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Unnecessary complexity of home medication regimens among seniors

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ABSTRACT

Objective: To determine whether seniors consolidate their home medications or if there is evidence of unnecessary regimen complexity.
Methods: Face-to-face interviews were conducted with 200 community-dwelling seniors >70 years in their homes. Subjects demonstrated how they took their medications in a typical day and the number of times a day patients would take medications was calculated. A pharmacist and physician blinded to patient characteristics examined medication regimens and determined the fewest number of times a day they could be taken by subjects.
Results: Home medication regimens could be simplified for 85 (42.5%) subjects. Of those subjects not optimally consolidating their medications, 53 (26.5%) could have had the number of times a day medications were taken reduced by one time per day; 32 (16.0%) reduced by two times or more. The three most common causes of overcomplexity were (1) misunderstanding medication instructions, (2) concern over drug absorption (i.e. before meals), and (3) perceived drug–drug interactions.
Conclusion: Almost half of seniors had medication regimens that were unnecessarily complicated and could be simplified. This lack of consolidation potentially impedes medication adherence.
Practice implications: Health care providers should ask patients to explicitly detail when medication consumption occurs in the home.

1. Introduction

It is well established that patients frequently misunderstand medication instructions and take medications incorrectly [1–7]. Seniors and people with multiple chronic comorbidities are at greatest risk for unintentional medication errors and adverse events [8]. While an average adult fills 9 prescriptions yearly, seniors fill an annual average of 20 prescriptions [9]. As the number of medications increase so does regimen complexity, making it difficult for seniors to reconcile and find a straightforward daily medication schedule. The complexity of a medication regimen can be defined by the number of medications (polypharmacy) and the number of times per day or "doses" that the patient takes a medication (multiple dosing schedules) [10].

From a conceptual model, multiple factors may impact the complexity of medication regimens. Health providers (e.g. prescribing physicians, nurses) may provide instructions on individual medications – "take at night" or "take after dinner" – that may be interpreted differently by patients. Pharmacists may add warning or food-intake labels to medication bottles which may not be fully understood by patients [5,11]. Patients may have beliefs that medications may lose their efficacy if taken together. When patients are moved from health care settings (e.g. hospital to home), medications may be added without any information on how to incorporate into the current regimen. If patients switch pharmacies, different labels or directions may be placed on the bottles [12,13]. These human and system factors potentially will unnecessarily complicate medication regimens.

These complicated drug regimens raise the risk for adverse drug events and errors [14]. The Institute of Medicine report, *Preventing Medication Error*, suggests 1.5 million preventable adverse drug events occur annually, with a third occurring in outpatient settings at an estimated cost of $1 billion [15].

Medication adherence is generally defined as the extent to which patients take medications as prescribed by their health care

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providers [16]. Studies have shown that one out of every four seniors were non-adherent to their medications [1,17]. With increasing regimen complexity, medication adherence is difficult for many older adults. Health care professionals have long been taught that adherence improves dramatically as prescribed dose frequency decreases [18,19]. Multiple studies have shown that the frequency of a medication directly impacts whether patients will be compliant (e.g. patients are more likely to comply with twice daily regimen than a three times a day regimen) [1,17–19]. In one study, adherence improved from 59.0% on a three-time daily regimen to 83.6% on a once-daily regimen [19]. It has been proposed that the single most important action that health care providers can take to improve compliance is to select medications that permit the lowest daily prescribed dose frequency [16].

Consolidating medications into regimens with the lowest frequency is a step is ensuring compliance, although patients may have difficulty doing so. Due to inadequate health literacy, impaired cognition, and misunderstanding of medication instructions, patients may not always have adequate skills to consolidate their complex medication regimens [20–26]. Wolf et al. gave 464 adults, ages 55–74 years, a hypothetical 7-drug medication regimen and asked them to demonstrate how and when they would take the medications in a 24-h period. While the regimen could be consolidated into 4 dosing episodes per day, participants chose an average of 6 times (SD, 1.8 times; range, 3–14 times) in 24 h to take the 7 drugs [26]. With hypothetical regimens, people frequently did not consolidate medications. While overcomplicating prescription regimens has clear implications for sustained adherence, this has been less studied among patients with their actual medications. The aim of the present study was to investigate seniors' dosing of their actual medications in the home. We sought to better understand whether seniors consolidated their medications and what patient beliefs influenced medication regimen complexity.

