

Initiation of a discharge pharmacy within a busy urban emergency department: The first year

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Purpose: Discharge prescriptions represent an important aspect of care for patients seen in the emergency department (ED) setting and are used by providers to continue therapy for acute illness once patients leave the ED or to prevent future exacerbations of chronic conditions. The success of an ED discharge and the medications prescribed rely on patient compliance. Compliance depends on patients' ability to obtain prescriptions, which can be hindered by limited access to pharmacies and cost.

Summary: In order to address issues traditionally associated with medication noncompliance, a discharge pharmacy was implemented within a busy urban ED. The pharmacy began processing prescriptions on December 18, 2019, using a formulary aimed towards providing commonly prescribed and high-risk medications. The pharmacy accepts insurance plans in addition to utilizing 340B Drug Pricing Program pricing to offer affordable medications to patients. During the first year of operation 10,230 prescriptions were filled for 5,703 patients, representing 13% of all patients discharged during that time. Of the prescriptions filled, 35.4% were for products considered high-risk medications, including epinephrine auto-injectors, insulin, and antibiotics. Over 50% of these high-risk medications were provided to patients through reduced cash pricing. Pharmacist interventions were made on 4.3% of prescriptions to address incorrect dosing, avoid use of inappropriate antibiotics, and recommend alternative therapies.

Conclusion: The implementation of a discharge pharmacy within the ED allowed over 5,700 patients to be discharged with medications and represents a potential solution to issues surrounding medication noncompliance. Similar initiatives have the opportunity to improve medication access for a larger ED population.

Keywords: counseling, emergency medicine, medication access, medication safety, pharmacy practice advancement, pharmacy service

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Discharge medications are a frequent and important aspect of care for patients treated in the emergency department (ED). Initial treatment of acute conditions within the ED often requires prompt treatment with medications, but just as important is the continuation of therapy in the outpatient setting to prevent relapse into acute illness or future exacerbations of chronic conditions. It is the availability of medications in the outpatient setting as well as trust in patient compliance that allows patients to be discharged from the ED

rather than admitted to the hospital. Unfortunately, patient noncompliance with prescribed therapies is a frequent occurrence and has been reported in 50% to 90% of patients following ED visits.^{1,2} Patient inability or unwillingness to comply with medical therapy in chronic disease states has been shown to increase emergency visits and subsequent hospital admissions, an issue that is more pronounced when patients are nonadherent to therapies aimed at treating acute conditions and exacerbations of chronic illnesses.^{1,3}

Noncompliance is multifactorial and can be increased by patient-specific factors such as lack of trust in the healthcare system, low health literacy, conflicting medical information, fear of adverse effects, and drug interactions.¹ Patient-specific issues regarding discharge medications are ideally addressed prior to discharge in the ED, where education can be provided and medication therapy can be evaluated for appropriateness in the context of a patient's acute illness and chronic disease states. Pharmacists in the ED with expertise in acute and ongoing pharmaceutical management may be optimally positioned to preemptively address patient-specific medication concerns; however, they are often not directly involved in the selection of, or education about, discharge medications.

Medication noncompliance can also start prior to patients ever receiving their prescriptions. Inability to fill prescriptions secondary to issues with insurance and cost, as well as lack of access to pharmacies, are known barriers to complying with prescribed medical care. Issues of cost and pharmacy access disparately affect underserved and minority communities where affordable pharmacy options are more limited than for the general population.^{4,5} Dispensing prescriptions directly from the ED prior to discharge is one solution that has been evaluated as a way to improve medication access, with studies showing a reduction in ED return visits when patients were discharged with antibiotics prior to leaving the ED.^{3,6} The available data are limited to a small subset of discharge prescriptions and do not address the larger issues surrounding medication access for patients treated in the ED.

The disconnect between initial management of patients in the ED and the dispensing of prescriptions may play a key role in the high rates of noncompliance with treatment following discharge. Issues surrounding medication access would ideally be addressed prior to the patient leaving the ED, and pharmacists are uniquely able

KEY POINTS

- Medication noncompliance is an issue following emergency department (ED) discharge and can be related to multiple factors, including pharmacy access, cost, and patient health literacy.
- A discharge pharmacy operated from the ED represents one option to provide high-risk medications at low cost to improve medication access for underserved patients.
- ED pharmacists are in an optimal position to educate patients on high-risk medications, reduce errors in discharge prescriptions, and potentially reduce admissions through discharge prescription services.

to confront a number of barriers associated with patient compliance.

