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Evaluating the impact of a discharge pharmacy in the emergency department on emergency department revisits and admissions

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ABSTRACT

Importance: Medication nonadherence leads to worse health outcomes, increased healthcare service utilization, and increased overall healthcare costs.
Objective: To determine whether a discharge pharmacy located in the Emergency Department (ED) reduces ED revisits and hospitalizations.
Design: This is a cohort study where we extracted data from our electronic medical records with adult encounters between 12/2019–10/2021. For the purpose of this study, we defined a revisit to the ED as within 7 days and an admission within 30 days from prior initial ED visit.
Setting: The University of Chicago Medicine is an academic medical center located in Chicago's South Side.
Participants: Between dates of 12/2019–11/2021, we had 78,660 adult distinct encounters. We created 5 different groups: no medications prescribed, ED discharge pharmacy only, e-prescriptions to outside pharmacies, combination of ED pharmacy and e-prescription sent elsewhere, and printed prescriptions with or without any e-prescriptions.
Exposure: Our ED pharmacy is located within the adult ED, serving only patients seen and discharged from the adult ED.
Main Outcome(s) and Measure(s): Our primary endpoint is to evaluate if prescribing and dispensing prescriptions from only our ED pharmacy is associated with decreased ED revisits within 7 days and reduced hospitalizations within 30 days of initial ED visit.
Results: When comparing patients who received prescriptions only from the ED discharge pharmacy, patients who received no prescriptions were 31.6% ($P < 0.001$) more likely to revisit our ED, and patients who received e-prescriptions sent to other pharmacies were 10.4% ($P = 0.017$) more likely to revisit. Patients who received e-prescriptions from other pharmacies were 29.2% ($P < 0.001$) more likely to be hospitalized and mixture of e-prescriptions were 59.5% ($P < 0.001$) more likely to be hospitalized compared to the ED pharmacy only group.
Conclusions and Relevance: We believe having a pharmacy providing medications to patients being discharged from the ED reduces barriers like cost, transportation, and pharmacy access patients face trying to fill prescriptions at their local pharmacy. All of these reductions in barriers provides an easier and more convenient method for patients to obtain their medications at discharge from the ED, reducing the risk of a repeat ED visit and subsequent hospital admission.

1. Introduction

In 2018, there were 130 million Emergency Department (ED) visits in the United States (US), with 16.2 million (12.4%) resulting in hospital admissions [1]. Discharge medications are an important aspect of patient care because it is a continuation of therapy for a patient's acute

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or chronic reason for their ED visit. Outpatient treatment by ED discharge medications is dependent on the patient's ability to fill medications prescribed and their compliance with the treatment. A revisit to the ED or a hospital admission could be a consequence of nonadherence to the medication discharge plan from an initial ED visit, leading to potential harm and additional cost to the hospital.

The behavior process of taking medications is complex, leading to a nonadherence rate around 50% [2]. Many factors including cost, transportation, pharmacy access, distrust in the healthcare system, low health literacy, patient-provider relationship, understanding the importance of their medications, and intentional choice can lead to the failure of patients taking their medications as prescribed. Medication nonadherence leads to worse health outcomes, increased healthcare service utilization, and increased overall healthcare costs. It also increases ED revisits and subsequent hospital admissions [3-9]. Annually in the US, studies have shown that 20–30% of prescriptions are never filled, contributing to approximately 125,000 deaths, at least 10% of hospitalizations, and estimated cost between $100–289 billion [10]. Studies have shown that 20% of patients do not fill their medications prescribed to them when they are discharged from the ED. Cost and transportation to the pharmacy are major barriers cited by patients on why they did not fill their prescriptions [11,12]. When a patient doesn't take their prescribed medications after discharge, they can exacerbate their medical issues, increase their risk of disease progression, and ultimately it may lead to a return visit to the ED with a possible admission to the hospital. Improving adherence to improve clinical outcomes and reduce cost becomes an important topic for study.

One solution that has improved rates of medication adherence is electronic prescribing (e-prescribing). A study conducted by Surescripts found that e-prescribing, compared to providing paper prescriptions, increased patients picking up their new prescriptions from the pharmacy by 10%. Without e-prescribing, only 73% of paper prescriptions made it to the pharmacy, with an even smaller percentage of prescriptions actually dispensed to patients. This study also showed that higher co-pays were correlated with patients not picking up their medications. They estimated that utilizing e-prescribing would save at least $140–$240 billion to the healthcare system over the following decade [13]. In the US, e-prescribing has become widely adopted with 84% prescribers utilizing e-prescribing [14].

