Pharmacist Assistance for Virtualized Emergency Room Follow Up (PAVER)

By

Eric John Wucki, PharmD, MBA

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Chair of Committee: David Wallace Pharm.D., R.Ph.

Committee Member: Shane Tolleson Pharm.D.

Committee Member: Monica Green Pharm.D., MBA, BCPS, BCACP, CDE

Committee Member: Chase Waxler Pharm.D., BCPS

University of Houston
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Abstract

Purpose: Patients returning to the emergency room within 30 days of a previous visit pose a transitions of care issue for hospitals; with a reported 19.9% of initial ER visits resulting in a revisit. The cost of a revisit has been reported to be 118% the cost of the initial visit and 26% of ED revisits result in a hospital admission. Patients who utilize the ER for primary care services due to being under resourced have been identified by AHRQ as having multiple risk factors that place them at risk for ER revisit. Memorial Hermann Southwest serves a large indigent patient population and has recently added a part time pharmacist position to assist with preventing ER revisits. Previous literature has demonstrated that pharmacist ER discharge phone calls are able to reduce 30-day ER patient revisits; however, a more efficient method to prioritize patients to call is desired. The use of an electronic survey application known as Vivify has been identified as a potential way to help the pharmacist prioritize which patients they contact. The primary purpose of this study will be to assess the overall impact on 30-day ER revisits seen in an ER equipped with a pharmacist utilizing an electronic health survey application.

Methods: A retrospective quasi experimental study was performed to evaluate the 30-day revisit rate seen between patients who downloaded the application and those who did not. Patients were excluded if they were younger than 18 years of age, presented to the ED for emergent dialysis or psychosis, were admitted during their primary ED visit, or enrolled in the hospital's COPD or CHF Vivify program. The primary outcome was to assess the 30-day revisit rate seen between the group that downloaded the Vivify survey application and all enrolled patients who did not download the application. Secondary outcomes included an assessment of the rate of survey downloads and responses and an analysis of the clinical interventions made by the pharmacist.

Results: This study enrolled 2053 patients across four months. 93 patients downloaded the application, 79 completed the survey, and 54 patients were able to be contacted by a pharmacist. The revisit rate seen by the application download group was 8.06% while the revisit rate for the non-download group was 12.7%. A chi-squared analysis was performed and showed a non-statistically significant difference between these two groups (χ^2=1.12, p=0.29). No statistical differences were found between the enrolled group and downloaded group for age, ethnicity, and payer; but a statistical difference in the gender ratio between the two groups was noted. The clinical pharmacist was able to perform 1.33 interventions for each at risk patient they contacted with 18.75% of interventions being clinical in nature, 43.75% involved cost interventions, and 37.5% of interventions were used to help the patient arrange a follow up visit or find a primary care provider (PCP).

Conclusion: The utilization of a pharmacist equipped with an electronic survey application was unable to show a statistically significant reduction in 30-day ER revisits. While groups intervened on by the pharmacist showed a beneficial trend in reducing 30-day ED revisits, the sample size that was able to be captured with the limitations noted was not large enough to detect a difference seen in ER revisit rates.

Keywords: Emergency Room, Revisits, Telehealth, Ambulatory Care

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Wucki E, Green M, Tollesen S, Waxler C, Wallace D

Introduction

Emergency rooms in hospitals are intended to serve as both a location for patients to receive treatment for critical illness, and also as a site capable of providing emergency outpatient services for a broad range of health conditions. However, due to the mix of acuities this setting sees, it is often not the most efficient setting to treat non-acute disease states that could be managed by a primary care physician. In 2019, UnitedHealth Group released a study that analyzed its own internal charge data for 2018 and found that the average cost for the top ten primary care related ED visits was $2,023 per visit. This is in contrast to the price of physician office visits which averaged $161 during the same interval.[1]

In complying with the Emergency Medical Treatment and Active Labor Act (EMTALA), Emergency Rooms (ERs), also referred to as Emergency Departments (EDs), are required to care for a patient regardless of race, religion, or ability to pay.[2] Because of this, ERs are often utilized inappropriately for primary care needs that could be handled at a less costly venue. A study conducted at Memorial Hermann's Texas Medical Center campus in 2010 showed that as many as 41% of all ER visits were for primary care related reasons and that 53% of those patients were either uninsured or Medicaid related visits.[3]