In consideration of those factors, an outpatient pharmacy was opened within the ED of a large urban medical center to ensure access to affordable medications. While initiatives aimed at providing patients with medications at discharge have been previously described, an outpatient pharmacy operated within an ED to provide discharge prescriptions has not been reported in the literature. The objective of this report is to review the first-year experience of this institution's ED discharge pharmacy.

Practice description

University of Chicago Medicine (UCM) is an academic medical center located in Hyde Park on Chicago's South Side, caring for an underserved population of trauma, transplant, left ventricular assist device (LVAD), and oncology patients. The adult ED at UCM has 75,000 patient visits per year, with approximately 50% of ED visits resulting in patient discharge. The patient population is 90% African

American, with over 75% of patients having government-funded insurance and greater than 10% having no insurance. Chicago's South Side is made up of a number of low-income neighborhoods with limited access to pharmacies and has been labeled a "pharmacy desert" due to a lack of pharmacies in those areas compared to other communities in Chicago.⁵ Studies specifically looking at Chicago's low-income urban communities found pharmacy accessibility on Chicago's South Side was half that of the rest of Chicago. These studies also showed that this population was travelling farther to obtain affordable medications and that distance traveled to obtain prescriptions was associated with insurance status and household income.^{4,5}

Discharge pharmacy operations

The discharge pharmacy is located within the adult ED, serving only patients seen and discharged in the ED, with no access to the general public. An outpatient pharmacy is located on the medical campus but is physically separate from the ED and does not provide delivery services to the ED. The pharmacy was developed as a cost-neutral initiative to cover expenses of added pharmacy personnel and operating, with cost calculations based on projected prescription numbers and insurance reimbursement rates. Pharmacy staffing mirrors that of the clinical coverage within the ED, with a clinical pharmacist and advanced pharmacy technician available 20 hours per day, 7 days per week. The clinical pharmacist is responsible for prescription evaluation, verification, and counseling for all prescriptions filled through the ED discharge pharmacy, in addition to acting as the primary clinical pharmacist for the department. Responsibilities outside of the discharge pharmacy include order verification; bedside response to emergencies, including trauma, strokes, intubations, and cardiac arrests; and acting as the primary preceptor for pharmacy students and residents. The pharmacy technician

performs prescription entry, insurance adjudication, and billing in addition to managing the operational needs of the retail pharmacy, including medication ordering and restocking. The pharmacy technician also collects medication histories from patients to be admitted from the ED.

The formulary was created based on historical prescribing practices at UCM, with an emphasis on high-risk medications. The formulary contains approximately 260 medications and is regularly evaluated for necessary additions and deletions. The pharmacy is contracted with the majority of pharmacy benefits managers in Illinois to process prescriptions through insurance. For patients who are under- or uninsured, nearly all of the 260 formulary medications are offered at a fixed cost of either \$5 or \$10. The pharmacy qualifies for 340B Drug Pricing Program contract pricing to allow for accessible cash pricing. Patients who are unable to afford their prescriptions are offered financial assistance through consultation with case managers and social workers to ensure patients leave with prescribed medications.

In terms of pharmacy workflow, prescriptions are primarily sent electronically to the discharge pharmacy once patient disposition is determined. All ED patients are offered discharge prescription services and are given the option of having medications filled prior to discharge, having prescriptions electronically sent to an outside pharmacy, or being sent home with a paper prescription. Prescriptions sent to the discharge pharmacy populate in the outpatient pharmacy processing software used by the institution, which is constantly monitored by the ED clinical pharmacist and pharmacy technician. The pharmacy technician performs initial review to determine availability of medications, insurance status, and ability of patients to afford medications. The pharmacist performs clinical review to determine appropriateness of medication(s) utilizing laboratory values, clinical diagnoses, and recent outpatient fill records available through

the hospital electronic medical record (EMR) in order to address potential errors, interactions, or opportunities for optimization with discharge prescriptions. Prescriptions are then filled by the pharmacy technician and verified by the pharmacist. Medications are either delivered to the patient's bedside or brought to patients in a waiting area near the pharmacy once they are discharged in order to limit delays in rooming new patients. All patients receiving prescriptions from the ED discharge pharmacy are provided medication counseling by a pharmacist prior to discharge.

