

A Community Pharmacy Initiative to Decrease Hospital Readmissions by Increasing Patient Adherence and Competency of Therapy (PACT)

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Readmission of recently discharged patients is a serious problem associated with increased morbidity, mortality, and cost.^{1,2} A meta-analysis found that direct pharmacist care was associated with improvement in a variety of outcomes including readmissions.³ A supporting randomized controlled trial found that educational materials dispensed by pharmacists were positively associated with increased adherence and decreased readmissions, emergency department (ED) visits, and costs.⁴

Hospitals in Kenosha, Wisconsin, as elsewhere, have become very concerned about the prospect for reductions in reimbursement rates under the Affordable Care Act unless readmissions are reduced. As a result, hospitals have been open to approaches that might reduce readmissions.

A local community pharmacy systematized the pharmacy's program for packaging medications and communicating with physicians, and created a program in which pharmacists would work directly with patients. The aim of the project was to decrease the likelihood patients enrolled in the program would be readmitted to the hospital unnecessarily. It was hoped that the project would lead to increased, or at least stable, reimbursement for both the hospitals and the pharmacy.

The study's hypothesis was that the interventions would lead to improved medication adherence by patients, which in turn would make it less likely their condition would deteriorate so as to necessitate another admission, ED visit, or outpatient encounter.

Methods

Good Value Pharmacy is a locally-

Abstract

Objective: To decrease admissions and readmissions for patients using a community pharmacy through a program of improved medication packaging, delivery, and patient education.

Methods: The study evaluated a community pharmacy intervention on hospital admissions, readmission rates, outpatient visits, emergency department (ED) visits, and community tenure for 178 Medicare beneficiaries.

Results: The study found a statistically significant reduction in admissions ($p < 0.05$), outpatient visits ($p < 0.05$), and a significant increase in community tenure ($p < 0.05$) in the 6 months after enrollment. A second analysis that normalizes the study period to a year centered on the patient's enrollment date in the Patient Adherence and Competency of Therapy (PACT) intervention found a statistically significant reduction in admissions ($p < 0.05$). However, neither analytic technique found a statistically significant reduction in readmissions nor ED visits.

Conclusions: The PACT intervention appears effective in reducing inpatient and outpatient utilization for patients who participate. Community pharmacies should consider instituting PACT, or similar programs, in their own practices. The study was unable to show a significant decrease in readmissions to accompany the decrease in admissions. In addition, the study has not stratified for changes in the intervention over time or in outcomes such as mortality or cost.

owned and family-operated pharmacy that serves approximately 1,000 people. The pharmacy has 4 locations in Kenosha, Wisconsin, and provides medication home delivery to customers living in the Wisconsin counties of Racine, Kenosha, and Walworth. The pharmacy is a member of the Kenosha County Coalition (the Coalition), which consists of 2 hospitals, a hospice, an Aging and Disability Resource Center (ADRC), 4 skilled nursing facilities (SNFs), 2 home health agencies (HHAs), 2 physician practices, 1 pharmacy, and 2

personal care agencies. In April 2012, the Coalition performed a root cause analysis that, along with the published literature, implied a pharmacy-based intervention could be a valuable method for reducing readmissions. This analysis was conducted via review of Kenosha hospital, SNF, and HHA charts for hospital readmissions within 30 days of discharge for the 9-month period from July 1, 2012, to March 31, 2013. In addition, a survey sent to 2,000 older adults and disabled persons in Kenosha County, which resulted

in a 21% return rate, found that 53% of respondents who had been hospitalized at least once indicated some kind of difficulty following discharge (Table 1), with 23.4% of respondents indicating some difficulty specifically with medication. Following the findings of the Coalition, Good Value Pharmacy implemented an intervention called Patient Adherence and Competency of Therapy (PACT); this intervention is ongoing (Figure 1).

PACT has 3 components:

- Packaging medications according to physician orders and patient-specific characteristics with a focus on simplifying drug regimens and improving adherence.
- Frequent education and follow up to identify non-adherence and barriers to adherence as well as to motivate patients.
- The pharmacy could deliver medication to patients' homes 6 days a week.

The intervention was led by a pharmacist at the community pharmacy, and was underwritten by the pharmacy. There were no ethical issues identified, the principles outlined in the Declaration of Helsinki were followed during this quality improvement evaluation. The components of the intervention are outlined in Table 2.

