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Readability Levels of Lymphedema Websites in Australia,
Canada, the United Kingdom, and the United States

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Abstract

Purpose:

Lymphedema is a chronic and progressive condition in which the lymphatic vessels are damaged and can no longer properly remove lymph fluid from the tissues (Papadopoulou, Tsiouri, Salta-Stankova, Drakou, Rousas, Roussaki-Schulze, & Giannoukas 2012). Occupational therapists often provide clients patient education materials that are written beyond the ability of the recipient. The purpose of this study was to analyze the readability of lymphedema websites in four English-speaking countries.

Method:

The websites selected by the researchers included patient-centered information about lymphedema. Each of the websites contained common content areas and included a minimum of 30 sentences within each topic area. The researchers classified the data by using predetermined procedures. An online version of the SMOG calculator was used to analyze data. Descriptive statistics were used to present the findings.

Results:

Descriptive analysis revealed the overall readability for each country and content area ranged from grade levels 10.90 to 13.40. These numbers are equivalent to the grade level of nearly three years of high school to one and a half years of college. The overall readability by country and content area was higher than the recommended fifth to sixth-grade level.

Conclusion:

Occupational therapists should be aware of the readability levels of the websites they are providing to clients for the purposes of patient education and advocate for websites to be designed at or below a fifth to sixth-grade readability level. Recommendations are presented on how to lower readability levels for websites.

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the United Kingdom, and the United States

Historical Foundations of Patient Education

Historically, the term ‘health education’ was brought into use by President Nixon in 1971 (Bastable, Gramet, Jacobs, & Sopczyk, 2011). The terms health education and patient education were viewed as synonymous during that time period and often used interchangeably. Although the term ‘patient education’ did not receive its use until the latter portion of the 20th century, it was used early in history when healers would educate the sick or injured (Bastable, Gramet, Jacobs, & Sopczyk, 2011).

Patient education is not simply an action, but rather a process. This process entails influencing patient behavior, providing knowledge and skills needed to improve health and well-being, and helping to transform attitudes towards success (Rankin, Stallings, & London, 2005). It is the responsibility of the educators to be sure they are not exclusively providing information, but also doing so in a way in which the learner is able to comprehend what is being delivered. With the high percentages of individuals with low levels of literacy, the information understood and retained is of concern.

However, literacy is more complex than simply the ability to read. There are different types and levels of literacy. Functional literacy can be differentiated from health literacy. Adults who are considered functionally literate have the capabilities to directly use what has been read and translate it into life skills (United States HHS, 2000). Conversely, health literacy is how well basic health information can be obtained, processed, and understood so that an individual may make appropriate health decisions (United States HHS, 2000). The National Literacy Act of 1991 defined literacy as “an individual’s ability to read, write, and speak in English and compute

and solve problems at levels of proficiency necessary to function on the job and in society, to achieve one's goals, and to develop one's knowledge and potential" (Kirsch, Jungeblut, Jenkins, & Kolstad, 2002, p. 28).

The three types of literacy include prose literacy, document literacy, and quantitative (numeracy) literacy. According to the Educational Testing Services (2014), prose literacy is the ability of a patient to search and comprehend brochures, flyers, manuals, and magazine articles. In relation to patients with lymphedema, this may include using brochures about the causes of lymphedema and instructional materials for compression wrapping. Document literacy requires the skills needed to find and use charts, schedules, graphs, or tables of information. This may include job applications, transportation schedules to doctor appointments, and drug or food labels. Lastly, quantitative literacy measures how well a patient can use the numbers within printed materials. This may include figuring the monthly cost of medications.

There are two classifications of literacy levels. One classification system includes below basic, basic, intermediate, and proficient. The second classification system includes Level 1, Level 2, Level 3, Level 4, and Level 5. Both classification systems are discussed in further detail.

Persons classified at the below basic level are competent in the most simple and concrete literacy skills. This may range from being illiterate in English to the ability to locate easily identifiable information in short prose text or locating and following written instructions in simple charts or forms. The below basic level includes the patient signing a form or searching text to find out what food and drinks are allowed prior to a medical test (National Assessment of Adult Literacy, n. d.).

Basic level of literacy implies the patient has the skills required for simple and everyday literacy activities. This includes reading and understanding information presented in simple

documents, locating information to use to solve one-step problems with a specified arithmetic operation inferred. For a patient with lymphedema, tasks at the basic level may be finding a pamphlet explaining the causes of lymphedema or comparing medication costs for two different medications (National Assessment of Adult Literacy, n. d.).

Persons at the intermediate level of literacy demonstrate skills required to perform moderately challenging literacy activities. This includes reading and comprehending moderately dense prose text and incorporates the ability to summarize, make simple inferences, determine cause and effect, and recognize the author's purpose. Skills also include locating less familiar quantitative information and using it for problem solving when the arithmetic operation is not specified. Tasks within the intermediate level of literacy consist of calculating the total cost of medical supplies from a catalog, using reference materials to decide which foods contain low-levels of sodium, and using a map to find a specific location, such as a health care clinic (National Assessment of Adult Literacy, n. d.). For individuals with lymphedema, this may comprise calculating the total cost of medical supplies such as home lymphedema compression therapy treatment pumps and compression stockings. It also consists of the ability to use a map when they are traveling to a lymphedema therapy clinic for the first time.

Persons at the proficient level of literacy demonstrate skills needed to perform complex and challenging literacy activities. Skills to achieve a proficient literacy level include reading lengthy, complex, and abstract prose texts while being able to synthesize the material. Integrating, synthesizing, and analyzing multiple pieces of information and solving multistep and complex problems when the arithmetic operations are not easily inferred are under the proficient level. Tasks may include comparing viewpoints in two websites, interpreting a table about

physical activity with lymphedema, and calculating and comparing the cost of compression bandages per foot (National Assessment of Adult Literacy, n. d.).

The United Nations Educational, Scientific, and Cultural Organization (2014) and Schloman (2004) summarized the five levels of literacy from simple (Level 1) to complex (Level 5). Persons at literacy Level 1 have very poor literacy skills and are considered functionally illiterate. Generally, this is associated with an educational grade level below fifth-grade (Schloman, 2004). Persons with lymphedema at a Level 1 literacy level may be able to fill in blanks on a past medical history form when visiting an occupational therapist for the first time.

Persons identified at literacy Level 2 have the ability to read simple text but test poorly. Coping skills may be used to overcome literacy challenges. Statistics show that three-fourths of individuals functioning at Level 1 or Level 2 have chronic physical or mental health conditions (Schloman, 2004).

Persons identified at literacy Level 3 are generally able to cope with their demands and function in society. Generally, this literacy level is needed to complete 12th grade and enter college. However, the average American's readability skills are classified at the eighth- or ninth-grade level (Schloman, 2004). Individuals at literacy Level 3 may be able to answer questions about lymphedema risk management tactics from a patient education website.

Levels 4 and 5 tend to be combined and require higher level information processing skills. Therefore, it can be assumed that persons identified at these literacy levels have skills at a college level or beyond (Schloman, 2004). Individuals with lymphedema classified at this literacy level may be able to interpret an entire article that discusses lymphedema, risks factors, causes, and strategies for lymphedema management.

There is a link between rehabilitation and literacy levels. As discussed by Levasseur and Carrier (2010), the components “linking rehabilitation to health literacy include (a) capacities, functioning, participation, and empowerment of clients; (b) holistic approach; (c) client-centered practice; (d) teaching of information and methods; and (e) access to services and equity issues” (p. 760). An example of this from an occupational therapy standpoint is the Canadian Client-Centered Model. It states that, “Occupational therapists demonstrate respect for clients in decision making, advocate with and for clients in meeting clients’ needs, and otherwise recognize clients’ experience and knowledge” (Canadian Association of Occupational Therapists, 1997, p. 49). Therefore, occupational therapists can use compensatory methods in rehabilitation to help empower and improve the client’s ability to use and understand the information (Levasseur & Carrier, 2010).

Often, patient education materials provided to patients are written beyond the ability of the recipient. Although the estimated reading level in the United States is eighth grade, many individuals have skills below that (Cotugna, Vickery, & Carpenter-Haefele, 2005). Within the United States, about half of the adult population may have difficulty reading and understanding materials that are beyond a fifth-grade level (Institute for Healthcare Advancement, 2014). According to the Institute for Healthcare Advancement (2014), statistics additionally show that only 12% of the United States adult population have proficient health literacy skills.

