A Self-Administration of Medications Program to Identify and Address Potential Barriers to Adherence in Elderly Patients

Tim Tran, Rohan A Elliott, Simone E Taylor, and Michael C Woodward

There is an increased risk of medication nonadherence in elderly patients when they are discharged from the hospital to the community, with up to 46% of patients becoming nonadherent. This may result in poor clinical outcomes, reduced quality of life, and increased economic expenditure.

The use of a self-administration of medications program (SAMP) in the hospital gives patients the opportunity to administer their own medications while they are an inpatient, which increases their autonomy and understanding of their medication regimen.

A review of published SAMP studies by Wright et al. stated that, although the evidence was not conclusive, SAMPs appeared to improve patients’ medication adherence, knowledge, and satisfaction. For example, a study by Lowe et al. found that 95% of patients who participated in a SAMP were adherent to their medication regimen 10 days after discharge, compared to 83% of patients who did not participate in the program (p < 0.02). They also found that 90% of patients receiving the SAMP were aware of the purpose of their medication, compared to 46% of patients in the control group (p < 0.001).

BACKGROUND: Inpatient self-administration of medications programs (SAMPs) improve the medication knowledge and adherence of elderly patients after their discharge from the hospital. They may also identify patients who will have difficulties managing their medications after discharge; however, no previous study has evaluated the value of a SAMP for detecting and addressing barriers to adherence.

OBJECTIVE: To evaluate the usefulness of a SAMP for detecting and addressing barriers to adherence in functionally impaired elderly hospital inpatients, and to identify predictors of patient performance in a SAMP.

METHODS: A prospective cohort study was conducted on 2 subacute aged-care wards. Patients who were intending to independently manage their medications after discharge were recruited. Medications were dispensed and labeled with full directions, and the patients were educated about their medications. Each patient was required to request the medications from nursing staff when due, then select and administer them under supervision. Patient performance was documented. Barriers to adherence and interventions used to address these barriers were recorded. Analyses were performed to identify factors associated with failing the SAMP.

RESULTS: Of 62 patients who were recruited, 43 (69.4%) passed the program without requiring interventions to address adherence barriers, 7 (11.3%) passed with an intervention implemented to enable them to remain independent with medication management after discharge, and 12 (19.4%) failed and required full assistance with medication management after discharge. Overall, barriers to medication adherence (eg, inability to open containers, inability to request medications without prompting) were identified for 30.6% of patients. Mini-Mental State Examination scores and patient age were independent predictors of whether a patient would fail the SAMP.

CONCLUSIONS: An inpatient SAMP effectively detected barriers to medication adherence that otherwise may not have been detected and addressed prior to a patient’s discharge from the hospital.

KEY WORDS: adherence, inpatients, medication errors, self administration.
However, most previous studies recruited patients with good cognitive function and evaluated outcomes in patients who completed the SAMP rather than evaluating patients who were unable to successfully complete the program. It is this group of patients, especially those with cognitive or functional impairments, that may be more likely to benefit from a SAMP. The SAMP could enable medication management barriers to be identified and addressed by the health-care team before patient discharge. This may reduce the risk of adverse outcomes such as preventable drug-related hospital readmission associated with nonadherence and medication errors.

The review of SAMP studies by Wright et al. noted that it may be more important to identify patients not achieving desired therapeutic outcomes and consider strategies to remove any potential barriers. The primary objective of this study was therefore to quantify the proportion of elderly patients who have barriers to medication adherence, detected as a result of participation in a SAMP, and the strategies put in place for these patients prior to discharge from the hospital. A secondary objective was to identify predictors of patient performance in a SAMP.

Methods

SAMPLE AND RECRUITMENT

This was a prospective cohort study, conducted on 2 subacute aged-care wards (overall capacity 56 beds) at a major metropolitan teaching hospital in Australia between May and September 2008. Patients were eligible to participate in the study if they intended to independently manage their medications upon discharge from the hospital and were able to provide verbal consent to participate in the SAMP. Patients who were to be discharged to a residential care facility or who were using a multi-dose blister pack dose administration container at home (a facility not available at the hospital) were excluded.

Prior to commencement of the SAMP, patient medications were reviewed and, if possible, simplified by the ward pharmacist in conjunction with the medical team (eg, reduction of medications from twice daily to once daily, if possible). The pharmacist then assessed the patient to determine the method of medication administration (either original packaging or a dose administration container) that was most likely to be suitable upon discharge. Seven days of dispensed labeled medications and a medication list detailing instructions, indications, and additional information were then supplied to the patient. Medications were supplied in the form in which they were to be used by the patient at home (original packaging or dose administration container). Short-term medications that were not anticipated to be continued beyond discharge (eg, antibiotics), drugs of dependence, and as-required medications were not included in the program and were administered by the nursing staff. Counseling was provided by the pharmacist on the medication regimen (eg, purpose, dose, frequency, adverse effects). Patients who were of a non–English-speaking background were counseled by a pharmacist via an interpreter. This stage of the program was the same as the process routinely performed by the ward pharmacist when discharging patients from the hospital.

