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Analysis of patient information leaflets provided by a District General Hospital by the Flesch and Flesch-Kincaid method

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Title Page

Full Title: Analysis of patient information leaflets provided by a District General Hospital by the Flesch and Flesch-Kincaid method

Short title: Hospital PILs

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Abstract

Introduction

Patient information leaflets (PILs) remain the most frequently used sources of medical information. There is a concern that the reading age of these leaflets may exceed patient comprehension, thus negating their beneficial **effect**. The 'Flesch reading ease' and the 'Flesch-Kincaid grade level' are established methods for providing reliable and reproducible scores of readability.

Method

All available hospital PILs (171) were assessed and divided into 21 departments. Microsoft Word was used to provide Flesch and Flesch-Kincaid readability statistics and compared against the national reading age and the recommended level for provision of medical information.

Results

The average Flesch readability of all of the hospital's PILs is 60, with a Flesch-Kincaid grade of 7.8 (12-13 years old). There is considerable variation in the average readability between departments (Flesch readability 43.8-76.9, Fleasch-Kincaid 5.4-10.2). The average scores of two departments have PILs scores suitable for patient information.

Conclusion

Although our PILs were well laid out and easy to read, the majority would have exceeded patient comprehension. The current advice for provision of NHS information does not highlight the importance of a recommended reading

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level when designing a PIL. Potentially a wide group of patients are being excluded from the benefits of a PIL.

What's known?

PILs are well liked by patients and one of the most widely used methods to disseminate patient education. They provide increased satisfaction with consultations by increasing patients overall understanding of conditions and procedures. Some PILs are thought to be written at a level that exceeds patient comprehension

What's new?

This paper shows that the majority of PILs written by a UK district general hospital would exceed patient comprehension. Reading ages are not something addressed by the NHS toolkit for writing PILs.

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Introduction

Patient information leaflets (PILs) remain the most frequently used sources of medical information [1-2]. They have multiple benefits to patients including helping them understand what is wrong, gaining a realistic idea of progress, to provide reassurance and help cope [3-4]. They also assist in self-care and help legitimise help-seeking and concerns [3-4].

Like many health care providers, our hospital has a wide-range of leaflets for patient use. All of these leaflets have a similar layout, with the same font and style used. These adjuncts to a consultation improve both patient satisfaction and recall, allowing patient review at their leisure [2, 5-8]. PILs are subjected to regular review ensuring accuracy, opposed to sources from the internet [9]. These leaflets are also thought to decrease patient anxiety [10-13]. PILs may contain complex medical terminology, which can be confusing to patients and not be fully understood [14]. To be effective a PIL must be 'noticed, read, understood, believed and remembered' [15]. Written information is given at a fixed reading age, as opposed to oral information which can be adjusted to ensure patient comprehension.

The reading age of a PIL must therefore be sufficiently low to be understood by the majority of the population. The recommended level for provision of patient medical information is at US grade 6 (11-12 years), although the national reading age is US grade 8-9 (13-14 years)[16-18]. The lower level is suggested to ensure that patients understand unfamiliar terms and concepts. It is also likely that patients will have a degree of anxiety about their condition

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(for which they have been provided with a PIL) so a relatively easy piece of text to comprehend is likely to be beneficial.

Two of the most common methods of assessing the readability and comprehension difficulty are the 'Flesch reading ease' and the 'Flesch-Kincaid grade level' [19-21]. These two scales use word and sentence length (with different weighting factors) in formulae to provide a score of readability and education level (by the United States [US] grade level) of a piece of text [19-21]. These methods have excellent reproducibility and a high correlation to other readability scales and have been used in numerous previous studies [14]. The average reading age of the US and UK populations is the 8th Grade (13-14 years old) and patient information should be aimed at grades 5-6 (10-11 years old) [16-18]. A Flesch readability of 60 or more is considered well written and easy to follow [19-21].

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Aims and null hypothesis

The aim of this study was to assess the readability statistics of the PILs provided by our hospital by using the Flesch and Flesch-Kincaid methods. The readability statistics could then be compared to the national reading level and the recommended level for medical information.

The **null** hypotheses were that the reading statistics compare favourably with the recommended level and that there would be no discrepancy in the reading ages across the PILs.

Method

The hospital's website (which is accessible by the public) was used as a source of PILs. All available leaflets were downloaded (some leaflets were unavailable as they were being updated) and the remaining leaflets obtained from outpatients. This information was mostly general about patient's conditions, procedures, treatments and background information about the hospital. Specific information about medications was not assessed. Microsoft Word (Word 2000, Microsoft Windows XP Home Edition) was used to provide these reading statistics – this automated software has been proven to be reliable and valid [14]. The readability of each form in its entirety was assessed and the patient's statement section was assessed separately. In addition 20 newspaper articles (10 "tabloids" and 10 "broadsheets") from the top 10 UK daily newspapers [22] and 10 journal articles were chosen at

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random and assessed. The average readability scores were then compared against the PILs.

