The Influence of Age on Knowledge and Medication Usage By Persons Attending Rural North Florida Clinics

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Abstract

Medication therapy is an important component of the comprehensive treatment plan designed to maintain or improve health. If patients do not take prescribed medications correctly or are non-adherent, less successful therapy occurs. Reasons given for noncompliance include cost, misunderstanding the therapy, side effects, forgetfulness, or a belief that the medication is not effective or necessary. This study had two goals, the first was to evaluate medication use while simultaneously assessing knowledge, compliance, tolerance, and perceived efficacy. Drug-related problems, if any, were also identified. The second goal was to develop methods to improve patient outcomes based upon identified problems. For eight weeks, all patients attending four rural North Central Florida clinics were asked to participate in this study by completing a short questionnaire and personal interview. A significant inverse correlation ($p<0.05$) was found between participant age and knowledge about medications. Also, those with five or more prescriptions had decreased knowledge about their medications ($p<0.05$). Based upon these findings, researchers recommend that health professionals use specific communication techniques when teaching older persons for example, incorporation of open ended-questions in interactions will elicit more information than closed, thus enabling a clinician to better identify patient needs. In addition, devotion of more time and attention to instruction may improve learning outcomes, especially in the elderly.

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Introduction

Persons interested in maintaining or improving their health invest a significant amount of time, money, and effort in the health care system. The acquisition of health care usually begins with a scheduled appointment where a physician conducts a history and physical examination, orders specific laboratory tests, and possibly, secures ancillary studies to confirm a suspected medical diagnosis. Once a diagnosis is made, a comprehensive treatment plan that may include medication is developed and implemented.

It is impossible for physicians to predict which patients will adhere to their treatment plans as approximately 40% to 50% do not use their medications as prescribed (Mellins, Evans, Zimmerman, & Clark, 1992). Although knowledge about a prescribed medication affects patient adherence to a drug regimen, the responsibility for overcoming poor adherence belongs to both clinicians and their patients. Wiederholt et al. found that when patients were given new prescriptions, 17% to 30% received no verbal drug counseling from physicians, even though it has been shown that instruction improves adherence rates and enhances therapeutic results. The same study also found that less than 50% of patients were informed about the purpose of a medication, told about common side effects, or given precautionary warnings (Wiederholt, Clarridge, & Svarstad, 1992).

Although poor communication between health care providers and patients may be one of the most common reasons cited for poor patient adherence (McGrath, 1999), another issue affecting adherence is the large number of prescribed drugs taken (Barat, Andreasen, & Damsgaard, 2001), especially by the elderly. The average patient 65 years of age and older, takes more than four prescription drugs daily as well as two over-the-counter (OTC) drugs. (U.S. Food and Drug Administration, 1997). Kessler found that 64% to 89% of participants wanted information about taking and storing medication, potential side effects, and interactions with food and other medicines (Kessler, 1991).

Purpose of the Study

This study had two goals. The first was to evaluate use, adherence, knowledge, tolerance, and perception of efficacy for prescribed medications. Based upon identified problems, the second goal was to describe methods to improve patient outcomes related to drug therapy.

Methods

Clinics

This study was approved by the Institutional Review Board of the University of Florida. Four rural clinics in North Florida participated: the Alachua County Organization for Rural Needs (ACORN) Clinic, Bell Family Health Care, the University of Florida (UF) Clinic at Fanning Springs, and Trenton Medical Center, Inc. Each clinic serves a rural population mix of Medicare, Medicaid eligible, insured, and indigent uninsured persons who received medication at a minimal cost through indigent programs of the drug manufacturer. Seven counties were represented in the service area covered

by these clinics: Alachua, Bradford, Columbia, Dixie, Gilchrist, Levy, and Union.

Patients presenting at the clinics may be described as rural, low income, underserved, and underinsured. Each county is designated by the U. S. Health Resources and Services Administration (HRSA) as a health professions shortage area (HPSA) based upon a "special population or "geography of the whole county." They are also designated as medically underserved areas (MUA) with medically underserved populations (MUP). HRSA noted shortages in the areas of primary care medicine, dentistry, and mental health.

