

Drug Therapy Problem Identification and Resolution by Clinical Pharmacists in a Family Medicine Residency Clinic

Danielle A. MacDonald, PharmD, BCACP^{1,2,3}; Hannah Chang, Student Pharmacist²; Yi Wei, Student Pharmacist²; Keri D. Hager, PharmD, BCACP²

¹Essentia Health Ambulatory Clinical Pharmacy Services, Duluth, MN and Duluth Family Medicine Clinic, Duluth, MN

²Pharmacy Practice and Pharmaceutical Sciences, College of Pharmacy, University of Minnesota, Duluth, MN

³Family Medicine and Community Health, School of Medicine, University of Minnesota, Minneapolis, MN

Abstract

Purpose: There are limited data to evaluate the impact of ambulatory clinical pharmacist recommendations on family medicine resident prescribing and monitoring of medications. The purpose of this study is to begin to gain insight in this area by answering the research question, "How many ambulatory clinical pharmacist recommendations for drug therapy problem (DTP) resolution are implemented on the day of a medication therapy management (MTM) visit in an outpatient family medicine residency clinic?"

Methods: This is a retrospective chart review of face-to-face MTM encounters conducted by ambulatory clinical pharmacists (including pharmacist residents) from August 1, 2012 to June 30, 2015 at a family medicine residency clinic. Descriptive statistics were conducted to both quantify the number of DTPs identified and resolved on the day of the MTM visit as well as categorize the DTPs.

Results: Based on the 728 MTM encounters analyzed, patients were an average of 53.6 years old and took 11.9 medications to treat 5.7 medical conditions. A total of 3057 DTPs were identified in the 728 encounters, of which 1303 were resolved the same day as the MTM visit. This resulted in an average of 4.2 DTPs identified and 2.0 resolved per visit per patient. The most common DTP category identified in this study was the need for additional drug therapy (41.6%).

Conclusions: Approximately half of the ambulatory clinical pharmacist's DTP resolution recommendations were implemented the same day they were identified, which highlights the strength of team-based patient care and interprofessional collaboration in a residency teaching clinic.

Key points: Clinical pharmacists serve as important team members in a variety of settings, including family medicine teaching clinics, where they can identify and help to resolve drug therapy problems discovered within patients' medication regimens. This retrospective chart review of face-to-face medication therapy management encounters conducted in a family medicine teaching clinic identified that almost 50% of the drug therapy problems identified by a pharmacist were resolved on the same day through team-based care. The most common drug therapy category in this review was the need for additional drug therapy.

Key words: drug therapy problems, medication-related problems, family medicine residents, pharmacist-physician collaboration, residency teaching clinic

Introduction

Medications continue to be a primary treatment modality for the management of acute and chronic diseases.¹ Their prevalence of use is accompanied by significant expense to patients and the health care system.² Even more concerning is the potential for medication-related problems to cause morbidity and mortality.³⁻⁶ Pharmacists are increasingly being integrated as key members of the health care team, especially in primary care practices.⁷ Pharmacists' ability to assist in optimizing medications has demonstrated improvements in clinical, humanistic, and economic outcomes.^{8,9,10,11} Pharmacists improve patient outcomes in primary care through comprehensive medication management following a structured patient care process where each medication is evaluated for appropriateness, effectiveness,

safety, and the patient's ability to take the medication as intended.^{12,13} Family medicine residency programs have incorporated clinical pharmacists into their practices.¹⁴ Clinical pharmacists can serve as both patient care providers and faculty preceptors to guide the Family Medicine Residents' (FMRs) proficiency in medication management through a team-based approach to patient-centered care.¹⁵ Currently, there are several studies published about implementation of ambulatory clinical pharmacists' recommendations for drug therapy problem resolution in ambulatory primary care clinics and community pharmacies^{9,16-19} but there is limited information published within the family medicine residency clinic environment.^{14,15} The purpose of this study is to evaluate how many ambulatory clinical pharmacist recommendations for drug therapy problem resolution are implemented on the day of a medication therapy management (MTM) visit in an outpatient family medicine residency clinic.