Patients who return to the ER within 30 days of a previous visit are a large driver of Emergency Room (ER) expenses. With as many as 19.9% of patients returning to the emergency department within 30 days of a previous visit and these visits costing a reported 118% of the cost of the original visit, the cost of managing these patients is significant.[4] AHRQ has stated that risk factors for ER revisit within 30 days include: homelessness, income inequality, lack of a primary care provider (PCP), and poor health literacy.[5] Many of these factors are present among indigent patients and further demonstrates how this group is at risk for returning to the ER within 30 days of a previous visit.

As the cost of managing ER patients continues to increase, pharmacists have a unique opportunity to utilize their medication expertise to help control costs and prevent 30-day revisits due to primary care related issues. Literature supports the use of pharmacists inside the emergency department to help prevent 30-day revisits through the management of medication related issues.[6-10]

Previous Studies

In looking at reasons as to why patients revisit the ER, Gelder et al. followed 1,093 elderly patients after an initial ER visit and identified risk factors based on their baseline demographics that would put the group at a higher risk for ER revisit. The study identified that poly pharmacy as a significant risk factor for a patient returning to the ER within 30 days.[6]

Viswanathan et al. performed a systematic review of literature covering adherence methodologies and methods for improvement noting that 20% of prescriptions written are not filled and 50% are not taken as prescribed.[7]

Similarly, Pellegrin et al looked at reasons why patients were readmitted to the hospital and found that 26% of the 401 patients surveyed were readmitted due to medication related reasons. Non-adherence was the largest identified medication related reason for readmission, being responsible for 23.8% of all medication related readmissions.[8]

Phatak et al. studied the ability for pharmacists to help reduce patient readmissions and 30-day ER revisits through the use of medication reconciliation, education, and post discharge phone calls and observed a statistically significant decrease in readmissions and revisits within the intervention group. The overall reduction in readmission and revisits was noted to be 38%.[9]

Lastly, Han C et al. sought to determine the impact of a pharmacist driven phone call service to help reduce ER revisits and saw a 58% decrease in ER revisit rates between the control group and the intervention group that was found to be statistically significant.

Impact of Technology

While pharmacist directed phone calls directly made to patients have been proven to be effective based on literature, these calls can be time consuming and make it difficult for a department with limited pharmacist resources to implement. According to a nation survey completed in 2019, 81% of all adults in America owned a smartphone.[12] Additionally, the response rate for an application based survey was reported to be 9%.[13] Application based services offer many benefits to the end user, including the ability to flag specific patient responses for a pharmacist to contact the patient for follow up. Utilizing a secure application-based survey tool, such as Vivify Health®, presents a unique opportunity to help the pharmacist expand the scope of their impact through identifying and contacting the patients at highest risk for ER revisit. However, an application-based survey tool has not been used for this purpose before, and outcomes regarding patient engagement with the application and resulting clinical interventions have not been previously studied.

The primary objective of this study was to assess the 30-day revisit rate seen between the group that completed the Vivify Health® survey application and all enrolled patients who did not download the application. Secondary outcomes included an assessment of the rate of survey tool downloads and responses and an analysis of the clinical interventions made by the pharmacist.

Methods

Setting

This study was conducted within the Emergency Room at Memorial Hermann Southwest Hospital. Institutional Review Board (IRB) approval was obtained through the University of Texas Health Science Center-Houston.

The Memorial Hermann Southwest campus is a 547-bed community hospital located in Houston Texas. The campus features an Emergency Room that handles over sixty thousand ER visits annually and a patient resource center that recently added a part time pharmacist at 0.5 Full Time Equivalents (FTEs) to help support indigent patient medication services. It is estimated, based on data from the 2000 US Census, that approximately 35-50% of the population living in the area

immediately surrounding Memorial Hermann Southwest are living at or below the federal poverty Threshold.