The pharmacy has offered the opportunity to participate in PACT to all Medicare beneficiaries it serves. Patients volunteer for the PACT interventions. All patients who have volunteered to be in the program have been accepted. A monthly review of each participating patient's profile confirms the interventions were being implemented for that patient.

During the first 4 weeks of the intervention, the pharmacist-investigator telephoned patients to ask if they had been hospitalized and if the PACT intervention was improving their use of their medications. According to this survey, 29 of 30 patients surveyed said PACT improved their medication use. However, this survey eventually was terminated because it was time-consuming and there was concern that recall bias was affecting the accuracy of results.

Data on hospital admissions, readmissions within 30 days, ED visits, outpatient encounters, and community

TABLE 1. Survey Questions

<i>After leaving the hospital did you (or your relative) have any of the following difficulties?</i>	<i>Number of Responses to Question</i>	<i>Percent of "Yes" Responses to Question (%)</i>
Obtaining medications	19	9.4
Managing medications	10	5.0
Managing medications: New	11	5.5
Managing medications: Ongoing	7	3.5
Following up with my doctor	27	13.4
Falls or concerns about safety	27	13.4
Understanding how to manage my condition	33	16.4
Finding needed services or support	26	12.9
Other	41	20.4
Total	201	100

TABLE 2. Intervention Components of PACT

<i>Packaging</i>	<i>Education/Follow Up</i>	<i>Delivery</i>