Corresponding Author: Danielle A. MacDonald, PharmD, BCACP
1502 London Road Suite 101, Duluth, MN 55812
Phone 218-576-0118; Fax 218-733-1112
danielle.macdonald@essentiahealth.org

Methods

Setting

The Duluth Family Medicine Clinic (DFMC) is a residency teaching clinic located in Duluth, Minnesota.²⁰ The family medicine residency program²¹ focuses on developing and preparing collaborative, rural-ready, full-spectrum family medicine physicians and includes 27 family medicine residents (8-10 FMRs per postgraduate year) under the preceptorship of eight family medicine faculty, one to two behavioral health faculty and two ambulatory clinical pharmacist faculty. The care team also includes two to three rotating ambulatory clinical pharmacist residents, nurses, medical assistants, and other clinic staff. During their residency, the FMRs have progressively more time in the clinic, ranging from two to four half-days per week, and they see an average of six patients per half-day.

Clinical pharmacy services were introduced to the clinic in August of 2012. Pharmacists at this clinic provide comprehensive medication management in accordance with the process endorsed by the Patient-Centered Primary Care Collaborative and Joint Commission of Pharmacy Practitioners.^{12,13} This structured patient care process includes collecting information, assessing all drug therapies for indication, effectiveness, safety, and adherence, creating and implementing a plan, and following up. Patients are recruited by phone for face-to-face MTM visits by clinic staff based on acuity (e.g., recent hospitalization), complexity (e.g., multiple medications, multiple comorbidities), and clinical status (e.g., uncontrolled diabetes). MTM visits are typically conducted immediately prior to patients' scheduled FMR visits. Upon completion of the MTM visit, the ambulatory clinical pharmacist provides verbal recommendations to the FMR regarding how to optimize the patient's medication regimen; the FMR then implements recommendations they feel are appropriate and feasible for the day of visit; this may occur with or without precepting with a supervising physician depending on level of training and payer requirements. The ambulatory clinical pharmacist and FMR document their encounters with the patient in the electronic health record (EHR) as separate encounters. Drug therapy problems (DTPs) are tracked within the pharmacist's documentation and categorized according to The Patient-Centered Approach to Medication Management.²²

Study Design

This was a retrospective chart review of face-to-face MTM encounters conducted by ambulatory clinical pharmacists or pharmacist residents under preceptorship. All documented face-to-face MTM encounters from August 1, 2012 to June 30, 2015 were included. MTM encounters were excluded if the patient was under the care of family medicine faculty instead of a FMR. The following data were extracted from the EHR and compiled into a database: date of MTM visit, patient age, primary FMR physician, number of medical conditions, number of medications, number and category of drug therapy problems identified, and number of drug therapy problems resolved the same day as the MTM encounter. Descriptive statistics were

conducted for analysis. Additionally, a preliminary analysis was conducted towards the end of the date range that explored the percentage of DTPs resolved the same day of the MTM visit that specifically correlated with the chief reason for the patient's visit with the FMR. The purpose of this expanded analysis was to investigate whether there would be a higher percentage of DTPs resolved the same day of the MTM visit if the DTPs correlated with the chief reason for the patient's visit with the FMR. This study was determined to be exempt from review by both the Essentia Health and University of Minnesota Institutional Review Boards.

Results

A total of 733 face-to-face MTM encounters (689 unique patients) were conducted at DFMC from August 1, 2012 to June 30, 2015; five were excluded because the patient was not under the care of a FMR, which left 728 encounters for analysis. Table 1 describes mean and median age and number of medical conditions and medications in the population.

A total of 3057 drug therapy problems (DTPs) were identified in those 728 encounters of which 1303 were resolved the same day as the MTM visit. (Table 2) A preliminary analysis of the percentage of DTPs resolved the same day of the MTM visit that correlated with the chief reason for the patient's visit with the FMR revealed that 63% were resolved the same day of the visit (N=185).

The most common DTP category identified in this study was the need for additional drug therapy (41.6%), followed by the need for additional monitoring (14.5%), suboptimal adherence (9.9%) dose too low (9.4%), adverse drug reaction (7.3%), unnecessary therapy (6.7%), ineffective drug therapy (5.5%), and dose too high (5.1%) (see Table 3).

Discussion

The complexity of patients seen at DFMC for MTM visits can be represented by their average number of medical conditions (5.7) and medications (11.9). This complexity was similar to or slightly higher than "thousands of patient encounters from many different practices and settings" who had an average of 6 medical conditions and 9 medications, as reported by Cipolle et al.²²