As cited in Sand-Jecklin (2007), it is important to recognize that several studies have shown that the level of education completed by the individual may not be consistent with the level of literacy skills achieved. Therefore, literacy level should not be assumed solely based off of education. Additionally, the use of medical terminology within patient education materials may increase the readability scores. Medical terms are often polysyllabic and many of the

frequently used readability formulas take into account the syllable count (Sand-Jecklin, 2007).

The literacy rates of the various countries should also be taken into consideration. The next section will explore the literacy rates of Australia, Canada, the United Kingdom, and the United States.

International Literacy Rates

In 2006, the Australian Bureau of Statistics conducted the first national health literacy survey in Australia using the Adult Literacy and Life Skills Survey (ALLS) (Ferdous & Harreveld, 2011). Researchers surveyed adults between 15-74 years of age using the Adult Literacy and Life Skills Survey (ALLS). The individuals were measured, using the ALLS, to have skill levels extending from Level 1 (lowest skills) to Level 5 (highest skills). Level 3 was considered the minimum amount of skills required to meet the complex demands of everyday life (Australian Bureau of Statistics, 2009). Results of the ALLS determined that of the participants assessed, 59% of the individuals were at a Level 1 or Level 2 (Australian Bureau of Statistics, 2009). Results showed of the adult Australian population surveyed with the ALLS, health literacy was lower than other literacy types. In 2006, the ALLS demonstrated that 54% (prose), 53% (document), and 47% (quantitative) of the adults surveyed had scored a Level 3 or higher (Australian Bureau of Statistics, 2009). Poorest levels of adult literacy among the adults assessed using the ALLS were largely individuals who were older, un-employed, uneducated, or having a first language other than English (Ferdous & Harreveld, 2012).

The Canadian Council on Learning determined, according to a report completed in 2007, that 60% of Canadians do not have the required skills to properly manage their health (Canadian Council on Learning, 2008). Twelve million (48%) Canadians, 16 years of age and older, did not reach a Level 3 literacy level. It is among Canadians 26-35 years of age who are most likely

(66%) to reach or surpass Level 3 literacy (Library of Parliament, 2012). The International Adult Literacy and Skills Survey (IALSS) health literacy scale shows that approximately 45% of Canadians 16-65 years of age function beyond a Level 3 and 12% of Canadian adults above 65 years of age are functioning at or beyond a Level 3, as cited by Rootman and Gordon-El-Bihbety (2008). The Canadian Council on Learning (n.d.) proposed that several Canadian cities will see more than 15 million adults with low literacy levels by 2031.

In England and Northern Ireland, researchers conducted the Survey of Adult Skills (PIAAC) from August 2011 until April 2012 on 8,892 adults 16-65 years of age. England is the only country in which the older age group (55-65 years of age) performed better than the younger age group (16-24 years of age) in both literacy and numeracy (OECD, n.d.). A score at or below Level 1 was achieved by 16.4% of the adult population surveyed. In technology-rich environments, 49% of adults score within a Level 1 or below in problem solving. The Organization for Economic Co-operation and Development (OECD, n.d.) defines technology-rich environments as the “capacity to access, interpret and analyse information found, transformed and communicated in digital environments” (p. 1). Researchers surveyed adults using the PIAAC and 10.1% responded as having no prior experience with computers (OECD, n.d.). The portion of the population from the United Kingdom functioning below a Level 3 consists of 48% of individuals. Therefore, 52% of the population functions a Level 3 or higher (Blum, Goldstein, & Guerin-Pace, 2001).

Cotugna, Vickery, and Carpenter-Haeefe (2005) noted that within the United States, illiteracy is two times as common amongst older individuals and minorities who reside in the inner-cities. These individuals tend to be patients who use Medicare and Medicaid and may be seeking occupational therapy services (Cotugna, Vickery, & Carpenter-Haeefe, 2005).

Researchers demonstrated findings from the National Adult Literacy Survey (NALS) showing that 46% of the United States residents who were surveyed functioned below a Level 3 (Kirsch, Jungeblut, Jenkins, & Kolstad, 2002).

Understanding patients' current literacy levels and needs will help occupational therapists provide the most appropriate patient educational materials possible. Advocating for enhanced health literacy through healthcare delivery maintains a patient-centered focus. A patient-centered focus directs attention to what the patient, profession, or occupational therapists are lacking in order to bring forth positive results for the patients and expansion of the profession.

Understanding how patients are gathering their health information, in addition to what additional resources will enhance the teaching/learning process, is valuable information for occupational therapists. The following section will discuss how the internet plays a role in obtaining health information.

Internet Use to Obtain Health Information

Clients are using the internet more often due to the vast technological advancements, such as smartphones, iPads, and tablets. For individuals who do not have direct access to the internet in their homes or work, there are internet cafes and libraries. Older adults have used the internet to help boost and maintain their level of independence. The internet helps individuals by providing a means for easy access to banking, library borrowing, shopping, and maintaining relationships with friends and family (Cresci, Yarandi, & Morrell, 2010). With the transition from hard copy versions of information towards easily accessible electronic versions, more people may be able to access information instantaneously. This means the internet may become one of the leading interfaces of health information versus obtaining brochures, pamphlets, or consulting health care professionals face-to-face.

Among Australian adults over 50 years of age, 82% have access to the internet, and 93% of that proportion uses the internet actively (Zajac, Flight, Wilson, Turnbull, Cole, & Young, 2012). Zajac et al. (2012) polled a random sample of urban older Australians aged 50-74 years ($n = 8,762$) who completed a questionnaire via mail regarding internet usage. For those individuals who noted having internet access, 61% reported that they use the internet to search for health related information. However, only 38% of the respondents expressed interest in receiving unsolicited health information through the internet. Zajac et al. (2012) stated that this information reveals that individuals prefer to actively pursue health information rather than have it sent to them electronically.

Murray, Lo, Pollack, Doneclan, Catania, White, Zapert, and Turner (2003) conducted a telephone survey of adults 18 and over with a total of 3,209 respondents. Of those respondents, 31% used the internet within the last year to find health information. Valimaki, Nenonen, Koivunen, and Suhonen (2007) administered a survey to individuals who were recently discharged from surgical units and found that 39% of patients ($n = 813$) had internet access in 2002, while in 2003 the percentage increased to 43% ($n = 875$). Although those findings were not statistically significant, the change in frequency of daily internet use from 2002 (21%) to 2003 (27%) was found to be significant. Approximately one-tenth of the 3,209 respondents favored using professional literature or the internet to gain access to health information. Additionally, well-educated and younger individuals preferred technological access to health information.

Ridner (2006) interviewed 149 breast cancer survivors (74 with lymphedema and 75 without lymphedema). Ridner (2006) asked, “If you want to learn more about lymphedema occurring after breast cancer treatment, who would you ask or where would you look for

information?” Participants with lymphedema listed the internet ($n = 27$) as the most frequent informational source, followed by lymphedema therapists ($n = 25$)” (Ridner, 2006, p. 75). Participants without lymphedema listed oncologists ($n = 22$) and the internet ($n = 21$) as their primary sources (Ridner, 2006). It is important that occupational therapists are educated about where patients will most likely acquire their information so they can be equipped to fill in the knowledge gap and provide consultation.

As discussed by Zajac et al. (2012), it would be disadvantageous for occupational therapists to use the internet solely as a means of providing health related information. If occupational therapists chose to only provide web-based resources, it would likely lead to an increase in health discrepancies since internet access is not available or desirable by all individuals. Websites, as primary sources, are not appropriate for those with low literacy.

However, websites can serve as a supplementary means of disseminating information. Determining whether or not particular internet-based patient education materials are appropriate for certain patients is part of the occupational therapists’ role. Additional roles of occupational therapists in patient education are discussed in greater detail in the following section.

Occupational Therapists’ Role in Patient Education

Occupational therapists spend a significant amount of time getting to know their patients’ likes and dislikes, their goals, and what they find meaningful and purposeful in life. Smith, Hedrick, Earhart, Galloway, and Arndt (2010) advocated that occupational therapists play a role in health literacy by helping patients understand their diagnoses and the treatments they are currently undergoing and that are available to them. This is achieved by communicating with patients in language that matches their health literacy level, whether verbally or written.

Occupational therapists are also able to educate other health care professionals about the topic of health literacy (Smith et al., 2010).

A society that is health literate could save approximately \$73 billion in excess health care costs (Institute of Medicine, 2012). Low levels of health literacy have been linked to greater hospitalization rates, poor health outcomes, and an increased tendency to skip or disregard preventive services (United States HHS, n.d.). A goal of occupational therapists should be to keep costs down as much as possible. However, the focus for occupational therapists is not to alter the literacy skills within the individual. Rather, occupational therapists are equipped to provide compensatory strategies for literacy shortcomings with the anticipation that those strategies will help clients use the skills they currently have to prevent hospitalizations and poor health outcomes. As occupational therapists use compensatory techniques for health literacy appropriately, it not only advocates for the patients, but also for the expansion and development of the profession. Using compensatory strategies may also help clients increase their treatment compliance.