Each patient's daily medications are packaged together once a month in a roll of plastic baggies.	The pharmacy communicates with the patient's physicians to ensure the accuracy of the medication regimen.	At least 90% of patients have their medications delivered to their home; the remainder pick up the package at one of the pharmacy's locations.
Each baggie contains the medications a patient takes at the particular date and time printed on each baggie, which is also labeled with the patients name, medication names, strengths, and pill descriptions.	The pharmacy conducts a monthly review of each patient's profile before packaging.	
The pharmacy makes sure refills are always available for chronic medications.	The pharmacy calls the patient whenever they receive communication from the prescriber regarding a new or changed medication.	

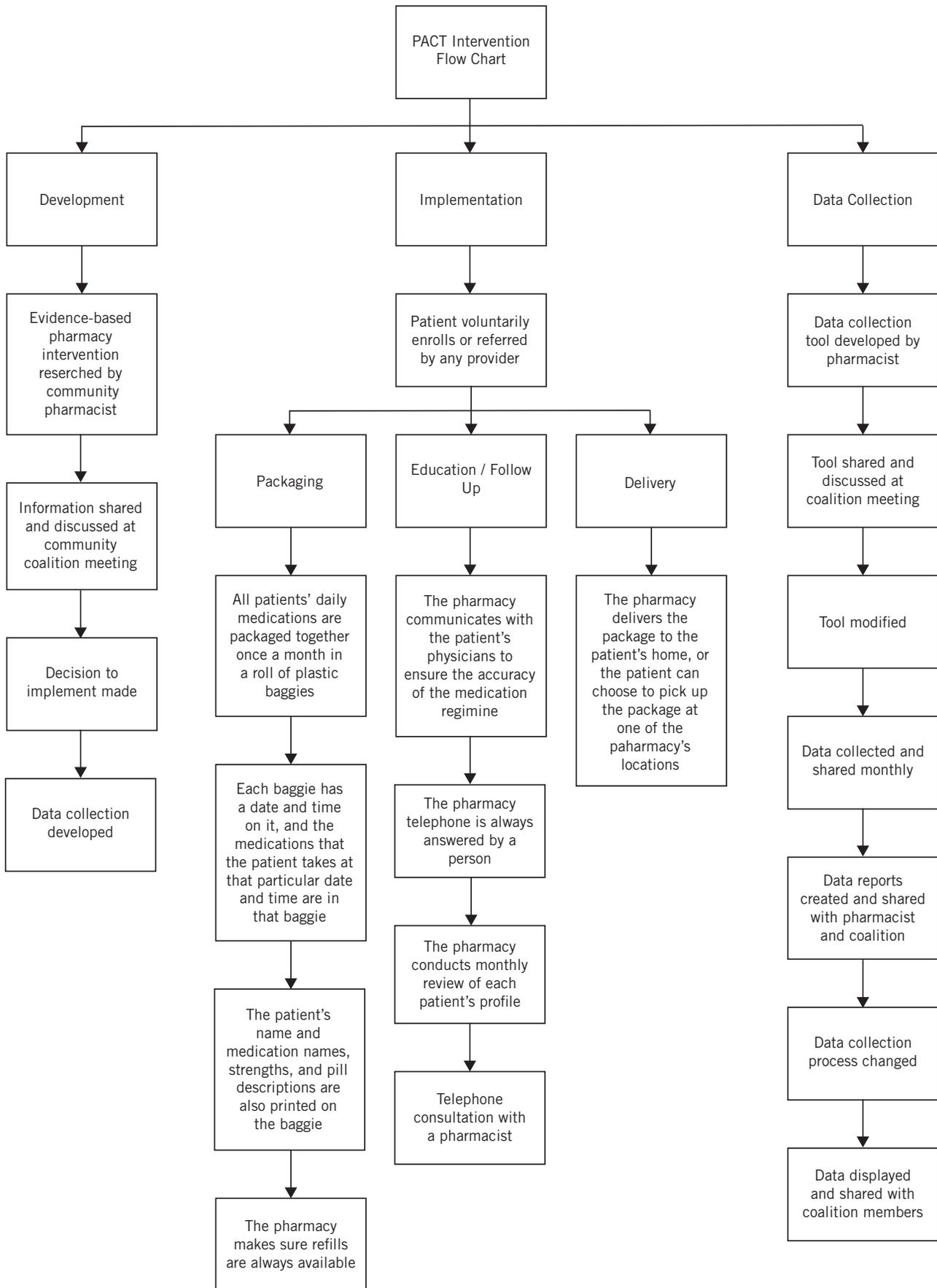
tenure after joining the study were compared to data for an equivalent period prior to the study (Figure 2). Each patient served as his/her own control. Community tenure was defined as the percentage of eligible days spent outside an inpatient setting. This is a more granular measure of utilization than just admissions, ED visits and outpatient visits, as it factors in the length of stay for each admission. The numerator for community tenure was calculated by subtracting the number of days spent in an inpatient hospital from the number of days the patient was an eligible Medicare Fee-for-Service (FFS) beneficiary during the time period being examined. The denominator is the number of days the patient was an eligible