Procedures

During the eight-week study period of June 16, 2003 to August 6**,** 2003, all adults over the age of 18 years attending one of the four clinics were invited to participate in this study. Prospective participants were approached, given a letter that described the study, and asked if they wanted to participate. Consent was assumed when a person chose to participate. Participants were directed to an area of each clinic where they completed an anonymous two-page questionnaire that investigated current medicines, medicine usage habits, and perceptions about different aspects of health care. Using a 10-point Likert-type scale, the questionnaire asked for the subjective rating of perceived effectiveness of the pharmaceutical treatment, description of side effects from the medication, and explanation of why prescriptions were not filled or why doses of medication were missed. Finally, participants were asked to rate their knowledge about their medications and their satisfaction with the education provided about their medicines by health professionals. A copy of the questionnaire is in Table 1.

After completing the questionnaire, an interview was used to elicit more specific information, provide answers to questions about medicines, and record suggestions about ways to improve care. During each interview, the patient's medical record was referenced to the extent possible to verify the accuracy of the patient's self-report and the chart's medicine list.

Table 1: Medication Evaluation Survey

Thank you for taking the time to fill out this survey. The information you provide will be used in evaluating your medication usage. Afterward, we will review your survey and identify any problems or misconceptions with your medications. We will talk with you and/or your health care provider about any of these problems.

AGE: _____ years SEX: ☐Male ☐Female RACE: _____

Please list all of the medications that you are currently taking. Include any nonprescription products, vitamins, and herbal products.	What dose and how often do you take this medication?	What do you take this medication for?	On a scale of 1-10 how would you rank the effectiveness of each medicine? 1 (Not very effective) to 10 (Highly effective)

1. What side effects or complications have you experienced while taking your medications? Can you describe them?

2. How often do you miss any of your medication doses? Which medications?

3. Have you ever been given a prescription by your physician that you did not fill? If so, do you remember why?

4. On a scale of 1-10, how would your rank your knowledge about your medications?

1 2 3 4 5 6 7 8 9 10

Low High

5. On a scale of 1-10, how satisfied are you with how well you have been educated and/or counseled about your medications by health care providers?

1 2 3 4 5 6 7 8 9 10
Unsatisfied Very satisfied

Data Collection and Analysis

Data collected from the questionnaire were entered in a Microsoft Excel spreadsheet and statistical analysis was completed using the data analysis function of Microsoft Excel. Descriptive statistics for all questionnaire items were reported and *t*-tests were used to measure differences for age, number of prescriptions, and knowledge about medicines taken.

A knowledge score was calculated for each person based on ability to give correct information about taking a medicine. Points were awarded using these guidelines: 1.0 point was earned for the ability to accurately report a reason for taking a medicine, 0.5 point was earned by identifying the organ system upon which the drug acts, 0.0 points were earned for no response, and -1.0 point was earned for giving an incorrect response. Using this point system, it was worse for a person to misunderstand the reasons for taking a medication or not know why a medication was being administered. A knowledge score was calculated for each medicine. Then, a mean knowledge score was calculated for each participant by adding the final scores for each medicine taken and then determining an average score.

An adherence score was calculated from responses to two questions. First, a report that no dose of medicine had ever been missed and second, a report that prescriptions were always filled lead to the award of 1.0 point. If a participant adhered to only one of the two issues, 0.5 points was awarded and non-adherence to both issues awarded 0.0 points. An adherence score was calculated for each medicine. Then, a mean adherence score was determined for each participant by adding the final scores for each medicine and calculating an average.

Results

In all, 88 questionnaires were completed by participants at four rural clinics. Differences in item responses by clinic are summarized in Table 2. The demographic summary of the study participants is shown in Table 3.

Evaluating Patient Medication Use

At the initial clinic visit, 74 subjects (84%) completed the questionnaire independently relying upon memory. The other 14 (16%) completed their questionnaires using a variety of other methods; for example, they brought their medicine bottles or a list of medications to the clinic, asked a relative or caregiver to complete the questionnaire for them, completed the instrument at home, or received prompts from their medical chart during the interview. Seventeen participants (19.3%) correctly listed a dose of medicine within the therapeutic range as found in the 2002-2003 *Drug Information Handbook* for all prescription medicines. The remaining 71 participants (80.7%) either listed an incorrect dose or did not provide a dose of their medicine. Some persons in this same group were unable to report the units of the strength of their medicine correctly. Thirty-seven participants (42%) reported missing at least one dose of prescribed medicine. Twenty-seven participants (31%) in this study reported they did not fill at least one prescription due to cost, ineffectiveness of samples, or fear of side effects**.**