The self-regulation theory describes how individuals cope with healthcare experiences (Johnson, Fieler, Jones, Wlasowicz, & Mitchell, 1997). This theory can be valuable for occupational therapy because its basis applies the supposition that patients are active participants in their healthcare journey. Occupational therapy is a patient-centered and holistic profession, allowing opportunities for active participation. As part of the self-regulation theory, Johnson and colleagues (1997) recognized that in order to make decisions about healthcare, information must be appropriately disseminated to the patients. Lacking such information inhibits the patients' abilities to cope and engage in successful self-care or occupations (Johnson, Fieler, Jones, Wlasowicz, & Mitchell, 1997). According to this theory, patients with lymphedema need to have

accessible information about the risk of lymphedema and need to be able to understand that information. It is part of the occupational therapists' role to provide such information and educate patients. Working with individuals who have developed lymphedema is a specialized area within occupational therapy. The next section discusses lymphedema in more detail.

Lymphedema

Lymphedema is a chronic and progressive condition in which the lymphatic vessels are damaged and can no longer properly remove lymph fluid from the tissues (Papadopoulou, Tsiouri, Salta-Stankova, Drakou, Rousas, Roussaki-Schulze, & Giannoukas 2012). Due to this interruption in the lymphatic system, homeostasis can no longer be met. It is clearly visible due to the anomalous amount of fluid build-up occurring in any area of the body. Although it can occur anywhere on the body, lymphedema most often targets either the upper extremities (UE) or lower extremities (LE).

Lymphedema can be broken down into primary or secondary. Primary lymphedema is a congenital abnormality or a dysfunction in which the lymph vessels are either absent or not working efficiently, whereas secondary lymphedema stems from damage inflicted on the lymphatic system (American Cancer Society, 2013). Secondary lymphedema etiologies include filariasis, trauma, and infection. Large populations of patients with secondary lymphedema have resulted from cancer treatments. This may develop as early as days post treatment or it may not develop until years later. Patients with breast cancer who have undergone radiation to the axilla or a lumpectomy or mastectomy, in which axillary lymph nodes were removed, may develop lymphedema of the ipsilateral upper extremity. Ipsilateral upper extremity lymphedema may also result from axillary node dissection. Lymphedema in the lower extremities may occur following

surgery for prostate cancer, uterine cancer, melanoma, lymphoma, vulvar cancer, or ovarian cancer (National Cancer Institute, 2013).

Although no cure exists for lymphedema, physical interventions (e.g. manual lymphatic drainage) and compression bandaging will help manage the condition. Preferred, are lifelong preventive measures that may reduce exacerbations of edema, swelling, and infection. Hygiene is critical for affected individuals. Lymphedema predisposes individuals to infection. Any puncture wound, cut, or scrape is an access point for bacteria. Patients must be cautious about cuts or wounds due to the prevalence of cellulitis associated with lymphedema.

Gloves should be worn during occupations such as gardening, washing dishes, or handling animals (Chickly, 2001). Bruno Chickly, developer of the manual lymphatic drainage technique, advises individuals with lymphedema to avoid constricting the affected area, such as with tight clothing, straps (bags, purses, or bras), and jewelry (Chikly, 2001). Due to the accumulation of fluid, there tends to be decreased range of motion. Engagement in occupations becomes challenging because the extremities become heavy, making them difficult to move.

There are psychosocial repercussions that may result from lymphedema, leading to isolation or avoidant coping skills. Moffatt, Franks, Doherty, Williams, Badger, Jeffs, Bosanquet, and Mortimer (2003) conducted an epidemiology study, which showed that out of the 1,609 patients studied, 80% of patients had taken time off work due to their lymphedema and 95% of the patients stated that the edema affected their employment status. Quality of life was diminished with impacts on self-esteem, body image and social relationships (Moffatt, et al., 2003).

Due to the chronic and progressive nature of this condition, it is necessary to have resources available to educate patients on the normalcy of feelings they may be experiencing

with such a difficult condition. This should include information on support groups or additional resources to seek out. Also, it is important make patients aware of what to expect in terms of symptom management, therapeutic process, and potential lifestyle changes. It is significant to address what to prevent, such as the exacerbation of symptoms or the development of psychosocial issues, such as depression. How to properly manage lymphedema is crucial to prevent it from worsening. This condition requires a significant amount of self-care and it can be time consuming. Therefore, time management may be a topic of patient education.

As cited in Ridner (2006), breast cancer survivors have expressed dissatisfaction and disappointment with lack of pretreatment education and with what the patients report as ill-informed health care professionals involved in their care. Patients report oftentimes not being informed of their risk of lymphedema or of risk reduction strategies, leaving them feeling abandoned. With proper patient education, occupational therapists can play a role in ensuring their patients understand their condition and the ways in which they can play an active role in their own health management.

Preventive education prior to interventions is an influential position for occupational therapists because as patients are well-informed they are better able to reduce the risk of acquiring lymphedema before undergoing any procedure. If patients are well-informed, it may increase the patient's motivation to seek out accompanying information. Substantial education about lymphedema also allows the patient to reduce the risk of exacerbating the condition if it has already developed. Additionally, this collaboration helps build a stronger patient-therapist rapport. In order to ensure patients are being well-educated, it is important to assess the readability of the resources that are being provided. The following section discusses how texts are assessed for readability.

Assessment of Readability

Health care professionals and researchers use readability formulas as a quick and easy means of assessing the literacy level of education materials. A variety of formulas are available and by the 1980's, DuBay (2004) estimated that 200 readability formulas existed. Some of the assessments, such as the Suitability Assessment of Materials (SAM), take into consideration a multitude of areas, such as complexity of content, graphics, learning stimulation and motivation, cultural appropriateness, layout, and the literacy demand (Doak, Doak, & Root, 1996). By assessing the literacy level, a "score" can be obtained that will determine the grade level at which the material can be read and understood. The Flesch-Kincaid formula was developed to determine comprehension difficulty by translating a score 0-100 into a corresponding grade level (DuBay, 2004).

In 1969, G. Harry McLaughlin published the Simple Measure of Gobbledygook (SMOG) formula. The SMOG takes into consideration sentence length and word length and uses the formula: $SMOG \text{ grading} = 3 + \text{square root of polysyllable count}$ (DuBay, 2004). Edgar Dale and Jeanne Chall developed the Dale-Chall formula for adults and children above a fourth grade level. The SMOG is available in both hand and computer versions. The computer version provides results as soon as an individual enters the desired text. McLaughlin (1969) noted that it takes nine minutes to complete the SMOG with a text containing 600 words. When the Dale-Chall formula is used, it takes nine minutes to obtain a grade prediction with a text containing only 100 words.

However, there are limitations with the use of readability formulas. DuBay (2004) stated that readability researchers have recommended that the formulas are used in combination with other measures of assessing texts. Readability formulas are advantageous since they provide

objective data informing the developers of the patient education materials assessed whether or not the material should be able to be read, understood, and used by the target audience.

Therefore, Sand-Jecklin (2007) cited that the readability formulas may be best used in conjunction with health literacy assessments, such as the Rapid Estimate of Adult Literacy in Medicine (REALM) in order to assess the patient's understanding of medical terminologies. Several researchers have studied the readability of various patient education materials, both written and internet-based. The following section discusses some of the results of studies that are in the literature.

Literature Review on Readability

Cotugna, Vickery, and Carpenter-Haeefele (2005) performed a study using the Flesch-Kincaid readability formula to determine the reading levels of 10 nutrition-related handouts published in 2002–2003. They randomly collected handouts from selected health care journals that were one to two pages in length. Of the materials they analyzed, 20% were within the recommended fifth through sixth-grade levels. Nair and Cienkowski (2010) used the Flesch-Kincaid readability formula to analyze the health literacy of counseling sessions and hearing aid instruction guides within the United States. They studied 12 patients with hearing impairments and mild to moderate sensorineural hearing loss. Results showed that all 12 patients in the study demonstrated reading levels below third grade within the counseling sessions. The authors then compared predicted patient health literacy to a fourth grade reading level using a paired samples *t*-test and they found that it was significantly different than a fourth grade reading level ($p = .01$). The statistical finding implies that the readability level was significantly lower than the literacy of average American adults.

