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BREAKING THROUGH THE INVISIBLE BARRIER OF LOW FUNCTIONAL HEALTH LITERACY: IMPLICATIONS FOR HEALTH COMMUNICATION

The substantial personal and social consequences of low health literacy levels have been well documented for over twenty five years, yet health-related information material continues to be produced that is written at a level well above patients' average reading ability. Patients with low literacy levels will go to great lengths to avoid potential embarrassment and shame, thus the barrier is invisible. Failure to improve information provision and comprehension means that patients are at risk for problems due to incorrect or inappropriate medication usage.

A large-scale empirical study of patient's medication information sources is reported. We suggest that relatively high use of some consumer media may be due to information in these vehicles being presented in ways that are more user friendly than material presented via traditional health-provider originated sources. The results of a readability analysis conducted to verify this proposition are discussed along with the implications for future health communication strategies.

Keywords: health literacy, medication compliance, medication information, health communication, media.

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1. Introduction

Fogarty (1997) notes the frustration of medical professionals with what appears to be illogical decisions by patients to not comply with recommended therapies. Compliance/adherence rates internationally are on average no better than 50%, with rates for behaviourally demanding treatment regimes being much lower, as are rates for many lifestyle treatments (Haynes et al. 2002). Even when non-compliance has potentially serious consequences such as vision impairment, or organ rejection, correct compliance rates remain low (Carter, Taylor & Levinson 2003; Sullivan & Abelson 2000; Shelton 1998). Non-adherence may also be a factor in the emergence of drug-resistant organisms (Myers & Midence 1998).

While there are numerous factors impacting on patient compliance rates (see, for example, Grant et al. 2003; Benson & Britten 2002; van Grunsven 2001; Horne & Weinman 1999; Rundall & Weiss 1998), a common factor is simply the capacity of the patient to understand or to be able to comply. An overlooked factor in compliance is the functional literacy level of patients (Wallendorf 2001). Sullivan and Abelson (2000) support this by identifying intelligence and education as limiting comprehension of diagnosis and treatment options as well as correct usage. They also indicate that cost and environmental factors such as working conditions, both co-related with intelligence and education, may also impact on the ability to comply. Further, demographics appear to also be a largely unrecognized factor in compliance behaviour. Loden and Schooler (2000) suggest that older adults may believe they are complying when they are not doing so on a consistent basis.

We therefore firstly review the literature regarding health literacy and the implications for medication compliance. We then report on two related studies designed to investigate aspects of information sources used by patients and the relative readability of material from a range of these sources. We suggest that a substantial amount of health-related material is presented in language that is beyond the comprehension ability of the average person.

2. Functional Health Literacy Levels

Functional literacy refers to "sufficient basic skills in reading and writing to be able to function effectively in everyday situations" (Nutbeam 2000: 263). When considered in the context of health, functional health liter-

acy means "being able to apply literacy skills to health related materials such as prescriptions, appointment cards, medicine labels and directions for home health care" (Parker et al. 1995, cited in Nutbeam 2000: 263).

The implications of low functional literacy have been extensively researched in the context of health (see, for example, Rudd, Moeykens & Colton 1999); Harvard University regards the area as sufficiently important to warrant maintaining a unit specifically focussed on Health Literacy Studies. The literature in this area indicates consistent findings that most written material, from commercial, government or health-organisation sources is at a level well beyond the ability of patients to understand it, even though the problems associated with low levels of health literacy have been recognized for at least twenty-five years (Adkins, Elkins & Singh 2001; Rudd, Moeykens & Colton 1999). Table 1 shows the reading skill level broadly associated with age cohorts (Hoffman et al. 2004; Wallace & Lemon 2004; Mumford 1997). The average reading skill level of the adult population is often overrated. It is generally 3 - 5 grades below the level expected from the final year of formal education (Shea et al. 2004; Brownson 1999). Thus, a person who left secondary school at age 15 (approximate reading level of 11) can be expected to have a post-education reading level of 6 - 8; a person with a tertiary undergraduate degree (approximate reading level of 15) can be expected to have a post-education reading level of 10 - 12. The average reading skill of American adults is reported to be no better than the 8th grade (i.e. pre-high school). The OECD-sponsored International Adult Literacy Survey conducted in 1996 indicates that this level is similar across most developed countries (Ministry of Education 2004). However, most health literature is some three grades above this (Hoffman et al. 2004; Wallace & Lemon 2004; Mumford 1997); we will show that a considerable amount of material is written at or above level 12.

More significantly, Wallendorf (2001: 506) notes that, while almost all adults in first world countries are assumed to be able to read and write, 21% of adult Americans have only rudimentary skills, leaving them unable to extract even simple information from printed material. A further 25% can perform simple reading functions but "cannot integrate or synthesize several facts" from documents. Further, she suggests that a largely unidentified group could be classed as 'aliterate', in that they are able to read but choose not to, and rely on television rather than print media for news. More importantly, they learn through trial and error rather than by reading instructions. While data from the 1996

International Adult Literacy Survey indicates that there is some variation in these rates across countries, with Scandinavian countries performing marginally better and countries such as Poland performing worse, the problem is a global one (Ministry of Education 2004; Easton 1999). The consequences for medication misuse are obvious.