The readability statistics were then compared against the national reading age (13-14 years, Flesch-Kincaid grade 8) and the recommended level at which patient medical information should be provided at (10-11 years, Flesch-Kincaid grade 6) [12-16]. US grades can be converted to give a reading age. For example grade 6 students are between 11 and 12 years old, grade 7 between 12-13, grade 8 13-14, grade 9 14-15, grade 10 15-16 and grade 11 16-17 years old. No specific guidance is given regarding the readability of a piece of text, however a score of 60 or more is considered easy to read [19-21].

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Results

In total 171 PILs were obtained and assessed to provide readability scores. For ease of interpretation the PILs were grouped into to 21 categories. Each category had an average of 8 leaflets (range 1-22). The average reading statistics of each group was calculated, for ease of comparison, and the range of each score tabulated (table 1).

Grouping	Readability Ease	Flesch-Kincaid Grade
Anaesthetics	63.6 (56.1-72.8)	7.6 (6.5-8.7)
Cardiology	68.3 (66.4-70.4)	7.3 (7.1-7.5)
Paediatrics	69.8 (62.1-77.5)	7 (5.9-8.1)
Dermatology	62.5 (54-73.5)	7.8 (5.6-9.9)
Diabetes and Endocrine	65 (63.1-67.7)	7.7 (7.2-8.2)
Emergency Department	62.4	8.0
Endoscopy	67.3 (65.1-69.1)	7.8 (6.8-9.6)
ENT	64.7 (59.4-78.7)	7.6 (5.0-9.4)
General	62 (55.4-74.7)	8.7 (5.9-10.9)
General Surgery	57.7 (44.3-71.4)	9 (6.5-10.6)
Gynaecology	56.7 (46.6-66.4)	8.8 (7.2-10.1)
Infection control	63.8 (59-68.5)	7.8 (6.8-8.5)
Maternity	64 (52-80.3)	7.3 (4.7-9.6)
Oncology and Haematology	63.6 (52.7-72)	7.6 (6.2-8.9)
Opthalmology	63.3 (55.6-77.7)	7.5 (5.3-9.3)
Orthopaedics	67.7 (52.4-79.4)	6.8 (4.5-8.8)
Pharmacy	51.4 (47.8-54.9)	10.2 (10-10.3)
Physiotherapy	76.9 (50.6-89)	5.4 (3.4-9.1)
Radiology	66.5 (55.4-81.6)	7.4 (5.5-8.3)
Rheumatology	62.9 (46-72)	7.9 (6.1-10.5)
Urology	60.9 (43.3-68.6)	8.2 (7.2-10.7)

Table 1: Readability scores of grouped hospital PILs

The average Flesch readability of all of the hospital's PILs is 60, with a Flesch-Kincaid grade of 7.8 (12-13 years old). The average leaflets from only 2 departments is at or below the recommended level for patient information (F-K grade 6). However, the majority of departmental averages (18 out of 21) have acceptable Flesch readability scores (60 or more). This suggests that

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most leaflets should be readable, but many may exceed the comprehension of their readers.

There is considerable variation in the average readability between departments (Flesch readability 43.3-89, Flesch-Kincaid 5.4-10.2), with PILs from the pharmacy department having the worst reading statistics and those from the physiotherapy department scoring the best (see figures 1 and 2).

