



Evaluation of nurse practitioners assessment of patient reading literacy levels
by Mary Kay Fouhy-Thurston

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Nursing
Montana State University

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Abstract:

Based on results of the National Adult Literacy Survey of 1992, it was possible one fourth of patients who received health care from nurse practitioners may not have been able to understand instructions on prescription bottles, or patients' education materials, use written directions for tests, or give true informed consent. Because of shame and fear, patients do not tend to self-report low literacy. This study compared nurse practitioners' utilization of indirect literacy assessment, that is, assessment strictly based on clinic interaction, and direct literacy assessment, by a word recognition test.

The Rapid Estimate of Adult Literacy in Medicine-Revised (REALM-R) was administered to 35 patients to screen for low literacy. Two nurse practitioners were asked "Do you think this patients reads at or above the 6th grade level, or below the 6th grade level?" after clinical interaction with the patients. Nurse practitioners accuracy, utilizing the indirect method of literacy assessment, the clinic interaction, was accurate 83% of the time, (n=29). Based on direct assessment by REALM-R testing, nurse practitioners inaccurately assessed patient reading literacy 17% (n=6) of the time. Of the patients who were inaccurately assessed for literacy levels, 67% of the time the reading skill level was overestimated, (n=4), and 33% of the time (n=2) the literacy level was underestimated. Chi-square results indicated no significant relationship between nurse practitioners' indirect assessment methodology and REALM-R instrumentation.

Nurse practitioners correctly assessed patient reading literacy skill levels in approximately 8 of 10 patients based solely on clinical interaction. When inaccuracy occurred, the tendency was to overestimate patients' literacy ability; in the study, 12% of patients were unable to read six of eight common medical words, indicating a reading skill level below the 6th grade. Written materials, such as most prescriptions and package inserts, consent and registration forms, and many patient education materials would be intelligible for those four patients placing them at greater risk for poor health outcomes associated with poor literacy skills. Nurse practitioners could have utilized the REALM-R word recognition tool to detect patient illiteracy not recognized during the clinical interaction.

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OF PATIENT READING LITERACY LEVELS

by

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ABSTRACT

Based on results of the National Adult Literacy Survey of 1992, it was possible one fourth of patients who received health care from nurse practitioners may not have been able to understand instructions on prescription bottles, or patients' education materials, use written directions for tests, or give true informed consent. Because of shame and fear, patients do not tend to self-report low literacy. This study compared nurse practitioners' utilization of indirect literacy assessment, that is, assessment strictly based on clinic interaction, and direct literacy assessment, by a word recognition test.

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CHAPTER 1

INTRODUCTION TO STUDY

Adults with low literacy skills are greatly challenged in meeting the enormous expectations and responsibilities of being a health care consumer in the United States today. Brez and Taylor, (1997) noted in their study that patients today are expected to be aware of their health needs, take action, gain access to a complicated care system, engage in technical discussions, know their rights and responsibilities, advocate for themselves and family members, and make health care decisions. Patients are also being given more accountability to learn about changing health care technology, procedures and, ways of paying for their health care as the health care system increases in complexity. Brez and Taylor also noted health care providers rely heavily on printed materials to convey and gather information.

Parker and Schwartzberg (2001) commented in their editorial, "We have overlooked the fact that almost half of the US population has limited literacy skills, meaning that many patients struggle to understand and act on basic health information." (p. 1).

In an editorial written for the American Journal of Nursing (AJN), Diana Mason (2001) asked the question, "How do you know if your patients *are* literate?" (p. 7). Health care professionals possess high literacy skills compared to the population in general and, nurse practitioners (NPs) as a highly literate group may overestimate the literacy skills of their patients. Habel (2001) stated, "People who have low literacy skills

are typical of patients that nurses see every day. They have no outward signs of disability, and nurse can not tell through casual conversation that they have significant reading problems.” (p. 3).

In truth, people with reading problems come from all income, racial, and ethnic groups, and all age groups. Patients also do not tend to self-report low literacy; it is a matter of shame and fear for most. They are careful to hide their poor reading skills and often have spent a lifetime concealing it. Patients themselves may not recognize they have limited literacy skills, as noted by Dr. Williams in AMNews (Shelton, 1998, p. 3). A survey conducted by Doak, Doak and Root (1995) noted two-thirds of those reading at the very lowest level self-reported that they read “well” or “very well”. Assuming adult patients can read at the level of years of schooling completed can lead to false literacy assumptions. (Doak, et al, 1995).

Identification of patients with poor reading skills can be difficult. A study done by Bass, Wilson, Griffith, and Barnett (2002), utilizing a reading skill test, the Rapid Estimate of Adult Literacy in Medicine-Revised (REALM-R) concluded that resident physicians overestimated the literacy abilities in 36% of patients solely on the clinical interaction. Another study comprised of cardiologists, primary care providers and, residents caring for urban congestive heart failure patients noted clinicians overestimated literacy levels of low literacy patients 81% of the time (Horowitz, Monteith, McLaughlin, Sisk, and Chatterjee, 2004).

Problem

Multiple studies document the adverse impact low reading skills have on a patient's abilities to successfully navigate the health care system. There was a paucity of information regarding assessment of patient literacy skill levels during clinic visits. No data could be found studying NPs assessment of patient literacy skills, in any manner.

Purpose

The purpose of this study was to compare nurse practitioners' assessment accuracy of patient reading literacy skill strictly on the clinical interaction.

Hypotheses

Nurse practitioners indirectly assess patient literacy skill levels through the clinical interaction. The indirect method of literacy assessment will produce incorrect assessments of patient literacy skill levels, therefore NPs will incorrectly assess patient literacy levels.

Background

No data could be found regarding nurse practitioners assessing patient literacy skills during clinic visits. The problem of illiteracy first gained national attention in the United States in 1993 with the publication of the results from the National Adult Literacy Survey (NALS). The survey, conducted in 1992 and released in 1993, was the most

comprehensive literacy study ever done by the U.S. government. Nearly 13,600 randomly selected Americans 16 years or older, plus 1,000 adults in each of eleven states were surveyed in their homes. An additional 1,147 inmates in eighty-seven state and federal prisons were also included. Participants were asked about their reading skills and tested to determine what they could read and how well they could interpret and use what they read. In all, the reading skills of 26,000 adults were examined (Kefalides, 1999). When extrapolated to the whole population, NALS found almost 44 million Americans functionally illiterate or approximately one quarter of the U.S. population, and another 50 million had marginal literacy skills.

Functionally illiterate individuals read below the fifth-grade level, while those with marginal literacy skill read at the next higher level of ability, grade levels five through nine (Kirsch, Jungeblut, Jenkins & Kolstad, 1993) NALS results found that 90 million people, more than half the adult population had very limited reading abilities (Kirsch, et al, 1993). Of important note, older Americans and inner-city minorities, primary users of Medicare and Medicaid, are twice as likely to have inadequate literacy (Kefalides, 1999).

Corroboration of the NALS findings in health settings had been established. Williams, Parker and Baker (1995) conducted a study of more than 2,500 patients at two public hospitals, using patients' native language, either English or Spanish. Study results revealed 42% could not understand directions for taking medications on an empty stomach, twenty-six could not understand an appointment slip, and 60% could not understand a standard informed consent document. The rate of inadequate or marginal

functional health literacy was more than 80% in those older than sixty. Similar findings were noted in the Medicare enrollee's cross-sectional survey of 3,260 community-dwellers which found 34% English speaking and 54% Spanish speaking respondents had inadequate or marginal health literacy (Gazmararian, et al, 1999).

History of Literacy and Health Literacy

Health literacy first appears in the literature in 1974 (2004). Rudd (2002) provides an excellent chronological history of literacy and health literacy as developing partners. In the 1980's literacy concerns took the form of assessing written documents in the health field. During this time, connections between illiteracy and health were being established by international studies documenting a mothers' literacy as being linked to her child's health (Rudd, 2002). Researchers needed an easy to use tool to assess and document the reading level of patients to allow evaluation of health-related differences between people without adequate literacy skills and those possessing strong literacy skills. Davis, Crouch, Wills, and Miller (1991) developed and tested a health literacy assessment tool called the Rapid Estimate of Adult Literacy (REALM). The tool, a word recognition test, tested a persons' ability to read through a list of medical words, moving from short and easy words to multisyllabic and difficult words. Data from NALS, released in 1993, pushed researchers in the health care field to utilize REALM for assessing the match between readability of written health materials along with directly assessing literacy skills as they related to the impact limited health literacy had on overall health.

Ethical and Legal Implications

Nurse practitioners bear legal and ethical responsibilities to communicate effectively with patients. Growing emphasis on health literacy was included in the objectives and goals of Healthy People 2010. Rudd (2002) listed the literacy-related objective, 11.2, "to improve the health literacy of persons with inadequate or marginal literacy skills." Health care accrediting bodies, such as the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) and the National Committee for Quality Assurance (NCQA) require health care providers to provide consumers with health information that was educationally and culturally appropriate. Legal responsibility for patient teaching was found in the nurses' scope of practice as described in nurse state practice acts.

It was vital NPs accurately assess patient literacy skill levels. Quirk (2000) indicates NPs can utilize screening tools to assess reading ability, such as the REALM tool. To facilitate quicker, easier word recognition testing in the medical setting, Bass, Wilson, and Griffith (2003) developed the Rapid Estimate of Adult Literacy in Medicine-Revised (REALM-R), a shortened version of the original REALM test. The REALM-R word recognition test offers a quick, valid and dependable reading literacy skill testing tool designed for use in health care settings. This study utilized the REALM-R assessment tool.

