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Evaluation of a Pharmacist-Driven Discharge Medication Reconciliation Service Pilot at a Children's Hospital

Jessica Kulawiak, PharmD; Jessica L. Jacobson, PharmD; Joette Amundaray Miller, PharmD; and Sara W. Hovey, PharmD

OBJECTIVE The purpose of this study was to evaluate the feasibility of a pharmacist-driven discharge medication reconciliation (DMR) service at our children's hospital by completing a 2-week pilot on a general pediatrics unit.

METHODS This was a prospective study and included patients discharged during pilot hours whose DMR was completed by the pharmacist. The primary outcome was evaluation of time required for a pharmacist to complete the DMR. Secondary outcomes included classification of pharmacist interventions made and their associated cost-avoidance, medication-related problems reported within 14 days of discharge, hospital readmission due to medication problems within 30 days of discharge, and medical resident satisfaction assessed via prepilot and postpilot surveys.

RESULTS A total of 67 patients had their DMR completed by a pharmacist during the pilot. The pharmacist spent an average of 30 minutes completing each DMR, although this was variable, as evidenced by an SD of 36.4 minutes. Pharmacists documented 89 total interventions during the study period. The most common intervention types were therapeutic optimization (32.6%) and modification of directions (29.2%). Total estimated cost-avoidance during the study pilot was $84,048.01. For the pilot population, 1 medication-related problem was identified within 14 days of discharge. There were no medication-related readmissions identified. Medical residents reported increased confidence that the DMR was completed accurately and satisfaction with the DMR process during the pilot compared with before the pilot.

CONCLUSIONS Implementing a pharmacist discharge medication service requires consideration of pharmacist time and salary, which may be offset by cost-avoidance.

ABBREVIATIONS ADE, adverse drug event; DMR, discharge medication reconciliation; EMR, electronic medical record; G-tube, gastrostomy tube; NG-tube, nasogastric tube

KEYWORDS discharge; medication error; medication reconciliation; pediatric; pharmacist; pharmacy service; pilot

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Introduction

The transition of care from inpatient to outpatient represents a time of increased medication errors for pediatric patients, with up to 29.9% of patients having at least 1 medication error at hospital discharge, of which 4.2% to 13.9% have the potential to cause harm.[1–5] Common errors include medications inappropriately continued or discontinued at discharge, overdosing and underdosing of medications, and incomplete prescriptions with missing components.[2,4,6] The incidence of medication errors at discharge varies by medical practitioner type, with medical residents having the highest reported error rates.[3,4,7] A study completed by Taylor et al[4] found that pediatric medical residents were less likely to commit medication errors at discharge compared with residents training in other disciplines: the pediatric resident error rate was 47.7% compared with 80.2% for other residents.

The increased risk of medication errors in pediatric patients results from a combination of weight-based dosing, limited US Food and Drug Administration–labeled medications, dosage form limitations, and narrow therapeutic windows.[5,8,9] Weight-based dosing is challenging because it involves calculations, weight changes as children grow, and medication formulations appropriate for pediatric doses may not be available.[8,9] When pediatric dosage forms are available, prescribers need to select the appropriate formulation and concentration to ensure a feasible volume can be delivered, which creates an opportunity for error. In addition, the risk of medication error is increased in medically complex pediatric patients. These patients are defined as those with chronic conditions, high health care usage, and dependence on medical technology.[2,10,11] Other reasons for increased medication errors in pediatric

patients include multiple medication lists in the electronic medical record (EMR), high discharge volume limiting medical provider time per discharge, and lack of medical resident experience with complex medication discharges.[3,7] Given the high risk of medication errors in pediatric patients, interventions to reduce the risk of error are needed.

There have been several studies evaluating pharmacist involvement at hospital discharge and its effect on medication errors. Although patient education is critical for appropriate ambulatory medication use, studies focusing solely on discharge medication education interventions have shown little effect on the incidence of medication errors in pediatric patients at discharge.[12–14] More extensive pharmacist-driven discharge programs include discharge prescription review, medication education, and medication delivery have reported cost savings, but no consistent decrease in medication errors.[15,16] Several studies examining pharmacist review of discharge prescriptions have found that between 23.6% and 81% of pediatric prescriptions require intervention to prevent errors or optimize therapy and associated cost savings.[17,18] Recently, a study found a decrease in medication errors with a pharmacist-led discharge medication reconciliation (DMR) program in adult patients when compared to patients who had their DMR completed by the medical team.[19] These data suggest pharmacist involvement at medication reconciliation may be a way to decrease errors.