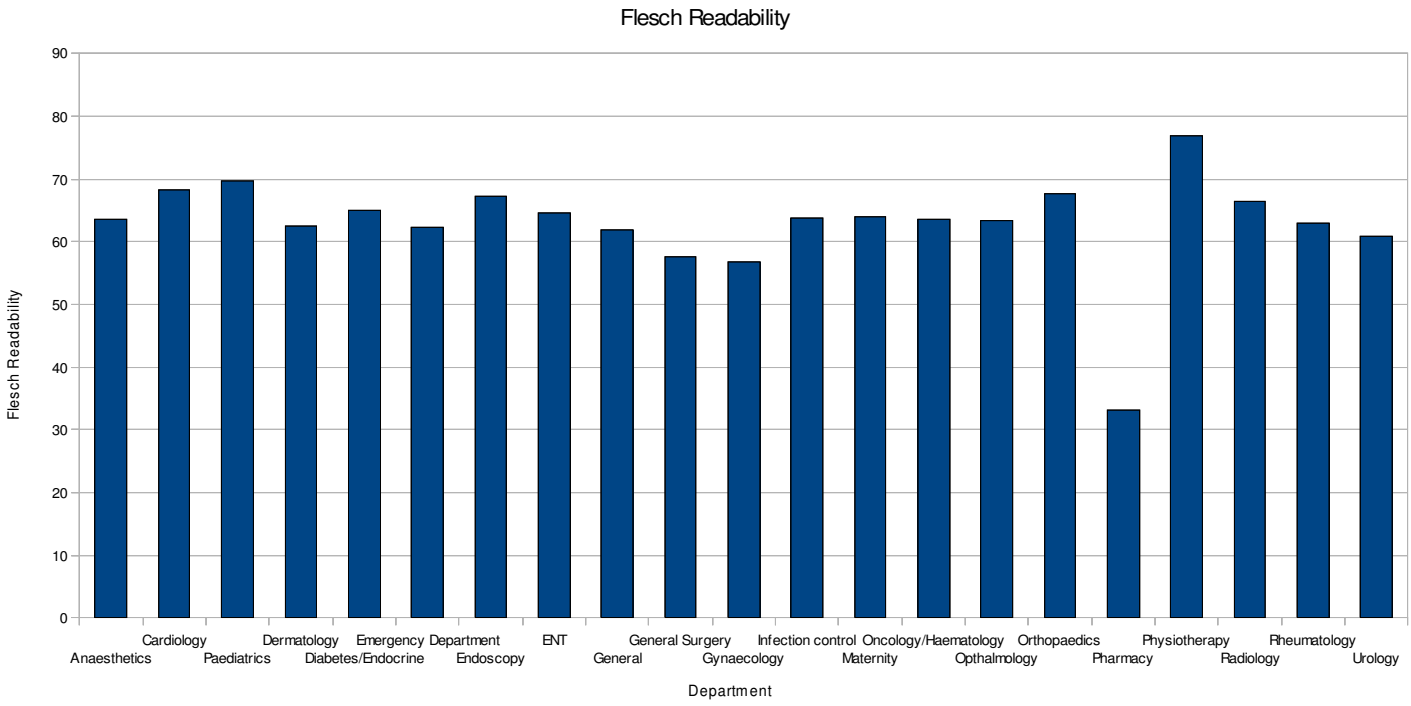

Figure 1: The Flesch Readability average scores for each hospital department

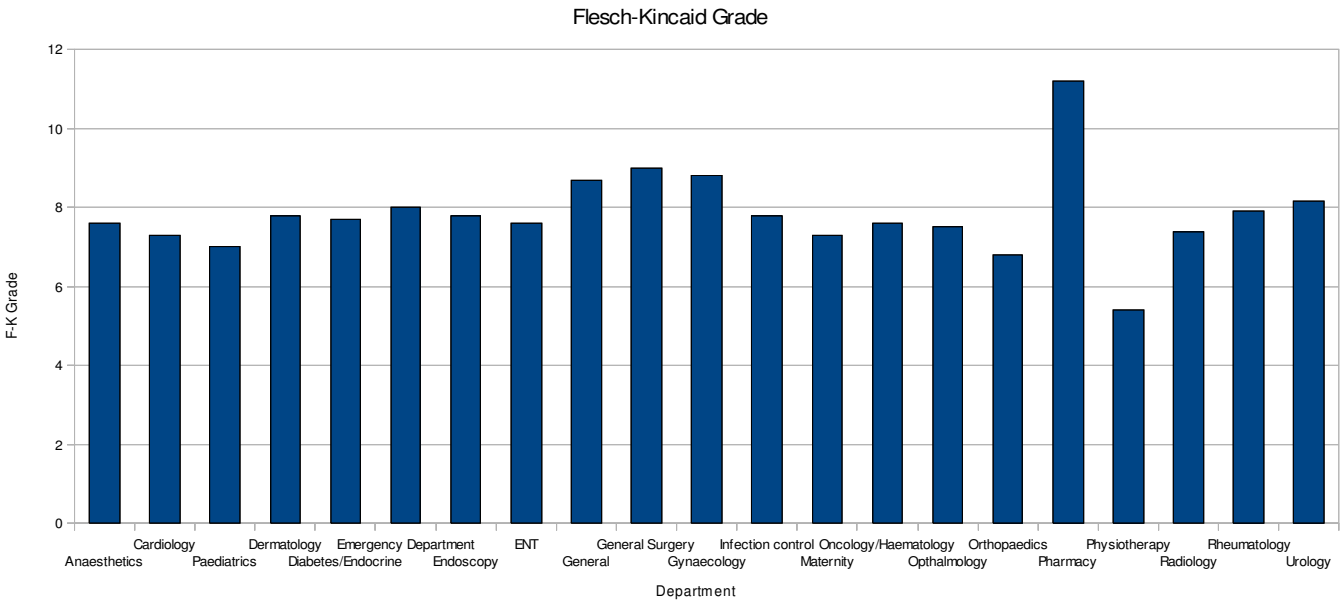

Figure 2: The Flesch-Kincaid average grades for each hospital department

As the Physiotherapy and Pharmacy departments had the best and worst average readability scores they were further analysed and the name and score of each individual leaflet displayed (tables 3 and 4 respectively). Sample text taken from the easiest to read physiotherapy leaflet ("General Exercise") and from the hardest to read pharmacy department ("Self-medication scheme") are displayed in boxes 1 and 2 respectively.