Table 1: Reading Skill Level by Age Cohort as indicated in the literature (see, for example, Hoffman et al. 2004; Wallace & Lemon 2004; Mumford 1997)

School level	Approximate Age	Approximate Grade / Reading Skill Level Expected
New Entrant	5	1
Junior / Primary School	6	2
	7	3
	8	4
	9	5
	10	6
Intermediate Level	11	7
	12	8
High School	13	9
	14	10
	15	11
	16	12
Higher Education (College / University)	17	13
	18	14
	19	15

3. Patient Communication and Comprehension

Poor communication between doctor and patient is a reoccurring theme in the literature as an important predictor of both patient dissatisfaction and non-compliance (Martin, DiMatteo & Lepper 2001). Inadequate communication on the part of a doctor includes aspects such as the lack of individualized medication counselling and lack of written, as opposed to verbal, instructions (Hammond & Lambert 1994). However, as we have already noted, the provision of written material that is beyond the

ability of many patients' comprehension will be ineffectual. Bachman (1993) notes that many patients are recorded as believing that they do not receive adequate information and advice about their medications. However, the fault does not necessarily lie with the prescriber. Patients' ability to correctly recall information is, at best, suboptimal. Ferner (2003: 821) suggests that up to 80% of information given during a consultation "is forgotten at once and almost half of what remains is incorrect". In fact, half of verbal instructions may be forgotten within as little as five minutes (Raynor 1998).

While several studies suggest the provision of written patient information in addition to verbal advice is desirable, the precise form it should take is not clear. In addition to the readability aspect of the material, the way that the information is presented ('framed') will influence processing of the message and decisions regarding subsequent behaviour (Buda & Zhang 2000). The tone of the material may have different effects, with personal ("You may..."), rather than impersonal ("A doctor should..."), being more effective (Berry, Michas & Bersellini 2003). Levins (1998) draws on a number of actual (American) case studies to suggest that personalised communication can positively enhance the provider-patient relationship to help educate and motivate patients to continue with their prescribed drug regime.

What appears to be missing in this discussion is consideration of the way in which information is provided. For example, Kefalides (1999) notes that the simple addition of a picture / pictogram to patient information can increase recall from 15% to 85%, yet many patient information brochures do not include this as part of the medication use material. Aspects of the presentation of information, including layout / design elements and the suitability of the material presented for the needs of the patient appear to be significant factors in effective comprehension and thus compliance (Kaphingst et al. 2004; Kaphingst, Rudd & DeJong 2004; Doak, Doak & Root 1985).

Pressure of time in adequately explaining treatment options remains a major perceived barrier for doctors, although Say and Thompson (2003) suggest that patient involvement in decision making may not in fact impact substantially on consultation times. Further, they note that registrars are on record as requesting additional skill development in patient decision making involvement techniques. In addition, they stress that a lack of adequate information to support patient's informed involvement in decision making is of concern to many doctors. It may be that ways

can be found by which information can be communicated more effectively without incurring additional time to check on correct understanding by patients.

The consequences of inadequate communication, or not checking of understanding, is graphically illustrated by Vlad (2003) who documents an elderly patient who, on the basis of shape, inserted rectal suppositories into her nose. However, while this case may be amusing, Eysenbach and Diepgen (1998) caution that misinformation could literally be a matter of life or death. Underestimation of the consequences of non-compliance may lead to avoidance of information itself. There is a clear need to communicate the vulnerability of patients undergoing treatment in order to stimulate receptiveness to relevant health management information and thus to increase the likelihood of positive action, including compliance, by the patient (Agrawal, Menon & Aaker 2003).

Communication, to be effective, extends well beyond the provision of advice or patient education. Patient understanding is impacted by (lack of) fundamental knowledge, patient misunderstanding or misconception about the nature of the medical problem, and information that may be presented in a form that is not readily comprehended. This problem is likely to be exacerbated by the complexity of what material is actually provided to patients. As noted earlier, most patient education material is written at a level that is far beyond the reading ability of most patients; only some 20% of patients will be able to read and understand it (Bar-Yam 2002). This is supported by Noble (1998: 66) who, in addition to noting that previous studies indicate that only one fifth of information leaflets would be understood by 75% of the population, also cites examples from these studies in which terms such as "lumbar puncture" and "incubation period" were completely misunderstood.

Thus, while considerable prior research indicates that written information provision, reinforced by verbal information, is the most effective means of information provision (Raynor 1998), there are substantial barriers in terms of comprehension that must be considered. Effective communication, in which the "message" sent is received and understood ("knowledge transfer": see, for example, Raynor 1998) is therefore necessary, but it is not of itself sufficient to engender compliance, especially when it is counter to existing attitudes and behaviours (Horne 1999).