Medicare FFS beneficiary during the time period being examined. The measure is thus a percentage, and a higher number is considered to indicate improved patient health. The null hypothesis is that there are no associations between participation in the PACT program and the outcome measures.

Data Sources

Study data came from 4 sources: 1) a list of patients enrolled in the study and 3 data files, 2) Medicare Part A (inpatient, emergency visits, and observation stays) claims, 3) Medicare Part B (outpatient) claims, and 4) the denominator file representing the list of Medicare beneficiaries for Wisconsin. The patient list was provided by Good Value

FIGURE 1. Intervention Development, Implementation, and Data Collection



Pharmacy and contained information about each of the enrolled patients, including their date of enrollment in the program, their date of disenrollment, and their Medicare Health Insurance Claim (HIC) number. This number was used to query the Part A claims, Part B claims, and denominator data sets. The Part A, Part B, and denominator data was provided by the Quality Innovation Network-Quality Improvement Organization (QIN-QIO) National Coordinating Center (NCC) and contained information regarding every FFS Medicare beneficiary in Wisconsin from January 1, 2014, to December 31, 2016.

Analysis

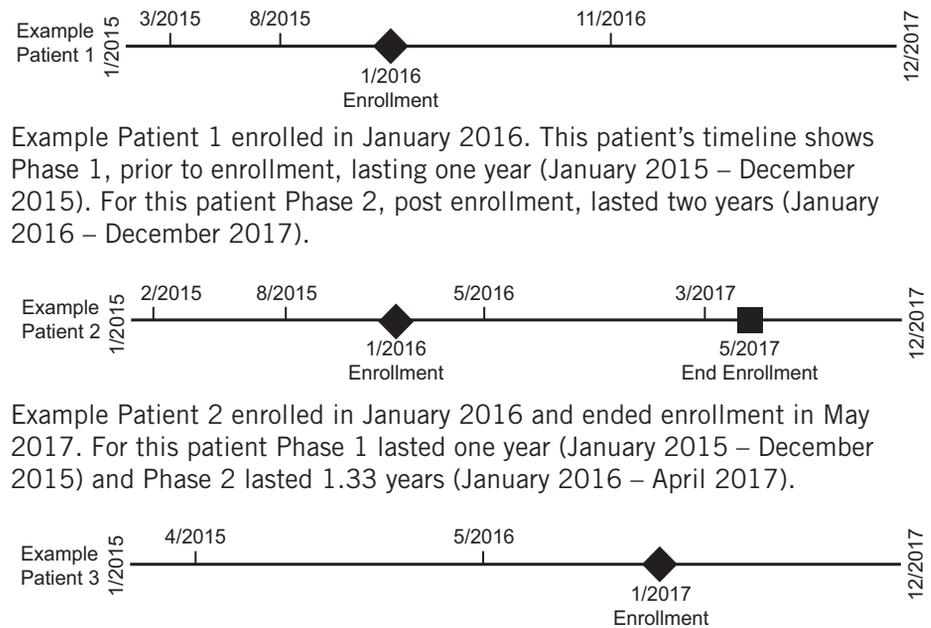
The post-enrollment and pre-enrollment average (for each outcome variable) were compared using paired t-tests. In cases where the data were highly skewed and an assumption of normality could not be reasonably made, the Wilcoxon signed rank test was used. To investigate any variation in the impact of the intervention by demographics, the study population data were stratified by gender, age, race, and beneficiary dual eligibility and t-tests were used to compare the outcome measures across the two phases within each stratum.

Part A data was used to calculate the numbers of hospital admissions, hospital readmissions, ED visits, and community tenure for each patient before and during enrollment in the program. Part B data was used to count the number of outpatient encounters during the 2 phases of the study. The time stamps of the Part A and Part B data set and the patient list was used to determine the duration of time each patient was in each phase of the study (Figure 2).

The mean number of admissions, readmissions, ED visits, and outpatient encounters do not account for the time patients spent in each phase of the study. In order to control for this duration variation, 2 techniques were developed.

The duration limited technique restricts the study duration to 6 months before and 6 months after the time of patient enrollment. Only admissions, readmissions, ED visits, outpatient encounters during this 1-year period are included, thus ensuring the time duration for each phase

FIGURE 2. Example Patient Intervention Phases



Example Patient 1 enrolled in January 2016. This patient’s timeline shows Phase 1, prior to enrollment, lasting one year (January 2015 – December 2015). For this patient Phase 2, post enrollment, lasted two years (January 2016 – December 2017).

Example Patient 2 enrolled in January 2016 and ended enrollment in May 2017. For this patient Phase 1 lasted one year (January 2015 – December 2015) and Phase 2 lasted 1.33 years (January 2016 – April 2017).

Example Patient 3 was enrolled into the intervention in January 2017. Phase 1, prior to enrollment, was two years (January 2015 – December 2016), while Phase 2 lasted one year (January 2017 – December 2017).

FIGURE 3. Duration Limited PACT Phase Timeline Example

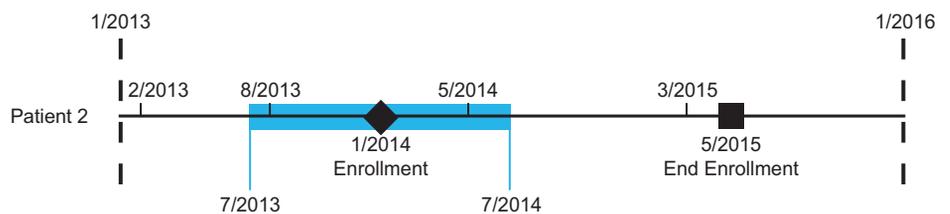
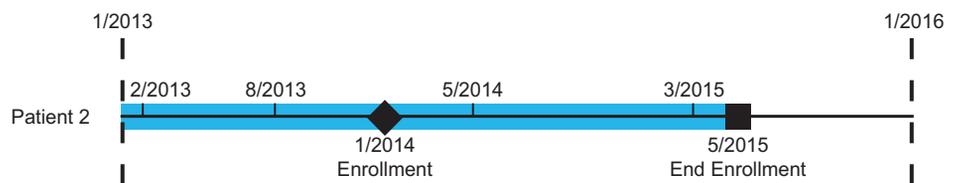