Another contributor to nonadherence can be lack of access to pharmacies, making it more difficult for patients to obtain their prescribed medications. In urban cities, pharmacy access disproportionately affects underserved and minority communities with fewer pharmacies located in Black and Hispanic/Latino neighborhoods than White or diverse neighborhoods. These disparities were most pronounced in Chicago along with Los Angeles, Baltimore, Philadelphia, Milwaukee, Dallas, Boston, and Albuquerque [15]. Chicago's South Side consists of a number of low-income neighborhoods and has been labeled a “pharmacy desert” because of lack of pharmacies. 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 [16,17]. Pharmacies in Black and Hispanic/Latino neighborhoods were less likely to offer drive-through windows or 24-h services and were more likely to permanently close than pharmacies in other neighborhoods [18]. With closures and decreased services available at remaining pharmacies, there has been an associated decline in adherence to prescribed medications [19].

Operating a pharmacy within the ED that can dispense medications at discharge has the potential to mitigate some of the issues of nonadherence for patients discharged from the ED. A study by Hayes et al. assessed whether providing medications to patients upon discharge from the ED would result in a reduction in return rates. The study was carried out at an urban, academic medical center and involved adults who had been discharged with certain infections. The study showed that 243 patients provided with a complete course of antibiotics at discharge from the ED were less likely to return to the ED within seven days compared to 4014 patients provided with a prescription at discharge (2.5% vs 5.9%; $p = 0.26$) [20]. The study demonstrated about a 50% reduction in ED return visits for patients who were given a free, complete course of antibiotics at discharge from the ED.

A study by Blome and et al. conducted a study to evaluate the cost-effectiveness of dispensing medications to patients in their urban, academic affiliated ED as a strategy to reduce ED visits and hospital admissions for skin and soft tissue infections. A full course of treatment was dispensed at no cost to the patient. Following the implementation of this medication dispensing program, the 7-day return rate decreased from 9.1% to 8.0%, and the admission rate dropped from 2.8% to 1.7%. For the same condition within 8–30 days, the return rate decreased from 2.1% to 0.8%, and the admission rate reduced from 1.0% to 0%. The total cost of the dispensed medications was $4050, while the estimated total cost savings amounted to $95,477. This study demonstrated that providing free, dispensed antibiotics for skin and soft tissue infections not only reduced return ED visits and admissions but also resulted in significant cost savings for the hospital [21].

Another study evaluated 74 patients who were candidates for outpatient therapy with macrolide antibiotics that were randomized to receive an entire course of azithromycin from the ED or a prescription for azithromycin to be filled at local pharmacy free of charge. Despite removing any financial barrier for patients, it showed that significantly fewer patients (74%) filled their prescriptions compared to the ED dispensed group where 100% received their medications. There was no difference in self-reported compliance and return ED visits or admissions [22].

Lastly, a study by Sarangarm et al., evaluated giving patients take home medications (THM) versus paper prescriptions on twenty medication options on discharge from the ED. The ED providers had the discretion to whom they provided the THM to. The study examined the 30-day ED return rate at an urban, university-affiliated, level I trauma center. Of the 711 patients (268 received THM and 443 received paper prescriptions), the THM group were 70% more likely to return to the ED [23].

Previous literature focused primarily on antibiotics, except for Sarangarm's study that had 20 THM which half of them were antibiotics. Notably, their central pharmacies facilitated the preparation of THM or “To-Go” medications with preset quantities and doses. Our initiative aimed to provide a more comprehensive pharmacy service for our patients and community by removing the barriers related to cost and access to pharmacies. As part of this effort, a dedicated outpatient pharmacy exclusively for ED patients was established at The University of Chicago Medicine within the ED of a large urban medical center located in Chicago's South Side. The pharmacy was developed as a cost-neutral initiative to cover the pharmacy personnel and operating expenses. The pharmacy is open 20 h a day (0800 to 0400) 7-days a week to maximize availability to patients at discharge. A formulary of approximately 300 medications was created based on historical prescribing practices, with an emphasis on “high-risk” medications such as antimicrobials, blood pressure medications, inhalers, diabetic medications, anticonvulsants, and anticoagulants. For patients who are underinsured or uninsured, nearly all of the medications are offered at a fixed cost of either $5 or $10 and those who are unable to afford their prescriptions are offered financial assistance to ensure patients leave with their prescribed medications.