Leaflet	Flesch Readability	Flesch-Kincaid Grade
Active Cycle of Breathing Techniques (ACBT)	80.3	4.7
Acupuncture	50.6	9.1
Hand injury	78.5	5
Knee arthroscopy	80.7	5.2
Ankylosing Spondylitis	80.3	4.7
Carpal tunnel	64.6	8.2
Exercise and arthritis	80.3	4.7
Exercise to prevent falls	76.6	6.0
Foot/ankle injuries	76.6	6
General exercise	89	3.4
Hand/wrist exercise	72.2	5.7

Lymphodema in upper limb	74.9	6.2
Shoulder	83.2	3.7
Transcutaneous Electrical Nerve Stimulation	80.3	4.7
Heat and cold	80.3	4.7
Your back	80.3	4.7
Average	**76.9**	**5.4**

Table 3: Reading statistics of Physiotherapy department leaflets

Leaflet	Flesch Readability	Flesch-Kincaid Grade
Prescription charging	47.8	10.3
Self medication scheme	54.9	10
Average	**51.4**	**10.2**

Table 4: Reading statistics of **Pharmacy** department leaflets

Neck
Do these exercises sitting in a firm upright chair

1. Lower your chin to your chest.

2. Gently turn your head to the right as far as you can and then back to the front.
Repeat to the left side.

3. Keeping your head straight and looking ahead move your head as if you are trying to rest your ear on your shoulder. Do this on both sides.

4. Tuck in your chin and stretch the back of your neck. If you keep your head and shoulders back this will improve your posture.

Box 1: Sample text from General Exercises leaflet (Flesch readability 100, Flesch-Kincaid grade 2.1)

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What is self-medication?

- Self-medication means that you will be responsible for taking your own medication whilst in hospital rather than the nurses administering this to you.
- Before you are allowed to self-medicate a nurse/pharmacist or pharmacy technician will talk to you about your current medication and will decide with you whether you are suitable and/or want to take part in the scheme.
- They will also ask you to sign a consent form.

Will I be able to take all my own medication?

It may not be possible for you to administer all your medication during your stay. For instance the nurse or doctor will administer injections and if you are drowsy, poorly or have had an operation the nurse will give you your medication.

Box 2: Sample text from Self Medication leaflet (Flesch readability 54.9, Flesch-Kincaid grade 10.0)

The Newspaper and Journal articles were chosen at random – articles were chosen from the top daily read newspapers [22] and from recent published medical articles. These articles were downloaded and assessed in an electronic format; for newspaper articles each was obtained via the Newspaper's online website. The Average Flesch Readability score and Flesch-Kincaid grade for each groupings of articles (Tabloids, Broadsheets and Journals) were calculated (Tables 5-7). These averages were then compared with the readability statistics of the averages of the hospital PILs in figures 3 and 4, showing Flesch readability and Flesch-Kincaid grade respectively.

Newspaper	Article	Date	Flesch Readability	Flesch-Kincaid Grade
The Sun	Boy, 12, turns into a girl	18/09/2009	69	8.3
The Sun	Wife killer scoops £250,000 Lotto win	18/09/2009	66.7	7.4
Daily Mail	Attorney General faces raid on her home and	18/09/2009	47.2	11.5

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	£10,000 fine over her illegal immigrant housekeeper			
Daily Mail	Deadly second wave of swine flu 'on its way', scientists warn	18/09/2009	50.1	12.0
Daily Mirror	Defiant Jordan tells police probing celebrity rapist claim: "I wish I never said anything"	18/09/2009	70.7	7.3
Daily Mirror	Chancellor holds spending cut talks	18/09/2009	39.0	12.0
Daily Express	Heart pills scandal	18/09/2009	50.2	12.0
Daily Express	Diana – Why is was a 'murder plot'	18/09/2009	53.1	11.6
Daily Star	Gladiator Ace: 'I did not rape Kate'	18/09/2009	68.9	8.1
Daily Star	A French Correction	18/09/2009	65.3	9.0
Average			58	9.9