FIGURE 4. Duration Normalized PACT Phase Timeline Example



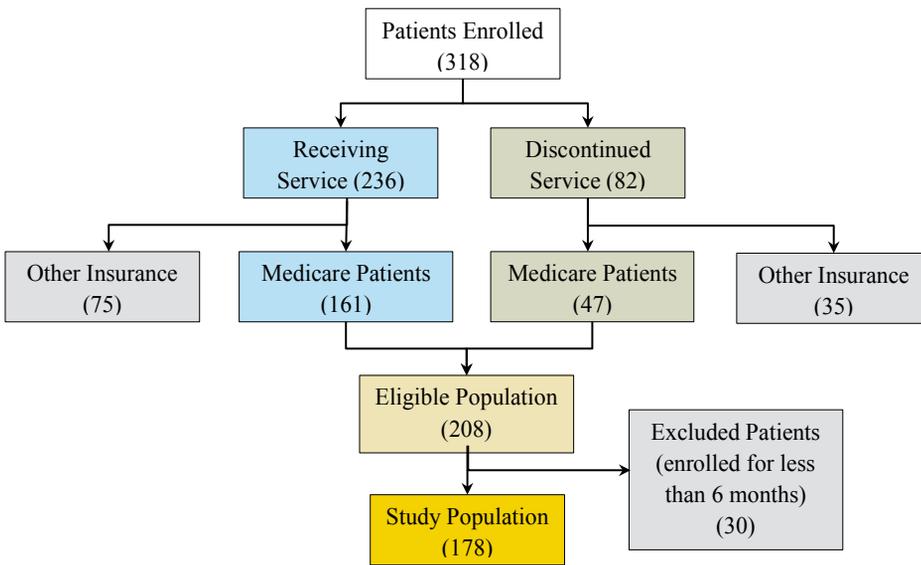
is equivalent for each patient and across patients (Figure 3). The community tenure measure is calculated for this one year time-period as well.

The duration-based normalization technique converts the counts of admissions, readmissions, ED visits, and outpatient visits to an annual rate. The post enrollment annual rates are then compared to those before enrollment. This techniques allowed us to use up to 3 years (including

both phases) of encounter data for each enrolled patient instead of the one year in the duration limited technique (Figure 4).

For each technique, 95% confidence intervals were created to estimate the mean for each phase. Analyses were performed using Statistical Analysis Software (SAS) Enterprise Guide 5.1 (SAS Institute, Cary NC) and Excel (Microsoft, Redmond WA).

FIGURE 5. Study Attribution Diagram



Results

Since the beginning of the intervention, PACT has impacted 318 patients (Figure 5). This evaluation used data for 178 Medicare beneficiaries who enrolled in the intervention and participated for at least 6 months post enrollment. The most

common reasons for discontinuing services included moving, transfer to a nursing home or hospice, and death.

Unadjusted Counts

When analyzing the total number of admissions and readmissions that occurred during the 2 study phases, there was a

slight decrease, from 90 observed patient admissions to 78 and from 20 to 19 readmissions (Table 3). A similar decrease was noticed for ED visits (166 to 119) and outpatient encounters (6,331 to 4,697). Using these numbers alone to measure the effectiveness of the PACT intervention would be misleading as there is a marked difference between the amounts of time patients spend in the 2 different study phases. An analysis of the Medicare part A inpatient claims data showed that the average time spent in phase 1 of the study is 1.47 years compared to 1.23 years in phase 2. An even greater difference exists in the outpatient data (Medicare Part B) with an average of 1.60 years spent in phase 1 and 1.17 years in phase 2.

Duration Limited Technique

By limiting the study period to only one year centered on the patient’s enrollment date in the PACT intervention, we were able to control for the different times spent in each phase of the study (Figure 3).

Though the admissions, readmissions, and outpatient results described in Figure 6 suggest improvements with the use of the

TABLE 3. Statistical Test Results

Setting	Measure	Time Interval	N	Mean	Std. Dev	T-statistic	P-value	S-statistic	P-Value2
Inpatient	Admissions	6 months	56	-0.375	1.153	-2.434	0.0182	*	*
Inpatient	Readmissions	6 months	56	-0.1	0.602	-1.2867	0.2036	*	*
Inpatient	Admissions	Normalized ¹	56	-1.145	5.734	*	*	-322.5	0.0034
Inpatient	Readmissions	Normalized ¹	56	-0.0815	5.773	*	*	-17	0.5153
Inpatient	Community Tenure	6 months	45	1.905	5.177	2.469	0.0175	*	*
ED Visits	ED Visits	6 months	70	-0.2	1.6294	-1.026	0.308	*	*
ED Visits	Any Acute Readmission	6 months	70	-0.14	1.207	-0.99	0.3256	*	*
ED Visits	ED Visits	Normalized ¹	70	-0.1805	2.83	*	*	-123	0.4564
ED Visits	Any Acute Readmission	Normalized ¹	70	-0.415	2.251	*	*	-105.5	0.0706
Outpatient	Outpatient Encounters	6 months	113	-4.23	16.917	-2.658	0.009	*	*
Outpatient	Outpatient Encounters	Normalized ¹	113	-10.48926	111.0151	*	*	-642	0.0586