Wilson, Mood, Risk, and Kershaw (2003) examined 238 patients who were undergoing radiation treatment from two Midwestern oncology clinics. Wilson and colleagues (2003) evaluated and analyzed 40 Radiation Side Effect Information (RSEI) cards using the SMOG. Wilson and colleagues (2003) also assessed suitability and appropriateness of the RSEI cards using the AHEC (1996) Assessment Checklist. Moreover, Wilson and colleagues (2003) used the REALM and CLOZE to analyze the patients' reading and comprehension levels. Wilson et al. (2003) used the REALM and CLOZE in addition to interviews the research team conducted to gather any family or patient concerns and experiences with side effects. Analysis results of the CLOZE showed that 52% of the patients understood the information they read, whereas 48% of the patients needed supplemental teaching after reading the information or did not understand what they read. Results also supported the concept that the highest grade level accomplished should not be used to determine an individual's comprehension capabilities ($r = -.08, p > .05$). The RSEI cards were shown to exceed recommended reading levels and were not within the abilities of several of the patients in this study. The RSEI cards were deficient in some areas. Need-to-know information was not present in beginning sections, no illustrations were used, and the cards were not culturally sensitive to the target population. Much of the research currently in the literature supports the need to decrease the readability level of patient education materials so it is able to be comprehended by individuals with low literacy.

Giuse, Koonce, Storrow, Kusnoor, and Ye (2012) conducted two sequential randomized studies with a total of 196 participants who were 18 years of age and older and had at least two blood pressure measurements of 140/90mmHg or higher. The researchers examined the impact of understanding and retaining health information on hypertension by administering information focused on health literacy only or health literacy in conjunction with preferred learning style. Of

the participants who were randomized into the health literacy level in conjunction with learning style preference group, the visual learners received handouts with illustrations and charts.

Participants with reading and writing preferences were provided with documents that enhanced the written components, such as bulleted lists. Those who preferred auditory learning listened to an audio version in the office and researchers provided them with a recorded version of the information to take home. Kinesthetic learners were given a card-sorting activity that they were able to complete during their visit and at home. Findings of this study indicated that customizing the educational materials to both health literacy level and learning preference improved the clients' retention of the information provided to them on hypertension (Giuse, Koonce, Storrow, Kusnoor, & Ye, 2012). Results of this study indicate that it may be beneficial for occupational therapists to understand clients' learning style preferences when providing compensatory strategies for health literacy. The next section examines characteristics of well-written patient education materials.

Characteristics of Well-Written Patient Education Materials

While occupational therapists are developing patient education materials, it is important for them to understand what characteristics will help to reduce the readability level so the final product is within the recommended fifth to sixth-grade level (Cotugna, Vickery, & Carpenter-Haeefe, 2005). Hackos and Stevens (1997) discussed factors to consider when creating documents using an online medium. It is necessary that the site is easy to navigate for the user. Hackos and Stevens (1997) noted that this can be accomplished when authors provide a home base and navigational instructions. The title should be visible, the content points should coincide with related topics. Authors should also provide clearly labeled links for the user (p. 353).

Additionally, the authors recommend the following: (a) know your users; (b) follow minimalist writing principles; (c) ensure accuracy and completeness; (d) maintain consistent language in heading levels; (e) use numbered lists and bulleted lists consistently; (f) use parallel structure in lists; (g) punctuate lists consistently; (h) use positive statements; and (i) conform to accepted standard styles (Hackos & Stevens, 1997, p. 356). Shorter line lengths with larger and readable on-screen fonts (standard 12 point) should be used with minimal font changes. The layout should remain consistent with no horizontal scrolling (Hackos & Stevens, 1997).

Hackos and Stevens (1997) mentioned a few considerations for including graphics on websites. Graphics should be used to show what objects look like, as examples, as verification, and to show process. Graphics should replace words, clarify meaning, and summarize. Graphics should maintain interest, be easy to understand, focus on the primary message, avoid covering text, and should be fully annotated (Hackos & Stevens, 1997, pp. 356-357).

DuBay (2004) discussed that Hackos and Stevens (1997), along with several researchers, have organized a set of golden rules for document writing that can be applied to any type of medium. The golden rules include: (a) use short, familiar words; (b) avoid jargon; (c) use culture- and gender-neutral language; (d) use correct grammar, punctuation, and spelling; (e) use simple sentences, active voice, and present tense; (f) begin instructions in the imperative mode by starting sentences with an action verb; and (g) use simple graphic elements such as bulleted lists and numbered steps to make information visually accessible (p. 2). This list includes elements that may be constructive when they are applied to websites.

Past research has shown the need to decrease the readability of websites. The former considerations can be applied to adjust the readability. Individuals are using internet-based education materials more frequently since they are easily accessible. However, internet-based

resources may not be appropriate for individuals with low literacy. Occupational therapists may play significant roles in educating patients about lymphedema, advocacy, and providing lymphedema resources that are appropriate for the individual's literacy level. Therefore, the research question for this study is: What is the readability of lymphedema websites in Australia, Canada, the United Kingdom, and the United States as measured by the online SMOG readability measure?

Methods

Websites

Researchers analyzed internet-based lymphedema patient education resources to determine readability levels. Websites from four different countries were used, including Australia, Canada, the United Kingdom, and the United States. The countries chosen were all English speaking in order to accommodate the software used to assess readability. The selected countries also had comparable literacy levels amongst their population and their websites had similar patient education content areas focused on lymphedema.

The websites used were reputable national organizations or associations. The internet-based resources were selected through a Google search performed by the researchers. Key terms were used in the search engine, such as "lymphedema resources" or "lymphedema educational materials." Numerous sites were identified but the researchers narrowed the search down to four websites, one from each of the countries formerly mentioned.

The websites selected by the researchers included patient-centered information about lymphedema. Each of the websites contained common content areas, including an introduction to lymphedema and lymphedema treatment, such as a description of lymphedema symptoms and complications, treatment approaches, and recommendations for self-management. Each website

included a minimum of 30 sentences within each topic area. Exclusion criteria for internet-based lymphedema resources were topic areas with less than 30 sentences. Websites that did not contain one of the chosen topic areas consistent with the other countries were excluded. Lastly, websites that were not derived from a reputable national organization were excluded.

The selected websites included in this study are the Lymphoedema Association of Queensland from Australia <http://www.lymphqld.org/info.htm>, Lymphoedema Association of Quebec from Canada <http://www.infolympho.ca/en/basics.htm>, National Health Services from the United Kingdom <http://www.nhs.uk/Conditions/Lymphoedema/Pages/Introduction.aspx>, and American Cancer Society from the United States <http://www.cancer.org/treatment/treatmentsandsideeffects/physicalsideeffects/lymphedema/what-everywomanwithbreastcancershouldknow/lymphedema-what-every-woman-with-breast-cancer-should-know-toc>. Once the websites were determined, the researchers copied the text from each website and inserted the sentences into the SMOG readability measure, the chosen instrument that was used for data analysis. The SMOG readability measure will be further discussed in the following section.

Instruments

The SMOG formula is one of the most common readability calculations used in health care settings and it is one of the easiest to use for assessing readability (Ley & Florio, 1996). The SMOG is a regression formula that can be accessed for free from the World Wide Web. French and Larrabee (1999) reported that the SMOG is 100% comprehension-based, whereas other formulas are only 50-75% comprehension-based. Therefore, if a patient education document was analyzed by another readability formula, the material would be understood by 50-75% of the

individuals (French & Larrabee, 1999). The SMOG formula will correctly predict the grade level of a text within one and a half grades amongst 68% of the cases (McLaughlin, 1969).

When tested for validity by researchers, the SMOG calculation was shown to result in scores that were approximately two grades higher than the Dale-Chall formula (DuBay, 2004). It is important to note that in order to ensure complete comprehension and not simply the ability to read the information, it is reasonable that the SMOG grades will be higher than the Dale-Chall levels. Thus, the higher SMOG score indicates the ability to both read and understand the patient education materials (McLaughlin, 1969).

Ley and Florio (1996) noted that the SMOG formula provides nearly identical results when it is applied to the same passage. Intra-text variability may exist throughout one patient education passage. The SMOG uses three samples or 10 sentences and depending on the congruity of the text, there may be different grade levels assessed within the passage (Ley & Florio, 1996).

As cited by Ley and Florio (1996), various researchers have demonstrated an estimated reliability of the SMOG formula between 0.74-0.97 when used to assess a variety of patient education resources (Kanouse, Berry, Hayes-Roth, Rogers, & Winkler, 1981; Klingbeil, Speece, & Schubiner, 1994; Ley, 1995; Meade & Byrd, 1989; Morris, Myers, & Thilman, 1980). Therefore, it has been concluded that the SMOG calculation has both good validity and reliability. Additionally, the American Cancer Society has supported the use of the SMOG formula for patient education materials due to its wide recognition as a convenient and accurate method and its ability to be hand-calculated if computer software is inaccessible. The SMOG is used by the Office of Cancer Communications of the National Cancer Institute (Meade, Diekmann, & Thornhill, 1992). The procedures used in this study to assess readability of the

selected websites using the SMOG readability measure are discussed in greater detail in the following section.