There are calls for balanced information in pharmaceutical company marketing communication, with equal emphasis on benefits and risk / side effects (see, for example, Lyles 2002). The communication of risks

and negative side effects is seen as an important factor in providing the basis for informed patient decision making, however Berry, Michas and Bersellini (2003) stress doctors' reluctance to advise patients about possible side effects, particularly if the risks are low; they note that written information about potential risks lessens satisfaction and decreases compliance due to heightened perceptions of perceived risks from the medication.

Fried (1997) supports this, indicating that emphasising risk information may be a factor in non-compliance for some medications, citing one study (for which the medications examined were not reported) that indicated that, after reading disclaimer statements in drug advertising, 70% of adults felt less inclined to use the drug and 62% actually stopped taking the drug because the side effects scared them. This creates the phenomenon described by Raynor (1998: 85) as "intelligent non-compliance".

Horne and Weinman (1999) suggest that an implicit cost-benefit analysis occurs, weighing up beliefs about the necessity of the medication against concerns regarding any adverse effects and that the outcome of this analysis then impacts on compliance. This view is supported by Playle and Keeley (1998) who caution against attempts to "educate" which ignore patient beliefs. Instead, they advocate "benevolent coercion" in order to help achieve "informed consent" to a proposed programme of treatment. This raises a number of questions relating to medical literacy, the provision of information initially from the patients' doctors and the wider issue of informed decision making at the time of issuing the prescription, as well as issues relating to how risk information should be best communicated. In addition, it requires genuine two-way information flow which must include checking on real rather than assumed comprehension and ability to comply with medication usage instructions.

Identification of unrecognized non-compliers is important, both in terms of taking appropriate actions to rectify their behaviour, but also as the unrecognized behaviour may be misinterpreted as being caused by problems with drug absorption or metabolic factors (pharmacokinetics) or other physiological factors (pharmacodynamics) which may result in unwarranted, and probably also ineffective, changes to medication regimes (Urquhart 2002).

Stone et al. (2002) observe that identification of non-compliant patients can be difficult, with photo sensor-fitted paper diaries revealing substantial differences between reported (90%) and actual (11%) com-

pliance behaviour. The possibility that non-compliant patients cannot comprehend the instructions, or are unable to appropriately record compliance in the diary, does not appear to have been considered by these authors. They do, however, report considerable improvement through the use of electronic diaries, suggesting that these, and a range of emerging electronic reminder / prompting devices, may warrant further investigation. It may well be that these electronic methods provide the resources that enable the patients to comply.

If patients do not receive the information they seek from formal medical sources, it is probable that they will seek information from more accessible sources with which they feel comfortable. In order to determine the relative importance and readability of a range of potential sources used by patients regarding medication options for patients, two separate studies were conducted. These are now reported.

4. Empirical Study

Part A: A large scale study was undertaken of the general New Zealand population as part of a wider study of factors influencing medication compliance rates. We report here only the part of that study that related to determining the relative importance of a range of patients' sources of information regarding medication for their own consumption.

A stratified random sample of adults aged 20+ was drawn from the New Zealand Electoral roll. A mail survey was selected, partially on a cost-efficiency basis, but primarily because of the complexity of the questionnaire and the desire to give respondents more time to reflect on their responses than would have been possible with telephone based interviews. This method was expected to also reduce, but not eliminate, shortcomings associated with any recall based method (Stone et al. 2002).

In addition, it was felt that the use of a mail survey would provide a greater degree of perceived anonymity and thus minimise social desirability and post rationalisation in responses – and encourage more open comments in regard to sensitive areas such as whether respondents were suffering from, or at risk of a range of illnesses. The use of Electoral Roll data also enabled stratification to ensure that the sample reflected all age groups in proportion to the overall New Zealand population. The questionnaire, together with a covering letter explaining the objectives of the study and a reply-paid envelope was mailed to a selected sample of 5,000 individuals in April 2004. It should be noted that respondents were asked

in some parts of the questionnaire to reflect back on discussions with medical professionals, introducing the potential for recall bias, an inevitable consequence of the methodology used (Calfee 2002).

An analysis of the demographic profile of respondents, as in previous studies of a similar nature (Eagle & Chamberlain 2003), indicates that Europeans are over-represented, as are females. The former is likely to be due to the complexity of questionnaires of this type and the probable daunting prospect it may have appeared to non-native English speakers. The likely skew in gender responses is possibly a reflection of the reluctance of males to discuss health matters with their doctors (Frederick 1998), let alone unknown researchers, however anonymous the questionnaire was. Eagle and Chamberlain (2003) also noted that it was also evident with several comments from respondents that, while the questionnaire may have been addressed to a male member of a household, they had passed it on to a female member of the household to complete. No significant differences between the age profile of respondents and that of the overall New Zealand population were evident; however upper socio-economic groups are over-represented. Conversely lower-socio-economic groups, who can be expected to have lower functional literacy levels and who would therefore have found a substantial printed questionnaire challenging, are under-represented. From the literature cited earlier (for example, Wallendorf 2001), this can be expected to be at least 20% of the population.