The Southwest Patient Resource Center offers services to indigent patients; including primary care provider enrollment, cell phone access services, and medication cost abatement services. The pharmacist in the clinic has full access to the Memorial Hermann electronic health record (EHR), Cerner, and can access all patient labs, medications, and insurance information from the patient's visit. This resource was added in August of 2019.

Study Design

This was a retrospective, quasi experimental study comparing the 30-day ER revisit rate of patients who downloaded the Vivify Health® application to those who did not. Additionally, factors influencing a patient's response rate and interventions performed by the clinical pharmacist were also analyzed.

Patients were eligible to be included into the study if they had visited the Memorial Hermann Southwest ER between November 1st, 2019 and February 29th, 2020. Patients were excluded if they were younger than 18 years of age, presented to the ER for emergent dialysis or psychosis, were admitted during their primary ED visit, or enrolled in the hospital's COPD or CHF Vivify program. A power calculation was performed and a sample size of 287 patients was required to show a 7.7% difference in ER Revisits, assuming a power of 80% and an alpha level of 0.05. A 7.7% reduction in revisits was selected for the power calculation as it represented the difference that existed between the hospital's inpatient 30-day ER return rate and the hospital's 30-day ER return rate from the previous calendar year (2018).

Patients were enrolled during the intervention period via convenience sample with pharmacists being able to enroll all patients discharged with a prescription for 30 of the 120 days in the intervention period. Survey questions delivered through the Vivify Health® application were created based on Agency for Healthcare Research and Quality (AHRQ) Re-Engineered Discharge (RED) program and AHRQ's published list of questions to ask when conducting a discharge phone call.

Endpoints

The primary analysis of this study compared the 30-day revisit rate seen between the group that completed the Vivify survey application and all enrolled patients who did not download the application. Patients were categorized as enrolled if they were selected via convenience sampling to receive an invitation to download and complete the Vivify survey. Patients were categorized as having downloaded if they clicked the link and downloaded the application.

The secondary analysis looked at demographic factors to assess if any particular demographic factor was a significant predictor of an individual downloading the application. The demographic factors assessed were gender, race, age, and payer type. Additionally, the interventions performed by the clinical pharmacist were collected and categorized via an intervention classification tool.[14] (Table 1)

Table 1. Types of Clinical Interventions

Intervention Categories
Cost/access
Drug Interaction
Untreated Diagnosis
Duplicate Therapy
Drug Allergy
Drug Not Indicated
Prevent ADE/Side Effect
Adjust Dose/Product/Frequency

Measures

Demographic measures collected included age, sex, pharmacy prescription benefits, ethnicity, Vivify program status, Vivify survey responses, and pharmacist interventions performed. The primary endpoint, 30-day ER revisits, was collected via Kauffman Hall's Axiom® data mining software. The secondary endpoints were collected via chart review from the EHR and from Vivify Health's® online portal.

Statistical analysis

30-day ER revisits were collected for patients using Axion EHR datamining software. Means and frequencies were calculated for baseline demographics data. Categorical variables were analyzed using a chi-squared test and for continuous, non-parametric variables a Mann-Whitney U test was used for analysis. All data analysis was performed using IBM® SPSS® 2018 statistics software Armonk, NY, assuming a type I error of $\alpha = 0.05$.