Procedures

In past studies, researchers have investigated the readability of patient education materials. The procedures used in this study to analyze the websites' text have been adapted from those previous studies (Austermiller, 2012; Dessner, 2006; Veith, 2014; & Wolf, 2011). Only the online measure was used in this study because it has been shown to be reliable when compared to the manual method of completing the SMOG (Austermiller, 2012; Dessner, 2006; Veith, 2014; & Wolf, 2011). The two focal points were introduction to lymphedema and lymphedema treatment. Researchers chose information that occupational therapists could use to educate their patients during therapy sessions. To establish consistency in the method of data collection, the researchers classified the data by using the following 26 steps:

1. Website text from the specific content areas was copied and pasted into individualized Microsoft Word documents.
2. Documents were saved and labeled according to the country and the date of access.
3. If the document needed to be reexamined or updated at any time during the process, the date of update was noted in the document.
4. Each document was trimmed to include only essential components of text.
5. Photos, borders, decorations, website design, headers and subheadings were deleted.
6. If headers were the beginning of a list or section, the sentence was included (see related step eleven).
7. In a document that had 30 consecutive sentences, the entire 30-sentence passage was used.

8. In a document that had more than 30 consecutive sentences, the researchers attempted to use ten sentences closest to the beginning of the document, ten sentences closest to the end of the document, and the middle portion consisted of ten consecutive sentences that are representative of the remaining content.

9. For sites where content was taken from the same web page, but a different section of the webpage addressing the same topic area, ten sentences from one page came from the beginning of that page, ten sentences from another page in the topic area came from the middle of that page, and ten sentences from the last page relating to the topic area came from the last section. This allowed the researchers to have a broad sampling for the sections and while representative of the topic area.

10. All items in a list format were converted into a sentence form, including one word items.

11. For sentences or headers that end in a colon and begin a list, the first item was used to complete the original sentence and the subsequent items were put into sentence form (see procedure 9). For example,

“For concentration and attention:

- Reduce distractions - find a quiet place, use earplugs, keep the radio / TV turned down or off.
- Watch out for signs of fatigue - one of the main causes of poor concentration is fatigue. Don't work on any one task too long. Take regular rest breaks.”

This will be changed to:

“For concentration and attention, reduce distractions-find a quiet place, use earplugs, keep the radio/TV turned down or off.

Watch out for signs of fatigue - one of the main causes of poor concentration is fatigue. Don't work on any one task too long. Take regular rest breaks."

12. Lists that are series of short items had punctuation added and were treated as a single sentence.
13. Lists composed of full sentences had bullets deleted and were treated as individual sentences.
14. Any string of letters or numerals with at least three syllables were included. Therefore, MLD, read as M-L-D is counted as a polysyllabic word (McLaughlin, 1969).
15. Large numbers that extended into the thousands were removed.
16. If there is a "%" symbol, it was changed to the word "percent". For example, "14%" was changed to "14 percent".
17. Symbols to phrase words such as " and ' were removed. For example 'minor head injury' was changed to minor head injury.
18. Words in all capital letters were placed into lower case letters. For example DON'T was changed to "don't" if in the middle of the sentence and "Don't" if it begins a sentence.
19. Any live hyperlink was deactivated and replaced with the words used to make the hyperlink.
20. Any citations in parenthesis were removed.
21. Any height that was written with feet being the symbol ' and inches being the symbol " was changed to the words. For example, if someone is 5'5", the height will be changed to 5 feet 5 inches.

22. In text references were removed such as APA or MLA sources and were added to the end of a paragraph.
23. Line spacing was adjusted to create single line spacing between sentences.
24. Original regional spelling was included for text analysis.
25. The abbreviation “i.e.” was left as an abbreviation.
26. Anytime temperature was used it was converted into words with the exception of °F or °C. For example, if it said “38.1 °C” then it was changed to “thirty eight point one °C”.

After the text was saved to a Word document by following the former procedures, the researchers documented the total word count per the Microsoft Office Word total word count. The text was copied and pasted into the online version of the SMOG calculator. Access to the online version of the SMOG calculator can be found at the following website:

http://www.wordscount.info./wc/jsp/clear/analze_smog.jsp/. Please see Appendix A for a picture of what the online version of the SMOG calculator looks like. The data analysis will be discussed in the following section.

Data Analyses

Descriptive analyses were used to analyze the data collected and to summarize the findings. Data analyses were performed on each individual content area and the collective text (introduction to lymphedema and lymphedema treatment) for each country. Researchers used the results of this study to answer the research question. The data are presented as the grade levels. The results of this study are further discussed in the following section.

Results

Tables 1-3 present the data for each country and content area. Each content area consisted of exactly 30 sentences. The combined content areas for each country totals 60 sentences. Data

were analyzed collectively per country for overall readability and by content area for each country. Table 1 lists the online SMOG calculated grade level per content area for each of the four countries. The overall readability grade level for each country was as follows: (a) Australia, 11.63; (b) Canada, 13.11; (c) United Kingdom, 13.40; and (d) United States, 10.90. The numbers represent the equivalent grade level of the text's readability for the respective country. For example, this range of 10.90 to 13.40 would be equivalent to nearly three years of high school up to a half year of college.

The readability grade levels of the introduction to lymphedema content per country can be seen in Table 2. Lymphedema treatment content readability grade levels per country can be seen in Table 3. The readability of the introduction to lymphedema content area ranges from grade levels 9.81 to 13.51. The readability of the lymphedema treatment content area ranges from grade levels 9.64 to 14.88. For example, this range of 9.64 to 14.88 would be equivalent to a half year of high school up to nearly three years of college.

Total word count and total polysyllabic count were documented and the percentage of the total was calculated to determine if there was a relationship between the percentage of polysyllabic words and the SMOG grade level. Please refer to Tables 2 and 3. Appendix B includes an example of modifications to text to improve readability. Based upon the results, suggestions were provided to improve the readability of the text analyzed (please refer to Table 4 for an example). The following section discusses the interpretation of the results.

Discussion

The purpose of this study was to measure and compare the readability levels for four internet-based lymphedema resources from Australia, Canada, the United Kingdom, and the United States. The results help to answer the research question, "What is the readability level of

selected lymphedema websites in Australia, Canada, the United Kingdom, and the United States as measured by the online SMOG readability measure?” The results demonstrate that the overall readability grade levels range from 10.90 to 13.40. This surpasses the recommended fifth to sixth-grade reading level (Cotugna, Vickery, & Carpenter-Haeefe, 2005; Institute for Healthcare Advancement, 2014). This indicates that the majority of the individuals accessing and using these resources will have difficulty understanding the content provided.

The overall readability grade level for Australia was 11.63, which is equivalent to two and a half years of high school. According to the Australian Bureau of Statistics (2009), 59% of Australians read below a literacy Level 3. A literacy Level 3 is the minimum required to have the ability to cope with the demands of everyday life. Therefore, approximately 41% of the Australian population was functioning at a literacy Level 3 or higher. For Australia, the introduction to lymphedema content was measured at a higher readability level than lymphedema treatment content, as shown in Tables 2 and 3, respectively. The 59% of Australian individuals functioning at a Level 3 or below are more likely to experience poor understanding of internet-based patient education content. Therefore, the results indicate that more than half of the Australian population would be at risk for poor understanding and comprehension of the content provided on the lymphedema website for Australia.

The overall readability for the website from Canada was at the 13.11 grade level, which is equivalent to the first year of college. As cited by Rootman and Gordon-El-Bihbety (2008), the International Adult Literacy and Skills Survey (IALSS) health literacy scale shows that approximately 55% of Canadians 16-65 years of age function below a literacy Level 3 and 88% of Canadian adults over 65 years of age function below a literacy Level 3. Rootman & Gordon-El-Bihbety (2008) noted that this is important since a large proportion of the population 65 years

of age and older tend to have chronic conditions and more medication needs. Effects from chronic conditions or aging, such as vision problems, anxiety, decrease in executive functioning, and medication side effects (confusion and decreased attention and memory) can make it difficult to use websites, in addition to understanding and retaining the information provided. For instance, complications that result from chronic conditions may lead to the inability to read the text due to poor contrast or attend to lengthy paragraphs.