5. Response Rates

Questionnaires despatched:	5,000
Returned as undeliverable:	381
Effective sample size:	4,619
Unusable due to insufficient questions completed:	14
Usable responses as at cut-off date:	965
Received after cut-off date:	4

A 19% response rate was achieved for the total posting; 21% for the effective sample. Given the complexity of the questionnaire and the comments made earlier in relation to functional literacy levels, we believe that this response rate is in the range that could be expected. However, the question of how to assess the opinions and beliefs of those who have low functional literacy levels must be raised.

Respondents were asked to rate the importance of a range of information sources regarding medication options, using a five point rating scale where 5 = extremely important and 1 = not important at all. Table 2 indicates that traditional medical practitioners are seen as the primary, most important, sources of medical advice, with pharmacists playing a lesser, but still important role. Consistency of advice between doctors and pharmacists was seen as being a major factor, with 87.6% of respondents rating this factor as either extremely important or important. This is consistent with previous literature (see, for example, Sluijs et al. 1998). Raynor (1998) also notes that, unsurprisingly, advice consistency reinforces effective information delivery. Non-traditional medical advice sources were also seen as information sources: almost 1/3 of respondents rated alternative medicine practitioners as extremely important or important sources of information.

The diverse range of sources perceived as providing information regarding medication options is evident and, at times, disturbing. The media are seen as secondary, but still important sources of information, with 36.1% rating news and documentaries and 35.1% rating newspaper or magazine articles as extremely important or important sources of information. Questions must be raised regarding the accuracy and completeness of the information obtained from some media sources. Often media coverage is sensationalized and unbalanced. For example, media misinterpretation of several studies involving laboratory animal's brain patterns when consuming food were presented in somewhat sensationalized forms:

- "Fast Food as Addictive as Heroin" (BBC News 2003)
- "Could Fast Food Be Addictive?" (TV One News 2003)
- "Is Fast Food Addictive?" (Daily News 2003)

While medical drama shows are seen as not important at all by nearly 2/3 of respondents, it is of some concern that a small percentage sees them as important sources of information. This may explain the rationale behind some (American) websites that includes coverage, not only of health aspects in the previous day's news, but also in popular shows such as "ER"! These sites are not necessarily popularist in their approach. One, "Following ER", is part of a multi-media initiative by the prestigious John Hopkins University. Ninety-second programmettes began to be produced in the late 1990s to follow the screening of each episode, pro-

viding more information on a specific medical condition featured in the episode. This was backed by a web page and an interactive telephone facility for additional advice and information. The stated aim of this initiative was to harness the "power of television to deliver preventive health information" (Fillmore 1997: 1).

The Internet is seen as extremely important or important by almost 1/4 of respondents with advertising being perceived as a less important source. Of the small number of respondents who listed other sources of information, books and journals constituted the main source (13), with pharmacy browsing (6), personal knowledge (4) and friends / colleagues (3) being the main sources cited. Other sources cited included lectures and seminars, radio (naturopath), physiotherapist, midwife and alternative GP.

The overall results indicate that consumer media, including television medical dramas, the Internet and newspaper / magazine articles, are a relatively important source of information (Table 2). Ease of access to such media may explain some of its popularity. For instance, 98% of New Zealand households have a colour television (ACNeilsen 2004) and New Zealand has one of the highest rates of Internet access in the world (Statistics New Zealand 2004). However, in addition to being accessible, we suggest that the popularity of consumer media may also be due to information in these vehicles being presented in ways that are more user friendly than material presented via traditional health-provider originated sources. Note: the quality of this information is discussed in relation to the qualitative part of the research undertaken.

We tested the mean scores for each of the information source ratings listed in Table 2 across socio-economic groups and the results confirm that this hypothesis has foundation - media news and documentaries and medical dramas were all seen as more important by lower socio-economic groups than higher level groups (statistically significant at $p< 0.05$). While there was no statistically significant difference between the socio-economic groups in terms of the importance of newspaper and magazine articles, this may be due to the wide variation in sophistication and complexity of material carried in these media.

In terms of the importance of advertising, unsurprisingly television advertising was the major source of advertising that had led to a discussion with a medical advisor regarding a specific medication, followed by magazines and newspapers (as shown in Table 3). However, it is interesting that the highly controversial practice of advertising prescription medications direct to consumers, currently permitted only in the USA and

New Zealand (item k in Table 2), does not rate as particularly important as an information source.

The diversity of information sources actually used is again evident in the range of sources other than mainstream media. 19 respondents nominated family or friends, 4 medical books or journals, 3 information at doctor's surgery (1 x video), 1 each chemist, health group newsletter, talkback radio, physiotherapist. The Internet does not appear to be an information source used by a major percentage of the population. However, active information seekers appear, from Table 4, to include this medium in their repertoire of information sources.