Measuring Literacy Directly

Screening tools, to assess and identify patients with low literacy have been developed. The Peabody Individual Achievement Test Revised (PIAT-R) was a nationally standardized test and could be considered the “gold standard” by which other literacy tests could be measured. It provides wide-ranging screening to measure content in six areas, 1) general information, 2) reading recognition, 3) reading comprehension, 4) mathematics, 5) spelling and, 6) written expression. The test must be administered by a trained professional and takes 30 to 40 minutes to complete and score, making the PIAT-R impractical in general practice (Peabody Individual Achievement Test, 2004).

The original Wide Range Achievement Test (WRAT) was devised in 1936 and has been revised four times. It consists of a list of 100 words that a patient is asked to pronounce. When three words have been mispronounced, the test was stopped and scored by the number of words missed or not tried. The WRAT can be completed and scored in approximately five minutes and its validity and reliability have been well documented (Quirk, 2000).

Davis, et al, (1991) developed the Rapid Estimate of Adult Literacy in Medicine (REALM). It was a 66-word reading recognition test that measures a patient's ability to pronounce common medical terms and lay terms for body parts and illnesses. The words are arranged in three columns beginning with short, easy words and ending with more difficult terms. Patients are instructed to begin at the top of the first column and read down, pronouncing all the words they can from the three lists. The total number of words

pronounced correctly was the raw score, which if converted to a grade, ranging from the third grade and below to ninth grade and above. REALM can be used to screen for low literacy in 5-6 minutes. The advantages over WRAT-R are, it measures a patients' ability to read medical and health-related vocabulary, takes less time to administer and, the scoring was simpler (Davis, et al, 1991).

The Rapid Estimate of Adult Literacy in Medicine-Revised (REALM-R) was designed by Bass, Wilson, and Griffith (2003). It was created to solve the problem of response burden, the amount of time a participant took to complete the test, to provide a tool that would be useful in typical busy clinic settings. The test was a shortened version of the original REALM. It was comprised of 8 words instead of 66. The choice of which eight words was based various correlation testing and interviewers reports; primary care physicians helped make the final selection of words that a patient would commonly experience and were expected to know in the process of interacting with their health care provider. While "fat", "flu", and "pill" were not scored as part of the test, they were left at the beginning of the REALM-R test to decrease test anxiety and enhance patient confidence. The words chose for the REALM-R were; "osteoporosis", "allergic", "jaundice", "anemia", "fatigue", "directed", "colitis", and "constipation". A correct response was pronouncing the word correctly. A score of 6 corresponded to a sixth grade reading level. Bass, Wilson, and Griffith (2003) noted "People with a sixth grade reading level would have difficulty with comprehension of written and oral materials." (p. 3). The REALM-R correlated well with WRAT-R and the original REALM tool (Bass, et al, 2003).

The need to determine functional health literacy assessment spurred the development of the Test of Functional Health Literacy in Adults (TOFHLA). Parker, Baker, Williams, and Nurss (1995) designed the test. It consists of two parts; reading comprehension and numeracy. The reading comprehension portion was a 50-item test using a modified Cloze procedure where every fifth to seventh word in a passage was omitted, and four possible options are provided. The patient chooses the option that best fits the passage and receives one point for each correct answer. The numeracy section was a 17-item test using actual hospital forms and labeled prescription vials. The test assesses ability to read and comprehend directions for taking medications, monitoring blood glucose, keeping appointments and, obtaining financial assistance. Numeracy and reading scores comprised the total TOFHLA score which was divided into three categories: inadequate, marginal, and adequate. A patient score of 60-74 was considered to have marginal functional health literacy; patients with scores greater than 75 are considered to have adequate functional health literacy. TOFHLA had demonstrated validity and reliability, a Spanish version was available (Parker, Baker, Williams, and Nurss, 1995). It however takes up to 22 minutes to administer, making its use in general practice similarly impractical as the PIAT-R.

Conceptual Framework

The Prescriptive Theory designed by Ernestine Wiedenbach provided a conceptual framework for this study. This theory was clinic practice based, and included interaction between the nurse practitioner and the patient. Three major concepts comprise

the Prescriptive Theory.

1. The *central purpose*, which the practitioner recognized as essential to the particular discipline.
2. The *prescription* for the fulfillment of the central purpose.
3. The *realities in the immediate situation* that influence the fulfillment of the central purpose (George, 1980, p.181).

Central purpose, as defined by Wiedenbach, was based on the individual nurse's philosophy and goals of accomplishment (George, 1980). According to Tomey and Alligood (1998), "Purpose—that which the nurse wants to accomplish through what she does—is the overall goal toward which she is striving... the why of clinical nursing... specifically directing her activities towards the 'good' of her patient." The NPs central purpose was caring for the patient, which Wiedenbach defines as "Overt action, directed by discipline thoughts and feelings toward meeting the patients' need-for-help, constitutes the practice of clinical nursing... [It] is goal directed, deliberately carried out and patient- centered." (Tomey & Alligood, 1998, p. 88). In this study, the patient's need-for-help was the determination of his/her reading literacy skill level.

The NPs purpose in this study was to determine patient reading literacy skill ability. The goal of this study is to determine the accuracy of indirect assessment of reading ability versus the direct approach. The indirect method of assessment was based solely on the clinic visit interaction between the patient and the nurse practitioner. The direct approach was utilization of the REALM-R word recognition tool to determine patient reading literacy skill level. The REALM-R test introduced the second major

concept of the Prescriptive Theory; the prescription.

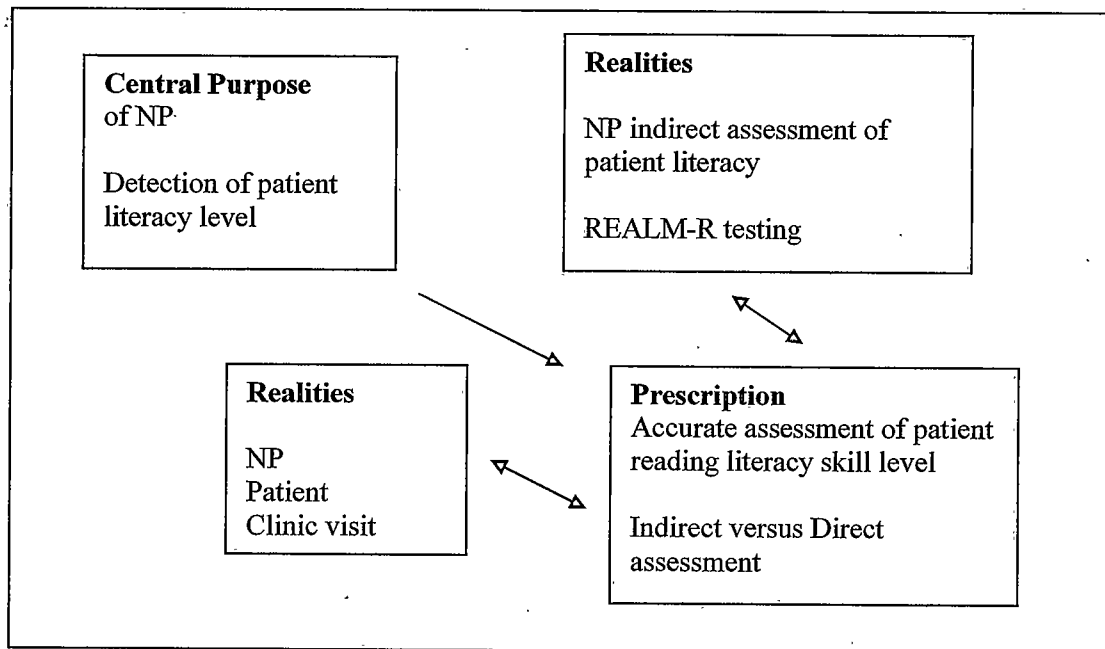
The prescription, as described by Wiedenbach, "is a directive to activity." (George, 1980, p. 140). Indirect assessment of patient literacy was based on the clinical interaction between the NP and the patient. This method was the usual technique for determining patient literacy. The prescription in this study was direct word recognition assessment to determine the actuality of the patient's reading literacy skill level. After the nurse practitioner determined her central purpose, and developed the prescription, various realities of providing patient care interact with the prescription.

Five realities are defined by Wiedenbach. They were noted to be the agent, the recipient, the goal, the means, and the framework (George, 1980, p. 141). In this study the NP was the agent, while the recipient was the patient. The goal was the nurse practitioners' assessment of patient reading literacy skill level strictly on the clinic interaction. The means was utilizing the REALM-R word recognition test, and the framework within which the process occurred was a clinic setting, during an office visit between the patient and NP.

Wiedenbach asserts human beings possess unique potential, need stimulation, strive toward self-direction, and responds in a manner that represents his/her best judgment at the time "... these characteristics require respect from the nurse." (George, 1980, p. 145). Determining a patient's literacy level requires sensitivity, kindness, compassion and, understanding. The patient needed an environment that was non-judgmental, and supportive to risk exposure of illiteracy. When the nurse practitioner

provided security and understanding her role as helper, which Wiedenbach notes as crucial to her central purpose, was fulfilled.

Figure 1. Conceptual Model of Wiedenbach's Prescriptive Theory adapted and revised for this study (George, 1995, g. 181).



Definitions

For the purpose of this study, the following terms have been defined:

1. Literacy: Using printed and written information to function in society. This includes understanding, interpreting, and applying written material to accomplish daily tasks (Kirsch, Jungeblut, Jenkins, and Kolstad, 1993).
2. Functional literacy: The ability to use reading, writing, and computation skills at a level of proficiency necessary to meet the needs of everyday life situation, function on

the job and in society, achieve one's goals, and develop one's knowledge and potential (Parker, Baker, Williams, and Nurss, 1995).