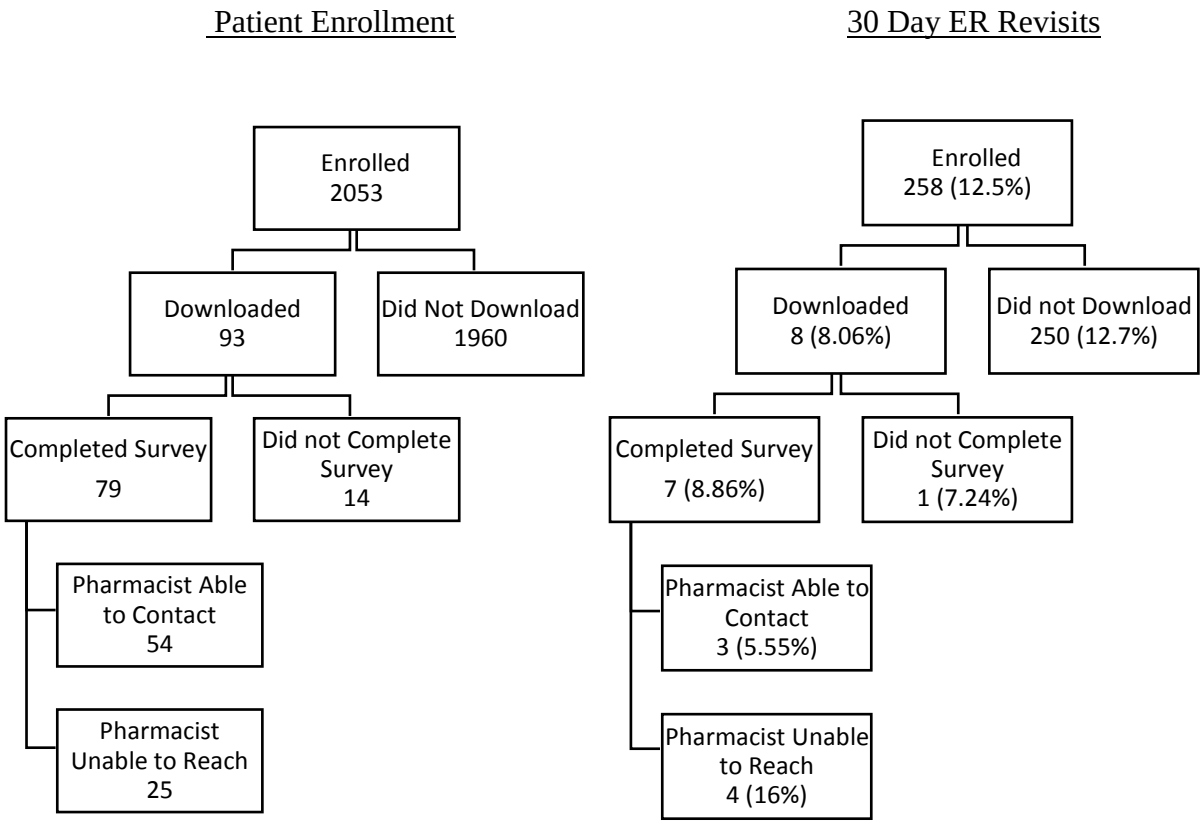
Sub-Analyses

Sub-analyses were performed to compare the 30-day revisit rates seen between patients who were able to be contacted by a pharmacist versus those who did not download the application. Additionally, a subsequent sub-analysis was performed to compare the 30-day revisit rate seen between patients who were able to be contact by a pharmacist to the ED revisit rate seen for all patients during the study interval. An additional 30-day revisit comparison was performed to ensure that the baseline 30-day revisit rate of the enrolled group did not significantly differ from the non-enrolled group.

Results

18,897 individuals visited the ER during the intervention period. The study enrolled 2053 patients during the intervention time frame (Table 2). Of the 2053 patients who were enrolled, 93 individuals downloaded the Vivify application and 79 completed the survey. No patients who downloaded the application were excluded due to the studies exclusion criteria. Of the surveys returned, 25 individuals were unable to be contacted for follow up. The revisit rate in the enrolled patient group that did not download the application was 12.7% (240 patients with a 30-day revisit/1960 patients) and the revisit rate seen for the download group was found to be 8.06% (8 patients with a 30-day revisit/93 patients). The chi-squared analysis between these two groups was found to be non-statistically significant (χ^2=1.12, p=0.29), indicating no detectable difference for the primary outcome.

Figure 1: Patient Enrollment



Sub-analyses were also conducted to assess if differences occurred between the pharmacist able to contact group, did not download group, and the all ER patient group. In comparing pharmacists able to contact vs. did not download groups, the χ^2=2.05, p=0.15 demonstrated no statistical difference between the groups. This was also seen in the comparison of the pharmacist able to contact group and the all ER patient group with the χ^2=2.2, p=0.14 again demonstrating no statistical difference between the groups. A third sub-analysis was conducted to assess for any difference between the enrolled group and the not enrolled group and found no statistical difference between the groups with a χ^2=0.33, p=0.57.

