level is calculated by subtracting (N/10) from 20.</td>
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<tr>
<td>Gunning Fog</td>
<td>Takes into account words with three or more syllables. The formula omits proper nouns, jargon and compound words. The result is a grade-level score beginning at 1 with no upper bound. The ideal score is between 7 and 8, depending on the audience.</td>
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<tr>
<td>SMOG</td>
<td>To calculate the score, 10 sentences from the beginning, middle and end of the text are selected, then words with three or more syllables are counted, the square root of that number is calculated and rounded to the nearest perfect square, then add 3 to that number to get the corresponding reading grade. The recommended grade level for this score is 7 to 8, depending on the audience.</td>
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