Generally, persons 60 years and older take more prescription medicines than younger persons. We evaluated the number of medicines the persons in our study sample were taking based on age and divided participants into two groups: (1) 60 years of age and older; and (2) less than 60 years of age. It was found that persons 60 years of age and older were prescribed, on an average, 8.05 medicines daily, whereas those less than 60 years of age were prescribed, on an average, 4.52 medicines. Analysis using the t-test showed a significant difference ($p < 0.001$, $T=3.74$, $df=86$) between the two groups, thus confirming the assumption that older persons take more prescription medications.

Table 2: Questionnaire Responses by Clinic				
	UF Clinic @ Fanning Springs	**Trenton Medical Center, Inc.**	**Bell Clinic**	**ACORN Clinic**
Number of surveys completed	47	18	12	11
% patients taking five or more medications/day	55.3	50.0	33.3	45.5
Average age (range) in years	60 (30-90)	54 (31-89)	48 (21-76)	59 (32-80)
% patients completing survey from memory	85.1	77.8	91.7	81.8
% patients able to list a reasonable dose	21.3	16.7	33.3	0.0
% patients who missed at least one dose	52.1	33.3	33.3	27.3
% patients not filling a minimum of one Rx	29.8	27.8	58.3	18.2
Average compliance score per patient	0.59	0.65	0.54	0.77
Average knowledge score per patient	0.77	0.84	0.88	0.64
Ranked satisfaction w/instruction (1-10)	8.45	8.53	8.17	8.54
Ranked knowledge of medication (1-10)	7.78	7.78	7.33	8.00

Table 3: Demographic Characteristics of Patients Completing the Questionnaire		
Age	**Number of Individuals**	**Percent (%)**
21 – 30	2	2.3
31 – 40	10	11.4
41 – 50	16	18.2
51 – 60	21	23.9
61 – 70	23	26.1
71 – 80	13	14.8
81 - 90	3	3.4
Sex		
Female	59	67
Male	29	33
Race/Ethnicity		
African American	4	4.5
Caucasian	82	93.2
Hispanic	2	2.3

Assessing Medication Adherence

A mean adherence score was calculated for each patient, and then the mean was calculated for the entire group of participants. In this study, the mean adherence score was 0.62. To interpret the result for each person, a mean adherence score of 0.0 indicated failure to fill a prescription and missed doses of medication; a score of 0.5 indicated failure to fill a prescription *or* missed doses of medication; and, a score of 1.0 meant the participant neither failed to fill prescriptions nor missed doses. Our score of 0.62 suggests that study participants either fail to fill prescriptions or miss doses of medication.

Assessing Knowledge Scores

The mean knowledge score was 0.78. A score of 1.0 meant that a participant reported a correct indication for all of their medicines and a score of 0.5 meant that a participant knew the organ system upon which all of the prescribed medicines acted, but not the precise indication. A score of 0.0 meant that a participant did not know the indication for their medicines. Finally, a score of – 1.0 suggests that a participant reported an inaccurate indication for all medicines.

Assessing Knowledge Score by Age and Number of Medicines

For participants 60 years of age and older, the averaged mean knowledge score was 0.69 but for those less than 60 years of age, the averaged score was 0.87. Analysis using the *t*-test shows a significant difference ($p=0.003$, $T=-3.01$, $df=86$). Therefore, older persons know less about their medications than do their younger counterparts. These results are supported by the work of Schectman et al who, when studying a rural population, found a strong correlation between age and adherence through age 65 (Schectman, Bovbjerg, & Voss, 2002). Participants were assigned to one of two groups based upon the number of medications taken daily. Group one took five or more medicines daily and Group two took less than five. The averaged mean knowledge score for those taking five or more medicines daily was 0.69, whereas, the averaged score for participants taking less than five medicines every day was 0.88. The *t*-test analysis revealed a significant difference between the two groups ($p<0.002$, $T=-3.26$, $df=86$). These results mean that those who take five or more medicines daily have less knowledge about their medicines.