The estimated 60% of the Canadian population (16 years of age and over) functioning below a Level 3 on the health literacy scale was higher than the percentage of Canadian adults functioning below a Level 3 solely on the prose (48%) and numeracy (55%) scales (Rootman & Gordon-El-Bihbety, 2008). Those statistics demonstrate that people need to use a variety of skills in conjunction with one another for finding information and services, communicating needs and preferences, understanding choices and consequences, and understanding the context of the information (Centers for Disease Control and Prevention, 2014). The presence of an impairment in any of the required skills, may affect individuals' ability to independently cope with health literacy tasks (Rootman & Gordon-El-Bihbety, 2008). Health literacy tasks may include the ability to communicate health problems to their occupational therapist and understand the health information provided, the ability to read prescription bottles and understand medication regimens, and the ability to enforce self-care management strategies (i.e. compression wrapping, skin care, and exercises).

In this study, Canada's content area for introduction to lymphedema was written at a grade level lower than the content area for lymphedema treatment, as shown in Tables 2 and 3, respectively. With an overall readability grade level of 13.11, this suggests that the website content for Canada would require advanced skills in order to understand, comprehend, and use

the information that is provided. Approximately 67% of the Canadian population 16 years of age and over function at a literacy Level 3 or below (Rootman & Gordon-El-Bihbety, 2008), which suggests that more than half of the Canadian population would be unable to successfully understand and use the content provided on the website for Canada.

The overall readability of the lymphedema website for the United Kingdom was 13.40, which was the highest readability grade level of the four countries included in this study. The introduction to lymphedema (13.51) content area for the United Kingdom was also the highest of the four countries. The overall readability grade-level is equivalent to nearly a half year of college. The introduction to lymphedema (13.51) content area was only slightly higher than the lymphedema treatment (13.30) content area. The results for the United Kingdom web-based information suggests that 48% of the population from the United Kingdom most likely would struggle with this website.

For the United States, the overall readability was at grade level 10.90. The United States website demonstrated the lowest overall readability grade level of the countries studied. This indicates that of the four countries analyzed in this study, the website from the United States is accessible to the largest proportion of the general population. Of the individuals that researchers surveyed in the United States, 46% functioned below a literacy Level 3 (Kirsch, Jungeblut, Jenkins, & Kolstad, 2002). Therefore, an estimated 54% of the population may have adequate literacy skills to use and understand the analyzed text from the United States.

The introduction to lymphedema (9.81) content area resulted in a lower readability grade-level than the lymphedema treatment (11.86) content area for the United States. A lower readability grade-level for the introduction to lymphedema suggests that the lymphedema treatment content area may be more complex for the United States population than the

introduction to lymphedema content. Although the readability grade level for the United States website was the lowest of the four countries, the overall readability for the United States is beyond the recommended fifth to sixth-grade level (Cotugna, Vickery, & Carpenter-Haeefe, 2005; Institute for Healthcare Advancement, 2014). For nearly half of the United States population, the text within the website from the United States will most likely be too advanced for easy comprehension.

Most likely, individuals functioning at a literacy Level 1 or 2 function below a high school reading level, yet all of the readability grade levels from this study represent literacy skills at a high school grade level or beyond. This suggests that the websites analyzed in this study would be too complex for a large portion of the population in each of the countries. Since websites (such as the websites analyzed in this study) can serve as valuable and no cost educational tools, it is important to assess the readability of the text. A website that may be useful to one client may not be useful to another client due to individual needs and skills. The required skills for easy comprehension of the website should be parallel to the health literacy skills of the individual.

Occupational therapists should note the importance of providing web-based resources that are helpful, easy to access, and easy to comprehend by all users. Results of this study demonstrate that web-based resources for lymphedema appear to be well beyond the recommended fifth to sixth-grade level for readability (Cotugna, Vickery, & Carpenter-Haeefe, 2005; Institute for Healthcare Advancement, 2014). Occupational therapists often use web-based resources to provide patients and caregivers additional information. The information provided should be readable, as well as supplementary, helpful, and educational. It should not provoke frustration or confusion.

Occupational therapists are also able to serve as advocates to authors of websites to improve the readability of the content disseminated. Furthermore, many clients tend to be autonomous in their health management by looking up information on their own. Although websites can be beneficial tools for educating clients, occupational therapists should make sure that the websites will be accessible and the information will be clearly understood by the individuals.

Results of this study were complementary to the previously discussed studies currently in the literature. In this study, it was similarly demonstrated that the website content was beyond the recommended fifth to sixth-grade readability levels (Cotugna, Vickery, & Carpenter-Haeefele, 2005; Institute for Healthcare Advancement, 2014). Therefore, researchers of this study suggest that authors of lymphedema websites implement strategies to reduce the readability levels so that the web-based resources may be accessible and used by a greater proportion of individuals with poor literacy skills within the general population.

The United States Department of Health and Human Services (n.d.) discussed several strategies to help improve readability. Recommendations included that authors keep the text simple with emphasis on specific actions and recommendations. For example, specific actions and recommendations may include suggesting distinct questions that are important to ask during a visit with the occupational therapist. Other examples include listing the types of exercises that can be performed and identifying specific outdoor activities that are and are not recommended for individuals with lymphedema and why.

Website authors should consider cultural inclusiveness for the intended audience. When focusing on culture, it is important to consider that culturally diverse individuals are often misdiagnosed and are more likely to prematurely end medical services (Center for Mental Health

in Schools at UCLA, 2008). It is critical to focus the content on the target audience and deliver it in a manner that is culturally appropriate. This is important to note because if resources are not easily accessible, helpful, or easy to comprehend and relate to, then compliance or follow-up may be inadequate.

The focus of the text should be on recommended behaviors and not on the underlying medical principles. For example, rather than discussing the medical principles supporting how lymphedema treatment works (e.g. use of compression garments), authors should focus on how the reader can take steps to manage his or her lymphedema through the use of compression garments. Authors should use plain language and an active voice but avoid medical jargon (e.g. fibrous tissue or standardized assessment). Also, authors should organize the material without run-on sentences.

Moreover, websites should not exclusively rely on reading comprehension. Authors should complement website text with images, video or audio files, and interactive features. Website authors should include multiple methods of information dissemination, especially when teaching a skill. Methods could consist of video clips and images of exercises. For example, website authors should supplement instructions with pictures or graphics that will help to convey the message. The purposes of pictures are not to make the document aesthetically appealing but provide understanding (United States Health and Human Services, n.d.).

When the author discusses self-management of lymphedema in terms of compression wrapping, they could display images of various compression garments with captions. A video on how to use a pneumatic compression device, or the proper way to wrap one's arm with a compression garment may be more effective than simply reading about them, especially for those with poor literacy skills. If website authors present a variety of ways to convey the information,

occupational therapists can assume that it will help readers receive the information via visual and auditory formats.

Another health literacy principle that authors should apply to websites concerns the font used in the text. The font should be clear and easy to read. Standard font size should be 12-point font and authors should avoid using text with all capital letters. Instead, authors can bold words for desired emphasis. Italicized and underlined words should be used minimally since they are more difficult to read. One should avoid fancy or script lettering should be avoided. Adhere to standard fonts, such as Times New Roman. For example, the website from Australia used 11-point size Arial font, Canada used 11-point size Verdana font, the United Kingdom used 13-point size Arial font, and the United States used 10-point size Arial font.

All of the websites, with the exception of the United Kingdom, used a font below the recommended standard 12-point size font. None of the websites used Times New Roman font style. Additionally, authors should use bullets and headings to help break up sections (United States HHS, n.d.). See Table 4 and Appendix B for examples of how text from Canada was modified into bullet form.

Research has shown that about 60% of the time, individuals from the general population are unable to find what they are searching for on websites due to poor organization, inconsistent navigation systems, confusing hyperlinks, and excessive need for scrolling (United States HHS, n.d.). Individuals with low literacy skills may have even more difficulty than the general population when it comes to finding what they are searching for on the internet. To reduce problems with searching, websites' navigation systems should be uniform. The websites should require minimal scrolling and searching. Additionally, authors should organize the website so that there is an option to sort the information from simple to complex (United States HHS, n.d.).

There are additional factors that occupational therapists should examine when using web-based patient education materials and readability. Occupational therapists should consider how lymphedema or other diagnoses or conditions may affect information processing, despite the client's literacy skill level. If an individual does not understand the condition or how to interpret lymphedema websites, it can generate anxiety. The anxiety itself can interfere with comprehension. Decreased comprehension may diminish the ability of the individual to process information as well as he or she typically could while searching for information, even if functioning at a higher literacy level.