While previous research primarily focused on dispensing antibiotics at discharge, there are no studies evaluating the ED return rates or admissions of a fully operational pharmacy dispensing various medication types located in the ED. The establishment of a standalone ED discharge pharmacy, exclusively dedicated to dispensing medications for discharged ED patients, remains unexplored in existing literature. This innovative approach not only permits a broader formulary of medications compared to prepackaged THM but also provides flexibility in adjusting quantity, dosage, and accommodating liver and renal function. Therefore, this study seeks to evaluate the clinical impact by

reporting ED revisits and hospital admissions for those who obtain medications from our ED discharge pharmacy versus other prescribing methods.

2. Methods

We received institutional IRB approval and extracted data from our electronic medical records (EMR) with adult ED encounters between 12/2019–10/2021. We only excluded patients under 18 years of age from our data extraction. We have one ED at our medical center. For the purpose of this study, we defined a revisit to the ED as within seven days and an admission within 30 days from prior initial ED visit. If a patient returns to the Emergency Department (ED) within 7 days, even for a different complaint, the subsequent visit will be considered an ED revisit and will be designated as the new index visit. This resets both the 7-day return period for ED visits and the 30-day admission timeframe. We created five different groups for analysis: no medications prescribed, prescriptions filled by the ED discharge pharmacy only, e-prescriptions transmitted to outside pharmacies, combination of e-prescriptions dispensed from our ED pharmacy and another pharmacy, and printed prescriptions with or without any e-prescriptions. When patients were ready to be discharged from the ED and needed a prescription, providers inquired about their preferred method and pharmacy for their prescriptions, including the choice of using the ED pharmacy. If the ED pharmacy option was selected, it was processed in a similar manner as the other options with the only difference being the pharmacy designation changed to "UCM ED Pharmacy" in our EMR. While analyzing the data, we excluded patients who had >24 ED visits per year to prevent skewing of the no prescription group by increasing the number of ED revisits and decreasing hospital admission rates. These pre-identified high-utilizer patients commonly came to the ED for non-medical related issues and rarely had medications prescribed or were admitted to the hospital.

2.1. Outcomes

Our primary endpoints are ED revisits within 7-days and hospitalizations within 30-days of the initial ED visit between the five different groups.

2.2. Statistical analysis

Basic descriptive statistics were reviewed for all variables for the overall sample as well as for patient subgroups with different prescription types. In comparing patients with different prescription types, chi-square test was used for binary or categorical variables and ANOVA test for continuous variables (Table 1). Multivariable logistic regression analyses were performed on the analytical sample. The analyses assessed the association between an ED revisit within seven days after ED discharge and prescription type (main term), controlling for patient age, gender, race, ethnicity, insurance, Charlson Comorbidity Index (CCI) score, and the number of prescribed medications during an encounter. Separate analyses assessed the association between a readmission within thirty days after ED discharge and prescription type, controlling for the same set of covariates used in previous analyses. A 2-sided $P < 0.05$ was considered to be statistically significant. All statistical analyses were performed in Stata software, version 16 (College Station, Texas, USA).

3. Results

In Table 1, there are statistically differences in age, gender, race, ethnicity, payer, CCI, and the number of prescribed medications during an encounter by prescription groups. As mentioned above, we used multivariable regression to account for the differences between the groups. Between the dates of 12/2019–11/2021 and removing patients with 24 or more encounters (2399 encounters), we had 78,660 distinct

Table 1
Baseline Characteristics of 5 Groups and Primary Outcomes.