At our institution pharmacists often help with DMR and perform yearly training for medical residents about DMR best practice. A previous study completed at our institution in the epilepsy population identified inaccurate DMR as a source of error.[13] There was interest from pharmacists and prescribers to incorporate pharmacists into the DMR process; however, pharmacy resources are limited. The resources necessary to run such a service have not been previously quantified. The aim of this study was to evaluate the time required for a pharmacist to complete the DMR process at our children's hospital by completing a 2-week service pilot on a general pediatrics unit.

Materials and Methods

Study Design, Setting, and Participants. The service pilot was conducted at an urban academic medical center with a children's hospital located within a primarily adult institution. The children's hospital has approximately 110 beds, including a 20-bed general pediatric unit. At our institution, medical residents complete DMR, prepare prescriptions, and provide education for pediatric patients. Our institution's electronic medical record (EMR), Epic Hyperspace, is used to complete DMR and prepare prescriptions. Pharmacist involvement at discharge is available through a discharge education consult service for medically complex patients and those with high-risk medications. Most pediatric patients are discharged home from the general pediatrics unit, which is composed of 2 teams, with 1 specializing in hematology-oncology and 1 in epilepsy, and both manage other general pediatric patients. These teams each have a primary clinical pharmacist who rounds with them on weekdays. Within the general pediatric unit is also an epilepsy monitoring unit, given the institution's large epilepsy population.

This was a prospective 2-week pilot study including pediatric patients (ages 0–21 years) discharged from the general pediatrics unit Monday through Friday from 1000 to 1800 hours. Patients were excluded if they were discharged outside of pilot hours or had their DMR completed by the medical team. A single pharmacist was assigned to complete the pilot and had no other assigned clinical expectations during this time. During the pilot time frame, the medical team informed the pharmacist of pending patient discharges, which allowed the pharmacist to review the EMR, complete the DMR, and discuss any changes with the medical team. The pharmacist completing the pilot did not round with the team. The DMR completion included reconciling inpatient and outpatient medications in the EMR, reviewing and preparing discharge prescriptions, ensuring medication availability, and providing medication education to patients/families as needed (per medical team request). Education included verbal counseling, provision of a medication list and relevant handouts as described by Hovey et al.[14] While preparing discharge prescriptions, the pharmacist selected the optimal medication concentrations to ensure the dose volume could reasonably be administered. The pharmacist also ensured the appropriate medication quantity (days supply) was prescribed and that prescriptions were sent to the patient's preferred pharmacy, which could include the institution's pharmacy that delivers medications to bedside. Additionally, when reconciling inpatient and outpatient medications, duplications due to formulary substitutions were resolved. Once DMR was complete, the prescriptions were pended for review and signature by the medical team.

To evaluate medical resident time spent and satisfaction with the DMR process, a 13-item internally designed survey was administered before and after pilot completion via RedCap. Medical residents included in the prepilot survey were pediatric and medicine-pediatric residents at our institution. Medical residents included in the postpilot survey were those rotating through the general pediatrics floor during the pharmacist pilot. All medical residents who received the postpilot survey also received the prepilot survey. Residents received an information sheet explaining that participation was voluntary and that by completing the survey consent was being provided.

