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Original Research

Retrospective analysis of drug therapy problems identified with a telephonic appointment-based model of medication synchronization

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Abstract

Objectives: To describe the drug therapy problems (DTPs) identified for patients enrolled in an Appointment Based Model (ABM) for medication synchronization, describe the pharmacist-delivered clinical interventions, and assess what patient characteristics are associated with the number of DTPs identified.

Methods: A cross-sectional chart review of 1 month of pharmacist notes for telephone ABM encounters at one independent community pharmacy in the Midwest U.S. was performed for a systematic random sample of patients active in the program during September 2017. Included patients were 18 years and older and took one or more synchronized medications. Data included months in the program, gender, age, insurance type, refill interval, medications (synchronized and total), DTP category, and intervention category. Descriptive statistics were calculated, and a multiple linear regression tested the association between patient characteristics and the number of DTPs identified.

Results: The study involved 209 subjects, 54% women, with a mean age of 69.5 years and. The average number of medications synchronized was 4.7, the mean total number of medications was 6.3, and mean length of time in the program was 20 months. The DTPs (n=334) identified included needs additional drug therapy (43.1%), inappropriate adherence (31.4%), unnecessary drug therapy (15.0%), and adverse drug reaction (9.6%). The regression showed age and number of medications was positively associated with number of DTPs identified, but months enrolled was not.

Conclusions: This ABM approach identified several hundred DTPs with corresponding interventions within a one-month period, suggesting that ABMs have a significant potential to improve patient care. The data also suggest that pharmacist interventions within an ABM program are valuable beyond the first few fills as patients move into maintenance use of their medications, especially for patients of advancing age and polypharmacy.

Keywords

Medication Adherence; Medication Therapy Management; Drug-Related Side Effects and Adverse Reactions; Professional Practice; Pharmacies; Community Pharmacy Services; Pharmacists; United States

INTRODUCTION

Polypharmacy (taking 4 or more medications) and the complexity of medication regimens can lead to adverse drug events and medication nonadherence.[1,2] Such drug therapy problems (DTPs) are associated with significant avoidable health care utilization, morbidity, and mortality.[3-7] The identification of DTPs, including nonadherence, is a common process measure used for describing pharmacist interventions as a surrogate for primary outcomes that occur later in life.[8-11]

Nonadherence is a complex phenomenon and there are many reasons why patients do not take their medications as directed.[12] A report by the National Community Pharmacy Association (NCPA) estimated that 28% of patients fail to refill medications on time and of those, 34% listed their nonadherence reason as they "ran out".[13] To address patient issues of medication management and refill coordination, a set of services have been developed under the terms "Medication Synchronization" and the "Appointment Based Model" for refills.[14] Medication synchronization is the process of aligning a patient's refills to reduce the number of trips to the pharmacy. The appointment based model infers that the patient and pharmacist are having a clinically-focused discussion about the synchronized medications.[14]

Initial claims-based analyses suggest these programs decrease the number of days patients go without their various medications through the aligning of their refills.[15,16] Patients that have their medications synchronized have been found to have higher levels of adherence, although evidence is lacking about the effect on clinical outcomes.[17-22] ABM and medication synchronization also have

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purported benefits to the pharmacy related to workflow, inventory management, the increased revenues associated with additional fills, and payer incentives for improved adherence for certain medication classes.[14,23-25] While the effect of ABM programs on adherence has been studied, less is known about the DTPs that can be identified by pharmacists as part of the process.

Implementing ABM programs can be complicated and involving patients in high quality interactions requires deliberate effort.[26,27] Pharmacies may struggle to identify drug therapy problems for refill prescriptions as part of an ABM program if they are not already proactively assessing patients for DTPs on a continuous basis.[28] Delegating dispensing tasks to technicians, integrated electronic documentation, and continuous approaches to medication monitoring are emerging approaches that may facilitate ABMs for medication synchronization.[29,30] The present study describes such an approach using a telephonically delivered ABM intervention supported by the pharmacy's overall workflow designed to continually monitor medications and electronically document interventions.

The objectives of the study were: To describe the drug therapy problems (DTPs) identified for patients enrolled in an Appointment Based Model (ABM) for medication synchronization and described the pharmacist-delivered clinical interventions. Also, to test if the duration of patient enrollment in a medication synchronization program impacts the number of DTPs identified.