Ambulatory clinical pharmacists identified an average of 4.2 DTPs on the day of the MTM visit, which was more than the 3.2 DTPs per visit detected by Czycalla et al. in a similar practice setting; their data was collected from four family medicine teaching clinics in Minnesota over the course of five months with a sample size of 541 MTM visits.²³ The average number of DTPs identified at DFMC is also larger than data from primary care clinics with a group of non-resident physicians. Oliveira et al. identified a mean of 4.26 DTPs per patient, which translated to 1.15 DTPs per encounter as the 9,068 patients analyzed over the 10-year period were seen for an average of 3.7 encounters in that timeframe.¹⁸ One explanation for the higher number of DTPs identified per

visit at DFMC may be that the majority of patients seen for MTM visits at DFMC were only seen for an initial visit, and that the mean DTPs per visit would be anticipated to decrease over time with subsequent MTM visits. Isetts et al. demonstrated a mean of 2.24 DTPs per patient, but this 1-year study focused on patients with hypertension or hyperlipidemia, so may not have reflected as comprehensive of a patient panel.⁹ Finally, data from MTM visits conducted in community settings revealed anywhere from 4.3 to 5.9 DTPs per patient, but these data are difficult to compare to the DFMC data owing to a difference in practice setting.^{16,17,19} Additionally, comparison is difficult due to lack of a consistent comprehensive care approach and differing patient care processes. As examples, Doucette 2003 solely focused on patients with hyperlipidemia, Doucette 2005 focused on a single payer (Medicaid), and recommendations were communicated in different ways (e.g., via patient or written to primary care provider).^{16,17,19}

Approximately half of the ambulatory clinical pharmacist's DTP resolution recommendations were implemented the same day they were identified. The fact that not all DTP resolution recommendations were implemented the same day is not necessarily surprising because the clinical pharmacist's process of care for a majority of visits is comprehensive to include assessment of appropriate indication, effectiveness, safety, and the ability of a patient to take the entirety of their medication therapies (prescription, OTC, supplements) as intended across all of their medical conditions. This comprehensive approach to each patient is in contrast to the majority of FMR visits with patients that are typically more focused on specific condition(s) or a chief concern whereby FMRs may need to prioritize the patient's presenting concern and limit the number of additional items addressed with a patient in a visit for a variety of reasons (e.g., acuity, time constraints, patient health literacy, and resident's skill level). Indeed, the preliminary analysis did uncover there was a higher percentage of DTPs resolved the same day of the MTM visit when the DTP correlated with the chief reason for the patient's visit with the FMR.

The most common DTP categories identified in this study were the need for additional drug therapy, followed by the need for additional monitoring, suboptimal adherence, and dose too low. With the exception of the need for additional monitoring (which was not categorized by Cipolle et al. nor noted by Oliveira et al.), these data align with the most commonly reported DTP categories in other comprehensive practices that follow similar DTP nomenclature and prioritization (e.g., need for additional drug therapy and dosage too low).^{18, 22} The most common DTP categories identified in the community setting differed slightly to include adverse drug reaction, ineffective drug therapy, the need for additional drug therapy, and adherence.^{16,17,19} Perhaps this is due to different information being available to the pharmacist conducting a visit in an external location.

Strengths

This study provides insight into the frequency of DTP resolution recommendations implemented as well as types of DTPs identified by pharmacists specifically in a family medicine residency clinic, an area of research not previously represented in the literature. An additional strength is that this study evaluated all of the MTM visits during the study period, not just a sample.

Limitations

There are several limitations to this study. The EHR data capture was limited to discrete data, which prevented obtainment of subcategory types of DTPs resolved day of visit, DTP specifics related to medications/conditions, DTPs resolved directly with patient (not through FMR), the categorization of DTPs not implemented, reasons why DTP recommendations were not implemented, and if DTP resolutions were implemented subsequent to day of visit. Additionally, the outcome of the DTP resolution is unknown. Finally, this study was conducted at only one clinic site, limiting its generalizability.

Future Research

Future research directed at identifying additional details about the DTPs identified would be valuable. For example, it would be useful to identify the subcategory types of DTPs and correlate DTPs with their respective medication/class and medical condition. It may also be helpful to identify if the "needs additional monitoring" category is linked to monitoring to determine either effectiveness or safety of the medication. This information would be beneficial in order to identify potential system improvements and/or gaps in FMR pharmacotherapy knowledge that could be addressed through systems change and/or additional FMR education/training. It would be useful to know more about how and when the DTP resolutions are implemented. In some cases, the plan for resolving DTPs can be implemented directly between the pharmacist and the patient during the visit (e.g., if it relates to an over-the-counter medication or adherence to a prescribed medication, or the pharmacist is working under a collaborative practice agreement allowing them to initiate, adjust, and discontinue prescription medications) while other interventions would require involvement of an FMR to adjust a prescription. Of note, the decision about whether or not to utilize a collaborative practice agreement in a residency teaching clinic may be deferred in order to use the recommendations as a teaching tool. It would be valuable to analyze the number, type, and timing of DTP resolutions that occur after the day of the MTM visit, categorize and appreciate reasons for recommendations that were not implemented, and evaluate implementation rates per residency year. Ultimately, it would be important to examine clinical and humanistic outcomes of the recommendations. Overall, this project has accelerated our understanding of the strengths and weaknesses of our EHR data capture methods and facilitated changes to allow for evaluation of the future research directions aforementioned.