	No Prescriptions	ED Discharge Pharmacy *E*-Prescriptions	E-Prescriptions to Other Pharmacies	Mix of E-Prescriptions from ED and Other Pharmacies	Printed Prescriptions with/without E-Prescriptions	Total	*P*-value
Number of Encounters	35,362	25,638	14,898	2358	404	78,660	
Age							<0.001
18–25	3489 (9.9%)	4529 (17.7%)	2281 (15.3%)	372 (15.8%)	68 (16.8%)	10,739 (13.7%)	
25–45	11,281 (31.9%)	11,371 (44.4%)	6022 (40.4%)	916 (38.8%)	149 (36.9%)	29,739 (37.8%)	
45–65	11,306 (32.0%)	6852 (26.7%)	4339 (29.1%)	702 (29.8%)	113 (28.0%)	23,312 (29.6%)	
>65	9286 (26.3%)	2886 (11.3%)	2256 (15.1%)	368 (15.6%)	74 (18.3%)	14,870 (18.9%)	
Gender							<0.001
Female	20,647 (58.4%)	14,900 (58.1%)	9925 (66.6%)	1497 (63.5%)	260 (64.4%)	47,229 (60.0%)	
Male	14,715 (41.6%)	10,738 (41.9%)	4973 (33.4%)	861 (36.5%)	144 (35.6%)	31,431 (40.0%)	
Race							<0.001
Black	32,870 (93.0%)	23,189 (90.4%)	13,311 (89.3%)	2123 (90.0%)	376 (93.1%)	71,869 (91.4%)	
White	1593 (4.5%)	1406 (5.5%)	1009 (6.8%)	156 (6.6%)	22 (5.4%)	4186 (5.3%)	
Other	899 (2.5%)	1043 (4.1%)	578 (3.9%)	79 (3.4%)	6 (1.5%)	2605 (3.3%)	
Hispanic or Latino	777 (2%)	910 (4%)	492 (3%)	74 (3%)	10 (2%)	2263 (3%)	<0.001
Payer							<0.001
Medicaid	16,992 (48%)	13,671 (53%)	7332 (49%)	1204 (51%)	217 (54%)	39,416 (50%)	
Medicare	11,317 (32%)	3422 (13%)	2914 (20%)	454 (19%)	72 (18%)	18,179 (23%)	
Medicare-Medicaid	1324 (4%)	501 (2%)	342 (2%)	70 (3%)	9 (2%)	2246 (3%)	
None	1239 (4%)	2757 (11%)	761 (5%)	155 (7%)	30 (7%)	4942 (6%)	
Other (Workers comp, international)	92 (0%)	190 (1%)	49 (0%)	14 (1%)	0 (0%)	345 (0%)	
Private	4398 (12%)	5097 (20%)	3500 (23%)	461 (20%)	76 (19%)	13,532 (17%)	
Charlson Comorbidity Index							<0.001
0	23,154 (65%)	23,322 (91%)	12,282 (82%)	1974 (84%)	372 (92%)	61,104 (78%)	
1–2	9006 (25%)	2063 (8%)	2240 (15%)	328 (14%)	31 (8%)	13,668 (17%)	
3+	3202 (9%)	253 (1%)	376 (3%)	56 (2%)	1 (0%)	3888 (5%)	
Average Prescriptions on each encounter	0.0	2.3	2.4	4.5	3.4	1.4	<0.001
ED Revisit in 7 days	3296 (9.3%)	1645 (6.4%)	1038 (7.0%)	152 (6.5%)	32 (7.9%)	6163 (7.8%)	<0.001
Admission in 30 days	885 (3%)	575 (2%)	522 (4%)	95 (4%)	7 (2%)	2084 (3%)	<0.001

Table 2
Multivariable Logistics Regression Analyses (patient age, gender, race, ethnicity, insurance, Charlson Comorbidity Index score, and number of prescribed medications) Comparison to ED Discharge Pharmacy.

		# Distinct Encounters	Odds Ratio	*P*-value	95% Confidence Interval
ED Revisit in 7 days	No Prescriptions	3296 (9.3%)	1.316	<0.001	1.214–1.427
	ED Discharge Pharmacy E-Prescriptions	1645 (6.4%)	x	x	x
	E-Prescriptions to Other Pharmacies	1038 (7.0%)	1.104	0.017	1.018–1.197
	Mix of E-Prescriptions from ED and Other Pharmacies	152 (6.5%)	1.044	0.636	0.874–1.247
	Printed Prescriptions with/without E-Prescriptions	32 (7.9%)	1.290	0.172	0.895–1.860
Admissions in 30 days	No Prescriptions	885 (3%)	0.563	<0.001	0.492–0.645
	ED Discharge Pharmacy E-Prescriptions	575 (2%)	x	x	x
	E-Prescriptions to Other Pharmacy	522 (4%)	1.292	<0.001	1.143–1.461
	Mix of E-Prescriptions from ED and Other Pharmacies	95 (4%)	1.595	<0.001	1.263–2.013
	Printed Prescriptions with/without E-Prescriptions	7 (2%)	0.744	0.444	0.349–1.586

encounters. There were 6163 revisits (7.8%) to our ED within seven days and 2084 (3%) hospital admissions within 30 days of initial ED discharge (Table 1).