¹ Duration Normalized Technique – Annual Rates

Abbreviations: N = number; ED = Emergency Department; Std. Dev = standard deviation

intervention, only the admissions (paired t-test p-value: < 0.05) and outpatient encounters reduction is significant (paired t-test p-value: < 0.01). The decrease in mean number of readmissions was not statistically significant (paired t-test p-value: > 0.2).

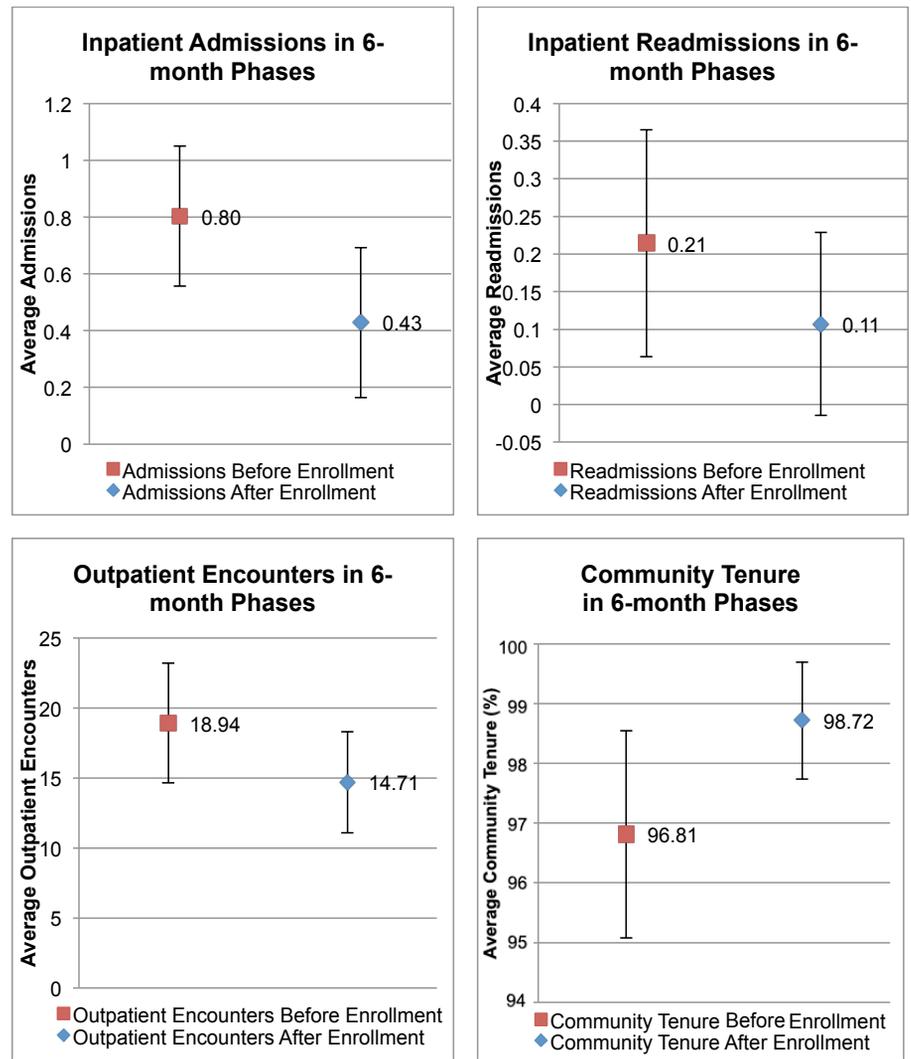
The duration normalization technique reinforces the findings from the modified technique (Figure 7). Again, there seems to be a reduction in admissions, readmissions, and ED visits. In addition, only the admission (Wilcoxon s-test p-value: < 0.01) and outpatient encounter reduction were statistically significant (Wilcoxon s-test p-value: < 0.05). Outpatient encounters saw a reduction from pre to post enrollment (Wilcoxon s-test p-value = 0.0586). The reduction in readmissions (Wilcoxon s-test p-value: > 0.2) and ED visits (Wilcoxon s-test p-value: > 0.4) were not statistically significant.