Table 2: Information Source Rating: sources of information regarding medication options for respondents

n = 795	Extremely important %	Somewhat important %	Neutral %	Not very important %	Not import-ant at all %
a. Medical specialist advice	71.7	18.5	6.2	1.8	1.8
b. General practitioner advice	73.9	22.0	2.9	0.6	0.6
c. Pharmacist advice	32.8	46.7	14.3	4.4	1.8
d. Consistency of advice by both doctor and pharmacist	58.0	29.6	8.5	1.6	2.3
e. Alternative medicine practitioner	9.6	21.6	31.3	10.4	27.1
f. Media coverage (news/ documentaries)	5.8	30.3	27.5	17.4	19.0
g. Medical drama shows on television	1.3	4.6	11.6	17.3	65.2
h. Newspaper or magazine articles	4.3	30.8	30.9	18.2	15.8
i. Word of mouth (friends/ family)	2.1	30.3	35.8	16.5	15.2
j. Internet	4.6	19.3	32.5	12.9	30.7
k. Advertising of prescription medicines	2.2	13.1	28.4	22.3	34.0
l. Advertising of non - prescription medicines	1.7	12.6	27.2	24.1	34.4
m. Advertising of alternative herbal medicines	1.8	12.7	27.8	20.3	37.4
n. Other (n = 172)	12.8	7.5	24.4	4.1	51.2

Table 3: Source of advertisement used to specifically ask for a medication or initiate a discussion with a medical advisor (multiple responses permitted, filtered by respondents who have initiated discussion)

Media source	%
On television	48.4
On radio	4.2
In a magazine	25.8
In a newspaper	13.7
On the Internet	7.9
Received an email advertising it	1.6
In a letter, flyer or announcement you got in the mail	8.9
Elsewhere	10.5

Table 4: Reported frequency of use of Internet to find medical information for the following

	Always %	Most of the time %	Half of the time %	Occasionally %	Never %
a. Before consulting your health professional	1.4	3.3	1.8	14.8	78.6
b. After a consultation / diagnosis	2.7	5.7	4.4	18.4	68.9
c. For information about a medical condition that you do not have	2.5	3.7	2.5	19.1	72.3
d. For general medical information	3.0	4.6	2.9	24.0	65.4

5. Qualitative Study

Part B: To verify the proposition that the readability and ease of information presentation of consumer-based media may account for at least some of the popularity of these information sources, a readability analysis was

conducted on a range of printed health information material using the SMOG (Simple Measure of Gobbledegook) Index. The SMOG Index was developed by Harold McGraw, an educational researcher, and is a simple readability formula for determining the reading levels of written texts (McLaughlin 1969). We use the SMOG index to determine the reading level of health information material ranging from medication leaflet pack inserts, through leaflets provided by doctors and leaflets available from pharmacies. In addition, we also assessed web-based material and consumer-oriented magazine articles. In order to compare the complexity of material from non-print sources with the print material, we obtained transcripts of radio editorials and transcripts of doctor-patient interaction segments in two television medical dramas and subjected the transcribed material to the same SMOG Index analysis as used for the print material. The SMOG index was selected due to its proven accuracy, correlation with other readability formulae and subsequent widespread use in the academic literature (Wallace & Lemon 2004; Mumford 1997). One researcher calculated the index figures, with calculations cross-checked independently by a second researcher in order to ensure reliability.

The method used for the SMOG calculations followed the methodology in the literature (Aldridge 2004; Wallace & Lemon 2004; Mumford 1997):

- Three groups of 10 consecutive sentences at the beginning, middle and end of a document were selected, giving a total of 30 sentences.
- All words with three o more syllables within these selected sentences were counted.
- The square root of the total was then calculated and rounded to the nearest integer.
- The number 3 was added to the integer to obtain the grade level of the document.

Where documents with less than 30 sentences were assessed, a modified version of the calculations was used, following the protocol outlined by Doak, Doak and Root (1985), consistent with the approach taken by other researchers (see, for example, Wallace & Lemon 2004, Mumford 1997).

We stress, however, that this calculation measures only the likely reading level required for comprehension of the material. Other aspects such as readability and suitability should be assessed using other widely avail-

able tools such as the Readability Assessment Instrument (RAIN) - see Adkins, Elkins and Singh (2001) or the Suitability Assessment of Materials measurement (SAM) - see Doak, Doak and Root (1985).

Website searches were conducted using the Google Search Engine, using simple search terms for major medical conditions such as asthma and arthritis. Pack leaflets were collected by a simple convenience sample of personnel being asked to provide leaflets (anonymously) for any medication taken. All advertising and other printed material was collected from major media over a four week period. Television programmes were videotaped and transcribed by the members of the research team. Radio transcripts were provided via the electronic database 'Newstext' over the same period as the other material.