An assessment of the survey download rate was performed. Of the 2053 patients enrolled in the study, 4.5% of patients downloaded the application, yielding a download rate of roughly half what had been previously reported. An analysis of demographic factors for age, sex, pharmacy prescription benefits, and ethnicity was performed to assess if a particular group was more likely to engage in application download (Table 2).

Patients were enrolled in the program an average of 56.1 (8-86) hours after their discharge and patients were able to be contacted an average of 13.2 hours (2-34) hours after survey completion.

Table 2: Demographics Analysis

Variable	Non-Download Group	Download Group	Test Value	P Value
Sex				
Male	771	24	$\chi 2$=6.85	P=0.009
Female	1189	69		
Age				
Mean	41.1 years	38.3 years	U=85916	P=0.102
Standard Deviation	17.3 years	16.6 years		
Ethnicity				
African American	792	37	$\chi 2$=0.96	P=0.619
Caucasian	386	22		
Other	782	34		
Language				
English	1546	76	$\chi 2$=0.39	P=0.528
Spanish	411	17		
Prescription Benefits				
Uninsured	984	44	$\chi 2$=2.45	P=0.652
Medicaid	303	15		
Medicare	193	7		
Commercial	462	25		
Other	18	2		

When comparing the demographic data of patients from the enrolled group to that of the download group, the statistical analysis performed for gender was found to be statistically significant ($\chi 2$=6.85, P=0.009). No statistical difference was noted for the subcategories of age (U=85916, P=0.102), ethnicity ($\chi 2$=0.96, P=0.619), language ($\chi 2$=0.39, P=0.528), and pharmacy prescription benefits ($\chi 2$=2.45, P=0.652).

An analysis of the clinical interventions completed by the clinical pharmacist was additionally performed to assess with what interventions a clinical pharmacist was able to assist patients. Table 3 summarizes the responses that patients submitted which flagged a pharmacist to respond, and Table 4 summarizes the interventions that the pharmacist was able to make given those responses.

Table 3: Summarized Patient Responses

Question	Responses
1. Overall how do you feel about your health today?	
Good	16
Ok	40
Bad	16
No Response	7
2. Were you prescribed a medication during your visit?	
Yes	71
No	1
No Response	7
3. Were you able to pick up your medication?	
No	17
Yes	55
No Response	7
4. Have you started taking the medication?	
Yes	53
No	19
No Response	7
5. What issues have you experienced in picking up your medications?	
Transportation	7
Cost	20
Already have the medication and do not need	1
Medication unavailable at my pharmacy	1
Medication Required Additional Paperwork (Prior Authorization)	1
Other Problems	5
No Problems	44
6. Do you know why you are taking this medication/side effects?	
Yes	66
No	5
No Response	8
7. Are you experiencing any side effects from the medicine?	
Yes	15
No	56
No Response	8

Table 3: Summarized Patient Responses (cont.)

8. Do you have a follow up appointment?	
Yes	27
No	44
No Response	8
9. Do you have any concerns that would cause you to return to the ED?	
Yes	18
No	53
No Response	8
10. Do you have additional concerns that you would like a pharmacist to contact you?	
Yes	7
No	62
No Response	10

Table 4: Pharmacist Interventions

Intervention Categories	Interventions Performed
Cost/access	21
Drug Interaction	1
Untreated Diagnosis	0
Duplicate Therapy	2
Drug Allergy	0
Drug Not Indicated	0
Side Effect Counseling	4
Prevent ADE	1
Adjust Dose/Product/Frequency	1
Primary Care Provider Referral	18

In total, 66 patients of the 79 who responded to the survey identified an issue that could benefit from a pharmacist follow up. A pharmacist was able to directly interact with 36 patients and a further 18 patients were expeditiously screened and found to have no current issues. 25 patients were unable to be contacted on attempted follow up.

An additional intervention category was added to document instances where the pharmacist helped the patient with locating a primary care provider/follow up visit. This was the most commonly reported issue among the patients who responded to the survey with 2/3 of patients with an identified issue indicating that they were experiencing this concern. Of the patients who were able to be contacted, 48 interventions were performed across 36 patients. 9 of these interventions were clinical in nature, while the remaining interventions were related to transitions of care issues, such as cost or PCP referral.

