Assessing Geriatric Patients' Ability to Functionally Manage Medication Packaging

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ABSTRACT

Background: Various studies have recommended that a skills assessment for safe medication management be incorporated into routine evaluation of geriatric patients. It has previously been demonstrated that pharmacists are more likely than other health care professionals to discover obstacles to self-administration of medication among older patients and to undertake interventions to ameliorate these barriers.

Objectives: To identify the proportion of geriatric hospital patients with functional inability to manipulate medication packaging and to determine any specific patient characteristics that might be used to predict this problem.

Methods: For this prospective, nonrandomized, observational study, 60 consenting geriatric patients were asked to perform a variety of timed tasks related to medication management.

Results: One-third of the patients in this study demonstrated overall impairment of ability to functionally manage medication packaging. Many of the patients were unable to distinguish different pill colours (25 or 42%) or to open and remove tablets from a non-child-resistant container (17 or 28%) or a blister pack (7 or 12%). Individual risk factors could not be identified, although those who demonstrated impaired functional ability were somewhat older (85.8 years versus 81.7 years, p = 0.003). The average time spent by the pharmacist to conduct the skills assessment exceeded 30 min.

Conclusion: Many of the geriatric inpatients in this study had impairment of their ability to perform specific function-related tasks in a simple and straightforward screening tool. However, the ideal screening tool to assess medication management skills among older people, incorporating the functional and cognitive components of these tasks and suitable for administration by any member of the health care team, has not yet been identified.

Key words: medication management, geriatric population, screening tool, pharmacist

RÉSUMÉ

Historique : Diverses études ont recommandé qu'une évaluation de l'aptitude des patients âgés pour la manipulation sécuritaire des médicaments soit incorporée à leur évaluation de routine. Il a déjà été démontré que les pharmaciens sont plus susceptibles que d'autres professionnels de la santé de découvrir les obstacles à l'auto-administration des médicaments chez les patients âgés et de prendre les mesures nécessaires pour lever le plus possible ces obstacles.

Objectifs : Déterminer la proportion de patients âgés hospitalisés qui présentent des incapacités fonctionnelles les empêchant de manipuler les emballages de médicaments et déterminer les caractéristiques particulières de ces patients qui pourraient servir à prédire ce problème.

Méthodes : Dans le cadre de cette étude d'observation prospective non randomisée, 60 patients âgés ont été sélectionnés et on leur a demandé d'exécuter diverses tâches minutées relatives à la manipulation des médicaments.

Résultats : Le tiers des patients de cette étude présentaient une incapacité fonctionnelle générale à manipuler les emballages de médicaments. Un grand nombre de ces patients étaient incapables de distinguer les différentes couleurs des comprimés (25 ou 42 %) ou d'ouvrir et de prendre des comprimés d'un contenant sans fermeture de protection à l'épreuve des enfants (17 ou 28 %) ou d'une plaquette alvéolée (7 ou 12 %). Les facteurs de risque individuels n'ont pas pu être déterminés, bien que les patients qui présentaient une incapacité fonctionnelle étaient un peu plus âgés (85,8 ans contre 81,7 ans, p = 0,003). Les pharmaciens ont passé en moyenne plus de 30 minutes à évaluer ces aptitudes.

Conclusion : Plusieurs de ces patients âgés hospitalisés présentaient une incapacité fonctionnelle dans leur aptitude à exécuter des tâches spécifiques, lors d'un test d'aptitude simple administré par le pharmacien. Toutefois, il a été impossible de déterminer le test idéal pour évaluer les aptitudes à la manipulation des médicaments chez les personnes âgées, qui englobe à la fois les aspects fonctionnels et cognitifs des tâches évaluées et peut être administré par n'importe quel membre de l'équipe de soins de santé.