Table 5: Readability statistics for random UK tabloid newspaper articles

Newspaper	Article	Date	Flesch Readability	Flesch-Kincaid Grade
Daily Telegraph	Alistair Darling holds Cabinet meetings about spending cuts	18/09/2009	45.0	12.0
Daily Telegraph	Iran: clashes as Mahmoud Ahmadinejad calls Holocaust a 'lie'	18/09/2009	26.2	12.0
The Times	Clashes in Teran as opposition defies regime warnings	18/09/2009	34.6	12.0
The Times	Obama scraps Star Wars and gambles on Russia	18/09/2009	40.2	12.0
The Guardian	IAEA secret report: Iran worked on nuclear warhead	18/09/2009	32.5	12.0
The Guardian	UK monthly budget deficit soars to record £16bn	18/09/2009	50.9	12.0
The Independent	Army chief: 'We must tackle Taliban grievances'	18/09/2009	47.5	12.0
The Independent	Titus the gorilla king is dead	18/09/2009	56.2	9.8
Financial Times	Lloyds considers toxic asset options	18/09/2009	48.1	12.0

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Financial Times	Public sector borrowing hits August record	18/09/2009	38.3	12.0
Average			41.9	11.8

Table 6: Readability statistics for random UK broadsheet newspaper articles

Journal	Article	Reference	Flesch Readability	Flesch-Kincaid Grade
The American Journal of Surgery	Middle-preserving pancreatectomy for multicentric body-sparing lesions of the pancreas	2009;**198**: e49-53	22.4	12.0
Journal of Critical Care	How do older ventilated patients fare? A survival/functional analysis of 641 ventilations	2009;**24**:340-346	27.3	12.0
The Lancet	Burden of disease caused by Streptococcus pneumoniae in children younger than 5 years: global estimates	2009;**374**: 893-902	9.3	12.0
Cardiovascular interventional radiology	Catheter-Directed Thrombolysis for Treatment of Deep Venous Thrombosis in the Upper Extremities	2009;**32**:980-987	33.3	12.0
Surgery Today	The Implications of the Presence of an Aberrant Right Hepatic Artery in Patients Undergoing a Pancreaticoduodenectomy	2009;**39**:669–674	25.5	12.0
Journal of the Royal Society of Medicine	Is multidisciplinary teamwork the key? A qualitative study of the development of respiratory services in the UK	2009;**102**: 378-390	20.2	12.0
British Medical Journal	Equity, waiting times, and NHS reforms: retrospective study	2009;**339**: b3264	25.3	12.0
Annals of the Royal College of Surgeons of England	Non-occlusive small bowel necrosis in association with feeding jejunostomy after elective upper gastrointestinal surgery	2009;**91**:477–482	26.6	11.0
Abdominal Imaging	CT appearance of Epstein-Barr virus-associated gastric carcinoma	2009;**34**:618-625	23.9	12.0
Journal of Gastrointestinal Surgery	Diagnostic Accuracy of C-reactive Protein for Intraabdominal Infections	2009;**13**:1599–1606	22.9	11.3

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	After Colorectal Resections			
Average			23.7	11.8

Table 7: Readability statistics for random journal articles

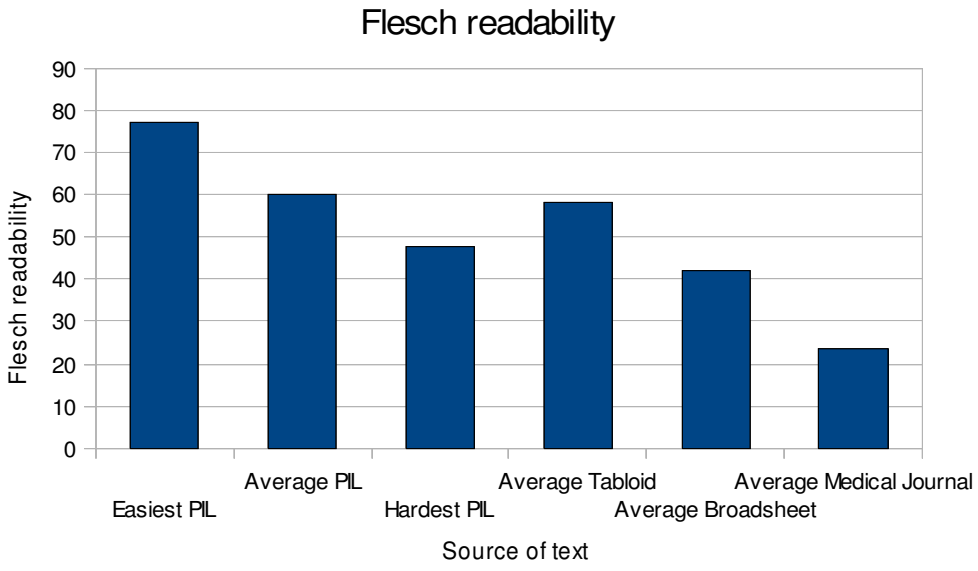

Figure 3: Comparison of selected hospital PILs with average Newspaper and medical journal articles using the Flesch readability formula