Discussion and Conclusions

This study was undertaken to address some of the medication adherence issues faced daily in rural clinics that ultimately influence patient outcomes. By definition, "rural" refers to an area with a population density of less than 100 individuals per square mile or an area defined as rural by the most recent United States Census (29 FRS sec. 381.0406). Applying this definition to the state of Florida, 33 of the 67 counties, or nearly 50%, are rural.

Florida has the largest percentage of senior citizens ($\geq$ 65 years of age) among all states in the United States. One of the fastest growing segments of the U.S. population is comprised of people 65 years of age (Hobbs, 2001). The issues they face today will confront more and more Floridians as well as other Americans. The 2000 census reported 15,982,378 persons living in the State and 2,812,899 (17.6%) over the age of 65. Clearly, Florida has a large percent of elder adults as nationally, only 12.4% of the population is older than 65 years of age. In the seven counties participating in this study, approximately 43,703 (11.6%) persons are older than 65 (U.S. Census Bureau, 2000).

To understand our results better, one must explore the areas of bias and inherent shortcomings in the study, itself. We must explore the method used for subject recruitment and selection, questionnaire design, content of individual questions, methods used to calculate individual scores, and individual differences inherent among participants.

Only 88 people participated in this eight-week study. If this study had a larger sample size and longer study period, researchers may have obtained more complete (and therefore, more conclusive) information about medication knowledge and use by patients attending rural Florida clinics.

This study identified three statistically significant relationships, but the study participants chosen were unintentionally skewed toward more adherent persons because of the method used for subject recruitment and selection. Because researchers personally approached those who were entering clinics to keep scheduled appointments and personally invited each to participate in the study, they selected subjects who were already exhibiting some level of adherence. We suspect that those who kept scheduled appointments were more interested, and consequently, more knowledgeable about their medical conditions and treatments. In addition to being adherent, the population selected may be skewed toward a more knowledgeable and willing participant who is comfortable discussing personal medications and treatment regimens.

In future studies, one way to correct for selection bias would be to select subjects via the roster of clinic patients and randomly choose a

predetermined number of persons from different age ranges that would yield both representativeness and greater statistical power. Once selected, a packet containing the questionnaire, instructions for completing the questionnaire and returning it in the mail, and a pre-paid and self-addressed envelope could be distributed. The instructions should stress the importance of maintaining anonymity and give practical tips, such as "do not place your return address on the envelope." This approach would help to correct for the bias associated with adherence because it would include the names of those who keep and do not keep clinic appointments. By introducing this new level of anonymity, there may be an associated increase in willingness to participate in the study. However, this approach raises two concerns. First, the ability to interview and advise participants while they are completing the questionnaire is lost. Second, low literacy, or more specifically, low health literacy may affect return rate and accuracy and validity of some obtained responses.

The 1992 National Adult Literacy Survey (NALS) reported that almost 22% of American adults are "functionally illiterate" with limited reading and writing skills that impair their ability to function in society (Kirsch, Jungeblut, Jenkins & Kolstad, 1993). Low literacy directly impacts health because of its negative effect on health literacy (Nath, Sylvester, Yasek, & Gunel, 2001) defined by Healthy People 2010 as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Institute of Medicine, 2004). Although most with limited literacy are Caucasian and native-born, those at greatest risk include age older than 65 years, low socioeconomic status, low or limited income, formal education less than 8 years, recent immigration status, minority group membership, and living in rural areas (Davis & Wolf, 2004; Wallace & Lennon, 2004).

The instrument itself had limitations that must be addressed. Some questions were written broadly and did not include information, such as time parameters to guide responses. Examples such as: "What side effects or complications have you experienced while taking your medications? Can you describe them?" and "How often do you miss any of your medication doses? Which medications?" do not provide a time frame, such as "in the last three-months," to guide the responses.

With regard to construct validity, it must be noted that both compliance and adherence scores represent a composite of more than one item, thereby facilitating between-group comparisons. Although we treat these scores as linear aggregates of equally important items, this assumption is likely incorrect. For example, when defining compliance, the relevance of not filling a prescription is likely greater than missing a dose of a filled description. Likewise, a knowledge score of 1 could result from different combinations of correct indications, organ systems or incorrect indications. The magnitude of the clinical difference in the between-group comparisons (by age and number or prescriptions) is therefore difficult to assess regardless of statistical significance. Despite these issues a trend towards decreased knowledge in older age groups and patients with polypharmacy is evident.