3. Functional health literacy: The ability to read, understand, and act on health information. This includes such tasks as reading and comprehending prescription labels, interpreting appointment slips, completing health insurance forms, following instructions for diagnostic test, and understand other essential health-related materials required to adequately function as a patient (AMA, 1999; Parker, et al, 1995).
4. Cultural literacy: The understanding of the values and views of those in other social classes and ethnic groups in the mosaic of cultures that exist in the United States (Giorgianni, found in Andrus and Roth, 2002).
5. Word recognition: Word recognition involves the translation of print to speech either phonetically or by instant recognition; the recognition of the meaning of printed symbols or a combination of both (Farr and Carey, found in Brez and Taylor, 1997, p. 1041).
6. Reading skill: "a persons' ability to decode words. Decoding was the process of transforming letters into words and being able to pronounce them correctly." (Habel, 2001, p. 5).
7. Response burden: The amount of time needed to administer and score literacy tests. (Bass, Wilson, and Griffith, 2003).

Assumptions

In planning this study it was assumed:

1. Nurse practitioners assess patient literacy levels primarily on the clinical interaction.

2. The REALM-R word recognition test was valid and reliable for measuring patient reading literacy.

Summary

The relationship between literacy and health was complex. Studies of adult literacy consistently find a portion of adults have reading difficulties. NALS provided data indicating millions of people are functionally illiterate. These people were found in all types of backgrounds; however, functionally illiterate adults were more likely to be older, poorer, less educated, and have more health problems (Kirsch, et al, 1993).

Persons with poor reading skills are often ashamed and have developed various methods to conceal their illiteracy. Signs of illiteracy are non-specific. NPs have both ethical and legal responsibilities to be aware of patient's literacy levels. While it may be impractical to screen all patients for literacy, patient with multiple medical problems, age 60 or older, those with limited education and income would benefit from literacy screening testing with word recognition testing.

A variety of screening tools are utilized in the research of health literacy. The Peabody Individual Achievement Test Revised (PIAT-R), the Wide Range Achievement Test (WRAT), the Rapid Estimate of Adult Literacy in Medicine (REALM), and the shortened versions of the REALM, the Rapid Estimate of Adult Literacy in Medicine-Revised (REALM-R). Determining functional health literacy was best achieved with the TOFHLA. WRAT, REAL, and REALM-R are word recognition tests. PIAT was a nationally standardized literacy test used in many fields.

Detection of illiteracy requires nurse practitioners not assume their patients possess functional health literacy. This study examined NPs accuracy when assessing patient literacy solely on the clinical interaction.

Ernestine Wiedenbach's Prescriptive Theory provided a model for the study. As a clinic and practice based theory, it presented a means to connect the NP, the patient, and the literacy assessment process while acknowledging various realities that affected the assessment process.

CHAPTER 2

REVIEW OF LITERATURE

Illiteracy, as it relates to health care, has become a significant problem. Literacy, as defined by AMA (1999) was the basic ability to read and speak English. Functional literacy was the ability to use reading, writing, and computation skills at a level necessary to successfully meet the needs of everyday life situations, including functioning on the job, and in society in general (Parker, et al, 1995). Functional health literacy was the ability to read, understand, and act on health information (Parker, et al, 1995). AMA (1999) notes functional literacy should also include various tasks such as reading and comprehending prescription labels, interpreting appointment slips, completing health insurance forms, following instructions for diagnostic tests, and understanding essential health-related materials required to adequately function as a patient.

Literacy and functional health literacy in individuals may vary by setting and context. Health literacy may be considerably less than a person's general literacy level. An individual may be able to read and understand materials at home or work but, struggle with medical material of the same complexity that contains unfamiliar words and concepts (AMA, 1999). It was possible for well-educated persons to functionally health illiterate. Persons with functional health illiteracy can experience detrimental effects on their health and well-being.

Prevalence of Illiteracy

The prevalence of illiteracy was shocking. Findings of the NALS, referred to as the “most accurate portrait of literacy in the United States” (Williams, Davis, Parker, and Weiss, 2002, p. 384. NALS results found approximately half the American public in 1992 had inadequate literacy skills. 40 to 44 million of 191 million adults were functionally illiterate, meaning they read at or below the fifth-grade level (Kirsch, Jungeblut, Jenkins, and Kolstad, 1993). Another fifty million adults were marginally literate; they read above the 5th grade level up to the ninth-grade level (Kirsch, et al, 1993).

NALS noted persons with inadequate and marginal literacy skills came from various backgrounds. Functionally illiterate adults were more likely to have health problems, be impoverished, and have completed fewer years of education (Kirsch, et al, 1993). However, illiteracy can be found in all patient populations, medical conditions, socioeconomic classes and, age groups. Due to literacy demands made on patients who interact with the increasingly complex health care system, adults who are functionally illiterate or marginally literate were likely to have low health literacy skills.

Studies confirmed patients read on a lower-level than their last grade completed in school, which was often assumed to correlate with reading skill ability (Jackson, et al, 1991; Doak, Doak, and Root, 1995; National Work Group on Literacy and Health, 1998). Jackson, et al, (1991) and, Doak, et al, (1995) found, on average, adults’ reading levels are five grade levels below their last completed grade in school.

Jackson, et al, (1991) studied 528 indigent patients in seven outpatient clinics and found 40% reported completing the 12th grade, yet 58% read at or below the fifth-grade level. Davis, et al, (1994) assessed the reading ability of 396 parents and caregivers of pediatric outpatients, utilizing both the REALM and WRAT-R word recognition tests. Study participants mean self-reported last grade completed was the 11th grade, but the mean reading level was sixth to eighth grade.

Estrada, Barnes, Martin-Hryniewicz, Collins, and Bryd (1999) studied the correlation of literacy levels to completion of high school in 40 patients taking warfarin. Eighty-three percent of the sample had completed high school; 47% had a REALM score correlated to a high school reading level while 30% had scores at or below the sixth-grade level.

Elderly individuals, who have more chronic disease than the younger population, were a special concern in regards to low literacy. Jackson, et al, (1991) assessed reading levels of 272 outpatients, aged 30 and older, utilizing the PIAT-R. 73% of patients aged 60 or older (n=75) read at less than a fourth-grade level, although 39% reported graduating from high school. Analysis of variance for four age categories established a decline in reading ability and education status with increasing age (Jackson, et al, 1991).

Prevalence of Inadequate Functional Health Literacy

It was not surprising that along with low literacy, there was a prevalence of inadequate functional health literacy. A large study, comprised of 2,659 patients at two

public hospitals, English and Spanish-speaking patients completed the TOLFA word recognition test, in their respect languages. The majority of participants were poor, had no health insurance, and had not completed high school. Combining results of marginal health literacy with low functional health literacy resulted in 48% of English speaking patients and 62% of Spanish-speaking patients with inadequate functional health literacy skills (Williams, Parker and Baker, 1995).

Gazmararian, et al, (1999) studied 3,260 Medicare enrollees, age 65 or older, at four different locations around the United States. Health literacy was assessed using a shortened version of TOLFA. In general, 34% of English-speaking participants and 54% of Spanish-speaking adults had inadequate functional health literacy. The majority of subjects were Caucasian females with at least a high school education earning more that \$15,000/year. A trend toward an inverse relationship between health literacy and age was noted. Data was adjusted for level of education and cognitive impairment and continued to indicate age was highly correlated to inadequate health literacy. Nearly 16% of patients aged 65-69 exhibited inadequate functional health literacy, compared with 58% of those 85 years and older.

Cultural Literacy

NALS data noted African-Americans, Native American Indians, Hispanic-Americans, Alaskan Natives and Asian-Pacific islander adults were more likely than Caucasians to score in the lowest two literacy levels (Kirsch, et al, 1993).

Cultural barriers do exist; language and patient-held beliefs may affect the experience of health care. Other barriers, which cross all cultures and groups include inadequate knowledge and communication barriers about where and how to seek health care. These barriers can keep functionally health illiterate patients from all cultures from receiving adequate care (Kirsch, et al, 1993).

Cultural differences can even be found among different English-speaking age groups. Elders as a cultural group have a significant prevalence of inadequate health literacy (Kirsch, et al, 1993).

Readability of Written Materials

Early history of literacy and health focused on assessing the readability levels of materials used in health care. A trend seemed to emerge; literacy levels of written materials often exceeded literacy abilities of the reader. Rudd, Moeykens, Colton (1998) stated that, "Education, occupation, and income are commonly used marker of socioeconomic status and strongly correlated with health." (p. 2). The authors also cite a number of studies to support the following comment, "Educational attainment has become the most convenient and commonly used indicator of socioeconomic status, and the association between years of schooling and health is well established." (Rudd, et al, 1998, p. 3).

With the NALS results, there was a shift in the study of literacy towards consideration of health literacy, utilizing direct measures of literacy rather than years of

schooling. "Patients' literacy directly influences their access to crucial information about their rights and their health care, whether it involves following instructions, for care, taking medicine, comprehending disease-related information, or learning about disease prevention and health promotion." (Rudd, et al, 1998, p. 4). Even the signing of consent forms, which often include legal and medical jargon, can be greatly influenced by patient health illiteracy (Rudd, et al, 1998).

Patient Experience

There are many frustrating and difficult experiences for patients with inadequate health literacy. Baker, et al, (1996) surveyed sixty patients with very low REALM scores about their experiences in the health care environment. The dominant theme identified was a sense of shame regarding low reading skills. Six barriers were identified as common problems the patients faced in their interactions within the health care system; 1) navigation or finding the hospital or locating departments within health care facilities, 2) completions of forms or registration, 3) interpretation and application of dosing instructions, 4) communication between health care providers and patients, 5) interpretation of appointment slips and, 6) coping with negative treatment by health care workers when they had admitted they had difficulty reading and needed assistance.