Study Outcomes and Data Collection. The primary outcome of this study was to evaluate the time required for a pharmacist to complete DMR for each

Table 1. Cost-Avoidance Definitions

Categories	Definition	Cost-Avoidance[20]
Drug information	• Creating a medication taper or titration	$130.55
Prevention of major ADE	• Drug-disease contraindications • Inappropriate dosage that significantly affects efficacy or safety • Duplicate therapy of a high-risk drug • Significant allergy to a drug prescribed • Major drug-drug or drug-food interaction	$3,866.76
Medication education	• Providing education on medications at discharge	$791.27
Prevention of minor ADE	• All other interventions not defined above	$448.54

ADE, adverse drug event

patient. This included pharmacist time spent reconciling medications and preparing discharge prescriptions in the EMR, communicating with the medical team and outpatient pharmacy, providing patient education, and assisting with prescription insurance issues. Time was tracked by the pharmacist using a timer for each of the listed activities above. Secondary outcomes included classification of pharmacist interventions made during the pilot and their associated cost-avoidance (Table 1). Interventions were defined as instances when the pharmacist needed to clarify a discharge prescription, take action to ensure medication availability, or complete medication education. Interventions were defined as direction modification (sending prescription for medication titration or taper, frequency adjustment, route of administration adjustment, or unclear directions), therapeutic optimization (dose change greater than 10%, drug and indication optimization, or duration adjustment), or drug availability (medication out of stock, prescribe refills, prior authorization, prohibitive cost, or therapeutic interchange). The definitions of these categories and their associated cost-avoidance were adapted from a study by Hammond et al[20] with costs adjusted for 2022 inflation as defined in Table 1. Additional secondary outcomes evaluated included identification of medication-related problems reported within 14 days of discharge as documented in the EMR and hospital readmission due to medication-related problems reported within 30 days of discharge. These 2 outcomes were collected retrospectively from the EMR. Medication problems and related admissions in the epilepsy subgroup of this study were compared to previous data from a study conducted at our institution that examined the incidence of medication-related problems in pediatric epilepsy patients.[13]

The prepilot and postpilot survey of medical residents included questions relating to resident demographics, time spent completing DMR and issues encountered, and resident opinions and comfort with the DMR process. The types of questions in these surveys were primarily multiple-choice and Likert scale, but they also included 2 true or false and 2 free response questions.

Additional data collected prospectively from the EMR at the time of discharge included patient demographics. Information on the patient's hospitalization, including chief complaint based on body system affected, epilepsy diagnosis, classification as a medically complex patient based on the definition by Simon et al[21] (significant chronic condition in 2 or more body systems, or progressive condition with decreased life expectancy, or continuous dependence on technology for at least 6 months), number of hospitalizations in the past year, number of medications at discharge, number and category of high-alert medications at discharge, and length of stay were collected.[21] Medications were classified as high alert based on the Institute of Safe Medication Practice[22] high-alert list with additional modifications for the pediatric population based on our own institution's high-risk policy. For our study, the following classifications of drugs were considered high alert: anticoagulants, antiepileptics, antiretrovirals, barbiturates, benzodiazepines, cardiovascular agents, cytotoxic and hazardous agents, hypoglycemic agents, immunosuppressants, and opioids. Lastly, the total number of pediatric patients discharged during and outside of pilot hours was collected.

Statistical Analysis. This study used a sample size of convenience based on the 2-week pilot time frame and an estimate of 6 to 8 discharges per day on the general pediatric unit. All data were reported using descriptive statistics, with mean ± SD used to describe normally distributed data and median (IQR) used for non-normal data.

Results

Patient Characteristics. Eighty-nine patients were discharged during the pilot, with 22 patients being discharged outside of pilot hours and being excluded from the study because their DMR was completed by the medical team. A total of 67 patients had their DMR completed by a pharmacist and were included