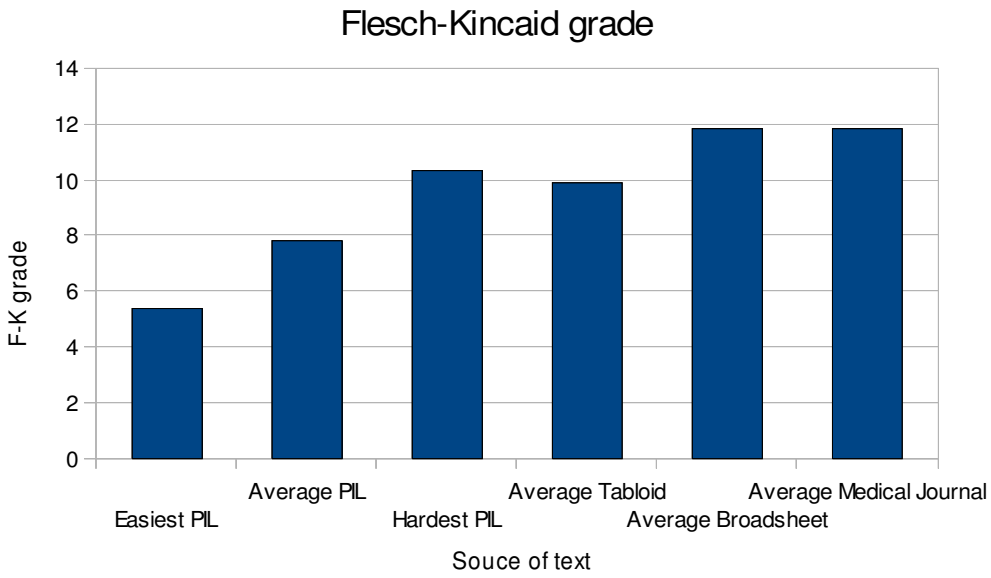

Figure 4: Comparison of selected hospital PILs with average Newspaper and medical journal articles using the Flesch-Kincaid grade

Discussion

PILs are well liked by patients and they remain one of the most widely used sources of information by patients [1-2]. They improve patient understanding and, when used as an adjunct to a consultation, improve recollection of discussed issues [2,5, 23-25]. They empower patients and allow them to re-refer to their information source at their leisure [2-8].

Our hospital produces a wide spectrum of PILs covering the majority of common conditions, ailments and procedures. Not all of these PILs were available to be assessed, but of the 179 that were the majority were easy to read (the averages of only 3 out of 21 had a Flesch readability of less than 60). Scoring of the average PILs Flesch-Kincaid grades was also good, with only 1 department exceeding the national reading age. However, when compared at the recommended grade for medical information, the PILs score badly. Only two departments have PILs at or below this recommended level. Other sources of written information do exist in our hospital; not only on patient information boards, but various other agencies produce PILs (e.g. Cancer Research UK and the British Lung Foundation). We have not assessed these other PILs, although they may indirectly influence which leaflets are produced by our hospital.

A PIL needs to be understood to be effective [15]. An established, reliable and reproducible method for assessment of readability is the Flesch and Flesch-Kincaid formulae [19-21]. These methods rely on assessing sentence length and the number of syllables in a word, but they do not take into account the

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overall cohesion of a sentence [19-21]. Thus two sentences with the same words in can be arranged quite differently and give the same readability statistics, but the comprehension of the text can be greatly affected [2]. Likewise it is known that style and layout can also greatly influence the readability of PILs and neither the Flesch of Flesch-Kincaid formulae can assesses these factors [2-3, 19-21].

One additional problem with assessing PILs is that they will, by definition, have medical terminology in them [14]. This terminology **may be** limited (in the case of the physiotherapy leaflets), but is likely to raise the reading age of a leaflet (medical terms tend to have multiple syllables) [2]. Therefore PILs need to contain relevant information, but be simple enough to be understood. While this balance is possible, a too simplistic style runs the risk of being perceived as patronizing and may lack interest and authority [2].

Even if a PIL is aimed at a reading age of 10-11 years, there will be a group of people for who this level will be too high – it is estimated that 20% of the population will struggle to understand this level of written information [16-18]. The management of this group of patients may also require more than one consultation (by one or more members of a multi-disciplinary team) so that any information than was not understood by a patient can be addressed to ensure comprehension. While information given in an oral format can be guided to an appropriate educational level, the provision of additional multimedia sources of information may also be beneficial [2,24,26].