The following classifications were used for the material evaluated:

a. Medication package insert leaflets.
b. Specific product advertising in print media
c. Official websites for specific high profile prescription medications.
d. Joint (cooperative) advertising in magazines, i.e. joint advertising between a retail pharmacy chain and multiple pharmaceutical advertisers with multiple products featured in the advertising.
e. Product brochures available via retail chemists - these relate to specific medical conditions such as asthma or arthritis.
f. "Advertorial" magazines which feature multiple non-prescription and editorial outlining medical conditions and recommended treatments. Some of these magazines are available both through retail chemists and as inserts in consumer magazines. Those that featured complementary and alternative medications were available through health food shops only.
g. Magazine editorials not overtly linked to the promotion of a specific product, i.e. addressing a specific medical condition but not recommending a specific brand as a treatment.
h. Newspaper editorials not overtly linked to the promotion of a specific product, i.e. addressing a specific medical condition but not recommending a specific brand as a treatment.
i. Radio editorials, (using transcripts from commercial sources) not overtly linked to the promotion of a specific product, i.e. addressing a specific medical condition but not recommending a specific brand as a treatment.
j. Official government-originated leaflets (downloadable from the Official Ministry of Health website) dealing either with specific med-

ical conditions or with multiple conditions associated with life-stages such as menopause or aging.

k. Official government information relating to specific prescription medications that have been authorised for this market. For consistency, the same common medical conditions were used as for the general Internet search.

l. Official leaflets, either government supported (such as those promoting safe sex) or originating from major organizations such as the Cancer Society, giving general advice rather than product-specific advice.

m. Non-governmental/non-authoritative (i.e. not linked to major organizations) websites. These are usually private commercial organizations.

n. Medical Dramas (transcript of segments involving doctor-patient interactions).

Note: while New Zealand is the only country other than the USA to permit prescription medicines to be advertised on television, this advertising was not included due to the lack of relevance of this form of communication to most other markets.

6. Findings

Table 5, (on page 47) shows the SMOG reading level scores by medical information source and medication type. Table 6, (on page 48) then ranks each of these from most readable, as indicated by the lowest SMOG score, to least readable. As foreshadowed earlier, a quarter of the information sources have reading grade level scores of 12 or higher, and are therefore likely to be comprehensible only by those with post secondary education backgrounds.

The television medical dramas "Casualty", with a reading grade level of 7 and "ER", with 7.5 were the only potential information sources to operate at a level at which the average person could be expected to be able to fully comprehend the material. In both programmes, there is a distinct change of pace from the high-drama of emergency room activity when there is a doctor-patient discussion. The pace slows and the dialogue is expressed in simple, jargon free language. The advantage of these types of programmes, of course, is that they offer no challenge to those with low literacy levels.

The growing popularity of the Internet as an information resource was evident in Table 2. While some health policy makers deride the

Internet in its entirety (MacDonald 2005), the quality of information it offers varies widely (Purcell, Wilson & Delamothe 2002). Non-government/non-authoritative website content appear relatively readable with a reading grade level of 8.4. It should be noted that both official government-originated health leaflets and specific product information available via the Internet, while less readable than the 'official' material, were still considerably more readable at a reading grade level of 9.8 than prescription medication pack leaflets at a reading grade level of 10.6 or official prescription medication websites at a reading grade level of 11.3.

It should be of concern to pharmaceutical companies that so much of their specific product-related communications is likely to be comprehensible to only the small segment of the population with high reading ability levels. There are obvious implications here for compliance and correct usage of the medications.

The high rating of material in magazines, newspapers and radio editorial segments may reflect the slight upper socio-economic skew of the specific magazines in which the material appeared, of newspapers in general, and the specific stations on which the editorial segments were aired (NAB 2005; RAB 2005).

It is interesting to note that the advertising and product brochures reviewed for complementary and alternative medicines (CAM) were written at a level above that for prescription and non-prescription products. This may be due to endeavours by the CAM sector to position themselves as basing their efficacy on scientific evidence (for a more detailed discussion of this aspect of the CAM sector, see Cummings 2003). However, this means that the material with high reading skill level requirements is likely to be comprehensible to only those with a tertiary education reading ability. This must raise concerns regarding the comprehension of material relating to possible interactions with other medicines.

While the Internet is growing in popularity, there are, however, some concerns with non-official material on the Internet. This material is considerably more positive in tone than the official information and also offers, in addition to a range of general information about the medical condition, personal endorsements, support groups and success stories (see, for example, myasthma.com, asthmafreeforlife.com and amazingarthritisrelief.com). Some sites are linked to the sale of a range of products for which somewhat extravagant claims are made and money-back guarantees are offered (amazingarthritisrelief.com).