Brez and Taylor (1997) interviewed patients with low literacy levels to gain insight regarding exposure of their inadequate reading abilities. Participants reported their exposure as "risky" but noted there was also risk in not disclosing their poor literacy

skills. The patients stated they felt embarrassed or stupid, but past experience reinforced that a lack of knowledge could negatively affect their ability to function in the hospital setting. The patients expressed the expectation that the hospital would be a caring place, and noted that health care professionals should be aware of patient literacy status. The same patients expressed possible emotional discomfort if literacy screening tools, such as REALM, were used.

A study done by Parikh, Parker, Nurss, Baker, and Williams (1996) explored the relationship between low literacy and shame. The study included 202 patients from emergency departments and walk-in clinics that were tested by the TOFHLA. Their scores revealed 43% had inadequate or marginal functional health literacy; and only 67% of that group had admitted they had difficulty reading or understanding what they read. Of the group who admitted having problems reading, 40% (n=23) admitted experiencing shame regarding their reading difficulties. Of the 58 patients who had inadequate functional health literacy, 67% had never told their spouses, 53 % had never told their children, and 19% had never disclosed to anyone their difficulties reading. The patients in the study by Parikh, et al, (1996) harbored a deep sense of shame regarding their reading problems, and did not tend to admit they had difficulty reading. These patients revealed various coping mechanisms to hide their low reading skills. They brought someone along who could read, made excuses such as "I forgot my glasses" to avoid reading, watched other closely to figure out what to do or how to respond, and asked staff for help (Parikh, et al, 1996).

Provider/Patient Experience

Persons with poor reading skills develop ways of concealing their illiteracy. Kefalides (1999) commented, "... clinicians should not assume their patients know how to read, or read well, based on the number of years the patient reports completing in school" (p. 334). Studies have established that the level of education does not necessarily correlate to reading skill level (Gazmararian, et al, 1999).

Signs of inadequate functional literacy are non-specific but may include inability to keep appointments and adhere to care therapies. Patients may utilize coping mechanisms mentioned in the study by Parikh, et al, (1996). Williams (2002) lists some clues that a patient may have inadequate health literacy: "bringing a family member to the clinic visit or wanting to discuss materials with family, claims of forgetting reading glasses or incompletely filing out forms." (p. 417).

Medicine was highly technical with a technical language that patients may not understand, although health care providers are proficient in reading, interpreting, and utilization of that language. A study conducted by Davis, Williams, Estela, Parker, and Glass (2002) found colon cancer focus group patients could not say or understand various terms including fecal occult blood test or flexible sigmoidoscopy. In this study, many of the patients did not know the meaning of the words polyp, tumor, lesion, screening, or blood in the stool. None knew what the colon or bowel was nor where anatomically they were located, and many were unclear about the rectum.

In the Gazmararian, et al, (1999) study of Medicare patients, it was found that

48% did not understand written instructions to “take medication every 6 hours, 68% could not interpret a blood sugar value, twenty seven percent could not identify their next appointment from an appointment slip, 27% did not understand “take medicine on an empty stomach” which was written at the 4th grade level, and 100% could not understand a statement of Medicaid rights written at a 10th grade level.

Health care providers are often unaware that their patients lack literacy to understand them and the health care system. The study by Bass, Wilson, Griffith and Barnett (2002) was conducted to determine whether residents could identify patients with poor literacy skills based on clinical interaction. Patients’ literacy levels were tested using the REALM-R tool, and residents were asked, “Do you feel this patient has a literacy problem?”, answering yes or no. Results of the study found resident physicians overestimated the literacy abilities of their patients. Residents believed ten percent of patients (n=18) had literacy problems based on their clinical interactions; of the remaining 90% (n=164) residents perceived as having no literacy problems, 36% failed the REALM-R cutoff of reading below the sixth grade level. reading at or below the sixth grade level places a patient at risk when interacting with the health care system (Bass, et al, 2002).

Consequences

Lack of Understanding of Preventative Services

Davis, Arnold, Berkel, Nandy and Jackson (1996) studied 445 women who had not had a mammogram in the past 12 months, testing their literacy with the REALM

word recognition test. Of those who read at a 3rd grade level or less, 61% did not know why mammograms were recommended compared to 88% of those who read at a high school level or higher.

Another study utilizing the REALM test conducted by Bennett, et al, (1998), assessed 212 males receiving care at a cancer clinic for prostate cancer. Results indicated those with low literacy levels were more likely to present with advanced-stage cancer than those with higher reading abilities. Adjustments for age and race correlated inadequate literacy as a strong predictor for advanced disease at presentation of prostate cancer.

Lack of Knowledge

A study of 483 asthma patients conducted by Williams, Honig, Lee, Nowlan (1998) evaluated the relationship literacy had to asthma knowledge and ability to use a metered-dose inhaler (MDI). Patients from an emergency department and a specialized clinic were assessed by REALM testing to determine their literacy levels. Mean knowledge scores directly correlated with reading levels. After adjusting for education and various socioeconomic variables, literacy level was the strongest correlate of health knowledge and disease management.

Williams, et al, (1998) studied 402 patients with hypertension and 114 with diabetes. The TOLFA test was used to measure functional health literacy. Knowledge of hypertension and diabetes was assessed using two validated questionnaires. Literacy scores strongly correlated to patients' knowledge of their disease. 49% of those with

hypertension and, forty-four percent of those with diabetes had inadequate functional health literacy.

Poor Health Status

Determining the existence of a relationship between literacy and health status among adults with poor literacy skills was the object of the study by Weiss, Hart, McGee, and E'stelle (1992). The study used the Sickness Impact Profile (SIP) which was a behavioral measure of sickness-related dysfunction. Scoring was a composite score of response based on physical and psychosocial dimensions of health. A lower score indicated better health. The subjects' literacy skills were also assessed. results revealed physical, psychosocial and total SIP scores significantly related to reading level. The relationship remained significant even with adjustment for potential confounding variables.

Poor Compliance

Poor compliance, aside from willful disregard, may be the result of failure to understand directions. Andrus and Roth (2002) noted there can be significant consequences with non-compliance with drug therapies, for whatever reasons. In a study of patients with human immunodeficiency virus (HIV), lower TOLFA scores were found to be a predictor of noncompliance to antiretroviral drug use. Kalichman, Ramachandran, and Catz (1999) found HIV patients with inadequate functional literacy were 4 times more likely to be non-compliant than those with higher literacy levels. Patients with low

literacy levels reported missed doses of antiretroviral medications were due to confusion about their treatment regimen, along with depression, or the desire to cleanse their body of drugs.

Anecdotal evidence provided significant insight into low literacy, shame and, non-compliance. In the study conducted by Baker, et al, (1996), exploring the health experiences of patients with low literacy, a patient told the researcher that he had some papers, but he didn't know they were prescriptions, and he walked around for a week without his medication; he was ashamed to go back to the doctor, but a woman saw the papers and told him they were prescriptions. Mayeaux, et al, (1996) noted in their report on improving patient education of a patient discharged from the hospital with written instructions to alternate 0.125 mg of digoxin with 0.25 mg every other day. When the patient returned with symptoms of digitalis toxicity, he admitted he couldn't read the written instructions and was too embarrassed to tell the doctor he couldn't read, so, he guessed at what to do and took both doses of digoxin every day.

Wertheimer and Santella (2001) conducted a literature categorization on medication compliance research. In their report under the section titled, "The Role of the Patient and Compliance" a different perspective was presented regarding patient compliance. The authors note that while patient compliance literature contains many contradictions explaining adherence understanding, it agrees that none of the following common demographic factors have been shown to consistently related to non-compliance; age, marital status, living alone, sex, race, income, occupation, number of dependents, intelligence, level of education, or personality type.

Increased Hospitalizations

Baker, Parker, Williams, and Clark (1998) studied 958 low-income patients to determine the association between patient literacy and hospitalization. The study setting was a hospital emergency department. Functional health literacy was tested with the TOFHLA. The patient's electronic hospital records were reviewed to provide the number of hospitalizations each patient had during the prior 2 years. Patients with inadequate health literacy were twice as likely as patients with adequate literacy to be hospitalized in the previous twenty-four months, even with adjustments for health status and various socioeconomic indicators.

Increased Cost of Health Care

Weiss and Palmer (2004), in their most recent study, examined the controversy of whether inadequate health literacy had a relationship to increased health care costs or not. A prior study conducted by Weiss, et al, (1994) evaluated the relationship between literacy and health care costs in Medicaid enrollees in Arizona. The study involved over 400 patients; most were enrolled in Medicaid because of pregnancy. Initially the study did not demonstrate a significant relationship between reading levels and the cost of medical care over one year, 1992. Conclusions were drawn that literacy levels had no relationship to increased cost of health care. Re-analysis of the original data from the 1992 study provided the basis for the 2004 study regarding literacy and health care costs.

The second study excluded women enrolled in Medicaid because of pregnancy because "... they were young, relatively healthy pregnant individuals who did not offer sufficient variation in health care costs to permit detection of a relationship between literacy and costs." (Weiss and Palmer, 2004, p. 44). Remaining subjects, 18%, (n=74) of the original 402 participants reading skill levels were tested using the Instrument for the Diagnosis of Reading (IDR). IDR scored from 0-8, which corresponded to grade-equivalent reading levels; a score of 8 indicated literacy above or equal to the 8th grade level. Weiss and Palmer (2004) found subjects' mean reading level was grade 5.4 $\pm$ 2.7. Eighteen (24%) had IDR scores at low-literacy levels (less than or equal to 3rd grade reading level) while 76% (n=56) tested at the next higher level (greater than or equal to 4th grade reading level). The 18 low-level readers generated considerably more annual mean total health care charges than the 56 higher-level readers; \$10,688 and \$2,891 respectively (p= .025). The difference persisted even after adjustments for potentially confounding variables. Weiss and Palmer (2004) concluded "Based on this small study, very limited reading skills seem to be independently associated with higher health care charges among medically needy and medically indigent Medicaid patients." (p. 1).