Table 2. Baseline Patient Demographics and Discharge Medications

	Value (N = 67)
Patient characteristics	
Age, average ± SD, yr	7.9 ± 5.9
Male, n (%)	40 (59.7)
Race, n (%)	
Black	15 (22.4)
Other	27 (40.3)
White	25 (37.3)
Hispanic, n (%)	28 (41.8)
Weight, median (IQR), kg	25 (13.6–54.1)
Epilepsy diagnosis, n (%)	21 (31.3)
Medically complex patient, n (%)	25 (37.3)
Admission characteristics	
Length of hospital stay, median (IQR), days	1 (1–2.5)
Chief complaint, n (%)	
ENT	4 (6)
Infectious	4 (6)
Gastrointestinal	11 (16.4)
Musculoskeletal	1 (1.5)
Neurologic	24 (35.8)
Ophthalmic	1 (1.5)
Other	8 (11.9)
Respiratory	14 (20.9)
Number of hospitalizations in last year, median (IQR)	0 (0–1)
Discharge medications	
Number of medications, median (IQR)	4 (3–7.5)
Number of high-alert medications, median (IQR)	0 (0–2)
Types of high-alert medications at discharge, n (%)	
Anticoagulation	2 (3)
Antiepileptic	21 (31.3)
Barbiturate	1 (1.5)
Benzodiazepines	23 (34.3)
Cardiovascular	6 (9)
Cytotoxic and hazardous agents	11 (16.4)
Insulin	1 (1.5)
Opioids	3 (4.5)

in the study, representing 75% of the total pediatric discharges during the 2-week time frame.

Patient demographics and baseline admission characteristics are in Table 2. The average age of patients was 7.9 years, and their median hospital length of stay was 1 day. The most common reasons for admission were neurologic (35.8%), respiratory (20.9%), and gastrointestinal (16.4%). Roughly 31% of patients had epilepsy, and 37% were considered medically complex. Patients were discharged with a median of 4 medications. Thirty-one patients (46.3%) were discharged with at least 1 high-alert medication. The most common high-alert medication classes were antiepileptics and benzodiazepines.

Pilot Outcomes. The breakdown of the primary outcome, time spent completing DMR by the pharmacist, can be found in Table 3. The pharmacist spent an average of 30 minutes completing each DMR. An average of 49 minutes was spent completing DMR for medically complex patients compared with 18.7 minutes in non–medically complex patients. In the epilepsy subgroup, an average of 43.1 minutes was spent completing DMR. Most pharmacist time was spent completing DMR in the EMR (average of 16 minutes per discharge) and resolving outpatient pharmacy or insurances issues (average of 5.6 minutes per discharge).

The pharmacist documented 89 interventions during the study. The interventions included 10 medication educations (11.2%) and 79 discharge prescriptions clarifications (88.8%). There were patients who required multiple clarifications on their discharge prescriptions, accounting for the high number of pharmacist interventions. Overall, 62.3% of patients required an intervention. Pharmacist intervention was needed in 88% of medically complex patients compared with 47.6% of non–medically complex patients. In the epilepsy subgroup, 95.2% of patients required pharmacist intervention. Table 3 describes the types of interventions

Table 3. Pharmacist Time Completing Discharge Medication Reconciliation (DMR) and Interventions

	Value
Components of DMR, time, average ± SD, min	
Average total time per DMR	30 ± 36.4
Completion of DMR in EMR	16.0 ± 14.2
Communicating with medical team	4.2 ± 6.6
Resolving pharmacy and insurance issues	5.6 ± 9.6
Providing patient/family education	4.2 ± 12.8
Intervention type, n (%); N = 89	
Medication education	10 (11.2)
Therapeutic optimization	29 (32.6)
Dose changes greater than 10%	12 (13.5)
Drug and indication	17 (19.1)
Duration	0 (0)
Modification of directions	26 (29.2)
Sending prescription medication titration or taper	5 (5.6)
Creating medication titration or taper	1 (1.1)
Frequency adjustment	11 (12.4)
Route of administration adjustment	5 (5.6)
Unclear directions	4 (4.5)
Drug availability	24 (27)
Medication out of stock	9 (10.1)
Prescribe refills	7 (7.9)
Prior authorization	1 (1.1)
Prohibitive cost	7 (7.9)
Therapeutic interchange	0 (0)

EMR, electronic medical record

Table 4. Cost-Avoidance Summary

Intervention Category	Intervention Type	Cost-Avoidance per Intervention	n (N = 89)	Cost-Avoidance
Medication education	Medication education	$791.27	10	$7,912.70
Prevention of major ADE	Dose changes greater than 10%	$3,866.76	12	$46,401.12
Drug information question	Creating medication titration or taper	$130.55	1	$130.55
Prevention of minor ADE	All other intervention types	$448.54	66	$29,603.64

ADE, adverse drug event

made when clarifying discharge prescriptions. The most common intervention types were therapeutic optimization (32.6%) and modification of directions (29.2%). Therapeutic optimizations most often related to drug and indication and modification of directions most often related to frequency adjustment. Details regarding interventions made by the pharmacist during this pilot including a review of the recommendations and associated medication can be found in the Supplemental Table.