During the SAMP, medications were stored in a locked drawer next to the patient’s bed, with access restricted to nursing and pharmacy staff. Patients were required to request their medications from the nursing staff each time medications were due. If the patient did not request them by the end of the medication round performed by the nursing staff, the nurse would prompt the patient, and if the patient still did not request them, the nurse would present the medications to the patient. The patient then selected and administered the medications under the supervision of the nurse. If this was performed incorrectly, the nurse would intervene and assist the patient as required. The ability of the patient to perform these tasks was documented on a monitoring chart as either being able to request and administer medications without assistance, being able to request and administer medications with partial assistance (eg, with prompting to request the medications or with assistance in removing medications from packaging), or being unable to request or administer the medication (ie, requiring full assistance). Reasons for requiring assistance were recorded on a daily progress chart so that they could be reviewed and addressed by the pharmacist. If the reasons could not be addressed, the patient was withdrawn from the SAMP. In the event that changes were made to the medication regimen by the medical staff while the patient was on the SAMP, the medications were redispensed and further education was provided by the pharmacist.

The duration of the SAMP was limited to a maximum of 7 days. In some cases it was concluded earlier, if it was deemed unsafe for the patient to continue (ie, the patient failed the program, as described below) or if the treating unit decided that the patient was medically and physically ready for discharge and was performing adequately in the SAMP prior to completion of 7 days.

At the conclusion of the SAMP, patients were deemed either to have passed with intervention, passed without intervention, or failed the SAMP. Passing without intervention meant that the patient was able to consistently request and administer medications correctly with no assistance. Passing with intervention occurred when patients required partial assistance from nursing staff in requesting and/or administering their medications (as described above), but the reason for requiring assistance could be addressed by interventions prior to discharge from the hospital so that patients would be able to remain independent with their medication management. Patients failed the SAMP if they...
were consistently unable to request their medications despite prompting by nursing staff or if they were consistently unable to administer their medications without assistance. These patients required assistance with their medications on discharge by means of community nursing services, other caregivers (eg, family members), or admission to residential care.

Data collected for each patient prior to commencement of the SAMP included demographic and sociodemographic characteristics, number of comorbidities, cognitive function (Mini-Mental State Examination [MMSE]), activities of daily living performance (Barthel Index), number of regularly scheduled medications, number of medication changes made during hospitalization, and medication regimen complexity (Medication Regimen Complexity Index [MRCI]). Barthel Index and MMSE data were obtained from routine assessments conducted on patient admission to the unit by medical practitioners and allied health professionals who had been trained in use of these instruments.

STATISTICAL ANALYSIS

Univariate and multivariate analyses to identify factors associated with failing the SAMP were performed using SPSS version 15.0 (SPSS Inc., Chicago, IL). The outcome measure (dependent variable) was whether the patient passed or failed the SAMP. The patients who passed the program were those who passed with or without intervention, while the patients who failed the program were those who were deemed unsafe to independently self-administer their medications after discharge. Student t-test was used to compare means of normally distributed data, while the Mann-Whitney U test was used to compare medians of variables that did not display a normal distribution. Multivariate logistic regression was then performed, including independent variables that were statistically significant in the univariate analysis (p value < 0.05), using both the forward and backward stepwise method. The Wald statistic was used to determine whether the β coefficient of the variables was significant.

The study was approved by the Human Research Ethics Committees of the participating organizations.

Results

During the study period, 202 patients were discharged from the participating wards. One hundred twenty-two patients did not meet the inclusion criteria for participation in the SAMP: 90 because they had caregivers who would be responsible for their medication management at home after discharge and 32 because they were to be discharged to a residential care facility. Sixteen patients did not participate because they were discharged home earlier than expected, with insufficient time to participate in the SAMP, and 2 did not participate because they were administering their medications at home via a multidose blister-pack dose administration container, which was not available at the hospital at the time of the study. Therefore, 62 patients participated in the study.

PATIENT CHARACTERISTICS

Patient characteristics are summarized in Table 1.

PATIENT PERFORMANCE

Of the 62 patients who participated in the program, 43 (69.4%) passed without requiring further intervention, 7 (11.3%) passed with intervention, and 12 (19.4%) failed and had alternative medication management arrangements put in place. Therefore in total, 19 (30.6%) of the patients had barriers to accurate and safe medication self-administration identified that may not have been detected by usual discharge procedures in the absence of the SAMP (Table 2).