Mots clés : manipulation des médicaments, population gériatrique, test d'aptitude, pharmacien

INTRODUCTION

The ability of geriatric hospital inpatients to self-administer medications safely and reliably is an important factor in determining appropriate discharge from acute care to an unsupervised setting. The potential for drug-related problems in older adults is compounded by the substantial changes in drug regimens that can occur after even a brief hospital stay due to acute illness.[1-3] Vision, hearing, and cognitive function play large roles in determining the ability of older adults to take medications, but motor skill is also an important factor for successful medication management.[4-6] Many drug packages in current use make it difficult for older people to access their medications, and there have been numerous reports of older adults resorting to unsafe practices such as using hammers, pliers, or wheelchairs to pry open containers, leaving the tops off medication containers, and combining medications in a single container.[7]

Although several studies have concluded that a skills assessment for safe medication management should be incorporated into the routine evaluation of all older patients admitted to hospital, such assessments are not widely implemented.[2,4,6,8-14] It has previously been demonstrated that pharmacists are more likely than other health care professionals to discover obstacles to self-administration of medication among elderly patients and to undertake interventions to ameliorate these barriers.[15,16] However, there is currently no gold-standard objective screening tool that hospital-based pharmacists can use to routinely assess, before elderly hospital patients return to the community, their capacity to take their own medications. It is also unclear which subgroup of these patients, if any, is at most risk for inability to manipulate their medication containers and therefore most likely to benefit from targeted interventions.

We sought to identify the proportion of geriatric inpatients in our practice with impaired ability to functionally manage their pre-existing medication regimen and to describe specific characteristics that might predict which geriatric inpatients are at increased risk. Our third objective was to explore the feasibility of having hospital pharmacists administer a screening tool to assess functional medication management among elderly patients.

METHODS

This prospective, nonrandomized, single-arm, observational study was conducted at a major tertiary care centre in Canada. The study received hospital and university ethics board approval before initiation. Consecutive patients admitted to the Acute Care for Elders (ACE) unit were screened for eligibility. The ACE unit cares for patients 75 years of age and older who require admission to the internal medicine or family practice services of the hospital because of acute medical illnesses. Many of these patients have a physical or functional disability or a high likelihood of such a disability. This specialty unit is staffed by an interdisciplinary team with experience in caring for frail elderly people.[17] The team includes clinical pharmacists with training in an accredited hospital residency program and the clinical skills needed to participate in the comprehensive pharmaceutical care of older adults in a primary care environment. Patients who were responsible for managing their own medications at home before admission (according to self-reported information) and who were anticipated to continue doing so upon discharge were asked to participate. Patients who had delirium at the time of the assessment, as indicated by a score of 3 or more (out of a possible score of 4) on the delirium subsection of the confusion assessment method (CAM),[18] and those with underlying cognitive impairment, as indicated by a score of less than 24 on the Mini Mental State Examination (MMSE),[19] were excluded. Those who had been admitted from or were to be discharged to a nursing home, who were medically too ill to participate (as reported by the primary nurse on the day of assessment), who could not communicate in simple English, or who did not provide informed consent were not enrolled.

A complete medication history, including nonprescription drug therapy, was obtained at the bedside by the pharmacist research assistant. A medication complexity index (MCI), taking into account the number of units of medication, the frequency of administration, and additional directions to be followed, was calculated for each therapy and scored for each patient.[20] For example, a medication administered as 1 tablet 3 times daily had an MCI of 3. Participants were also asked to rate on a 3-point Likert scale their perceived ease of medication administration before admission, by responding to the question "How are you able to take your medications at home?" The response options were 1 (with no difficulty), 2 (with some difficulty), or 3 (with great difficulty). Each participant was asked to perform 2 clock-drawing tasks: first, to draw a clock face, placing the hands at a fixed time (CLOX 1 test), and second, to watch the examiner draw a clock and then copy it (CLOX 2 text). The 2 parts of this test were administered and scored according to the procedure previously reported.[21]

Assessment of Skills

An objective, performance-based assessment of all participants was then conducted. This assessment consisted of 2 tasks to screen for visual impairment and 4 tasks to screen for manual impairment, described below. During the latter 4 tasks, the participants were timed while opening and removing tablets from a series of medication containers to quantify their difficulty in opening the containers.