The total estimated cost-avoidance during the study pilot was $84,048.01. The predicted cost-avoidance by intervention category can be found in Table 4. The most common intervention category was prevention of minor adverse drug events (ADEs) at 66 interventions. One medication-related problem was identified within 14 days of discharge. The issue involved a hydrocortisone wean that the patient and family had received pharmacist-based education and a medication calendar prior to discharge; however, the patient's guardian required additional clarification via a telephone encounter on the prescribed dosing wean. There were no medication-related readmissions identified. The medication-related problem described above was in the epilepsy subgroup, therefore this subgroup had a 4.8% (1 of 28 patients) incidence of medication-related problems.

Resident satisfaction with the DMR process evaluated via prepilot and postpilot surveys is described in Table 5. The prepilot resident survey was distributed to 52 medical residents and completed by 20 residents (38.5% response rate). Residents identified patients admitted to the epilepsy (35%) or oncology (35%) service

Table 5. Resident Survey Results

	Prepilot, n = 20	Postpilot, n = 8
Resident demographics, n (%)		
Type of residency		
Medicine-pediatric	5 (25)	1 (12.5)
Pediatric	15 (75)	7 (87.5)
Year in residency		
PGY1	5 (25)	4 (50)
PGY2	3 (15)	1 (12.5)
PGY3	11 (55)	3 (37.5)
PGY4	1 (5)	0 (0)
Baseline DMR characteristics		
Hours per day completing DMR		
0–1	6 (30)	7 (87.5)
1–2	11 (55)	1 (12.5)
2–3	3 (15)	0 (0)
Resident opinion of DMR, n (%)		
Confident DMR is completed accurately		
Strongly agree	0 (0)	6 (75)
Agree	4 (20)	2 (25)
Neutral	9 (45)	0 (0)
Disagree	7 (35)	0 (0)
Strongly disagree	0 (0)	0 (0)
Satisfied with current DMR process		
Strongly agree	0 (0)	7 (87.5)
Agree	5 (25)	1 (12.5)
Neutral	8 (40)	0 (0)
Disagree	6 (30)	0 (0)
Strongly disagree	1 (5)	0 (0)

DMR, discharge medication reconciliation; PGY, postgraduate year

as the most challenging DMR to complete. The most common issues with completing DMR were time (35%), issues with the EMR (25%), and familiarity with medications (25%). Of the prepilot survey respondents, 20% agreed they were confident that DMR was being completed accurately, 25% agreed they were satisfied with the DMR process, and 95% strongly agreed or agreed that pharmacist-driven DMR would be beneficial to their workflows. Most residents (90%) agreed or strongly agreed that DMR is a useful residency skill, and 35% felt resident training on DMR was adequate. Ninety-five percent of residents felt additional assistance with DMR was needed. The postpilot resident survey was distributed to 11 medical residents who were on the general pediatric service during the pharmacist-driven DMR pilot. Eight residents (72.7%) completed the postpilot survey. Most residents reported spending zero hours to 1 hour per day completing DMR during the 2-week pilot time frame outside of pilot hours. Residents identified that patients admitted to the epilepsy service (50%) or those with greater than 3 medications at discharge (50%) most benefited from pharmacist DMR. All medical residents agreed or strongly agreed that DMR was completed accurately, and all were satisfied with the DMR process during the pilot. Residents cited weekend discharge (62.5%) as the most common reason they did not use the pharmacist service.