METHODS

Study Design

This study used a retrospective chart review of one month of the pharmacist notes documented in the pharmacy's electronic documentation system as part of the pharmacy ABM for medication synchronization. The study pharmacy uses an electronic documentation system to maintain a record of pharmacist notes, prescriber communications, and other information about each patient. This includes encounters related to dispensing, appointment based medication synchronization, medication therapy management, and other notes. Such documentation facilitates the continuous medication monitoring approach to patient care.[30] A clinical pharmacist had made the ABM assessments and interventions and a separate community pharmacy resident performed the abstraction. The pharmacy is located in the Midwest U.S. The study was granted an exempt status by the University IRB.

ABM procedures

Patients were enrolled into the medication synchronization program by recommendation from the pharmacist or another staff member. Interested patients discuss the process with the pharmacist and sign up for the service. The pharmacist performed a medication reconciliation to ensure active medications are synchronized. The pharmacist identified a synchronization date and partial fills were used to align medication quantities.

For refills following the initial enrollment into the program, a telephone call was placed by a clinical pharmacist five days before the synchronization date to identify changes in therapy, adherence concerns, and adverse drug reactions. In this review, the pharmacist may identify DTPs related to both synchronized and non-synchronized medications. The clinical pharmacists were residency trained and perform other services such as medication reviews and disease state education. The pharmacy filled the patient's medications so they would be ready for pickup. This spacing allowed for time to contact prescribers for refill requests, order expensive medications, and ensure the needed quantity was on hand. The patient was then called again on the synchronization date by a pharmacy student, technician, or pharmacist to be notified the prescriptions were ready to be picked up. When picking up the prescriptions, the patient and pharmacist have another opportunity to discuss changes and concerns from the initial call or they could discuss new issues.

Pharmacist identification of DTPs and interventions

The residency trained pharmacist identified DTPs and made clinical interventions as part of the ABM program. Medication adherence was typically assessed using a multifactorial assessment and addressed using counseling, packaging, or requesting 90-day prescriptions.[31] Needs Additional Drug Therapy often related to annual influenza vaccines. The statewide immunization registry was checked to identify if patients were due for other vaccinations. Medication Therapy Management was documented if a therapy need was identified (e.g. statin in diabetes). In such case, a note was faxed to the prescriber requesting to initiate a new medication. The clinical software also alerted high risk drug for patients over 65.[32] In this case, the patient's situation is reviewed and if appropriate following a discussion with the patient, a recommendation would be faxed to the prescriber. PDMP Evaluations were generally documented for new patients to the pharmacy or requests to pay cash. Other interventions were made and documented as appropriate.

Patient selection

A systematic random sampling approach was used to identify patients for the sample. Patients were selected if their synchronization date fell on an odd date in September 2017. The odd dates were based on the result of a coin flip (odd versus even numbered day of the month). A sample was used to increase the feasibility of completing the analysis given the time available and was not expected to influence the interpretability of the results. Subjects also had to be ≥18 years-old and taking at least two synchronized medications.

Variables abstracted

An electronic form was utilized to collect data about drug therapy problems from both the pharmacy's dispensing and clinical software. Information collected from the dispensing software included synchronization date, enrollment date, gender, age, insurance, refill frequency (30-90 days), number of medications synchronized, number of total active medications, and medication classes. Refill history was extracted from the dispensing software retrospectively covering a 90-day period, from August 1 - October 31, 2017, to find the total number of unique

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Table 1. Description of Study Sample (N=209)

Characteristic	N (%) or Range	Mean (SD)
Age (years)	29-97	69.5 (13.0)
Gender		
Male	96 (45.9)	
Female	113 (54.1)	
Insurance		
No Insurance	2 (1.0)	
Medicaid	9 (4.3)	
Medicare Part D	102 (48.8)	
Private	96 (45.9)	
Duration Enrolled (months)	0-30	20.3 (8.9)
Sync Interval (days)		
30	160 (76.6)	
60	4 (1.9)	
90	45 (21.5)	
Number of synchronized meds	1-14	4.7 (2.7)
Number of total unique meds	1-20	6.3 (3.7)
Number of DTPs identified	0—12	1.60 (1.76)
Numbers may not sum to total due to missing data		

medications. Synchronized medications were classified according to AHFS classification (E.g. vaccines, cardiovascular, central nervous system). DTP categories and pharmacist interventions were collected from the pharmacy's clinical software dated September 1 through September 30, 2017. DTPs were classified based on the pharmacy's clinical dispensing software (PharmClin, Integrated Pharmacy Solutions, Iowa City, IA, USA) categories. Demographic information for age, gender, insurance type, and synchronized medications was collected for those patients who were included in the sample.