1. Ability to read prescription label: Participants were asked to read a standard prescription label (prepared in a community pharmacy) with the directions, "Apply to rash on legs as needed". The label consisted of black type (10-point Times font, 2 lines per centimetre) on a white background and was attached to a 32-dram (3.8 g; 4.5 cm diameter, 6.5 cm height) prescription vial.

2. Ability to distinguish colour: Each participant was shown 2 yellow tablets (digoxin 0.125 mg [Lanoxin, Virco Pharmaceuticals Co.]) and 2 white tablets (levothyroxine 50 μg [Synthroid]) and asked to describe the colour of each tablet. Each participant was then shown 2 green tablets (levothyroxine 88 μg [Synthroid]) and 2 blue tablets (levothyroxine 150 μg [Synthroid]) and asked to describe the colour of each tablet.

3. Ability to open and close a child-resistant container: A 32-dram vial with a white cap with green lettering reading "open PUSH DOWN & TURN close" was provided. Each participant was asked to open the container and remove one tablet without being given any additional instruction or demonstration.

4. Ability to open and close a non-child-resistant container: A 32-dram vial with a white cap with green lettering reading "open PUSH DOWN & TURN close" was provided. Each participant was asked to open the container and remove one tablet without being given any additional instruction or demonstration.

5. Ability to manipulate a dosette container: Each participant was asked to remove a placebo tablet from the compartment of a 7-day medication organizer.

6. Ability to manipulate a bubble pack: Each participant was asked to remove a placebo capsule and 2 placebo tablets enclosed within the "bubble" of a blister-packaged medication card.

Each participant's ability to complete each of the 6 tasks within 30 seconds was recorded as a binary outcome (Yes or No). Impairment of ability to functionally manage one's own medications was defined a priori as inability to complete one or both of the 2 visual tasks ("No" response for tasks 1 and/or 2) and inability to complete at least 1 of the 4 manual tasks ("No" response for any of tasks 3 to 6). Participants who were unable to perform the task that directly corresponded to their own medication packaging at home before admission (e.g., task 5 for a participant who had home medications packaged in a Dosette) were automatically considered to have impaired ability to functionally manage their own medication regimen, regardless of their performance of the other visual and manual tasks.

Postassessment Intervention

To optimize medication safety, information about participants whose ability to manage their own medications was impaired (according to this assessment) was communicated to the primary clinical pharmacists(s) responsible for discharge medication planning. For instance, for any patient who was unable to manipulate prescription vials or dosette organizers, we contacted his or her community pharmacist to coordinate blister packaging of medications.

Participants were contacted by telephone at home within 2 weeks after discharge and were asked to rate their perceived ease of medication administration since discharge from hospital by responding to the question, "How are you able to take your medications at home?" The response options were the same as listed above.

The sample size (n = 60) was based on the overall point prevalence of geriatric inpatients who were expected to demonstrate impaired ability to functionally manage medication packaging. On the basis of prior published experience,[22] we estimated that 20% of the study population would meet this primary outcome with 95% confidence interval 15% to 25%, assuming α = 0.05, ß = 0.80, and the margin of error for the estimates to be within 0.10 (or 10%). The specific point prevalence was also calculated for each of the 6 individual tasks tested in the screening tool.

The χ^2 test was used for comparisons between discrete qualitative variables, and the Student t test was used for comparisons between continuous quantitative variables expressed as means and standard deviation (SD). Comparisons for which p was less than 0.05 were considered statistically significant. Logistic regression was performed to determine the association of independent variables with overall outcome in terms of the patient's inability to functionally manage his or her medication, as determined by the pharmacist-administered tool. All data analyses were conducted using SPSS for Windows standard version release 11.0 (SPSS, Inc., Chicago, Illinois).