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Within the NHS, advice to improve PILs advocates the use of plain everyday English, written in short sentences, and advises about font, style, layout and format – each of these is likely to affect readability, but is harder to objectively assess [3-4]. The use of pictures, diagrams and space all help the reader to clearly see the message within the leaflet [3-4]. Although the instructions given are likely to improve readability, little formal instruction is given with regards to reading age. It is recommended that guidelines for patient information should be developed after contact with the audit or quality assurance departments, and that these PILs should be reviewed and audited regularly [3-4]. It is important that any information leaflets produced are focused on a particular group of patients and they should be relevant [3-4]. The information provided should be up to date and patients and carers should be involved in their construction [3-4].

We would agree with these principles for developing a worthwhile, readable, understandable and current PIL. However, as this paper has shown, we are in danger of producing PILs that are incomprehensible to some patients. To keep PILs effective a combination approach may be required to improve patient understanding, with the use of the NHS toolkit, the regular formal assessment of PILs for readability (by use of the Flesch-Kincaid scores) and a panel of test readers, including both health professionals and lay people. However, it is likely that some patients may still not understand the information and a PIL should not be used as a substitute for a consultation. Potentially patient information can also be given in a multimedia format, which

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they can also review at their leisure, thus negating the effect of patients' reading age.

Conclusion

While there is little doubt that PILs are of great benefit to patients, providing increased satisfaction with consultations, increasing their overall understanding of the condition/procedure/operation and allowing patients to absorb this information away from the hospital setting [2, 5-8, 16, 25]. This information need to be easily understood and although most of our PILs were easy to read, almost all of them had a reading age in excess of the recommended level. The current NHS guidelines for provision of PILs does not stress the importance of ensuring the leaflet is written at (or below) grade 6 comprehension. Potentially a wide group of patients does not benefit from the provision of a PIL, and thus resources are being wasted.

With some minor modifications and regular review this information can be provided at a more appropriate level, ensuring comprehension from a wider population. By enhancing patient understanding we should reduce patient anxiety, empower patients to their condition and procedure, and fully inform them about treatment options. Improving comprehension will also allow patients to be more actively involved when discussing invasive procedures, enhancing the notion of 'informed' consent.

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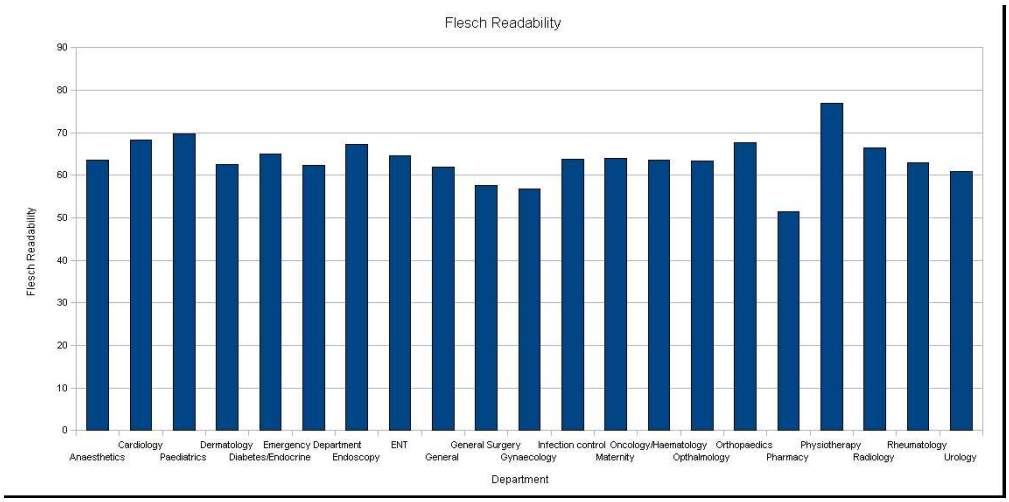

The Flesch Readability average scores for each hospital department
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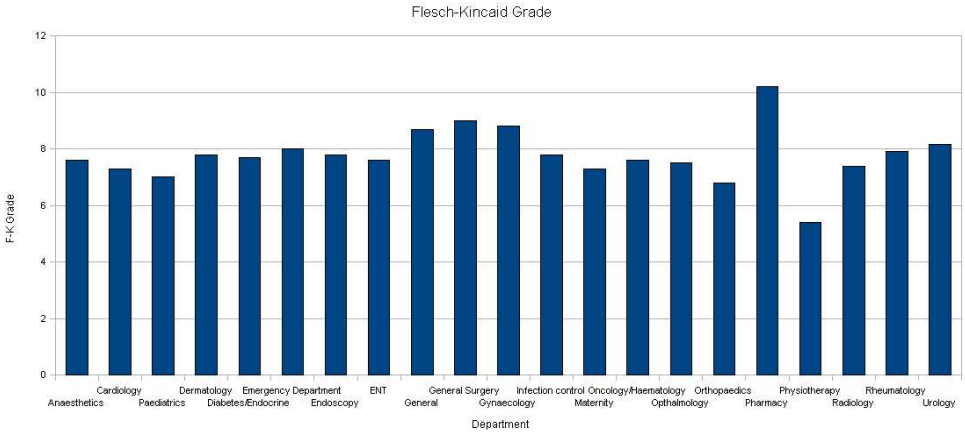
For Review Only