When comparing patients who received prescriptions only from the ED discharge pharmacy, patients who received no prescriptions were 31.6% ($P < 0.001$) more likely to revisit our ED within seven days, and patients who received e-prescriptions sent to other pharmacies were 10.4% ($P = 0.017$) more likely to revisit our ED. There was no significant difference in revisits to the ED with groups of mixture of e-prescriptions ($P = 0.636$) and printed prescriptions ($P = 0.172$) with or without any e- prescriptions compared to the ED discharge pharmacy group (Table 2).

The other endpoint evaluated if the groups were associated with hospitalizations within 30 days of the initial ED visit. When compared to patients who received prescriptions only from the ED discharge pharmacy, patients who had medications e-prescribed to alternative pharmacies (29.2%; $P < 0.01$) or a combination of e-prescriptions sent to the ED discharge pharmacy and an alternative pharmacy were more likely to be hospitalized (59.5%; $P < 0.01$) within 30 days of their ED visit. We found no significant difference in the no prescriptions and printed prescriptions group (Table 2).

4. Discussion

Having a discharge pharmacy located in the ED reduced the risk of ED revisits and hospital admissions compared to transmitting it to other pharmacies through the same method of e-prescribing.

When evaluating patients who returned to our ED within seven days of their initial ED visit, we found no significant difference in the group of mixture of e-prescriptions compared to only sending the prescriptions only to the ED pharmacy. One potential explanation for the absence of difference may be attributed to the ED pharmacy dispensing high-risk medications that the patients needed for their primary complaint, resulting in other medications being sent to another pharmacy which may have been non-formulary or unrelated to their presenting complaint. We still categorize this scenario as a mixture of e-prescribing. The no prescription group had higher risk of revisiting the ED but lower risk for hospital admission. A possible explanation, is that those frequently seeking ED care may have mild presentations exacerbated by lack of access to healthcare or they may be presenting for non-medical issues such as seeking shelter and food. The no prescription group had a lower risk of subsequent hospitalizations potentially due to fewer acute medical issues requiring admission compared to the other groups. Lastly, the printed prescription group in both the ED revisits' and admissions' analysis showed no significant difference likely because there were so few printed prescriptions (0.5% of evaluated ED visits) due to the widespread adoption of e-prescribing. We attribute these results to enhanced medication access by addressing barriers related to non-adherence, including challenges in pharmacy access, transportation, time constraints, costs, the patient-provider relationship, and fostering a better understanding of the importance of prescribed medications.

One of the benefits of the ED pharmacy for patients is not needing to determine if their pharmacy is open or finding an alternative pharmacy if the medication is out of stock. Also, patients do not need to worry about transportation to and from the pharmacy to obtain their medications. This is an important aspect for our patient population with more transit issues due to fewer public transit options compared to other parts of the city and they may lack access to vehicles [24]. Patients benefit from the convenience of accessing the pharmacy within the same ED where they received care. This arrangement eliminates barriers related to pharmacy access and transportation.

Another benefit of the ED pharmacy is how any clinical questions or issues regarding the prescription can be clarified in real time before the patient is discharged from the ED, ensuring access to medications is not delayed and they are dispensed appropriately. A technician or pharmacist in the ED pharmacy can easily reach providers by telephone or in-person, unlike the process of a community pharmacy that has to call and wait for physician availability, which can lead to delays in prescription dispensing. In one study that evaluated phone calls, 1278 documented calls to the ED for prescription clarification were classified as clarification of directions for use (611, 47.7%), insurance or affordability issues (182, 14.2%), dose (172, 13.4%), medication availability (126, 9.8%), lost or missing prescription (93, 7.3%), patient allergy or adverse event (62, 4.8%), duplication in therapy (17, 1.3%), and clarification of medication ordered (17, 1.3%). When grouped into provider, system, or patient-related issues, provider issues were noted to be most frequent clarifications (862 clarifications, 67.3%) [25]. Unfortunately, there are many barriers causing the delay of communications between community pharmacies and ED providers: busy pharmacy staff where they are unable to take necessary time to call ED, the method of reaching out to prescriber through the phone versus awaiting for a return page, busy ED staff where they are unable to answer or respond back, and difficulty connecting with the prescriber due to shift schedules. Given that contacting ED physicians by community pharmacies can be difficult, starting their prescribed therapy may be delayed and even not started. This could lead to a deterioration in the patient's condition, potentially requiring a return to the ED and, in certain instances, admission for additional treatment.