Bias inherent in the project design may have affected the knowledge scores. First, because the majority of subjects (84%) completed the questionnaire from memory and the calculated knowledge score was based upon a correct self-report, there was no way to verify the accuracy or completeness of information provided by subjects for whom no medical chart or list of prescribed medicines is available. Without access to a medical chart to verify information, consider cases of two different individuals who each take seven medicines daily. *Person A* correctly recalls only two of the prescribed seven medicines and gives a correct indication for each one. *Person B* is able to recall all seven prescribed medicines but can correctly list an indication for only five. *Person A* will receive a higher knowledge score than *Person B* because there is no way to verify the accuracy of information provided. In addition, those who take medicines for conditions perceived as socially undesirable (e.g. HIV, schizophrenia, or gonorrhea) may list an inaccurate indication due to embarrassment and a desire to protect privacy. This misreporting results in a lower knowledge score than if the medicine had not been reported at all. The provision of a medical chart containing information about a subject will prevent failure to list a medicine but will not affect misreporting of indications for use.

When a new medicine is prescribed or a medication regimen is changed, a simple conversation between the medical professional and patient may decrease the number of persons who do not fill prescriptions because of cost, ineffectiveness of sample medicine, and personal concerns. As noted, 31% of study participants did not fill at least one prescription because of cost, ineffectiveness of samples, and fear of side effects**.** Spend time discussing common side effects and what to expect when taking a medication, identify beneficial alternatives, especially those covered by the patient's insurance plan, and describe available cost-saving generics. These clinician-initiated discussions are equally important for patients who rarely asks

questions, as they may be intimidated by the expertise of health care providers. Lastly, communicate with patients using terms they can understand. Relationships of age, knowledge, and number of medicines taken daily, while possibly confounding, show that giving extra time and attention to patients during instruction may increase information when starting or changing medications. When interviewing a patient, the use of open-ended questions improves the quality and quantity of information received. For example, it is better to ask, "What medicine do you take?" rather than, "Are there any changes in your medication use?" Sleath et al report that physicians spend an average of 3.94 minutes per patient discussing medicines and <1% of questions are open-ended (Sleath, Roter, Chewning, & Svarstad, 1999). One reason for this choice may be that closed-ended questions help an individual maintain control of conversations. The downside is that closed-ended questions offer more limited information. With regard to medications, so much information must be conveyed to patients that comprehension improves when the patient becomes actively involved in the conversation by asking questions. Studies by Sleath et al have found that physicians ask an average of 9.3 questions in a conversation whereas patients ask only an average of 1.3 questions.

The substantial proportion of patients who reported that they missed taking doses of prescribed medicine could be decreased by use of pillboxes or medicine dosing schedules. Adherence may be improved when memory-assisting aids such as pillboxes, medication charts, and timers are utilized, or they may be encouraged to associate their pills with aspects of the daily routine. These memory devices will assist patients who forget to take their medications or who cannot remember if they have yet taken them. These devices would have no effect on those who do not fill prescriptions due to cost, perceived side effects, or other barriers. In an emergency or as a recommended health habit, these investigators suggest carrying a current list of medications and their doses in a wallet. Wallsten et al say it is important for health care professionals and their patients to work together to find dosage timing that fits into a person's daily routine (Wallsten, Sullivan, Hanlon, Blazer, Tyrey, & Westlund, 1995).

As the proportion of elderly persons in Florida continues to grow, clinicians need to be aware of the extra education and information needed by this group. In our study, the group over age 60 years took almost twice the amount of medication as younger age groups, yet knew less about them. We also found that persons frequently missed doses or failed to fill prescriptions. An earlier study of seniors found that 14% did not fill at least on prescription because of expense. To increase adherence, providers must discuss costs and insurance coverage before prescribing any concerns or anxiety the patient may have with taking the new drug. Consequently, we recommend that health care providers spend extra time providing education to older persons and those taking more medicines, teaching about medication usage, side effects, and potential interactions. In conclusion, it is important for health care providers to keep in mind, especially when dealing with the elderly, that the communication methods used during patient interactions can make a significant difference in patient health care outcomes.

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