Discussion

To our knowledge, this is the first study attempting to determine the resources needed to create a pharmacist-driven DMR service and the benefits of such a service in a pediatric population. Quantifying resources such as pharmacist time is an important aspect in developing services aimed at improving transitions of care.[23] In this study, an average of 30 minutes per patient was required to complete the DMR process. However, the time per patient was highly variable, as evidenced by an SD of 36.4 minutes. This variability may have resulted from the heterogenicity of our patients. Patients classified as medically complex made up 37.3% of our population and required more time per DMR than the non–medically complex patients (49 minutes vs 18.7 minutes).[21] More patients in this group required pharmacist interventions (88% vs 47.6%), which likely accounts for the increased time. This fits with current literature that identifies medically complex pediatric patients to be at higher risk of medication errors, therefore necessitating more interventions.[2,10,11] The epilepsy subgroup in our study (31.3% of patients) also required a longer

average time of 43.1 minutes to complete their DMR, and 95.2% required pharmacist intervention. Although several epilepsy patients were considered medically complex (n = 9) based on the definition used in our study, not all met this criteria.[21] The epilepsy population innately is at higher risk for medication errors because of disease and medication complexity contributing to a higher intervention rate.[10] The higher average times to complete DMR and increased pharmacist interventions among the medically complex and epilepsy subgroups suggests that these patients may benefit most from such a service.

The pharmacist interventions employed in our study are consistent with those commonly identified in the literature.[2,4,6] A pharmacist-led discharge program in an adult population implemented by Clark and colleagues found that 35% of patients had at least 1 medication discrepancy when DMR was completed by the medical team vs 11% when completed by the pharmacist. The most common pharmacist interventions included discontinuation of unnecessary medications and modifying doses that were too high.[19] Our study identified the same interventions as most prevalent but found that nearly double (62.3%) the patients required pharmacist intervention, which may be due to our study having a pediatric population. This is the first pediatric study examining pharmacist-driven DMR; however, it is worth comparing our results to previous studies that have evaluated interventions following pharmacist review of pediatric discharge prescriptions written by the medical team.[17,18] Cesarz et al[17] found that 23.6% of emergency department prescriptions retrospectively reviewed required interventions, a number much lower than the 62.3% observed in this study. The difference in intervention rates observed between these studies is likely due to differences in medical complexity between patients discharged from the emergency department and the medically complex group discharged in our study. When Christiansen et al[18] prospectively reviewed discharge prescriptions, they found a higher rate of pharmacist interventions; however, most of their interventions focused on identifying missing prescription components rather than preventing medication errors, making it difficult to compare to our study.

The only study to report cost-avoidance with a pediatric discharge medication review program is Christiansen et al,[18] from 2008. They reported an estimated $7,620 savings during 30 days in 2008 dollars, equating to $10,834 in 2023. The estimated cost-avoidance in this study ($84,048.01 during 2 weeks) is much more than the $5,400 from the Christiansen et al study if adjusted for inflation and duration of intervention. There are many possible reasons for this. Despite there being significantly more interventions per patient reported by Christiansen et al,[18] the types of interventions made were primarily identification of missing prescription components, which differed from the interventions in our study. Furthermore, there is the value per intervention used to calculate the cost-avoidance. Christiansen et al[18] used software that assigned a value of $48 to $200 per intervention, which was different than the values estimated in Hammond et al.[20] Although the study by Hammond et al[20] is more recent than that by Christiansen et al,[18] and is the most comprehensive pharmacist cost-avoidance study to date, this study has been criticized for overestimating pharmacist cost-avoidance, which may explain the high number in our study.[20,24,25] The method used in the current study of defining every intervention as avoidance of a major or minor ADE, medication education, or drug information question likely resulted in overestimation of pharmacist effect. It is unlikely that every intervention would have resulted in avoidance of an ADE because patients likely would have rectified certain issues, such as intended route or need for prescription refills, accounting for ~$5,000 in cost-avoidance; however, better methods on which to base our estimate are currently not available and represent a big limitation in gathering data in the outpatient setting. Additionally, the study conducted by Hammond and colleagues[20] estimating cost-avoidance focused on adults in the intensive care unit, which differs from the general pediatric patient population in this study and limits applicability; however, studies in pediatric populations are lacking. Although the estimated cost-avoidance of $84,048.81 in this study is likely an overestimate, even a cost-avoidance of a fraction of this number still extrapolates to an annual cost-avoidance that is clinically significant.