Another important barrier to medication adherence is the affordability of medications. Our ED pharmacy can provide affordable or even free medications through the hospital to patients to ensure adherence and remove cost as a factor to nonadherence. For uninsured and underinsured patients, the pharmacist can coordinate financial assistance in real-time with ED social workers and case management, avoiding delays in initiating therapy. Of the prescriptions filled during the first year of ED pharmacy operation, 4293 (42.0%) were billed through the patient's prescription insurance and 5800 (56.7%) were filled using our reduced cash pricing, which may have otherwise been unaffordable and inaccessible for these patients at outside pharmacies.

Lastly, the ED pharmacists also perform clinical duties such as interventions on errors, optimization of medication therapy, and expert education to patients. In one study, ED pharmacists evaluated 674 discharge prescriptions and intervened on 68 prescriptions, resulting in an intervention rate of 10.1% [26]. Another study, evaluated 3136 ED prescriptions where pharmacist identified an 3.2% error rate [27]. In our prior study, pharmacists made 436 interventions (4.3%) on discharge prescriptions over the course of the program's first year in operation, with the highest proportion of these related to antimicrobial stewardship (agent selection/duration of therapy optimization) [28]. Pharmacists' interventions optimized patient therapies, and their educational and counseling efforts have the potential to address non-adherence barriers of low health literacy, patient-provider relationship, and understanding the importance of their medications,

In the previous highlighted studies about discharge ED medications, all medications were prepacked by the central pharmacy rather than by a standalone pharmacy and the majority of these studies focused solely on antibiotics. The centralized prepackaging limited the formulary and the variety of available medications. There is one previously mentioned study similar to ours, by Sarangarm et al., which evaluated giving patients take home medications (THM) versus paper prescriptions on discharge from the ED. This group found the opposite result from our study and their own hypothesis as well. The authors noted patients often returned for a problem unrelated to initial complaints resulting in the opposite effect than they hypothesized. The authors suspected the increased likelihood of patients utilizing the ED for their source of care instead of non-ED outpatient clinic settings could be due to increased satisfaction with the convenience of THM combined with their medical care [23]. Also, another explanation is that providers could be preferentially providing THM to patients with fewer resources and that group is a selective population that may use the ED more. Their formulary consisted of 20 medications compared to our ED pharmacy's formulary that consist of 300 medications, which leads to larger application of use and diseases that could be treated.

Our study has several limitations. Since this was a retrospective analysis of charts, we could not track if patients received care at other EDs or were admitted to other hospitals. The patients could have revisited another ED or hospital and we would not have accounted for it, but this would apply across all the different groups. We also did not examine if the initial ED complaints were related to subsequent ED revisits or hospitalizations to assess for exacerbation or non-resolution of the initial complaint. Another limitation of our study was it was conducted at a single ED in a lower socioeconomic area so it may not be fully applicable to other more resourced areas. Further studies would help determine applicability including other EDs in Chicago and surrounding areas. Since this was an observational study, our results reflect association. A prospective randomized controlled trial could be a better of method of study, however, it is not possible or ethical to take away this resource after introducing it to the patients and community.

We believe having a pharmacy within the ED to provide medications at time of discharge reduces barriers such as cost, transportation, and pharmacy access for patients compared to trying to fill prescriptions at their community pharmacy. This is similar from previous literature, which highlights that significant barriers to non-adherence included cost and access to pharmacies [11,20,21]. Through the implementation of an on-site discharge pharmacy, patients were provided with an accessible and affordable option for filling discharge prescriptions directly in the ED. 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 adherence. Dispensed medications from our ED pharmacy serve as an important bridge to overcoming barriers to patient adherence to treatment regimens. All of these reductions in barriers provides an easier and more convenient method for patients to obtain their medications at discharge from the ED, reducing the risk of a repeat ED visit and subsequent hospital admission.

CRediT authorship contribution statement

Thomas Spiegel: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Hui Zhang:** Writing – review & editing, Formal analysis, Data curation, Conceptualization. **Laura Celmins:** Writing – review & editing, Conceptualization. **Daniel Bickley:** Writing – review & editing, Conceptualization. **Denise Scarpelli:** Writing – review & editing, Conceptualization.

Declaration of competing interest

All authors declare no declarations of interest.

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