It is possible for authors to organize websites so that they provide a broad and general discussion at the recommended grade level. Additional links could be available for the reader to seek more detailed and complex information appropriate for individuals functioning at higher literacy levels. Websites designed as described allow for more information to be effectively disseminated to a larger audience of varying literacy levels. Identifying and listing the readability grade levels on each section of the website would also help readers to determine the complexity of the information.

Another approach, for those who are in contact with their occupational therapist for an extended period of time, is to use their occupational therapist as a resource for information. Occupational therapists are well-prepared with advanced knowledge and skills and are able to provide information and feedback to help educate their clients. Patient educational materials are intended as supplementary tools. Therefore, it is important to consider in what ways clients are receiving their primary source of information. As clients need additional information or clarification, they should consult with their occupational therapist.

In this study, all of the websites exceeded the recommended readability levels. However, each of the websites in this study also had components that were effective. Examples of how the readability suggestions discussed in this section have been appropriately implemented in the websites of this study can be demonstrated. Text from the United States website states, “It helps to talk to people who understand what you’re going through. Call us or contact the National Lymphedema Network (see the ‘To Learn More’ section) to find support groups in your area.” This recommendation has a specific action, allowing the reader to seek out further information about support groups. It also provides two locations in which contact can be made. There is a specific link where the reader is directed to actively learn more about support groups in the area in which the individual resides.

Most of the websites’ lymphedema treatment content areas in this study provide behavior-focused suggestions. For example, text from Australia’s website discusses how to manage lymphedema during the summer heat. The author suggests that, “Shower temperature should be cool, not hot” and “Shower before bandaging at night and at the start of the day before putting garments on.” Additionally, Australia’s website recommends that individuals “Use a pH balanced body wash rather than soap (i.e Hamilton's Bodywash).” This approach is desirable and practical because it is not only behavior-focused and specific, but it also provides an example of a specific bodywash product that could be used.

Canada’s website suggests the following, “Wear your compression garments. Do any of the exercises that can be undertaken in the space available to you. Try to arrange to have a seat where you have more space and may be able to raise your affected limb.” These are examples of desirable statements for a web-based patient education resource. The statements place emphasis on specific actions that the reader can use.

However, the United Kingdom website discusses lymphedema treatment in terms of what the trained therapist will do to help. There is a lack of behavior-focused actions for the readers to actively manage their condition. For example, the United Kingdom website states, “Remedial exercises are designed to strengthen muscles involved in lymph drainage. You will be given an exercise plan tailored to your requirements and ability.” This statement informs the reader what may be provided by the trained therapist, leaving the reader without specific actions to follow. The quoted passage also uses a passive voice. Passive voice does not tell the reader who is designing the exercise program, and who is giving the plan.

The United States website recommends that individuals with lymphedema “Try to reduce the stress in your life and get enough sleep. You also need people you can turn to for strength and comfort.” The United States’ website provides readers with tips on ways to help manage their condition that are not medically based. The United States’ website also provides further information on finding support groups. This section of the United States’ website could be more practical by providing a few simple examples of how to reduce stress, such as participating in a desired hobby, listening to music of choice, or journaling.

Lastly, it is valuable to note that a criticism of revisions to text in order to reduce the grade level, is that it can be perceived as demeaning to those with higher literacy skills. Sentences that are shorter with fewer polysyllabic words, may appear simplistic to individuals who function at a higher readability level. However, as it has been stressed previously, it is imperative to be able to target all potential readers and ensure that they will be able to understand and use the information that is provided within the website. It is also possible for authors to use creativity in designing websites to accommodate varying levels of literacy. Authors can present information at a basic level of literacy and then add layers that have additional information

written at higher literacy levels. Authors should also harness the power of the internet to present multi-media content that does not rely solely on the written word. These methods would better meet the varying needs of a larger proportion of the population.

In conclusion, occupational therapists have advanced skills and knowledge to serve as primary resources to their clients. However, sometimes additional information is needed or desired. As it has been stressed previously, there are certain factors that occupational therapists should consider. Even those clients who function at higher readability levels may miss points and lack information retention if they are feeling anxious (a common effect of chronic conditions, such as lymphedema). It may appear demeaning to have information written at a lower readability level to individuals who are functioning at higher readability levels. However, it is important to make sure that information is accessible and can be used by everyone. The next section discusses the implications for occupational therapy.

Implications for Occupational Therapy

Occupational therapists are educators and advocates, as well as clinicians. Services may be provided to persons with a wide variety of demographics and literacy skills. Therefore, occupational therapists need to be prepared to tailor education and interventions to each client individually. Oftentimes, occupational therapists will develop home programs, design brochures or hand-outs, develop webpages, and help clients with medication labels or schedules. This list is not all-inclusive, but demonstrates a few ways in which occupational therapists will be playing a role in addressing health literacy through a variety of patient education interventions.

It is also important for occupational therapists to be aware of the readability of the websites they are recommending their clients use. The websites may have great information, but if they are not easy to access, helpful, or easy to comprehend for that client, it will be a

disservice. As discussed earlier, research has indicated that customizing educational materials to the individual's learning style preference and health literacy level may enhance the individual's retention of information (Giuse, Koonce, Storrow, Kusnoor, & Ye, 2012). Therefore, the occupational therapist should be assessing each client's learning preference. Asking what has and has not worked in the past is important and an efficient strategy to understand what may work best for a particular patient.

A health literacy approach places emphasis on the accessibility of information for the intended audience to promote good health and well-being. Improving access to health information helps to empower individuals. The World Health Organization (WHO) advocates that healthcare professionals use their powerful positions to address issues of accessibility and readability of information. The World Health Organization encourages healthcare providers to take steps beyond the transmission of information and instead, take a participatory role in analyzing the clients' needs and advocating for them (WHO, 2015).

Occupational therapists have the power to advocate for improved readability amongst patient education materials, such as websites. Occupational therapists also have the ability to help empower clients. The World Health Organization states that empowerment coincides with health-related goal achievement and thus, creates positive outcomes for clients (WHO, 2015).

Occupational therapists should apply a health literacy approach in their healthcare delivery for each individual. This approach makes it more likely that all patients can understand the information that the occupational therapist provides and that patients can easily access and effectively use the information. In addition, a health literacy approach helps the client feel more central to the team and strengthens the client-practitioner rapport. Hopefully, this will also increase client compliance.

Lastly, occupational therapists can serve as advocates for their clients and the profession. Advocating for better readability of patient education resources amongst other practitioners and within facilities and websites will better enable clients to manage their own health. Enhanced readability is not only practical in terms of better health outcomes, but it is an ethical way of practicing. Clients have the right to know, understand, and be actively involved in their healthcare. By providing care, instructions, or resources that go above and beyond the client's health literacy level, occupational therapists are no longer providing person-centered care. This is potentially doing a disservice to the client and placing him or her at risk for noncompliance with occupational therapy services, decreased comprehension of educational materials, poorer health status, and increased health care costs and hospitalizations. However, providing information beyond an individual's health literacy skill level can be prevented, managed, and improved. The next section discusses limitations within this study.

Limitations

A few limitations should be noted with this study. Due to the nature of the internet and the rapid changes that occur because of advanced technology, a limitation to this study is that the data were collected at one point in time. Information could be added, deleted, or modified during any given time period. If any of the websites analyzed for this study include rapidly changing content, the results, in terms of readability grade level, may not stay the same.

Furthermore, in order to use 30 sentences for each content area, some additional content was included from separate sections of the webpages. Therefore, sections were broken up rather than having continuous and smooth transitions. The reason for doing this was to allow for data analyses of specific content areas within the website, in addition to the overall readability of the

whole website. Refer to step nine of the procedures section for details on how data were collected on separate webpages.

Future Research

The authors recommend that future research analyze additional websites beyond those selected for this study. Researchers should also explore web-based resources from countries that were not analyzed in this study. Additionally, the authors suggest that the websites analyzed for this study be re-analyzed periodically using the online SMOG calculator. Re-analyzing data will reveal any changes that are made on the website and how those changes affect the calculated readability level.

Since health literacy does not solely deal with reading skills, future research could explore barriers to website accessibility, such as short-term memory loss or visual impairments. For example, individuals with short-term memory loss may find it difficult navigating websites containing too many hyperlinks. Individuals with short-term memory loss may experience difficulty remembering where information was located if the design of the website is not uniform. Persons with short-term memory loss may also experience challenges retaining information that is too complex or information that is not clearly indicated.

Furthermore, visual impairment could be an accessibility issue for websites. For instance, individuals with low vision may experience difficulties using websites if the font is too small. Not all websites are designed for text enlarging. Therefore, websites with small font may be considered inaccessible to individuals with low vision, regardless of their literacy skills.