Early experience with the discharge pharmacy

The discharge pharmacy began filling prescriptions on December 18, 2019. During the first year of operation, 10,230 prescriptions were filled for 5,703 unique patients representing 13% of all patients discharged from the ED during that time. Demographics of the patients receiving prescriptions from the pharmacy can be found in Table 1. In the initial 6 months, the pharmacy

averaged 430 prescriptions per month (15 prescriptions per day), while in the second 6 months that average increased to over 1,200 prescriptions per month (39 prescriptions per day). The number of prescriptions has increased as the ED discharge pharmacy has been able to expand the number of contracts with pharmacy benefits managers as well as educate patients and providers regarding this available pharmacy resource.

A breakdown of the prescriptions filled is available in Table 2. The greater part of the prescriptions were for analgesics (38.1%) and supportive care for gastrointestinal complaints (10.1%). However, 3,617 dispensed prescriptions (35.4%) were for medications classified by the authors as high-risk medications based on the likelihood of clinical decompensation, re-presentation to the ED, or a need for hospital admission in their absence. Antibiotic, anticoagulant, antiepileptic, antidiabetic, and antihypertensive agents, as well as postexposure antiviral prophylaxis (PEP), naloxone, buprenorphine/naloxone, epinephrine auto-injector pen,

Table 1. ED Discharge Pharmacy Patient Demographic Data (N = 5,703)

	Value
Age, median, y	37
Gender, %	
Male	38.2
Female	61.8
Race/ethnicity, No. (%) (n = 5,215) ^a	
Asian/midwest Indian	53 (1.0)
Black/African American	4,688 (89.9)
Hispanic or Latino	67 (1.3)
White	271 (5.2)
Multiple races/other	136 (2.6)
Financial class description, No. (%) (n = 5,262) ^a	
Medicaid	2,633 (50.0)
Medicare	832 (15.8)
Private insurance	1,187 (22.6)
Self-pay	610 (11.6)

^aData based on available records. Information not available for some patients.

Table 2. Breakdown of Prescriptions Filled by Medication Category

Medication category	Covered by insurance, No. (%)	Cash price, No. (%)	Unknown payment, No. (%)	Total, No. (%)
Allergy/antitussive/decongestant	187 (42.2)	256 (57.8)	0 (0)	443 (4.3)
Analgesia	1,590 (40.8)	2,297 (59)	6 (0.2)	3,893 (38.1)
Anticoagulation ^a	67 (66.3) [*]	33 (32.7)	1 (1)	101 (1.0)
Antidiabetics (oral/insulin)	43 (24.4)	130 (73.9)	3 (1.7)	176 (1.7)
Antiepileptic	26 (31.7)	56 (68.3)	0 (0)	82 (0.8)
Antimicrobial				
Antibiotic	989 (45.4)	1,183 (54.4)	4 (0.2)	2,173 (21.2)
Antiviral (excluding HIV PEP)	33 (37.1)	52 (58.4)	4 (4.5)	89 (0.9)
Antifungal	17 (34)	33 (66)	0 (0)	50 (0.5)
Antiplatelet	9 (28.1)	22 (68.8)	1 (3.1)	32 (0.3)
Asthma/COPD	167 (36.8)	285 (62.8)	2 (0.4)	454 (4.4)
Cardiac ^b	160 (45.2)	187 (52.8)	7 (2)	354 (3.5)
Electrolyte/vitamin/supplement	20 (50)	20 (50)	0 (0)	40 (0.4)
Gastrointestinal	444 (42.9)	592 (57.1)	0 (0)	1,036 (10.1)
Genitourinary	23 (54.8)	19 (45.2)	0 (0)	42 (0.4)
HIV PEP ^c	NA	NA	NA	73 (0.7)
Ophthalmic	91 (37.4)	152 (62.6)	0 (0)	243 (2.4)
Other	85 (37.6)	141 (62.4)	0 (0)	226 (2.2)
Otic	3 (37.5)	5 (62.5)	0 (0)	8 (0.1)
Psychiatric	15 (45.5)	18 (54.5)	0 (0)	33 (0.3)
Steroid	307 (50.6)	298 (49.1)	2 (0.3)	607 (5.9)
Substance use disorder	54 (72)	21 (28)	0 (0)	75 (0.7)
Total	4,327 (42.3)	5,800 (56.7)	30 (0.3)	10,230 (100)

Abbreviations: COPD, chronic obstructive pulmonary disease; NA, not applicable; PEP, postexposure prophylaxis.

^aTotal number of rivaroxaban and apixaban prescriptions in insurance column includes those covered by patients' prescription insurance and those covered by a voucher or manufacturer coupon for a free 1-month supply.

^bCardiac medications included antihypertensives, statins, and diuretics.