Table 1. Patient Characteristics

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>n (%)</th>
<th>Mean ± SD.</th>
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<tbody>
<tr>
<td>Female, n (%)</td>
<td>42 (68)</td>
<td></td>
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<tr>
<td>Age, y</td>
<td>43.6 ± 13.7</td>
<td></td>
</tr>
<tr>
<td>Length of hospital stay (days)</td>
<td>28.5 ± 40.8</td>
<td></td>
</tr>
<tr>
<td>Number of coexisting medical conditions</td>
<td>4.0 ± 2.1</td>
<td></td>
</tr>
<tr>
<td>Regular medications on admission, n</td>
<td>6.0 ± 3.7</td>
<td></td>
</tr>
<tr>
<td>Regular medications on commencement of SAMP, n</td>
<td>9.0 ± 3.7</td>
<td></td>
</tr>
<tr>
<td>Changes made to regular medications, n</td>
<td>6.0 ± 3.1</td>
<td></td>
</tr>
<tr>
<td>MRCI on commencement of SAMP</td>
<td>18.0 (12.0-26.0)</td>
<td></td>
</tr>
<tr>
<td>BI (out of 100)</td>
<td>53.0 ± 19.0</td>
<td></td>
</tr>
<tr>
<td>MMSE (out of 30)</td>
<td>26.0 (22.0-27.0)</td>
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both the forward and backward method (both achieving the same result) indicated that older age and lower MMSE were the only statistically significant predictors of failing the SAMP. There was no correlation between age and MMSE (Pearson correlation coefficient = –0.185, p = 0.2).

Discussion

This study suggests that an inpatient SAMP is a useful tool for detecting barriers that may contribute to medication errors and nonadherence after patient discharge from the hospital. Such barriers were identified in 30.6% of patients in this very old, functionally impaired population. The utility of a SAMP for identifying and addressing barriers to independent medication management has not previously been evaluated in other studies. Identifying patients at risk for nonadherence and medication errors is important because more than 20% of preventable medication-related adverse drug events are a result of patient errors.14

Eleven percent of patients who participated in the program had barriers identified but were able to remain independent in their medication management after discharge because the barriers were addressed with an intervention, such as use of a dose administration aid. Without the SAMP, these patients may have been discharged with barrier(s) to adherence undetected, therefore risking becoming nonadherent. It was considered unsafe for 19% of patients who participated in the SAMP to continue managing their medications independently upon discharge. If these patients had been discharged home without participating in the SAMP, they would have been at a high risk of medication nonadherence and medication errors. The interventions that were implemented in this patient group focused on the recruitment of another caregiver to manage the medications.

In the univariate analysis, patients who were older and who had poorer cognitive function were more likely to fail the SAMP. Unexpectedly, patients who had fewer regular medications, fewer changes to their medications, and less complex medication regimens were also more likely to fail. However, these latter variables were not significant when included in the multivariate analysis, so they were possibly confounded by age and cognitive function (eg, medical practitioners may have deliberately prescribed fewer medications for the very elderly and/or those with poor cognitive function).

In the multivariate analysis, the only variables that were predictive of patient performance in the SAMP were cognitive function and age. The fact that cognitive function was a predictor of patient progress through the SAMP

<table>
<thead>
<tr>
<th>Table 2. Barriers Detected and Interventions Implemented</th>
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<tbody>
<tr>
<td>Barrier Detected</td>
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<tr>
<td>------------------</td>
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<tr>
<td>Passed SAMP with intervention to address adherence barrier(s) (n = 7)*</td>
</tr>
<tr>
<td>Unable to sort medications</td>
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<tr>
<td>Unable to open child-proof container</td>
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<tr>
<td>Unable to read medication list</td>
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<tr>
<td>Unable to request medications without prompting</td>
</tr>
<tr>
<td>Failed SAMP (n = 12)</td>
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<tr>
<td>Unable to request and/or administer</td>
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SAMP = self-administration of medications program.

*Multiple barriers were detected for some patients.

<table>
<thead>
<tr>
<th>Table 3. Univariate Analysis</th>
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<tbody>
<tr>
<td>Variable</td>
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<tr>
<td>Regular medications on commencement of SAMP, n*</td>
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<tr>
<td>Changes made to regular medications during hospitalization, n*</td>
</tr>
<tr>
<td>BI*</td>
</tr>
<tr>
<td>MMSEb</td>
</tr>
<tr>
<td>Age, yb</td>
</tr>
<tr>
<td>Length of hospital stay, daysb,c</td>
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<tr>
<td>MRCIb</td>
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</tbody>
</table>

BI = Barthel Index; MMSE = Mini-Mental State Examination; MRCI = Medication Regimen Complexity Index; SAMP = self-administration of medications program.

*Mean ± SD.

*Median (interquartile range).