Summary

Functional health literacy derives its origin from literacy. The prevalence of illiteracy was brought strongly into focus with the NALS findings. The NALS study also noted illiteracy could be found in all patient populations, medical conditions, and

socioeconomic classes and all ages. Using last grade complete in school as a reference of literacy can lead to false literacy level assumptions; on average, adults' reading levels were about five grades lower than the last grade completed. Prevalence of functional health illiteracy was found in a large study of indigent and minority patients. Results indicated 48% of English-speaking adults, and 62% of Spanish-speaking participants were either marginally or functionally health illiterate. Another study noted an inverse relationship between age and health literacy.

Cultural literacy problems were clearly noted in NALS. Even among English-speaking adults, cultural differences exist among various age groups.

Initial relationships between literacy and health literacy focused on assessing written materials for readability. NALS results shifted the focus of research from written materials to be read to the reader. Realization of the impacts poor health literacy could have on the patient fueled a burst of research based on assessing patient reading literacy.

A qualitative study provided patient insight into experiences patients with inadequate health literacy have in the health care environment. Shame was the dominant theme, and six barriers were noted; navigation, completion of forms, understanding dosing instructions/applications, patient/provider communication, interpretation of written materials and, coping with negative treatment when illiteracy were exposed. Participants of another qualitative study felt exposing their inability to read were "risky" but also acknowledged not disclosing their low literacy skills were also risky. Ironically, the participants agreed health care professionals should be aware of patients' literacy

status, but expressed potential emotional discomfort with the possible use of literacy screening tools.

Deep shame experienced by patients may delay them from seeking health care. Shame, the prevalent emotions experience of patients with inadequate health literacy, kept 67% of people in one study from telling their spouses they could not read, and 19% had never disclosed their inability to read to anyone. Persons with inadequate health literacy develop mechanisms to hide their illiteracy. Signs of inadequate functional health literacy are nonspecific.

Health care was a technical world with its own language. Patients may not know medical terms or anatomical terms and locations commonly referred to during conversations between health care providers and patients. Health care providers can be unaware of patients' lack of literacy. The only study to be found, researching health care providers ability to accurately assess patients literacy skills solely on the clinic interaction, found medical residents overestimated the literacy abilities in 36% of patients they assumed from the clinic interaction as having no literacy problems.

There are multiple consequences of inadequate functional health literacy. Studies indicate patients lack understanding of the use and importance of preventative services. They also can lack basic knowledge of their disease. A significant relationship between low literacy and poor health indicated the overall health status of patients were associated with inadequate health literacy. Poor compliance might result from failure to understand directions and health care providers should not automatically assume willful disregard on the part of the patient. Increased hospitalizations were associated with inadequate health

literacy levels in patients; patients with inadequate literacy were found to be twice as likely to be hospitalized. A re-analysis of an earlier study noting there was not relationship between literacy and increased health care costs, found a strong correlation between higher health care charges in patients with inadequate health literacy skills.

CHAPTER 3

METHOD

The purpose of this study was to examine nurse practitioners' assessment accuracy of patient reading literacy skill levels strictly on the basis of the clinical interaction. While the study of patient literacy is not a new concept, this study is unique; it studies NPs assessment of patient literacy rather than studying the patients' literacy levels. It was a replication of a study conducted by Bass, Wilson, Griffith and Barnett (2002) that found medical residents overestimated patient literacy levels solely on clinic interaction.

Design

This study used a non-experimental descriptive design. Data was acquired using the survey method. Two sets of questionnaires, including demographics on both the nurse practitioners and their patients comprised the study data collection.

Population and Sample

Two ambulatory care health clinics located in Bozeman, Montana were utilized to gather data on both nurse practitioners and their patients. Thirty-five patients, all adults, and two NPs participated in the study. Patients were chosen by non-random, convenience selection. A letter to the clinic director introduced and explained the study (Appendix H).

Instrumentation

The Rapid Estimate of Adult Literacy in Medicine-Revised (REALM-R) reading literacy screening tool was developed by Bass, et al, (2003). It was a revised version of the original REALM tool which was a 66 item word recognition test of common medical terms. Reading grade range estimates were based on the total score, the number of words the subject is able to pronounce correctly. Test response time, or response burden, had been reported as 2 to 3 minutes, but testing found the response burden to be 5 to 6 minutes in a busy clinic setting (Bass, Wilson, and Griffith, 2003). The response burden made the REALM tool impractical in most clinic settings.

The REALM had been correlated with other standard readability tests including the PIAT-R, the Slosson Oral Reading Test (SORT), and the WRAT-R as noted by Wonch (n.d.).

Table 1. Correlation of REALM with PIAT-R, SORT, and WRAT-R

	PIAT-R	SORT	WRAT-R
Correlation Coefficient	.97	.96	.88
P value	P < .001	P < .001	P < .001

Parker, et al, (1995) found dependable correlation of the TOFHLA with WRAT-R and REALM; correlation coefficients were 0.74 and 0.84, $p < .001$ respectively.

The REALM-R tool was designed as a shortened version of the REALM test. It was designed to assess how well primary care patients read words that they commonly experience and are expected to understand while interacting with their physician. Words

chosen for the REALM-R were: osteoporosis, allergic, jaundice, anemia, fatigue, directed, colitis, and constipation. The words fat, flu, and pill were included at the beginning of the test, but not scored, to decrease test anxiety and enhance patient confidence. The new 8 item word recognition test, REALM-R, demonstrated a Cronbach's α of .91, with the part-whole correlation between REALM and REALM-R being .72. Burns and Grove (2001) note, "Homogeneity testing examines the extent to which all items in the instrument consistently measure construct. It is a test of internal consistency." (p. 398).

"Testing of the REALM-R substantially correlated with the WRAT-R... the response burden for the new instrument [REALM-R], including explanation and delivery of the REALM-R, is less than 2 minutes." states Bass, Wilson, and Griffith (2003, p. 398). Refer to Appendix B for a copy of the REALM-R tool, and instructions for its use.

Data Collection Procedures

Utilizing a non-random convenience patient sampling technique, patients were asked to participate in the study prior to being seen by the NP. The study consent form was carefully explained to the patient by the researcher, including the testing process involved with the REALM-R word recognition test which could be a sensitive, threatening process, especially for low literacy patients. A demographic sheet was filled out by each patient, and each nurse practitioner. Data on the NP demographic sheet differed from the data on the patient demographic sheet. The REALM-R test was

administered by the researcher; a scoring sheet for each patient was filled out by the same single researcher at both sites. All data collection sheets were linked numerically, providing anonymity for both patients and NPs. After the nurse practitioner interacted with the patient during the clinic visit, she assessed the patients' reading level on the patient reading level query sheet.

Testing occurred over a two day period at each clinic facility, totaling four days of data collection by the single researcher. All 35 patient subjects met the inclusion criteria of age 18 or older, able to read and speak English, clinic visit with NP, and the ability to provide consent to participate. Exclusion criteria were previous involvement with medically oriented schooling or employment. Three persons were eliminated from the study based on the exclusion criteria.

Interview and Testing Procedure

The patient interview was initiated with an explanation of the study and informed consent obtained (Appendix G). Being sensitive to the tendency for patients with low literacy to feel shame or fear related to literacy testing, the words "test" and "read" were avoided by the researcher during communication with the patient. Demographic data were collected from the patient (Appendix D). In keeping with suggestions which accompanied the REALM-R test from Dr. Pat Bass (Appendix A), the patient was told the REALM-R was word list tool and the patient was asked to "say" the words on the word list sheet, rather than "read" the words (Appendix A, section Administration and Scoring).

The REALM-R screening test consisted of eight scored medical words which increased in difficulty, introduced by three simple medical words to give the patient being evaluated a sense of ease. A score of 6 or less occurred when the patient missed three or more words; either the patient could not pronounce the word or mis-pronounced the word within 5 seconds. The score of six or less identified the patient as reading below the sixth grade level, and at risk for poor reading literacy skills (Appendix D). The sixth grade reading level was chosen as a cutoff for this study based on prior studies indicating significant comprehension problems among adults who read at this level. Patients reading at or below the 6th grade level would most likely have difficulty understanding most health related written materials, possibly even oral instructions (Bass, et al, 2002).

After the NP completed her interactions with the patient, she filled out the NP Patient Reading Level Query Sheet (Appendix F). A single question with two possible responses were listed on the query sheet: "Do you think the patients' reading level is:"

1. "at or above the sixth grade reading level?"
2. "below the sixth grade reading level?"

Each NP filled out the Nurse Practitioner demographic sheet prior to beginning the research (Appendix C). All testing was conducted on site, at each clinic, either within a patient exam room, or another private area within the clinic. REALM-R testing formed the foundation for evaluating the NPs assessment of patient reading literacy skills.

Demographics

Nurse practitioner demographics included age, gender, ethnicity, number of years of nursing experience, number of years at current job, date of graduation from NP education, number of years practicing since obtaining NP status, and highest education preparation achieved (Appendix C).

Patient demographics were age, gender ethnicity, years of formal education, marital status, income, and insurance status (Appendix D). Numerical coding provided the only method of linking data sheets.

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) 12.0 for Windows. Descriptive statistics including frequencies, percentages, means and standard deviations were used, along with Chi-Square analysis, to summarize study results.

Human Subjects and Consent Process

The Institutional Review Board for Montana State University-Bozeman granted this study exempt status from the requirement of full review by the Human Subject Committee based on research involving the use of educational tests, survey procedures, interviews, procedures or observation of public behavior.

Summary

The purpose of this study was to examine the accuracy of nurse practitioners' assessment of patient reading literacy skills strictly on the basis of clinical interaction. This method was considered, for this study, to be an indirect method of assessment.