^cHIV PEP medications were all provided to patients with no out-of-pocket cost via either insurance coverage or a Medicaid voucher. Cost breakdowns for these medication are not included in this data as they did not fall under the usual billing processes.

and medications for control of asthma or chronic obstructive pulmonary disease were included in this list.

Of the prescriptions filled, 4,293 (42.0%) were billed through the patient's prescription insurance, 5,800 (56.7%) were filled using our reduced cash pricing, 34 (0.3%) were filled using manufacturer coupons, 73 (0.7%) were PEP medications billed through either insurance or a Medicaid voucher with zero out-of-pocket cost to the patient, and 30 (0.3%) had missing payment information. Greater than half of all high-risk

medications (54.9%) were dispensed using reduced cash pricing.

Patients who required anticoagulation prior to discharge represented a specific high-risk group targeted by this initiative, as this population has traditionally been admitted for medication initiation and patient education. During the first year, 101 patients were discharged on anticoagulants through insurance, reduced cash, or manufacturer coupon pricing. In addition to ensuring affordability and appropriate dosing, pharmacists were involved before discharge,

working closely with the medical team and patient to determine the optimal anticoagulant, and post discharge, providing medication counseling.

Over the course of the program's first year in operation, pharmacists made 436 interventions on discharge prescriptions (4.3% of all prescriptions) (Table 3). The majority of interventions made by pharmacists included optimizing antibiotic use (antibiotic selection, duration, removing unnecessary antibiotics) (35.1%), correction of inappropriate dose/frequency of discharge prescriptions (30.5%), new

Table 3. Pharmacist Interventions on Discharge Prescriptions

Intervention type/focus	No. (%) of interventions (n = 436)
Antimicrobial stewardship (agent/duration of therapy optimization)	153 (35.1)
Adverse drug event prevention (wrong dose/rate/frequency)	138 (30.5)
New therapy recommendation	49 (11.2)
Clarify order (indication, dosing, appropriateness)	47 (10.8)
Formulary substitution	16 (3.7)
Medication teaching (extensive counseling for high-risk medication)	10 (2.3)
Wrong medication ordered, medication ordered for wrong patient, inappropriate therapy discontinued	9 (2.1)
Other	14 (1.6)

therapy recommendation (11.2%), and identification of an incorrect medication order (2.1%). Data were captured based on input of documented interventions into the EMR by pharmacists and likely underrepresent the true number of interventions made on discharge prescriptions.

Discussion

Lack of access to medications has been identified as a major contributor to noncompliance in patients discharged from the ED. Previous studies have associated cost, transportation, and pharmacy wait times as barriers to filling discharge prescriptions.^{2,7,8} Many patients treated at UCM are under- or uninsured, which is compounded by a lack of affordable pharmacy options on the South Side of Chicago compared to surrounding neighborhoods. This lack of access to pharmacies has led some to label this community as a pharmacy desert.^{4,5} Through the implementation of an on-site discharge pharmacy patients were provided with an accessible and affordable option for filling discharge prescriptions, affording ED pharmacists the opportunity to optimize therapy and reduce prescribing errors prior to patients leaving the department. The approved formulary focuses on high-risk medications and qualifies for 340B pricing, which ensures patients leave the ED with

medications in hand while limiting the financial impact to patients and the hospital. In the first year, 56.7% of all prescriptions and 54.9% of high-risk medications were dispensed to patients at a discounted cash price and may have otherwise been unaffordable and inaccessible for these patients.

In addition to increasing this population's access to medications, the inclusion of a pharmacist into the discharge medication process can provide more comprehensive medication education to patients in an attempt to improve likelihood of compliance. Previous literature has looked closely at the impact pharmacist education can have on a subset of patients being discharged from the ED on anticoagulation. Zydb et al⁹ demonstrated that, compared to no discharge counseling, patients who had received anticoagulant discharge counseling from an ED pharmacist were significantly less likely to have an admission or ED return visit within 90 days (1.85% vs 12.12%, $P = 0.0069$) or require intervention related to administration, adherence, or drug interaction (12.9% vs 36.4%, $P = 0.0005$). Increased compliance was not specifically evaluated during the first year of operation; however, the discharge pharmacy enabled pharmacists to provide discharge counseling on all prescriptions filled, including comprehensive teaching on

high-risk medications such as anti-coagulants, insulin, inhalers, and epinephrine auto-injectors.