Finally, stratification on the basis of age, race, gender, and dual eligibility found no statistically significant differences among groups (Table 4). Demographic information for 35 patients with outpatient encounters was not available.

Discussion

The most striking conclusion is that the intervention appears to be effective in decreasing both inpatient and outpatient utilization. This finding is significant whether we look at inpatient admissions for 6 months before and after ($p < 0.05$)

FIGURE 6. Admissions, Readmissions, Outpatient Encounters, and Community Tenure for the Duration Limited Measures



Duration Normalized Technique

FIGURE 7. Admissions, Readmissions, and Outpatient Encounters for the Duration Normalized Measures

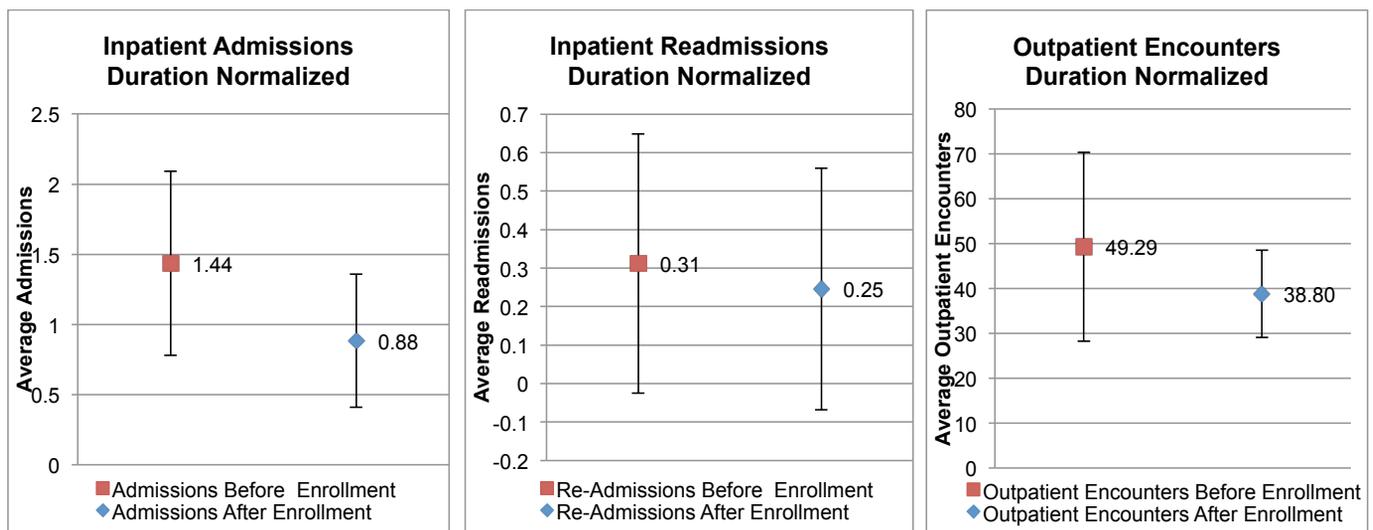


TABLE 4. Stratification by Demographics

<i>Demographic</i>	<i>Inpatient n</i>	<i>Inpatient Percent (%)</i>	<i>ED Visit</i>	<i>ED Visit Percent (%)</i>	<i>Outpatient n</i>	<i>Outpatient Percent (%)</i>
Gender: Male	18	32.1	21	30.0	30	38.5
Gender: Female	38	67.9	49	70.0	48	61.5
Race: White	47	83.9	53	75.7	62	79.5
Race: Black	7	12.5	13	18.6	11	14.1
Race: Other	2	3.6	4	5.7	5	6.4
Age: Under 65	20	35.7	32	45.7	38	48.7
Age: 65-74	17	30.4	17	24.3	19	24.4
Age: Over 75	19	33.9	21	30.0	21	26.9
Dual-eligible	20	35.7	33	47.1	11	14.1
Total	56	100	70	100	78	100

Abbreviations: n = number; ED = emergency department

or inpatient admissions normalized over a year ($p < 0.01$). The increase in community tenure (the percent of eligible days spent outside of an inpatient setting) also was significant ($p < 0.05$). Furthermore, outpatient encounters showed a statistically significant decrease post-intervention ($p < 0.01$), although ED visits did not.