It is beyond the scope of this paper to provide a detailed analysis of the claims made on these sites. However, there is evidence of long-term concern among regulators internationally over the variable quality of information available on such sites (Charatan 2002; Watson 2002). While several forms of regulation have been proposed, it is unlikely that, given the nature of the Internet, options such as a code of practice (Watson 2002) would eliminate any poor quality sites. An additional concern must be that Internet-based resources are probably not used by those with low literacy levels. We have been unable to locate any studies that specifically examine the use of Internet resources across reading ability levels but suggest that this should be included in future research in this area.

There are reports of inaccurate Internet-originated material having contributed to actual patient harm (Risk and Petersen 2002). However, these authors also note inaccuracies in some 20% of printed health-related pamphlets as well. Eysenbach and Kohler (2002) report that consumers use few quality indicators in evaluating health information web sites. Part of the problem may be that there is no agreement as to the criteria by which such material should be assessed. Purcell, Wilson and Delamothe (2002) note a plethora of proposed instruments - but a lack of validation of these tools. To this, Eysenbach and Kohler (2002) add variations in methodology, and numerous definitional issues along with inconsistent methodological rigour.

Official government websites, while providing material that is closer to the average reading ability than most other sources, still need to refine their material further. Most important is the ability for this information to be readily located and identified as highly credible. A method needs to be developed to enable patients to determine which sites - or other information sources - offer credible information. This could include implied endorsements via links from official websites to approved sites, a facility provided by the John Hopkins University site discussed earlier (see also Eagle & Chamberlain 2003). Additionally, guidelines for controllers of these sites appear warranted in terms of ways to present the material to enable users to obtain maximum benefit from the information.

Table 5: Range of SMOG Scores for patient information material assessed

Type of Material	Read-ability rank	SMOG reading grade level	
		Mean	Range
a. Pharmaceutical Companies (Pack Leaflets)			
Prescription (n=6)	11	10.8	8-13
Non-Prescription (n=11)	9	10.6	8-13
b. Product Advertising in Print Media			
Prescription (n=13)	8	10.3	7-13
Non-Prescription (n=10)	5	9.6	7-12
Complementary & Alternative Medicines (n=8)	16=	12.3	10-15
c. Official Prescription Medication Website			
Prescription (n=6)	14=	11.3	10-14
d. Cooperative Advertising in Magazines (Retail Chain & Multiple Phar maceutical Products)			
Non-Prescription (n=5)	6=	9.8	9-11
Complementary & Alternative Medicines (n=4)	12=	11	10-12
e. Specific Product Retail Brochures (Available via Chemists)			
Prescription (n=2)	12=	11	10-12
Complementary & Alternative Medicines (n=16)	16=	12.3	8-14
f. Advertorial Multi -product Magazines			
Available via Chemists and as Consumer Magazine Inserts (n=3)	10	10.7	10-11
Available via Health Shops (n=3)	17	12.7	11-14
Available via Direct Mail (n=3)	18=	13	12-14
g. Magazine Editoria ls (Multi -topic Advice Columns)			
Total (n=5)	13	11.2	10-12
h. Newspaper Editorials			
Prescription (n=4)	15	12	9-14
Other Health -related Articles (n=12)		11.3	10-13
i. Radio Editorials			
Prescription (n=3)	18=	13	11-15
Complementary & Alternative Medicines (n=1)	7	10	10
j. Government -originated Multi -topic Information (Official New Zealand Ministry of Health Leaflets available via website)			
Total (n=5)	6=	9.8	9-11
k. Medsafe (Prescription) Product Information for Consumers (Available via New Zeal and Ministry of Health Website)			
Total (n=6)	6=	9.8	9-11
l. Government / Authoritative Organization Brochures			
Total (n=8)	3	8.4	8 - 11
m. Non-government / Non -authoritative Websites			
Total (n=5)	4	8.8	8 - 10
n. Medical Dramas (ER) and Casualty			
ER (n=2)	2	7.5	7-8
Casualty (n=1)	1	7	7

Table 6: Ranking of SMOG Scores for patient information material assessed

Read-ability Ranking	Information Source	Average Reading Grade Level
1	TV Drama : "Casualty"	7
2	TV Drama "ER"	7.5
3	Non-government / non -authoritative websites	8.4
4	Government / Authoritative Organization Brochures	8.8
5	Non-Prescription product adve rtising : print media	9.6
6=	Cooperative advertising non -prescription medicines	9.8
6=	Official New Zealand Ministry of Health Leaflets available via website	9.8
6=	Medsafe (Prescription) Product Information for Consumers (via N Z Ministry of Health Web site)	9.8
7	Radio editorial: Complementary and alternative medicines	10
8	Prescription product advertising : print media	10.3
9	Non Prescription medicines pack leaflets	10.6
10	Advertorial Multi product - via chemists and magazine insert	10.7
11	Prescription medicines pack leaflets	10.8
12=	Prescription medicine retail brochure	11
12=	Cooperative magazine advertising: Complementary and Alternative medicines	11
13	Magazine editorial - multi topic	11.2
14=	Newspaper editorial - general health relat ed	11.3
14=	Official prescription medicines websites	11.3
15	Newspaper editorial prescription medicines	12
16=	Complementary and Alternative medicines specific product print advertising	12.3
16=	Complementary and Alternative medicines specific product brochures	12.3
17	Advertorial Multi product - via health shops Complementary and Alternative products	12.7
18=	Advertorial Multi product - via direct mail	13
18=	Radio editorial prescription medications	13