Statistical analysis

Descriptive statistics were used to analyze drug therapy problems and pharmacist interventions. A multiple linear regression was used to test the influence of age, male gender, months enrolled in ABM, and number of medications synchronized on the number of DTPs identified during the September ABM encounter with the pharmacist.

Table 2. Medication classes associated with identified DTPs

AHFS Medication Class	Frequency (N = 365)
Vaccines	97
Cardiovascular Drugs	89
Central Nervous System	55
Anti-infective Agents	39
Hormones & Synthetic Substitutes	38
Gastrointestinal Drugs	10
Respiratory Tract Agents	9
Eye, Ear, Nose, & Throat Preparations	9
Skin & Mucous Membranes	8
Blood Formation, Coagulation, and Thrombosis	4
Autonomic Drugs	4
Electrolytic, Caloric, & Water Balance	2
Vitamins	1

RESULTS

There were 209 patients that met inclusion criteria and had their synchronization date on an odd numbered day in September 2017. The average age for the sample was 69.5 years (range 29-97), and 54.1% were female (Table 1). Patients had on average, 4.7 (range 1-14) synchronized medications on their September 2017 synchronization date and 6.3 (range 1-20) unique total medications listed on their dispensing profile. The most common sync interval was 30 days. The most commonly synchronized medication (N=903) by class was cardiovascular medications, such as anti-hypertensives.

Overall, 74.2% of ABM participants had at least one DTP identified during their encounter. In all, 365 medications (Table 2) were associated with 334 DTPs (Table 3). The most common medication classes associated with the DTPs were vaccines=97 and cardiovascular medications=89. The most common DTPs identified were needs additional drug therapy (43.1%), inappropriate adherence (31.4%), unnecessary drug therapy (15.0%), and adverse drug reaction (9.6%). The most common intervention documented was to address medication adherence, followed by recommending a vaccination.

Table 3. DTPs identified and corresponding intervention category

DTP	Associated Intervention	Frequency (%)
Needs Additional Drug Therapy		144 (43.1)
	Annual influenza vaccine indicated/administered	96 (66.7)
	Prescription Counseling	27 (18.8)
	Supplementation Recommended	14 (19.7)
	Medication Therapy Management appointment scheduled and/or completed	7 (4.9)
Inappropriate adherence		105 (31.4)
	Assess and address potential adherence Issue	104 (99.0)
	Medication Therapy Management appointment scheduled and/or completed	1 (1.0)
Unnecessary Drug Therapy		50 (15.0)
	Duplicate Therapy identified/ managed	50 (100)
Potential Adverse Drug Reaction		32 (9.6)
	High Risk Drug for Patient >65yo assessed and managed	26 (81.3)
	Prescription Counseling	1 (3.1)
	Medication Therapy Management appointment scheduled and/or completed	1 (3.1)
	Address Adherence Issue	2 (6.3)
	Drug-Drug Interaction assessed, Managed	1 (3.1)
	Prescription drug monitoring program evaluation	1 (3.1)
Dose Too Low		3 (0.9)
	Medication Therapy Management appointment scheduled and/or completed	2 (66.7)
	Prescription Counseling	1 (33.3)
DTP: Drug Therapy Problem.		

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Table 4. Influence of patient characteristics on the number of DTPs identified

Variable	B	Std. Error	*P*
(Constant)	-0.675	0.649	0.300
Gender	0.078	0.233	0.739
Age	0.024	0.009	0.009
Months Enrolled	-0.019	0.014	0.185
Total # Active Meds	0.150	0.033	<0.000
Multiple linear regression: r^2 0.131 F=7.324 p<0.001			

Nine patients were excluded from the regression due to missing date of enrollment. The regression (Table 4) explained 10.2% of the variation in the number of DTPs identified. Age and the total number of medications synchronized had significant positive associations with DTPs identified. The regression was also run for total medications rather than synchronized medications and yielded similar results.