We suspect the failure to show a significant reduction in readmissions is due to a phenomenon that has been noted in the literature.⁵⁻⁶ Interventions that reduce the number of readmissions are apt to reduce the number of admissions as well. Where the metric for readmissions is number of admissions within 30 days post-discharge divided by the total number of discharges, a successful intervention is apt to reduce the denominator as well as the numerator. This means that a successful intervention may well show the precise pattern of the results shown here, namely, a significant decrease in admissions in the absence of a significant decrease in readmission. The small sample sizes in our study could be another potential reason for the lack of significance for readmissions and within the strata.

We believe the work would be equally successful for similar community

pharmacies. Still, there are a number of aspects of the study that limit the knowledge to be gained from it. It may be of significant benefit to duplicate this study at multiple sites, in order to assess the generalizability and transferability of this intervention. First, there are 3 components to the PACT intervention: packaging, patient education, and delivery. The study did not look at these components independently. If one of the components contributed more to the results than the other, the study offers no way to confirm such an attribution. Second, there are important outcomes for which no analysis was performed – for example, mortality, cost, or quality of life. While analyzing the other direct impacts of the intervention on patients is important, there may be significant benefit to calculating the costs to the pharmacy, patient, and society. These results would allow us to understand the scalability of this intervention. Third, as noted, changes were made in the interventions early in the project: telephone consultations were initially made (or at least attempted) by the pharmacist. The study did not look at how these changes might have affected the results.

While there was no measure for patient

satisfaction, it should be noted that for many patients, the PACT program is the last resort to keep them independent in their homes. Perhaps for this reason, there has been considerable anecdotal positive feedback about the program from the patients and their caregivers.

Conclusion

In conclusion, this program of medication packaging and patient education has shown to decrease the likelihood a patient will be admitted to the hospital. Such results support the program as a promising intervention for other pharmacies. While there is some cost to the pharmacy for the packaging and patient education, this expense may be counterbalanced to some extent by increased numbers of patients who utilize the pharmacy and hence by increased income.

Good Value Pharmacy will continue PACT and will continue to collect data on its outcomes. Such data will provide additional evidence of the value of the program. If other pharmacies adopt the program, it will be possible to test whether differences in context lead to differences in result. We also would encourage additional

analytic efforts to determine how to measure such a program's effect on the readmissions rate while the admissions rate – which constitutes the denominator of the readmissions rate – is decreasing.

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PR This article has been peer-reviewed.
The contribution in reviewing is greatly appreciated!



**The Journal of the Pharmacy Society of Wisconsin
2019 Editorial Plan**

Editor's Note: This plan has been developed in collaboration with PSW staff, the Editorial Advisory Board, and reader feedback. Each of the six issues scheduled for publishing in 2019 will have a general theme and submission deadline (Table 1.). The purpose of this is to provide authors an opportunity to plan ahead and contribute based on their expertise.

Not every article in these issues will be or needs to be focused on the theme listed.

Table 1. The Journal of the Pharmacy Society of Wisconsin 2019 Editorial Plan

Journal Issue	Issue Theme	Submission Deadline
January / February	Theme: Endocrine Series: ID Corner / Precepting Tips I am a Pharmacy Professional and a... Teacher/Coach	Submission Deadline: October 1, 2018
March / April	Theme: Epidemics Series: ID Corner / Precepting Tips I am a Pharmacy Professional and a... Comedian	Submission Deadline: Dec 1, 2018
May / June	Theme: Allergy / Asthma Series: ID Corner / Precepting Tips I am a Pharmacy Professional and a... Athlete	Submission Deadline: Feb 1, 2019
July / August	Theme: Practice Advancement Series: ID Corner / Precepting Tips I am a Pharmacy Professional and a... Innovator	Submission Deadline: April 1, 2019
September / October	Theme: Immunizations and Population Health Series: ID Corner / Precepting Tips I am a Pharmacy Professional and a... Traveler	Submission Deadline: June 1, 2019
November / December	Theme: Pediatrics Series ID Corner / Precepting Ti I am a Pharmacy Professional and a... Pet Owner	Submission Deadline: Aug 1, 2019