The Flesch-Kincaid average grades for each hospital department
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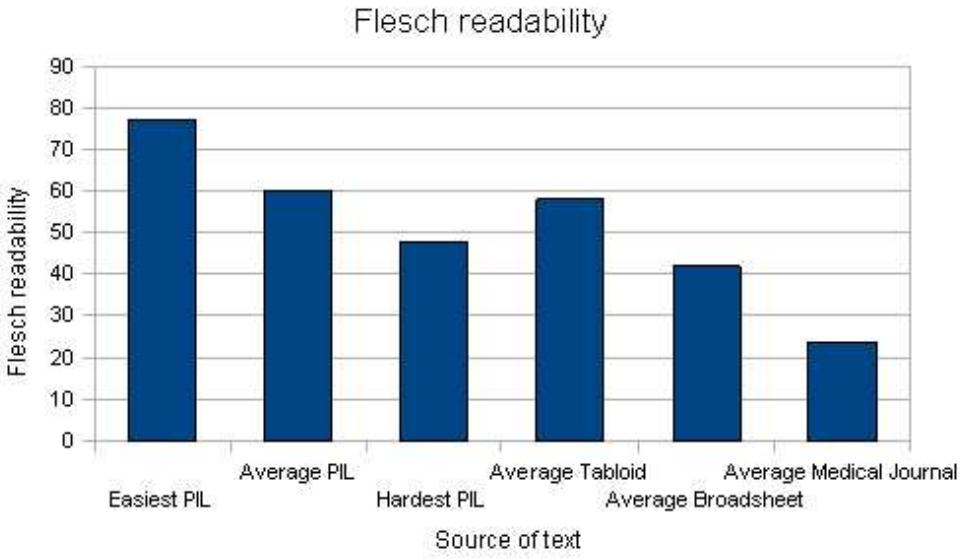

Comparison of selected hospital PILs with average Newspaper and medical journal articles using the Flesch readability formula
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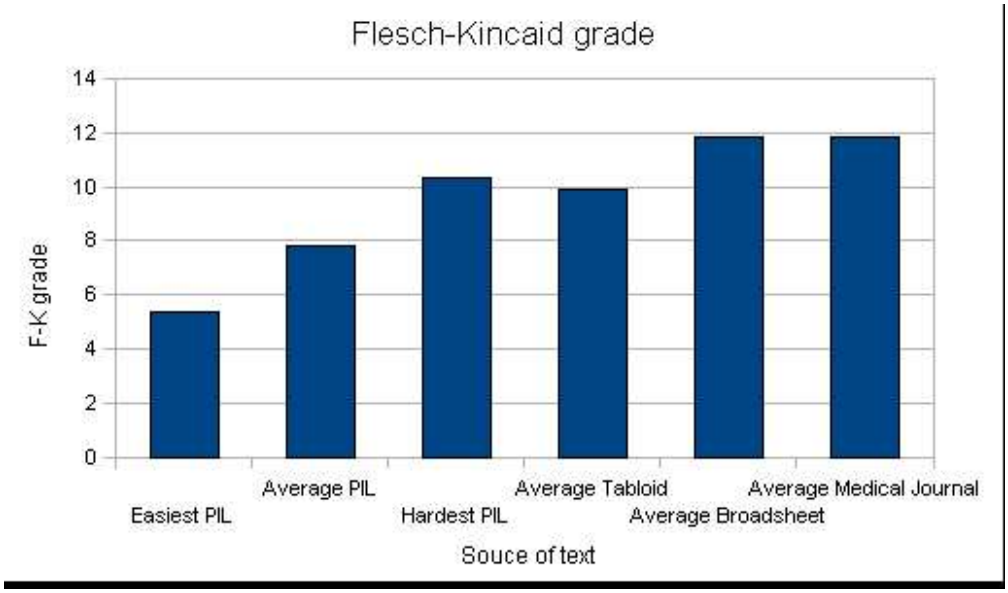

Comparison of selected hospital PILs with average Newspaper and medical journal articles using the Flesch-Kincaid grade
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