DISCUSSION

The clinical pharmacist administering the telephone based ABM program identified and addressed at least one DTP for three quarters of the 209 patients seen in the study month. The most common interventions related to vaccination recommendation and administration, and adherence counseling. Other authors also have identified the need for vaccines as a potential intervention within a medication synchronization program.[23,33] The periodic ABM interactions between a pharmacist and patient in the present study appear to be a promising opportunity for the pharmacist to engage in personal selling – a relational approach to identifying and meeting patient needs.[34] Utilizing active listening with patients enables the pharmacist to engage, interpret, and evaluate the patient's drug therapy and overall health status.[22]

The adherence counseling and support that was provided by the pharmacist during the appointments suggest there are adherence issues that are not related to the technical process of synchronizing medication refill dates. It appears that with ongoing monitoring, pharmacists can pick up on patterns in patient refill histories and investigate potential issues by asking questions to identify patient barriers to adherence. Studies suggest medication synchronization process of aligning refills and providing reminders leads to more frequent refills, but some of these studies are subject to selection bias and variable clinical contribution by the pharmacist.[15,16,19,20,21,25,35] As a result, the impact of the pharmacist in appointment based models on outcomes like adherence and medication therapy goals is less clear. The present study and another by Andrews *et al*. suggest there is a benefit to having pharmacists regularly engage in clinically focused assessments as part of a continual appointment based model.[17]

This study also provides some evidence for having the primary clinical ABM encounters occur over telephone and supplemented by the availability of the pharmacist when patients pick up their medications. This process is part of the study pharmacy's overall approach to continually monitoring patient medications and documenting drug therapy problems.[30] A comparison study by Barnes *et al*. suggested telephone and face-to-face ABM programs have similar effects on rates of medication refills, although it did not compare the rates or outcomes of clinical interventions by pharmacists.[36] While telephone may have efficiencies, one article found it was difficult to enroll and maintain low-income patients in a telephone-based medication synchronization program – a demographic that may especially benefit from regular conversations with a pharmacist as part of an ABM.[19] More work is needed to better understand the content of the interactions, including the use of more rigorous research designs. It remains challenging to disentangle the pharmacist counseling component from the medication consolidation component of these programs.

The present analysis also tested the influence of patient characteristics on the number of DTPs identified and found no association. Our initial hypothesis was that DTPs would be less frequent for patients enrolled in the ABM program longer. This, however, was not the case as DTPs continued to be identified for patients throughout the range of enrollment durations. The continued identification of DTPs suggests that issues may linger and require ongoing intervention such as belief-based nonadherence. Alternatively, new problems can arise as old issues are resolved. This pattern is consistent with progressive conditions like diabetes where new medications are added periodically to an increasingly complex regimen. A small study on the clinical benefits of medication synchronization on blood pressure control, however, did not show an effect.[22] It was, however, beyond the scope of this cross-sectional study to examine the acceptance of recommendations and follow these patients over time. Future research should follow a cohort of patients using factorial designs that pair medication synchronization with other pharmacy services such as disease state management and examine clinical endpoints in addition to process measures. As expected, the regression did show that age and number of medications was positively associated with DTPs identified. Older patients with polypharmacy may particularly benefit from participating in a clinically oriented ABM program.

These findings have several implications. First, pharmacists may be missing opportunities to identify and manage DTPs if they simply synchronize patient medications and do not continually monitor the medication therapy of patients enrolled in a medication synchronization service. This is consistent with Hinson *et al*. who suggest ABM may improve quality measures and the original premise of the appointment based model.[14,23] Second, this study echoes Luder *et al*. by providing additional support that an appointment-based model can be used to identify patients that need vaccines, such as for seasonal influenza or herpes zoster.[33] It is established that medication synchronization increases refills for enrolled patients. The next frontiers are to test the impact of pharmacist clinical interventions as

part of ABM programs and their effect on clinical outcomes. This could involve pairing the service with disease state management type interventions and assessing using factorial experimental designs.

Limitations

This was a cross sectional analysis of systematic random sample of patients in the ABM program. Patients were not included in the analysis if they did not have an entry for their synchronization. There were many DTPs associated with the need for vaccination given that influenza season was approaching. It is possible that this is a seasonal effect and a different cross-section during a different time of year would yield different results. More work is needed to test such a seasonal difference. The authors made their best effort to categorize the medications for their most common use, but this was not validated for each patient. It also was beyond the scope of this project to analyze the acceptance rate of interventions by the patient and, or the prescriber. The cross-sectional nature of the analysis also did not allow assessing if DTPs were carried forward.

CONCLUSIONS

Using an ABM of medication synchronization that involved a clinical pharmacist routinely assessing patient drug therapy led to the identification of an average of 1.6 DTP per interaction, the most common being the need for additional therapy such as vaccines. The data also suggested that DTPs can be identified and interventions can be made whether the patient is just starting with synchronization or if they have had been participating in the service for multiple years.

CONFLICT OF INTEREST

McDonough and Deninger are co-owners of the study pharmacy and own intellectual property related to the pharmacy clinical documentation software PharmClin. The other authors have no financial disclosures.

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