This study assumes that individuals have access to the internet. While many individuals use the internet, not everyone has access to the internet. The authors suggest that comparison studies be conducted, measuring the readability levels of both web-based and written documents

from respective countries. The author additionally recommends that further research be conducted on readability levels of web-based resources for multiple conditions and diagnoses. Lastly, the researchers of this study suggest that further research explore literacy skills in collaboration with learning style preferences. Literacy skills, in conjunction with learning style preference, may enhance learning and may be more efficacious than considering either alone. The next section will provide concluding statements for this study.

Conclusion

The purpose of the study was to analyze the readability of lymphedema websites in four English-speaking countries. The results showed that the overall readability and the two content areas of each site exceeded the recommended grade level. Therefore, the information on the selected websites for this study may be too complex for the large proportion of individuals from each of the countries studied with limited health literacy to be able to process and understand. The results of this study are consistent with past studies.

Occupational therapists who create or recommend websites for purposes of patient education may want to reexamine the readability level of the websites. Website authors should include multiple methods to convey their message, which can help readers better retain and understand the information. Occupational therapists should be aware of the readability levels of the websites they are providing to clients for the purposes of patient education and advocate for websites to be designed at or below a fifth to sixth-grade readability level. Future research is needed on this topic.

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Table 1

Overall and Content Area Analysis of SMOG Readability Grade Levels for Australia, Canada, the United Kingdom, and the United States

Country	Content Area		
	Overall	Introduction to Lymphedema	Treatment
Australia	11.63	13.24	9.64
Canada	13.11	10.93	14.88
United Kingdom	13.40	13.51	13.30
United States	10.90	9.81	11.86

Note. Sentence count for each document is 30 sentences.

Table 2

Analysis of SMOG Readability Grade Levels, Total Word Count, Total Polysyllabic Words, and Percentage of Polysyllabic Words for Australia, Canada, United Kingdom, and United States in Content Area: Introduction to Lymphedema

Country	Online SMOG	Total Word Count	Total Polysyllabic Words	% of Total
Australia	13.24	511	94	18.40%
Canada	10.93	296	56	18.92%
United Kingdom	13.51	505	99	19.60%
United States	9.81	533	41	7.70%

Note. Sentence count for each document is 30 sentences.

Table 3

Analysis of SMOG Readability Levels, Total Word Count, Total Polysyllabic Words, and Percentage of Polysyllabic Words for Australia, Canada, United Kingdom, and United States in Content Area: Lymphedema Treatment

Country	Online SMOG	Total Word Count	Total Polysyllabic Words	% of Total
Australia	9.64	357	39	10.92%
Canada	14.88	454	127	27.97%
United Kingdom	13.30	557	95	17.06%
United States	11.86	567	70	12.35%

Note. Sentence count for each document is 30 sentences.

Table 4

Examples of Revisions to Original Passages taken from Canada’s “Treatment” with grade equivalence from the online version of the SMOG

Recommendation	Original: 14.88	Revision: 6.89
Use shorter sentences	<p>When considering comments by non-experts or information obtained from for-profit sites, however, be aware of commercial interests, or untested claims. Information from other patients may be factually correct, but may not apply to everyone because of different medical conditions.</p>	<p>Lymphedema varies, so reports from others may not apply to you. Be careful when reading posts from people who are not experts.</p>
Use fewer polysyllabic words	<p>The LAQ encourages developing self-management practices where possible, because of the benefits of feeling more in control.</p>	<p>The LAQ says to take care of yourself. It may help you feel in control.</p>
Avoid medical jargon and use bullet points	<p>CDT combines manual lymph drainage (MLD), compression bandaging, decongestive exercises and skin care. Manual lymph drainage (MLD) is a specific, gentle light pressure technique different from regular massage.</p>	<p>CDT uses:</p> <ul style="list-style-type: none"> • Light massage • Bandages • Exercises to help swelling • Skin care

Appendix A
 Online SMOG Calculator



- Statistics
 - Stat Mule
 - Explanation
- Syllable
 - Syllable Scythe
 - Explanation
- Readability
 - Calculator
 - Explanation
- SMOG
 - Calculator
 - Explanation
- CLEAR
 - Calculator
 - Explanation
- Advanced
 - Doc Validation*
 - diFsnif*
 - Doc Shuffler*
 - Doc Generator*
 - Pwr Find*
 - WC Download*
- Fun
 - Fill-in-M_k_r*
 - Quiz*

WordsCount: SMOG

This SMOG measure give you the reading grade determined by the formula described below.

Submit
100000 characters remaining.

Click button to submit

WordsCount SMOG Results

To calculate SMOG

1. Count a number of sentences (at least: 10 from the start of a text, 10 from the middle, and 10 from the end).
2. In those sentences, count the [polysyllables](#) (words of 3 or more syllables).
3. Calculate using

$$\text{grade} = 1.0430 \sqrt{30 \times \frac{\text{number of polysyllables}}{\text{number of sentences}}} + 3.1291$$

References

- **Dr. McLaughlin's Web site:** Professor G. Harry McLaughlin describes his formula with wit. [\[more\]](#)
- **Wikipedia:** SMOG (Simple Measure of Gobbledygook) is a readability formula that estimates... [\[more\]](#)

Appendix B

Example of Modifications to Text to Improve Readability

Canada: Treatment. (Original: 14.88)

While there is at present no cure for lymphedema, it can be successfully managed. Treatments focus on the benefits of compression and on improving the drainage of lymphatic fluid. Specially trained lymphedema therapists will assess the degree of lymphedema, help set realistic treatment goals, provide treatment and instruction in self-care, and monitor progress. A physician's referral for lymphedema is normally required to ensure that no other health conditions could affect the lymphedema treatment.

Combined decongestive therapy (CDT) is presently considered the most effective treatment available and should be provided by specifically trained and certified CDT therapists. Treatment consists of an intensive phase to reduce swelling as much as possible and a long-term maintenance phase to keep swelling down and promote functioning. CDT combines manual lymph drainage (MLD), compression bandaging, decongestive exercises and skin care. Manual lymph drainage (MLD) is a specific, gentle light pressure technique different from regular massage. MLD stimulates lymph flow and redirects the lymph fluid to areas of the body where the lymphatic system is functioning. Special techniques help to break down fibrous tissue.

Lymphedema is a poorly researched and under-treated condition that is not recognized as a serious health problem. Physicians may fail to diagnose lymphedema. Standardized assessment and accurate measuring techniques are needed. Only then can the effectiveness of treatments and therapies be evaluated. With improved clinical research, lymphedema and its treatments may enjoy better recognition from medical practitioners and higher funding priority from our governments. Primary lymphedema and chronic secondary lymphedema are lifelong conditions that can be managed successfully.

Management involves learning about lymphedema (from a trained lymphedema therapist, where possible), treatment as necessary, and commitment to self-care practices. Learning to manage your lymphedema is an individual and gradual process. The encouragement and support of friends, family and medical professionals can help. The LAQ encourages developing self-management practices where possible, because of the benefits of feeling more in control, maintaining reduced swelling, and leading an active life. Wear your compression garment. Do any of the exercise that can be undertaken in the space available to you. Try to arrange to have a seat where you have more space and may be able to raise your affected limb.

Support groups. Anyone living with lymphedema and especially families of children with lymphedema may find support in the wider community through internet connections. There are a number of lymphedema support groups that may be accessed on-line. These can provide valuable personal connections and emotional support. When considering comments by non-experts or information obtained from for-profit sites, however, be aware of commercial interests, or untested claims. Information from other patients may be factually correct, but may not apply to everyone because of different medical conditions. If in doubt, consult your physician.

Canada: Treatment. Modifications for Lower Readability. (Modified: 6.89)

There is no cure for lymphedema. It can be managed. When prescribed by your doctor, trained therapists can provide care. Combined decongestive therapy (CDT) is very helpful. CDT uses:

- Light massage
- Bandages to decrease swelling
- Exercises to help swelling
- Skin care to prevent problems

There is little research on lymphedema. Doctors may miss it. There are two types. Both are lifelong problems. Learning to take care of your condition takes time. Friends and family can help, too. The LAQ says to take care of yourself. It may help you feel in control. Wear your garments. They will help control swelling. Do the exercises in the space you have. Try to have more space to move your arm or leg. If you or your children have this condition, there is help. Support can be:

- Found in the area where you live
- Found online
- Hopeful
- A way to make friends
- Helpful with your feelings
- A way to cope

Lymphedema varies, so reports from others may not apply to you. Be careful when reading posts from people who are not trained. Call an expert if you have questions.