The feasibility of having a hospital pharmacist assess functional medication management for geriatric

patients was measured by the time required (mean and SD) for a pharmacist to administer the screening tool. Although there is no accepted standard for this outcome, a mean time of greater than 30 min was considered not feasible.

RESULTS

To obtain a sample size of 60, we screened 330 consecutively admitted patients over an 11-week period (May to July 2005). Patients were excluded if they were admitted and discharged over the weekend or on holidays before they could be assessed for eligibility (*n* = 32); were unable to communicate in English (70); were unable to provide informed consent because of medical instability, such as sepsis, stroke, or agitation, as reported by the primary nurse (62); had been admitted from a nursing home (51); did not independently manage their medication regimen at home (31); or were cognitively impaired, as indicated by an MMSE score of less than 23 (24). Interestingly, half of the patients with impaired cognitive function lived alone and managed their own drug therapy.

The mean age of the participants was 82.9 years, and nearly two-thirds were women (Table 1). Twenty-six (43%) of the participants lived alone, and 29 (48%) were living with a spouse and/or other family members in the community. Although only 6 participants reported a current condition impairing their vision, 9 had a history of macular degeneration, 8 had a cataract that had not been removed, and 5 had glaucoma. Similarly, only 2 participants reported any conditions that impeded manual functions, but several had arthritis (osteoarthritis [12] or rheumatoid arthritis [7]), tremor (6), or peripheral neuropathy (3).

The mean number of medications (prescription and nonprescription) was 7.5, and about three-quarters of the patients were using more than 4 drug therapies. The mean MCI was 18.4. All participants reported having their prescriptions processed by one community pharmacy, but 21 (35%) were being cared for by more than one physician. Fourteen (23%) already had their medications prepared in bubble packaging by the community pharmacy, and 10 (17%) organized their drug therapy using a weekly dosette container. More than half used more than one medication packaging modality.

Overall, 17 (28%) of the participants demonstrated inability to functionally manage medications. Of these, 8 were unable to complete the manual task that best reflected their primary medication packaging before admission to hospital. Individual task performance is

Table 1. Characteristics of 60 Geriatric Patients Assessed for Functional Ability to Manage Medications

Characteristic	No. (%) or Mean ± SD
Age (years)	82.9 ± 4.9
No. of women	37 (62)
Living status	
Alone	26 (43)
With spouse and/or family	29 (48)
Assisted-living facility	5 (8)
Score for Mini Mental State Examination	26.8 ± 1.9
No. of medical conditions	5.2 ± 2.4
Self-reported baseline visual or manual impairment	8 (13)
No. of medications	
Prescription	5.6 ± 3.5
Nonprescription	1.9 ± 1.9
Total	7.5 ± 3.4
Medication complexity index	18.4 ± 12
Required support administering medication	13 (22)
Used a regular community pharmacy	60 (100)

SD = standard deviation.

Table 2. Inability to Perform Individual Tasks in Assessment of Medication Management

Medication Administration Task	No. (%) with Impaired Ability
Read prescription label	4 (7)
Distinguish pill colours	25 (42)
Open a child-resistant container and remove tablet	9 (15)
Open a non-child-resistant container and remove tablet	17 (28)
Open and remove tablets from a dosette container	4 (7)
Pop a blister pack and remove tablets	7 (12)

given in Table 2. Eleven participants (18%) reported some or great difficulty taking medications at home before hospital admission. For 16 patients (27%), the study pharmacist undertook an intervention to adapt medication packaging (primarily by contacting the community pharmacist to recommend non-child-resistant containers). All of the 39 patients who were reached at home after discharge reported no difficulties in managing their medications.