The study used a non-experimental descriptive design. Data was acquired using the survey method. Patient subjects were a convenience sample, chosen in non-random fashion. Each patient participant signed an informed consent form. A single researcher performed data collection. Numerical coding identified demographics, test results, and NP assessment results. Participant's names, or identifying information were never used during the study.

Two nurse practitioners, practicing at separate sites, were the care providers. The word recognition test, REALM-R, provided the basis for testing patient reading literacy. Data was entered into SPSS by the same, single researcher who originally conducted data collection.

CHAPTER 4

RESULTS

A non-experimental descriptive design and educational tool, the REALM-R, was utilized to compare nurse practitioners accuracy in assessing patient reading literacy skill levels. Descriptive statistics were utilized to present patient demographic data; narrative description provided NP demographic data. Chi-square testing determined whether a relationship could be determined between indirect and direct literacy assessment.

Demographic Characteristics

The nurse practitioner sample consisted of two participants, labeled NP A and NP B. NP A was 46 years old, female, Caucasian, had 9 years of nursing experience, and had been working at her current clinic job 3 years. She had practiced as a Family Nurse Practitioner (FNP) for two years, and as a Pediatric Nurse Practitioners for 5 years. NP B was 51 years old, female, Caucasian, had worked 28 years as a nurse, and three years as a FNP. She had worked at her current clinic site for twenty years.

Patient demographics consisted of 35 participants from two sample sites, both ambulatory health clinics in Bozeman, Montana. Clinic site one, a community clinic, comprised 57% (n=20) and, site two, a college student health center contributed 43% (n=15) to thirty five patients tested.

The mean age of patients was 34 (SD=13.95) with a range of 19 to 69. 43% were male (n=15), 63% (n=22) were female. Most of the patients were Caucasian, eighty-nine

percent (n=31). Fifty-one percent (n=18) were never married. A majority of patients had some college education, 63% (n=22); three respondents 6% (n=2) noted they had six or less years of education. Income in the lowest category of 0 to \$776/month was reported by fifty-seven percent (n=20) patients. Monthly income on a sliding scale were designed to accommodate the income sliding scales used at the community clinic. Insurance coverage ranged from 37% (n=13) without medical insurance to one person, 3%, covered by Medicaid.

Table 2. Demographics of Patient Sample (n=35).

Demographic	%	n
<u>Gender</u>		
Male	43	15
Female	57	20
<u>Ethnicity</u>		
Native American	3	1
Caucasian	89	31
Hispanic	6	2
Other	3	1
<u>Years of Education</u>		
6 or less	6	2
11 or less	9	3
Graduated from high school	9	3
Some college	63	22
College graduate	9	3
Master/Doctorate	6	2
<u>Marital</u>		
Never married	51	18
Married	11	4
Widowed	3	1
Divorced	26	9
Separated	9	3
<u>Income</u>		
B: \$0 to \$777/month	57	20
C: \$777 to \$970	14	5
D: \$971 to \$1,164	6	2
E: \$1,165 to \$1,358	3	1
F: \$1,359 to \$1,552	9	3
None given	11	4

Table 2. Demographics of Patient Sample (n=35) continued.

<u>Insurance</u>		
Private	26	9
Medicare	3	1
Medicaid	11	4
None	37	13
Student Insurance	23	8

Literacy Testing

Data were available from 35 patients who completed the REALM-R test and two NPs that completed literacy level queries on each patient. The nurse practitioners, utilizing the indirect literacy assessment technique, reported 33 (94%) patients as reading at or above the sixth-grade level, and 2 patients (6%) as reading below the sixth-grade level. Direct literacy assessment with REALM-R noted 31 patients (89%) read at or above the sixth-grade level while 4 patients (11%) read below the sixth grade level.

Table 3. Indirect and Direct Assessment of Patient Literacy.

	%	n
<u>NP Assessment: Indirect on Clinical Interaction</u>		
Reads at or above 6 th grade level	94	33
Reads below 6 th grade level	6	2
<u>REALM-R Assessment: Direct</u>		
Reads at or above 6 th grade level	89	31
Reads below 6 th grade level	4	4

Cross tabulation provided further descriptive data. The nurse practitioners erroneously assessed patient reading literacy skill levels 17% of the time; six of 35 participants were incorrectly assessed as to their literacy level. NPs overestimated patient

literacy levels in four patients, or 11% of the time, and underestimated literacy ability in two patients, 6% of the time. Accurate literacy level were assessed by nurse practitioners 83% of the time, in twenty-nine of 35 patients.

Table 4. REALM-R * NP Evaluation Cross Tabulation.

	<u>NP Evaluation</u> Reads at or above 6 th grade level	<u>NP Evaluation</u> Reads below 6 th grade level	Total
<u>REALM-R</u> Reads at or above 6 th grade level	29	2	31
<u>REALM-R</u> Reads below 6 th grade level	4	0	4
Total	33	2	35

Chi-square testing from the above 2 x 2 table reveals a chi-square of 0.274 with 1 *df*, *p* equals 0.601. Of notable importance, 3 cells had an expected count less than 5.

Summary

The nurse practitioners were both female, Caucasian and held FNP certification and Masters in Nursing. Modest differences were noted in age, 5 years difference in ages 46 and 51 and, in years of practicing since becoming certified as FNPs, 3 and 6 years. Considerable differences were noted in years of nursing experience, nine and 28, and number of years of employment at their current job, 3 and twenty.

The 35 patient subjects came from two sites, a community clinic (n=20) and, a college student health clinic (n=15). Age ranged from 19 to 69; forty-three percent of

patients were male, 57% female; 89% of patient subjects were Caucasian. A majority of patients either never married (n=18) or were divorced (n=9). Sixty-three percent of patients had some college education and two persons noted they had six or less years of education. 57% (n=20) reported earning a monthly income in the lowest range; only four patients earned income in the highest level. Thirty-seven percent of subjects had no insurance. Demographic results were reported in table form (Table 2).

Literacy testing data related to indirect assessment by NPs based on the clinic visit only and direct testing by REALM-R were reported in Table 3. Nurse practitioner assessed reading literacy at the 6th grade level in 33/35 patients, and below the 6th grade level in 2/35 patients. REALM-R testing noted literacy level skills at the 6th grade level in 31/35 patients, and below the 6th grade level in 4/35 patients. NPs erroneously assessed patient reading literacy 17% of the time; they overestimated literacy in 4 patients, and underestimated literacy reading level skills in 2 patients. Nurse practitioners were accurate in utilizing indirect assessment to determine patient literacy 83% of the time, (n=29). Chi-square testing utilizing cross tabulated data resulted in chi-square of 0.274, 1 *df*, *p* = 0.601 (Table 4).

CHAPTER 5

DISCUSSION

The purpose of this study was to examine nurse practitioners' accuracy in assessing patient reading literacy levels based only on clinical interaction. Direct assessment of patient reading skill levels were assessed by the word recognition tool, the REALM-R test. The study addressed the hypothesis that nurse practitioners would incorrectly assess patient literacy levels.

The research sites for this study could be considered extremes in assumed patient literacy levels. The community clinic served low-income individuals, and it could be assumed to provide care for more low literacy patients than the clinic on the college campus where presumably college students were at presumably at high literacy levels. The purpose of this study does not include further data evaluation related to this observation.

Conclusions

The nurse practitioners incorrectly assessed patient literacy levels in 6 of 35 patients; they were incorrect 17% of the time. Of the patients who were incorrectly assessed for literacy skill levels (n=6), 67% of the time (n=4) the reading skill level was overestimated and, 33% of the time (n=2) the literacy level was underestimated. Overall, NPs correctly assessed literacy levels 83% of the time (n=29).

Burns and Grove (2001) explain, "The chi-squared test of independence tests

whether the two variables being examined are independent or related.” (p. 570). The two variables, nurse practitioners’ indirect assessment of patient reading literacy skill levels solely on clinic interaction and the second variable, direct literacy testing with REALM-R comprised chi-square testing. Results were chi-square of 0.274 with 1 *df*, $p = 0.601$ indicating no statistically reliable relationship ($\alpha p = 0.05$). Although the chi-square result indicated REALM-R direct assessment as having little relationship to nurse practitioners’ indirect assessment of patient reading literacy, there were other data to be considered.

Discussion of the Findings

Results of this study joined a minute section of health literacy research evaluating the provider rather than the patient regarding data collection on health literacy. The results can not be generalized to other populations, but provide insight into the problem of nurse practitioners accurately detecting patient health literacy levels.

While a significant trend between REALM-R testing and the nurse practitioner indirect assessment method were not statistically supported, other data supported consideration of a relationship for NPs to utilize direct literacy testing, the REALM-R word recognition tool. The data includes knowledge of the impact low literacy has on patients from considerable research information, and over two decades of clinical nursing experience on the part of the researcher who conducted this study.

It was counter-intuitive, based on documented research, to assume REALM-R testing would have no causal relationship to assessing patient reading literacy skill levels

accurately. In this study, NPs believed only 6% (n=2) of patients had a reading literacy level below the 6th grade level; in fact, 12% of patients assessed were unable to read six of eight common medical words. Written materials, such as most prescriptions and package inserts, consent forms, and many patient education materials would have been unintelligible for those 4 patients. The patients' inability to interact with the health care system effectively could place them at greater risk for poor health outcomes associated with poor literacy skills. The nurse practitioners could have utilized the REALM-R test to detect patient illiteracy not recognized during the clinical interaction.

Limitations

Limitations existed with this study. The sample size of both nurse practitioners (n=2) and patients (n=35) were small. The subjects represented considerable homogeneity, being comprised predominately of Caucasian adults. Data collection from only two sites limited sample size, homogeneity, and subject variability; it also decreased the option of test results being generalized to other populations.