7. Conclusions and Managerial Implications

The 2001 New Zealand Census data (Statistics New Zealand 2001) indicates that some 43% of the New Zealand population left school with a

reading age of 11, with a subsequent post-education reading level indicated by the literature as likely to be no better than 8 (Shea et al. 2004; Brownson 1999). Our SMOG analysis indicates that this group is likely to be functionally illiterate with respect to almost all of the health-related material analysed, presenting the group with substantial comprehension difficulties.

The consequences of low health literacy have been extensively studied. The major consequence is cost, as patients with low literacy use more health care resources than those with higher literacy abilities (Bar-Yam 2002; Kefalides 1999). Health care expenditure due to low health literacy in the USA is estimated at $US 73 billion and includes longer hospital stays and more frequent doctor visits (Bar-Yam 2002). Extrapolating these figures to the European Union on a simple population ratio basis (Internet World Statistics 2005) would indicate that the costs within the European Union may be in the vicinity of $US 115 billion.

Foulk et al. (2001: 8) suggest that there are many patients "unable to read and understand directions such as 'avoid taking medication on an empty stomach'". Bar-Yam (2002) cites 1997 findings that those with low levels of literacy were 5 times more likely to misinterpret their prescriptions. There are potentially serious consequences in this, both for themselves and for others, such as children to whom they may be administering medicines. This problem may be particularly severe among older patients; Roman (2004) suggests that almost 42% of older Americans are unable to read the instructions on how to take their medication. In addition, those with low literacy levels are more likely to have difficulty separating medical information from folk wisdom (Foulk et al. 2001). This has obvious consequences for overall medication compliance, and for undetected problems due to interactions between prescription, non-prescription and complementary and alternative medications (see Eagle et al. 2005).

Of concern is that low functional health literacy is an invisible barrier and patients will go to great lengths to hide it due to shame and attempts to avoid potential embarrassment; up to 70% of these patients have not revealed the problem even to their spouses (Aldridge 2004; Roman 2004; Bar-Yam 2002). Identifying functionally illiterate patients is a major challenge as, due to concerns regarding potential stigma and associated embarrassment if their low literacy skills are exposed, patients seldom admit problems and adopt numerous strategies to hide the problem (Aldridge 2004; Weir 2001). These strategies include asking others to read material out, watching and copying the actions of others or stat-

ing that they have forgotten their reading glasses and / or will read the material later at home (Aldridge 2004; Bar-Yam 2002). Yet the problem appears to be largely unrecognized and material continues to be produced that is written at a level well above the average reading ability of patients (Hoffman et al. 2004). Failure to recognise the extent of the problem or to improve the means of patient information provision means that patients continue to be at risk for problems due to incorrect or inappropriate medication usage.

It is probable that the medical profession is unaware of the extent of the low functional health literacy problem and therefore do not consider ways of checking for understanding. Further, some of the frustrating conundrums of non-compliance with prescribed medications may be traced back to a failure to understand the prescribed regime.

There appear to be two choices: allow the problem to continue as it has for at least the last twenty-five years, or actively investigate ways to improve patient comprehension. This requires a synthesis of the recommendations in the somewhat fragmented extant literature, as previously proposed by Kefalides (1999), and the development of a range of potential interventions based on this material. A number of possible interventions aimed specifically at improving patient understanding of their medical conditions and the rationale for a prescribed treatment regime, together with the consequences of non-adherence to the regime should be developed and trialled. This should be coupled with a rigorous empirical investigation of the effectiveness and efficiency of the various interventions.

One aspect that has not been well addressed in the literature to date is the determination of what information, resources and other support is actually sought, and from what combination of sources, or how well it is valued by patients. Simply understanding this aspect of communication would go a considerable way to helping guide the development of more effective material. Thus, the popularity of medical dramas such as ER as an information source may offer guidance in terms of both information content and presentation.

There is unlikely to be a single solution to the problem and solutions are likely to be both medical condition specific and population segment specific. However, a considerable body of literature has been built up regarding the effectiveness of a range of communication tools and it is likely that there will be some elements in common across these areas, such as multiple user friendly packaging, forms of individual counselling (Peterson, Takiya & Finley 2003) and the use of positive versus negative

message framing (Block & Keller 1995) in messages in addition to information layout and design features discussed earlier.

Success will also require the cooperation of a number of stakeholders. The pharmaceutical companies themselves have a significant role to play in the redesign of much of their patient communication material in order to make the material more readily understandable.

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