Although the mean age of those who successfully performed the medication management tasks was slightly younger (81.7 years versus 85.8 years, *p* = 0.003), other individual risk factors potentially associated with inability to functionally manage medication packaging did not reach statistical significance in this elderly cohort (Table 3). Specifically, the CLOX and MCI scores did not

Table 3. Risk Factors for Functional Inability to Manage Medication Packaging

Characteristic	No. (%)*		p value	OR (95% CI)
	Impairment (n = 17)	No Impairment (n = 43)		
Mean age ± SD (years)	85.8 ± 4.8	81.7 ± 4.5	0.003	1.2 (1.05–1.38)
No. of women	12 (71)	25 (58)	0.57	1.71 (0.51–5.72)
Visual impairment†	14 (82)	29 (67)	0.40	2.21 (0.47–10.71)
Manual impairment†	8 (47)	16 (37)	0.67	1.58 (0.48–4.66)
Living alone	8 (47)	18 (42)	0.95	1.26 (0.39–3.79)
Self-reported difficulties	4 (24)	7 (16)	0.73	1.62 (0.39–6.32)
> 4 medications	13 (76)	34 (79)	0.93	0.86 (0.23–3.34)
Mean MCI score ± SD	15.1 ± 8.0	19.6 ± 13.0	0.19	0.97 (0.92–1.02)
CLOX 1 score ± SD	8.9 ± 3.5	9.9 ± 2.5	0.29	0.88 (0.72–1.08)
CLOX 2 score ± SD	10.8 ± 3.0	12.1 ± 2.2	0.07	0.82 (0.65–1.02)

OR = odds ratio, CI = confidence interval, MCI = medication complexity index, CLOX = clock drawing tests (described in the text), SD = standard deviation.
*Unless indicated otherwise.
†As documented in medical records.

differ between the 2 groups of participants, nor did these scores correlate with self-reported difficulty managing medications at home. Multivariate analysis using a logistic regression model also did not identify risk factors.

Excluding the time for obtaining consent and collecting patient data, the average time that pharmacists spent administering the CLOX screening tool and conducting the functional assessment tasks was 38 ± 1.4 min per patient.

DISCUSSION

Although age is not an independent predictor of nonadherence to drug regimens, it has been positively correlated with inability to read labels and manipulate medication containers, factors prevalent among frail older adults.[15] The difficulties that older adults experience with medication packaging may result from decreased muscle strength or sense of touch, both of which may lead to reduced manipulative or adaptive skills.[23,24] Decline in visual acuity and impaired ability to distinguish colour are contributing barriers to medication management. The capacity to functionally administer a medication regimen relies on the ability to coordinate both psychomotor skills and cognitive activity to carry out associated tasks. As such, medication management differs from medication adherence, in that any deviations from the prescribed regimen are attributable to lack of ability and are unintentional.[20] Medication management is one component of medication adherence, but the nature and determinants of nonadherent behaviours are complex and not well understood and include belief systems.[25]

Other screening instruments have been used to detect how cognitive deficits may negatively affect medication management by geriatric patients, but there is currently no gold-standard screening tool to assess patients' functional ability to manipulate medication packaging. Although poor cognitive function has been associated with failure to complete the functional tasks needed to access medication, at least one study has demonstrated that the capacity to operate medication containers may remain intact despite evidence of cognitive impairment.[4]

The selected tasks used in the medication management assessment tool in this study were adapted from previously published work, and the results reported here are consistent with a number of studies of elderly hospital patients.[3,5,9-11,13,14,20,26] One-third of the patients that we studied had impaired ability to functionally manage medication packaging. Among elderly patients who independently managed their drug therapy before admission for acute care in Scandinavia, 10% were unable to open a blister pack and 44% failed to access medication in a non-child-resistant flip-top vial.[10] Poor rates of label reading (70%) and pill colour recognition (63%) were found among general medicine geriatric inpatients in the United States.[4] Similar findings have been reported for geriatric outpatients.[6,24,26]