Pharmacist time is a finite resource. Extrapolating the average time to complete DMR per patient and number of patients discharged per day (6–7) from our 20-bed general pediatric unit, approximately 3.4 hours of pharmacist time per day would be required to run the service on that unit alone. Implementation on all pediatric units in our institution would increase this time requirement. The additional time required to complete DMR is significant and would not be able to be added to the responsibilities of pediatric clinical pharmacists in our current practice model. Our institution employs 4 inpatient pediatric clinical specialist full-time equivalents for our 110 pediatric beds (neonatal intensive care unit, pediatric intensive care unit, general pediatrics, and hematology/oncology) who attend multidisciplinary rounds, perform order verification and admission medication reconciliation, have clinical teaching responsibilities for residents and students, and participate in project and committee work. Because of limitations in the EMR at our institution, we were unable to electronically require pharmacist discharge prescription review prior to patient discharge, necessitating frequent monitoring of patients by the pilot pharmacist and frequent communication with medical providers about the pharmacist DMR pilot. A more streamlined process in the EMR could decrease the time requirement.

At our institution, staffing a pharmacist-driven DMR service for pediatric patients would require an additional clinical pharmacist full-time equivalent; however, this may vary at different institutions depending on current pharmacist responsibilities, pediatric patient census, and patient complexity. The average salary for a clinical pharmacist in our geographic area is approximately $140,000 compared with the average salary for a medical resident of approximately $66,000.[26] The cost of a clinical pharmacist would be higher than that of a medical resident; however, cost-avoidance and potential to decrease medication errors in pediatric patients likely outweigh the increased salary cost.

Our study showed a positive effect on DMR accuracy and medical resident satisfaction with the DMR process as measured by the postpilot survey. Additionally, the amount of time residents reported spending on DMR decreased, allowing more time for direct patient care, which may have unmeasurable benefits for patients. This decreased time spent on DMR may allow for other resident learning opportunities, including wellness activities targeted at preventing burnout. Burnout is increasingly recognized as a problem in health care, particularly among residents.[27] Pharmacists have a unique skill set, including training in prescription review and drug knowledge, making them optimal individuals to complete DMR. However, DMR is often a responsibility of the medical team, as is the case currently at our institution; therefore, resident training in DMR could be argued to be crucial to prepare residents to practice in a clinical model without established pharmacy support. Current Accreditation Council for Graduate Medical Education standards for pediatric medical residents lack detailed requirement or training in DMR, possibly reflecting variability of practice between institutions.[28]

There are several limitations to this study not previously discussed. First, the pilot was only 2 weeks in duration and did not include weekends, and therefore extrapolating data to determine required resources and potential cost-avoidance can be challenging. Two weeks is a limited time frame and may not truly reflect the year-round patient census and complexity, which play a crucial role in determining resources needed and potential cost-avoidance. Additionally, this study was only completed on the general pediatric unit at a single center, and therefore applicability to other care areas or institutions may be limited. This study also lacked an internal comparator group outside of the epilepsy subgroup, and therefore the baseline medication error rate when DMR is performed by medical residents at our hospital was unknown. Also, data for medication-related problems and readmissions were collected retrospectively and would only be identified if documented in the medical record at our institution. As a result, undocumented problems and outside admissions would not be captured. Other limitations include not being able to directly quantify time saved by prescribers or positive effect on length of stay, and limited resident response to the surveys.

Conclusion

This 2-week pilot of a pharmacist-driven DMR service was successful and identified an unmet need in this pediatric patient population, as evidenced by 62.3% of patients requiring pharmacist intervention, an estimated cost-avoidance of $84,048.01, and increased medical resident satisfaction. Implementing a pharmacist discharge service requires consideration of pharmacist time and salary, which may be offset by cost-avoidance.

Article Information

Affiliations. Department of Pharmacy (JK, JLJ, JAM), Rush University Medical Center, Chicago, IL; Department of Pharmacy Practice (SH), University of Illinois at Chicago, College of Pharmacy, Chicago, IL

Correspondence. Jessica Kulawiak, PharmD; jessicakulawiak@gmail.com

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Ethical Approval and Informed Consent. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national guidelines on human experimentation and have been approved by the appropriate committees at our institution.

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