Discussion

The primary endpoint in assessing the utilization of an electronic patient survey tool to prevent 30-day ER revisits was not found to be statistically significant. Despite a 4.64% reduction in the revisit rate seen between the download group and the not downloaded group, the small size of the downloaded group may not have allowed a statistical difference between the two groups to be detected. This was similarly seen when a sub analysis was conducted between the pharmacist able to contact group and the non-download group. While a much larger difference of 7.2% was seen between these two groups, the number of patients who were able to be contacted for an intervention may have been too small to detect a statistically significant difference.

In analyzing the rate of patients who downloaded the application, it was noted that 4.5% of patients who were enrolled chose to complete the application download. In assessing the factors that influenced patient application download; age, ethnicity, and payer status were all identified as being statistically non-significant in predicting if a patient would download the application. There was a statistically significant difference detected when comparing the gender distribution seen in the download group vs. the enrolled group. Women made up a larger proportion of the enrolled population than the enrolled population and appeared to be more likely to download the application than males.

Of the interventions performed, 18.75% of interventions performed by the pharmacist were clinical interventions, 43.75% of interventions were associated with cost, and the remaining 37.5% of interventions were dedicated to helping the patients to schedule follow up appointments or find PCPs. Of cost focused interventions, 20 of the cost interventions performed were non-clinical in nature and were facilitated by providing appropriate discount cards for the patient to utilize. The clinical pharmacist was able to perform 1.33 interventions per patient who flagged as needing assistance and was able to contact 54% of patients who flagged for a clinical pharmacist follow up based on their survey response. Patients were deemed unable to be contacted after three attempts by the pharmacist.

Limitations

This study was a non-randomized quasi experimental study where patients were able to self-select, based on their response to the application download request, what group they would be categorized into. Based on a lower than expected application download percentage, this study was unable to reach power to validate the primary outcome. While large percentage decreases in 30-day revisits were seen between the pharmacist contacted group and the non-download group, this too was insufficiently powered to show a statistical difference.

An additional limitation of the study was seen around the labor-intensive process that was required to perform a patient entry into Vivify. The application required around 5 minutes of data collection and data entry to enroll one patient. This time intensive process limited the days that investigators were able to perform data entry and required the use of a convenience sample to select when patients would be able to be enrolled. Control for this potential cause of bias was attempted by comparing the baseline ED revisit rates between both the enrolled group and the non-enrolled group.

While the use of an application-based survey tool has not been studied in the health care setting, the download rate identified in this study was noted to be only 50% as large as seen when similar technology is used in other industries. In an attempt to assess the baseline level of participation, no communication regarding the application was performed to the patient ahead of time. This potentially could have contributed to the low response rate that was seen.

One more barrier that was identified mid-study related to the reporting of a patient's phone number in the EHR. It was discovered that inside Memorial Hermann's EHR, only one line was present to store a patient's phone number and a designation was not made if the phone number was a cell phone number or a traditional wired line. This limited the overall number of patients who could respond and download the application to those who had used their cell phone number as their primary phone number during registration and may have impacted in the lower than expected response rate that was observed.

Conclusion

The utilization of a pharmacist equipped with an electronic survey application was unable to show a statistically significant reduction in 30-day ER revisits. While groups intervened on by the pharmacist showed a beneficial trend in reducing 30-day ED revisits, the sample size that was able to be captured with the limitations noted was not large enough to be able to detect a difference seen in ER revisit rates. Increasing the ease of mass patient enrollment and providing a method to ensure the patient's cell phone number was being captured and used to enroll the patient are two potential refinements that could be utilized to improve this study in the future.

Based on our analysis, women appeared more likely to download the application than men, making this a potential tool that could be used to help reach that group in the future. Positive results were seen in terms of the number of interventions that the pharmacist was able to make for patients identified to be in need of an intervention. However, for future studies, a majority of the interventions performed were not clinical in nature, allowing for a non-clinical or technician position to potentially play a larger role in this process.

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