Many patients had comorbidities associated with visual or manual impairment, but relatively few reported interference in medication-related tasks. Indeed, these impairments did not appear to predict functional performance in this population. Greater complexity of drug therapy (including a greater number of drugs) was not associated with inability to manipulate medication packaging; in fact, it might have offered an advantage

through exposure to a greater variety of containers before admission to hospital. Younger patients generally have superior manual proficiency with medication management; however, the statistically significant difference in age and overall performance in our study group was probably not clinically relevant, as any strategies to identify at-risk patients would automatically include all octogenarians.[24] Although self-reporting of difficulties managing medication has been found to both predict and underestimate actual comprehension and functional implementation of a medication schedule, self-reporting is subject to social desirability; therefore, patients' responses when asked to rate perceived ease of medication administration before hospital admission may not accurately reflect their confidence with their drug regimens.[13] A variety of clock-drawing tests have been proposed to screen for dementia and related motor vehicle driving competencies; such screening has had mixed results, but one study demonstrated that scores on clock-drawing tests were predictive of medication management capacity in frail elderly people.[26] It is possible that a similar relationship was not detected in this study because patients with an MMSE score of less than 24 were excluded. Furthermore, the CLOX test may not be useful to screen for functional impairments.

A pharmacist-initiated intervention to adapt discharge medication packaging was offered to any patient who demonstrated overall impaired ability to functionally manage medication containers. Seamless care or medication reconciliation activities are increasingly being emphasized to ensure accuracy of intended drug therapy for patients transitioning between community and acute care.[27,28] Our results underscore the need to incorporate a functional assessment into these activities to minimize adverse medication events and enhance adherence.

In this study, the average time required for the pharmacist research assistant to administer the entire medication management assessment exceeded 30 min per patient, which would be considered prohibitive for routine use in our busy acute care setting. Although functional testing responsibilities could in theory be shared among allied health staff (e.g., nurses and occupational therapists), this would preclude interaction between pharmacists and patients and the important ancillary medication teaching that commonly occurred with subjects during this study. It might be more practical for pharmacists to simply ask patients to perform the tasks that reflect their own medication packaging during discharge counselling sessions and, if deficits are identified, determine the patient's ability to operate the proposed alternative container.

Our study had several limitations deserving comment. First, we did not administer the functional tasks using patients' own medication packaging. The subjects might have been more successful if asked to manipulate their own drug packages, and this might have yielded a more realistic assessment of functional capacity at home. Patients were not prompted with directions for opening the various medication containers during the skills assessment, and performance might conceivably improve with orientation and additional practice. Second, the study used a small convenience sample, which had limited power to detect associations between specific characteristics and outcomes. Third, several patients were unable to participate in the follow-up self-assessment because of prolonged hospital stay in an acute or subacute care facility; 2 additional patients could not be reached by telephone at home, and 2 patients had died. Similarly, exclusion of non-English speakers and those with delirium or cognitive impairment and inability to give informed consent because of medical illness is clearly limiting. Men were underrepresented in the sample, and generalization of results to other geriatric populations is therefore constrained. Finally, reliably identifying and predicting adherence is complex and inconsistent. Declining performance on a mediation management screening tool has been linked to a greater number of emergency department visits, whereas a home-based pharmacist medication assessment has been associated with increased health care utilization.[29,30] We cannot conclude that adapting medication packaging for these patients had any effect on medication adherence or decreased medication errors at home; however, perceived ease of managing drug regimens seemed to improve.

CONCLUSIONS

A routine, structured clinical assessment tool evaluating how well older hospital inpatients functionally manage their drug therapy upon discharge to the community is not presently employed. We found that a substantial proportion of geriatric inpatients exhibited impairment of their ability to perform specific function-related tasks when a pharmacist administered a simple and straightforward screening tool. These patients might have been at risk of suboptimal medication management, and alternative packaging or home support for medication administration was coordinated before discharge. Unfortunately, the ideal screening tool, incorporating both functional and cognitive components of medication management for elderly patients and suitable for efficient admininstration by any member of

the health care team, has not been identified. More study is needed to determine how the various assessment tools available predict actual medication use at home and whether interventions have an impact on health-related outcomes.

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