*Includes both subacute and the preceding acute admission for patients who were transferred from an acute ward.
is consistent with previous studies, which also showed this association.\textsuperscript{15-17} Age, however, has not been found to be an independent predictor in other studies and may have been confounded by factors that we did not measure in this study.\textsuperscript{18} We cannot rule out functional decline as a factor because the study may not have been powered to detect a significant difference in the Barthel Index between patients who passed and patients who failed the SAMP. The trend of the data favored patients with a higher Barthel Index to pass (mean = 54.7), compared to those who failed (mean = 45.4); however, the high standard deviation (19.2 and 22.0, respectively) combined with missing data indicates that a larger study population would be required to detect a significant difference. It is possible that the Barthel Index may not be a predictor of a patient’s medication management ability because it only assesses basic activities of daily living, such as dressing and grooming. A scale that measures more complex instrumental activities of daily living, such as medication management, may be a better predictor of patient ability to self-administer medications.

There were limitations to this study. Due to nursing time constraints and legal issues, as-needed medications and drugs of dependence were not included in the SAMP; thereby reducing medication regimen complexity in the hospital. Duration of self-medication was limited to 1 week for practical and logistical reasons; however, based on our experience with the SAMP program over more than 10 years, this was felt to be an adequate length of time to determine whether a patient would be able to safely self-administer his or her medications and to identify barriers to adherence. Assessment of patient errors and performance in the SAMP was somewhat subjective and dependent on the opinions of multiple health professionals. There was no follow-up of patients who passed the program to determine whether they remained independent with their medication management and adherent to their prescribed regimen after discharge. Barthel Index and MMSE data were not available for some patients when routine assessments were not completed, which may have reduced the strength of the analysis.

Only patients who were planning to manage their own medications after discharge were included in the study. While this is usual practice for a SAMP (since there is no reason to put patients through the SAMP who are already known to be unable to independently manage their medications, and it could be unethical to do so), it does mean that the most functionally and cognitively impaired patients were excluded from this study. Therefore, the identified predictors would only be applicable to moderately impaired patients in whom medication management ability is unclear.

SAMPs have traditionally been used as a tool primarily to improve patient knowledge, adherence, and satisfaction. This study demonstrates that SAMPs can also be diagnostic, by detecting and addressing potential barriers to medication nonadherence prior to patient discharge. Cognitive function and age were found to be predictors of patient performance through the SAMP. Larger studies with follow-up of patients after discharge are required to validate these findings.

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Conflict of interest: Authors reported none

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References

Un Programa de Auto-Administración de Medicamentos para Identificar y Tratar Potenciales Barreras para el Cumplimiento con la Terapia en Pacientes Ancianos

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EXTRACTO

TRASFONDO: Programas de auto-administración de medicamentos para pacientes hospitalizados (SAMPs) mejoran el conocimiento sobre medicamentos en pacientes ancianos y el cumplimiento con la terapia después de ser dados de alta del hospital. Los SAMPs también pueden identificar a pacientes que tendrán dificultades en manejar sus medicamentos después de ser dados de alta, sin embargo, ningún estudio previo ha evaluado el valor de un SAMP para detectar y tratar barreras para el cumplimiento con el tratamiento.

OBJETIVO: Evaluar la utilidad de un SAMP para detectar y tratar barreras para el cumplimiento con la terapia en pacientes ancianos y discapacidad funcional hospitalizados, e identificar indicadores del desempeño o la ejecución del paciente en un SAMP.

MÉTODOS: Un estudio cohorte prospectivo fue realizado en 2 salas de cuidado sub-agudo de pacientes ancianos. Se reclutaron pacientes que tuvieron la intención de manejar sus medicamentos independientemente después de ser dados de alta. Los medicamentos fueron despachados, rotulados con instrucciones completas y el paciente fue orientado sobre su manejo. Los pacientes devolvieron sus medicamentos después de ser dados de alta. Doce (19.4%) no aprobaron y necesitaron intervenciones para tratar barreras para el cumplimiento.

RESULTADOS: Se reclutaron 62 pacientes, 43 (69.4%) aprobaron el programa sin necesitar intervenciones para tratar barreras para el cumplimiento. Siete (11.3%) aprobaron con la implementación de una intervención que les permitiera mantener su independencia con el manejo de medicamentos después de ser dados de alta. Doce (19.4%) no aprobaron y necesitaron ayuda total con el manejo de medicamentos después de ser dados de alta. En general, las barreras para el cumplimiento con el tratamiento (incapacidad de abrir los envases, incapacidad para pedir los medicamentos por iniciativa propia) fueron identificados para 30.6% de los pacientes. Los resultados del examen Mini del Estado Mental (MMSE) y la edad del paciente fueron indicadores independientes de si un paciente no aprobaría el SAMP.

CONCLUSIONES: Un SAMP para pacientes hospitalizados detectó efectivamente barreras para el cumplimiento con la terapia que de otra manera no se hubiesen detectado y tratado antes del paciente ser dada de alta del hospital.

Traducido por Brenda R Morand