Test results, which reflected no statistically reliable relationship between application of the REALM-R instrument and the indirect literacy assessment by NPs, may have been affected by limited sample sizes of both patient subjects and NPs. The results might also have been affected by an insignificant difference in literacy skill level outcome results between indirect and direct literacy assessment. This could have contributed to a Type II error. Burns and Grove, (2001) stated, "Type II errors can occur for three reasons: (1) a stringent level of significance, (2) a small sample size, and (3) a

small difference in measured effect between groups.” (p. 486). Although chi-square results negated a relationship between direct and indirect literacy assessment, other data suggests one appears to exist.

The directional hypothesis utilized in the study created a potential limitation of research bias. Use of a non-directional hypothesis could have eliminated potential research bias.

Implications

Practice

Results of this study reveal that nurse practitioners indirect assessment of patient literacy ability was successful 83% of the time, a statistic which many researchers would consider a successful reference point. The implications of overestimating patients reading skill level, assuming he/she can read above the sixth-grade level, places the patient at considerable risk. The consequences of low literacy include a lack of understanding of the use and importance of preventative services, lack of basic knowledge of their disease, poor health, non-compliance, increased hospitalizations and, higher health care costs.

Nurse practitioners are responsible for more than patient care, they are obligated to patients to provide health education and communication appropriate to the patients' literacy skills. Assessment of health literacy with the REALM-R to communicate in ways the patient could understand and utilize.

The question of screening all patients was controversial. Indeed, it was impractical to screen all patients for illiteracy, but some groups should be targeted for

screening. These groups included patients who fit the profile of those with the lowest reading levels as noted by NALS results: African-American, older than 65, foreign-born, living in poverty, multiple health problems, fewer years of education, and anyone imprisoned.

It should be noted that while patients feel shame and fear in being exposed as illiterate, they also feel it was important for health care providers to know patients can not read. Shame will often keep patients from disclosing poor literacy skills to their nurse practitioners. Literacy issues should be treated with compassion, sensitivity, and confidentiality in the same manner as any health problem.

Education

Nurse practitioner preparation programs need to continue to promote consideration of the patient as a whole person while incorporating patient literacy into the assessment process. Individual NP care providers can gain further education regarding inadequate health literacy and its implications to the patient and provider through continuing education (CE) and articles in professional journals.

Research

Additional studies need to be conducted on the health care providers' role in patient literacy detection. All data to date concluded health care providers inaccurately assessed health literacy levels using only the clinical interaction, and the common trend was to overestimate rather than underestimate patient literacy levels. Replication of this

study, with increased sample sizes, could provide increased accuracy of NPs indirect literacy assessment methodology . Including more clinic sites for evaluation would also benefit demographic data collection. Larger sample sizes would likely correct the Type II error, and provide power to statistical analysis lacking in the current study as evidenced by the chi-square results.

The REALM-R tool itself would benefit from being studied further. Research adding to the current body of data supporting its validity and dependability would promote the tools use in both research and general clinic settings. Undoubtedly more research in the health literacy field will be stimulated by the release of the most recent 2002-2003 NALS results which will include data specific to health illiteracy and its impacts on the American public.

Summary

Nurse practitioners demonstrated their accuracy in assessing patient reading literacy 83% of the time in thirty-five patients. Within the group of six patients who were incorrectly assessed, the trend to overestimate on the part of NPs occurred 67% of the time. Small sample size and small difference in results may have caused a Type II error, and most likely affected chi-square results, which indicated no statistically reliable relationship between the use of the REALM-R tool and accuracy of NPs assessment of patient literacy levels. Data refuting the implications of the chi-square results were based on the significant quantity of health and literacy research encountered in the preparation of the study, and the researchers own observations and clinical

experience. Deductive reasoning assumes anything that would increase the accuracy of assessing patient literacy levels, in this study the utilization of the REALM-R tool, would benefit the patient and the provider.

This study offers opportunity in areas of practice, education and research. Literacy issues need to be treated in the clinical setting with compassion, but not go undetected regardless of the patients' lifelong attempts to avoid exposure. Use of the REALM-R tool, a quick, reliable word recognition test facilitated accurate measurement of patient literacy levels.

Higher education programs for graduate nurse should include health and literacy in their curriculums. Currently practicing NPs can acquire knowledge regarding inadequate health literacy from CE offerings and their professional journals.

Due to the scarcity of research in health care providers' assessment of patient literacy in any manner, this study should be replicated, with various changes to improve demographic data, sample size, and depth of data collected. The REALM-R tool, as a recently revised instrument would benefit from further validity and reliability research. The upcoming release of the most recent NALS should provide considerable insight into health and illiteracy, and spurn more research. There were also potentially more data to be gleaned from this current study regarding relationships within the various demographic variables to health literacy level.

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APPENDICES

APPENDIX A

PERMISSION OF USE REALM-R TOOL

Subject: RE: REALM-R tool

Mary Kay

I am sorry I never received your first email- Our system sometimes loses these things. You are free to use the REALM-R. It is subject to the limitations I mention in the JGIM article. I am attaching some information regarding the administration. You can laminate the patient copy from the attached word document.

I would be happy to talk with you about this. My direct phone line is 318-675-6490. Also feel free to call me at home before 9pm central time.

Ricky Bass

Pat F. Bass III, MD, MS
Assistant Professor of Internal Medicine & Pediatrics
Department of Internal Medicine
LSUHSC- Shreveport
1501 King's Highway
PO Box 33932
Shreveport, LA 71130-3932
Phone 318-675-5856
Fax 318-675-7176
Email pbassi@lsuhsc.edu

-----Original Message-----

From: thurston [mailto:thurston@montana.edu]
Sent: Tuesday, February 24, 2004 11:08 PM
To: pbassi@lsuhsc.edu
Cc: 'MK Thurston'
Subject: REALM-R tool

Dear Dr. Bass,

Let me introduce myself, Mary Kay Thurston, BSN pursuing a Masters Degree in Nursing, along with a Family Nurse Practitioner specialty from Montana State University-Bozeman. This email message is a request for further information, and permission to use the recently designed Rapid Estimate of Adult Literacy in Medicine- Revised (REALM-R) tool to aid my thesis development.

The research report "Residents' Ability to Identify Patients with Poor Literacy Skills" sparked my interest in using the REALM-R tool as the basis of my thesis which will involve assessing nurse practitioners ability

Subject: RE: REALM-R tool (continued)

to identify patients literacy skills. I was delighted to find your most recent article, "A Shortened Instrument for Literacy Screening" which further elucidates the tool.

As many graduate students often do, I have left my thesis research to the last few months of my program. My initial attempt to reach you via email was unsuccessful, and I can only hope this message will find its way to you.

I would deeply appreciate permission to use the REALM-R tool, and access to the actual tool itself. I would like to base my research study similar to the design used in the "Residents' Ability to Identify Patients with Poor Literacy Skills", although subject numbers for both patients and providers will be much smaller than those noted in your study. It would also be of great help to be able to further communicate with you regarding various questions I have about both articles.

Along with my email address, thurston@montana.edu, my mail address is:

Mary Kay Thurston, BSN
PO Box 271
Gallatin Gateway, MT. 59730
My landline is (406) 763-4469, and cell number is (406) 580-5277.

Thank you for your time and consideration Dr. Bass; your assistance will be invaluable to me.

Mary Kay Thurston, BSN, FNP student

APPENDIX B

REALM-R TOOL WITH USE INSTRUCTIONS

Description of the REALM-R Test

The REALM-R is a brief screening instrument used to assess an adult patients' ability to read common medical words. It is designed to assist medical professionals in identifying patients at risk for poor literacy skills. The REALM-R is a **word recognition** test— not a reading comprehension instrument. Adults are asked to de-code or pronounce words. The test takes less than 2 minute to administer and score.

Preliminary data regarding the REALM-R has been published in the *Journal of General Internal Medicine* December 2003; 12: 1036-1038.

Administration and Scoring:

1. Give the patient the laminated copy of the REALM-R word list. Attach the examiner record form to the clipboard. Hold the clipboard at an angle such that the patient is not distracted by your scoring procedures

In you own words, introduce the REALM-R to the patient:

In a research setting or for research purposes:

It would be helpful for us to get an idea of what medical words you are familiar with. What I need you to do is look at this list of words, beginning here [point to first word with pencil]. Say all the words you know. If you come to word you don't know, you can sound it out or just skip it and go on. If the patient stops, say, "Look down the this list [point to list] and say other words you know."

In a clinical setting:

"Sometimes in this office, we may use medical words that patients aren't familiar with. We would like you to take a look at this list of words to help us get an idea of what medical words you are familiar with. It will help us know what kinds of patient education to give you. Start with the first word [point to 1st word with pencil], please say all the words you know. If you come to a word you do know, you can sound it out or just skip it and go on." If patient stops do as above.

**** Special Note:** Do not use the words "read" and "test" when introducing and administering the REALM-R. These words may make patients feel uncomfortable and unwilling to participate. Tell the patient *"Please say these words for me."*

2. If the patient takes more than 5 seconds on a word, encourage the patient to move along by saying:

"Let's try the next word."

If the patient begins to miss every word or appears to be struggling or frustrated, tell the patient:

"Just look down the list and say the words you know."

3. Count as an error any word that is not attempted or mispronounced (see Special Considerations for pronunciation/scoring guidelines).

4. Scoring options:

1) Place a check mark on the line next to each word the patient pronounces correctly.

OR

2) Place an X on the line next to each word the patient does not attempt or mispronounces.

Scoring should be strict, but take into consideration any problem which could be related to dialect or articulation difficulties. Use the dictionary if in doubt. Count as correct any self-corrected word. ***In our study we chose to define 'at risk patients' as those with a score of six or less.***

Special Considerations for Administration and Scoring:

Examiner Sensitivity:

Many low literate patients will attempt to hide their deficiency. Ensure that you approach each patient with respect and compassion. You may need to provide encouragement and reassurance.