2. Methods

2.1. Recruitment of subjects

The Institutional Review Board of Northwestern University Feinberg School of Medicine approved this study. Research staff recruited consecutive community-dwelling seniors aged 70 and older who were hospitalized to the acute medicine services at Northwestern Memorial Hospital. This project was part of a larger study to determine the frequency of low cognition at hospital discharge and the changes in cognition that occur one month following hospitalization among community dwelling seniors. It was found that many seniors have low cognition at hospital discharge which improves one month post hospital discharge [27]. Subjects were excluded if they were (1) blind or had a severe vision problem that could not be corrected with glasses (due to testing of cognition including vision-dependent tests), (2) unable to consent to their own procedures while hospitalized, (3) admitted for cognition issues, (4) reliant on a caregiver 8 h or greater per day [since we wanted to assess patients completing their own home medication regimens], or (5) living outside of a 60 mile radius of the hospital [due to logistics]. Subjects were also excluded if they had documented cognitive loss in the past medical history of their admission history and physical, specifically history of mild cognitive impairment, cognitive disorder, dementia, Alzheimer's disease, vascular dementia, or memory loss. Research staff obtained written informed consent from subjects within 24 h prior to hospital discharge and set up home visit dates. Demographic information collection and cognitive testing was performed prior to hospital discharge. Subjects did not receive compensation for their participation.

2.2. Interviews

A research nurse contacted subjects, one month after hospital discharge, and confirmed the home visit to conduct the interview which lasted between 30 and 45 min. One month was chosen as it was expected that subjects would have developed a routine schedule for taking their medications by that time. At the visit, the research nurse asked subjects, "Can you walk me through a day in your life of how you take your medications? Let us start with when you first wake up." The study nurse asked the subject to demonstrate how they took their medications in a normal day. The subject then gave open ended responses and pantomimed their daily routine of where medications were stored and the reasons for the locations. The nurse documented where the medications were stored and whether or not a pill box was used, prompting as necessary for the exact times of medication consumption and why the subjects chose to take the dose at each time. A pill box was defined as a container with dividers that was used to organize pills outside of the original pill bottle. This information was compared to the discharge instructions and any differences were noted. All responses were recorded verbatim.

2.3. Data preparation and coding

Following the data collection, research staff entered each subject's home medication regimen (medication name, dose, and frequency) into a database. Medications that were taken as needed medications (PRN) were listed as the times taken in a day (i.e. subject took a medication occasionally nightly for sleep was listed as nightly). The research staff then calculated the number of times medications were taken in a 24 h period for each subject. Medication regimens were then copied from the database into a separate file that showed the medication name, dose, and frequency. The file was then given to two health care professionals (a pharmacist and a physician) blinded to the actual use of the subject who would act as coders.

Coders were asked to determine the fewest number of times a day that a patient could take the regimen. Prior to starting, the two coders met and decided on rules specifically for which medications (1) had to be taken in relation to food (e.g. insulin), (2) had to be taken at a specific time (e.g. atorvastatin could be taken at anytime) [28], and (3) could not be taken together. The coders were also not allowed to consolidate by alternating short acting with long acting preparations (e.g. substituting once daily metoprolol succinate for twice daily metoprolol tartrate). A third healthcare professional served as a tie-break where discrepant responses occurred.

2.4. Data analysis

The primary outcome of interest was the difference between the actual and the health care professional recommended number of times per day that subjects would take a medication. Statistical analysis was performed with the SPSS Statistics 17.0 (SPSS Inc., Chicago, IL) to determine frequencies of this outcome.

For the analysis of qualitative data, responses from open-ended questions on why subjects chose to take medications at independent times were distributed to two coders. The two coders used the inductive approach of latent content and constant comparative analysis on the detailed interview notes to organize the content into operational categories. Multiple coders are often used in the development of such categorical systems to control for the subjective bias each coder brings to the analytic process. The two coders independently reviewed the interview notes to familiarize

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