In addition to addressing patient-specific barriers, the implementation of the ED discharge pharmacy gave pharmacists the opportunity to play a larger role in the review of discharge prescriptions. A number of studies have evaluated the impact of pharmacists on preventing prescribing errors and optimizing medication therapy from the ED. Cesarz et al¹⁰ prospectively reviewed discharge prescriptions and found an intervention rate of 10%, including error prevention and medication optimization. Anzan et al¹¹ identified errors in 13.5% of prescriptions reviewed, with wrong dose, wrong frequency, and wrong strength being the most common errors. Most recently, a pilot project conducted over a 12-week period in the ED of a large academic medical center identified medication-related problems in 41% of discharge prescriptions, with pharmacists intervening on 18.5% of prescriptions.¹² In the first year of operation, 436 prescriptions were intervened on, for an intervention rate of 4.3%, although this figure likely underrepresents the true number of interventions made during that time period and, based on previous literature, just a fraction of interventions that could be made on discharge prescriptions. Preventing errors is particularly important for patients leaving the ED, given that contacting ED physicians from community pharmacies can be difficult, leading to delays in patients starting therapy, or even obtaining prescribed medications at all, if the provider is unable to be reached and the error resolved.

Challenges

While the potential benefits of operating an outpatient pharmacy within an ED are described above, there are a number of challenges to implementing and offering this service in other hospitals that are worth mentioning. ED providers balance the care of medical emergencies with the disposition of patients

back into the community, and ED pharmacists are no different. The addition of this service would ideally be done in conjunction with increased pharmacist resources. Despite the use of pharmacy technicians to assist with operational functions and prescription filling, discharge pharmacy services represented a substantial time commitment for ED pharmacists and created competing priorities between critical ED patients and patients waiting for prescriptions. Separate pharmacists dedicated to each of the discharge and acute care service lines would ideally be in place to optimize and expand the services provided to both populations while avoiding delays in care for each.

In conjunction with the need for increased resources comes the initial cost and time necessary to establish the discharge pharmacy. Costs associated with purchasing medication inventory, purchasing software necessary to process prescriptions, and hiring additional staff represent a substantial investment and may be prohibitive for institutions. Large medical centers with associated outpatient pharmacies outside of the ED may be better positioned to establish similar services or expand current operations to include the ED population.

Being able to provide patients with prescriptions upon discharge from the ED represents a significant opportunity to address medication access in the targeted community; however, providing medications outside of a patient's usual pharmacy may create challenges in evaluating appropriateness of newly prescribed medications. Consistency in the use of a particular pharmacy is recommended to allow pharmacists to have a complete medication list with which to determine significant drug interactions and therapeutic duplications. Pharmacists at UCM have access to recent fill records and past medication histories as well as laboratory values through the EMR, yet during the pilot project there were likely instances where ED pharmacists did not have access to a complete

medication history and were unable to fully evaluate drug interactions. Ideally each patient would have a complete medication history prior to leaving the ED, although that is not feasible with our current workflow.

Next steps

Implementation of this pilot project and the ability to dispense over 10,000 prescriptions in the first year demonstrate that discharge medication dispensing can be done successfully in the ED if appropriate resources are provided. Since the discharge pharmacy was implemented, potential areas for growth and expansion have been identified.

Currently this service is limited to the adult patient population, as pediatric patients are cared for in a physically separate ED on the medical campus. The pediatric population is at a high risk for noncompliance, medication access issues, and prescribing errors.^{10,11} Expanding the service to include pediatric patients will help to improve access and reduce errors for an especially vulnerable population.

In addition to reaching a larger population through discharge pharmacy operations, expansion of discharge pharmacy services would allow for more comprehensive medication education to be provided without a separate medical encounter. Currently pharmacists counsel on all prescriptions; however, acute exacerbations of chronic disease states such as diabetes and asthma represent an opportunity to sit down with patients to help them better understand their disease states, address individual barriers, and equip patients with the medication and hands-on education necessary to properly use medications as they transition out of the ED.

Finally, the addition of increased resources and expanded services could be directed towards more comprehensive discharge prescription review. Prescribing errors are commonplace and likely underrepresented in the literature as well as in the interventions

reported here. Consistent pharmacist evaluation of discharge prescriptions, similar to the evaluation of inpatient orders, would not only limit prescribing errors but create opportunities to optimize discharge medication therapy, most importantly by ensuring appropriate scope and duration of antibiotics.¹⁰⁻¹³

Conclusion

Providing prescriptions to patients leaving a large urban ED through the implementation of an ED-specific discharge pharmacy can help increase patient access to medications and address prescribing errors. There are opportunities for similar programs to be established at other institutions.

Disclosures

The authors have declared no potential conflicts of interest.

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