Conclusion

Clinical pharmacists serve as important team members in a variety of settings, including family medicine teaching clinics, where they can identify and help to resolve drug therapy problems discovered within patients' medication regimens. These data highlight the strength of interprofessional collaboration in a residency teaching clinic.

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Table 1. Patient Data

	Age (n=728 encounters)	Medical Conditions (n=726 encounters) ^a	Medications (n=726 encounters) ^a
Mean (SD ^b)	53.6 (+/-15.7)	5.7 (+/-2.5)	11.9 (+/-5.8)
Median	55	5	11

^aData missing from electronic health record (i.e. information was not documented in visit note and couldn't be extracted). Missing data not included in denominator for mean/median.

^bSD = Standard Deviation

Table 2. Medication Therapy Management Visit Data

	Drug Therapy Problems Identified Day of Visit (n=726 encounters) ^a	Drug Therapy Problems Resolved Day of Visit (n=642 encounters) ^a	Face-to-Face MTM Visit Time (n=724 encounters) ^a
Mean (SD ^b)	4.2 (+/- 2.1)	2.0 (+/-1.7)	31.2 (+/-9.3)
Median	4	2	30

^aData missing from electronic health record (i.e. information was not documented in visit note and couldn't be extracted). Missing data not included in denominator for mean/median.

^bSD = Standard Deviation

Table 3. Drug Therapy Problem Category Results

Table 3. Drug Therapy Problem (DTP) Category Results (n = 3,010 ^a DTPs)	
INDICATION 48.3 (1,453/3,010), % (no.)	
Unnecessary Drug Therapy <ul style="list-style-type: none"> • Duplicate therapy • No medical indication at this time • Non-drug therapy more appropriate • Addiction/recreational drug use • Treating avoidable adverse reaction 	6.7 (202/3,010)
Needs Additional Drug Therapy <ul style="list-style-type: none"> • Preventive therapy • Untreated condition • Synergistic therapy 	41.6 (1,251/3,010)
EFFECTIVENESS – 14.9 (447/3,010) - excludes monitoring, % (no.) ^b	
Ineffective Drug <ul style="list-style-type: none"> • More effective drug available • Condition refractory to drug • Dosage form inappropriate • Contraindications present • Drug not effective for condition 	5.5 (165/3,010)
Dosage Too Low, no. (%) <ul style="list-style-type: none"> • Dose too low • Frequency inappropriate • Incorrect administration • Drug interaction • Incorrect storage • Duration inappropriate 	9.4 (282/3,010)
Needs Additional Monitoring, no. (%) ^a <ul style="list-style-type: none"> • Medication requires monitoring 	14.5 (438/3,010)
SAFETY – 12.4 (374/3,010) - excludes monitoring, % (no.) ^b	
Adverse Drug Reaction <ul style="list-style-type: none"> • Undesirable effect • Unsafe drug for the patient • Drug interaction • Incorrect administration • Allergic reaction • Dosage increase/decrease too fast 	7.3 (220/3,010)
Dosage Too High <ul style="list-style-type: none"> • Dose too high • Frequency inappropriate • Duration inappropriate • Drug interaction 	5.1 (154/3,010)

Needs Additional Monitoring ^b Medication requires monitoring	14.5 (438/3,010)
ADHERENCE 9.9 (298/3,010), % (no.)	
Adherence <ul style="list-style-type: none"> • Does not understand instructions • More cost-effective drug available • Cannot afford drug product • Patient prefers not to take • Patient forgets to take • Drug product not available • Cannot swallow/administer drug 	9.9 (298/3,010)

^a3,010/3,057 (98.5%) of DTPs were documented such that category could be extracted from electronic health record and included in this analysis.

^bThis analysis was unable to attribute “Needs Additional Monitoring” to either Effectiveness or Safety due to the limitations of the EHR documentation template during the time frame of this analysis.

Adapted from Cipolle RJ, Strand LM, Morley PC. *Pharmaceutical Care Practice: The Patient-Centered Approach to Medication Management*. 3rd ed. New York, NY: McGraw-Hill; 2012, p 157).