A positive, respectful attitude is essential for all examiners. (Remember, many people with low literacy feel ashamed.) Be sensitive.

Visual Acuity:

If the patient wears glasses, ask him/her to put them on for this test. The REALM-R is designed to be read by persons with 20/100 vision or better. For vision of 20/100 or better use a font size 18. In my studies we have excluded patients with worse vision. The REALM has a visually impaired versions using a font size of 28.

Pronunciation:

Dictionary pronunciation is the scoring standard.

Dialect, Accent or Articulation Problems:

Count a word as correct if the word is pronounced correctly and no additions or deletions have been made to the beginning or ending of the word. For example: a patient who says "jaundiced" would not receive credit for the word "jaundice"; "directs" would not receive credit for the word "directed"; "colon" would not receive credit for "colitis". Words pronounced with a dialect or accent should be counted as correct provided there are no additions or deletions to the word. Particular attention should be paid for patients who use English as a second language.

Column1

Fat

Flu

Pill

Allergic

Jaundice

Anemia

Column 2

Fatigue

Directed

Colitis

Constipation

Osteoporosis

REALM-R Examiner Record

Fat	Fatigue	_____
Flu	Directed	_____
Pill	Colitis	_____
Allergic _____	Constipation	_____
Jaundice _____	Osteoporosis	_____
Anemia _____		

Fat, Flu, and Pill are not scored. We have previously used a score of 6 or less to identify patients at risk for poor literacy.

APPENDIX C

NURSE PRACTITIONER DEMOGRAPHIC SHEET

Nurse Practitioner Demographics Data Sheet

Code _____

1. Age _____

2. Gender

- 1. Male
- 2. Female

3. Ethnicity

- 1. Native American
- 2. Caucasian
- 3. African American
- 4. Hispanic
- 5. Asian
- 6. Other _____

4. Number of years of nursing experience: _____

5. Number of years at your current job: _____

6. Date of graduation from Nurse Practitioner education: _____

7. Number of years practicing since obtaining Nurse Practitioner status: _____

8. Highest education preparation achieved:

- 1. Diploma
- 2. Associate Degree
- 3. Baccalaureate Degree
- 4. Master Degree +

APPENDIX D
PATIENT DEMOGRAPHIC SHEET

Patient Demographics Data Sheet

Code _____

1. Age _____

2. Gender

- 1. Male
- 2. Female

3. Ethnicity

- 1. Native American
- 2. Caucasian
- 3. African American
- 4. Hispanic
- 5. Asian
- 6. Other _____

4. Years of formal education

- 1. 6 or less
- 2. 11 or less
- 3. Graduated from high school
- 4. Some college
- 5. College graduate
- 6. Masters/Doctorate

5. Marital status

- 1. Never married
- 2. Married
- 3. Widowed
- 4. Divorced
- 5. Separated

6. Income sliding scale

- 1. B 0-\$776/month
- 2. C \$777-970/month
- 3. D \$971-1,164/month
- 4. E \$1,165-1,358/month
- 5. F \$1,359-1,552/month
- 6. None given

7. Insurance

- 1. Private/parents
- 2. Medicare
- 3. Medicaid
- 4. None
- 5. Student Insurance

APPENDIX E

REALM-R EXAMINER RECORD/SCORING SHEET

REALM-R Examiner Record

Date _____

Code _____

Location _____

Researcher _____

Fat**Flu****Fatigue** _____**Pill****Directed** _____**Allergic** _____**Colitis** _____**Jaundice** _____**Constipation** _____**Anemia** _____**Osteoporosis** _____

APPENDIX F

NURSE PRACTITIONER READING LEVEL QUERY SHEET

Nurse Practitioner Patient Reading Level Query Sheet

Code _____

Do you think the patients' reading level is:

1. at or above the sixth-grade reading level?
2. below the sixth-grade reading level?

APPENDIX G
CONSENT FORM

SUBJECT CONSENT FORM
PARTICIPATION IN HUMAN RESEARCH
MONTANA STATE UNIVERSITY-BOZEMAN

PROJECT TITLE: Nurse Practitioners' Perception of Patients Literacy Skills.

PARTICIPATION: You are being asked to take part in a study that uses a word recognition tool called the Rapid Estimate of Adult Literacy in Medicine-Revised (REALM-R). To be in the study you need to be a patient that will be seen by a nurse practitioner, and not have an education in the medical field. You also need to be 18 years of age, or older. Your vision, either corrected or uncorrected, must be 20/100 or better.

PURPOSE: The information gathered in this research will be used to assess nurse practitioners ability to determine literacy skills during an office visit.

PROCEDURES: If you agree to take part in this study, you will be asked to look at a list of medical words, and to say all the words you can. The second part of the process involves asking the nurse practitioner, who has seen you during an office visit, if she/he thinks you might have difficulty reading the medical words on the REALM-R word list.

RISKS: There is no risk involved in participating in this study. Nothing that could identify you as having participated in this study is included in the research process. The general information questions, known as demographics, asking age, gender, race, year of schooling completed, occupation, and estimated annual income are not connected to directly to you, the participant.

BENEFITS: Previous studies of adult literacy have found at least one fourth of medical patients in America may not be able to understand the instructions on prescription bottles, understand patient education materials or verbal instructions, make use of written directions, or even give informed consent as consent forms are often written at the college literacy level.

Historically, the decision about a persons' literacy ability has been made during the office visit while the nurse practitioner interacts with the patient. Recent studies indicate this method often fails to identify patients with limited literacy skills. Screening tools that can be used to determine a persons' literacy level are available, but take too long to use during an office visit. The REALM-R screening tool is a way to determine a persons' literacy skill level, quickly, easily, and reliably.

There are many advantages to knowing a patients' literacy ability. Written and verbal instructions can be presented in ways that are useful and understandable which helps improve patients' health care and health outcomes. Your participation in this study will provide data substantiating the usability of the REALM-R tool during an office visit. If you wish, you may receive your score on medical word recognition list.

COST: Taking part in this study does not involve any financial expense; however, there is a small investment of your time, usually 2-5 minutes for which you will not be paid.

CONFIDENTIALITY: Your medical diagnosis and any of your medical information is not a part of this study. The study does not involve looking at your medical records. While you will be asked to provide demographic information, such as your age, gender, etc., and to sign this form, no personally identifying information will be a part of the study.

Information from this study will be used primarily in preparing manuscripts for publication. Signed consent forms will be kept in a locked file cabinet at Montana State University-Bozeman for five years and destroyed after that time.

CONCERNS: Any questions or concerns about the rights of human subjects can be answered by the Chairman of the Human Subjects Committee, Dr. Mark Quinn, (406) 994-5721.

SUBJECT CONSENT FORM
PARTICIPATION IN HUMAN RESEARCH
MONTANA STATE UNIVERSITY-BOZEMAN

AUTHORIZATION: I have read the above and understand the inconvenience and risk of this study. I _____, agree to participate in this research. I understand that I may refuse to participate, and can withdraw from the study at any time. I have received a copy of this consent form for my own records.

SIGNED: _____

WITNESS: _____

INVESTIGATOR: _____

DATE: _____

APPENDIX H

LETTER TO CLINIC DIRECTOR

Mary Kay Thurston, BSN, FNP student
Montana State University-Bozeman College of Nursing
Home address: PO Box 271
Gallatin Gateway, MT. 59730
Home PH: 406-763-4469 Cell: 406-580-5277
Email: thurston@montana.edu

June 11, 2004

Buck Taylor, Clinic Director
Gallatin Community Clinic
214 E. Medenenhall St
Bozeman, MT. 59715
PH: 406-585-1360

Hello Buck,

Thank you for being so receptive to my research request. The Rapid Estimate of Adult Literacy in Medicine- Revised (REALM-R) screening tool makes it possible to evaluate patient literacy, based on word recognition, quickly and effectively. The test can be administered and scored within two minutes, making it possible to determine patient literacy during the office visit.

My thesis title is "Nurse Practitioners' Ability to Identify Patients with Poor Literacy Skills". It is based on a study conducted by Dr. Bass, Wilson, Griffith, and Barnett, published in Academic Medicine (2002). In terms of research, it is a straight forward, reasonably simple research process. After patients are placed in the exam room, before the nurse practitioner (NP) sees the person, I will ask the patient to participate in a medical word recognition project. A consent form will be available for the patient to sign, explaining the process. I will not use the words "read" or "test" in my interaction with the patient, thereby avoiding the tendency for patients to feel shamed if their literacy level is low. The REALM-R screening test consists of 8 scored words, and three simple introduction words to give the patient a sense of ease. I have included a copy of both the description of the tool, and the tool itself for your reference. After the NP is finished caring for the patient, I will ask the NP a single question, "Do you feel this patient has a literacy skill level above the sixth grade, or below the sixth grade?" Simple demographic data will be asked of the patient: age, gender, race, amount of schooling completed, sliding fee schedule they are on for the GCC, and anything else you might want as part of the demographics. The NP will be asked number of years practicing as an BSN, year of graduation from NP training, number of years employed as NP. The demographics list is not complete, at this date, and could include other data requests, but will be kept simple, and functional for my needs. Identification between patient and NP is based on a code only; no personal data is needed from the chart, or from the patient beyond the basic demographics.

I hope to include 1-2 NP s and approximately 35 patients in the study, if possible. Research could be started immediately, although the week of March 15 - 19 would be convenient, as it is spring break week in my schedule, and I could be on premise as needed that week.

During our phone conversation yesterday, you mentioned the clinic's current interest in patient literacy. If there is anything to be gained by your clinic from my research, I would be pleased to share the data. If there is any further information you need, or questions you might have, please contact me. I will call next week to finalize dates and times for my research collection. Thank you so much.

Mary Kay Thurston, FNP student with MSU-Bozeman

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