



A community pharmacy initiative to decrease hospital readmissions by increasing patient adherence and competency of therapy

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Abstract

Background: Direct pharmacist care has been associated with substantial reduction in hospital admission and readmission rates and other positive outcomes, as compared with the absence of such care.

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

Design: Comparison of the number of admissions and readmissions for each patient enrolled in the program, comparing the time elapsed since enrollment with the equivalent period prior to enrollment.

Setting: A community pharmacy in Kenosha, Wisconsin.

Patients: Medicare beneficiaries served by the community pharmacy conducting the intervention. This includes 263 patients, 167 of which are Medicare beneficiaries, who have been placed in the intervention group as of June 2016.

Intervention: A voluntary program to package medications according to patient-specific characteristics and physician orders, to deliver medication to patients' homes, and to educate and follow up with patients regarding problems with adherence.

Measurements: Hospital admissions and readmissions post-enrollment as compared with the equivalent pre-enrollment period.

Results: An analysis that limits the study period to a year centered on the patient's enrollment date in the PACT intervention found a highly statistically significant ($p < 0.01$) reduction in admissions. An analysis that included the entire duration of the patient's enrollment in PACT also found a statistically significant ($p < 0.001$) reduction in admissions. However, neither analytic technique found a statistically significant reduction in readmissions ($p = 0.2$ and 0.1 respectively).

Limitations: That the study was unable to show a decrease in readmissions to accompany the decrease in admissions may be due to the success of the intervention in decreasing the denominator as well as the numerator of the readmissions measure. In addition, the study has not stratified for changes in the intervention over time, and for differences in patient characteristics or outcomes other than admissions and readmissions.

Conclusions: The PACT intervention appears effective in reducing the rate of hospital admissions of patients who participate in it. Community pharmacies should consider instituting PACT or something like it in their own practices.

Introduction

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 published randomized controlled trial found that educational materials dispensed by pharmacists were positively associated with increased adherence and decreased readmissions, emergency department 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, and 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 is to decrease the likelihood that patients enrolled in the project will be readmitted to the hospital unnecessarily. It is hoped that if successful, the project will lead to increased or at least stable reimbursement both for the hospitals and for the pharmacy.

The question that guided this study is: To what extent will improvements in the process of packaging medications and communicating with patients lead to a decreased likelihood of readmission for those patients?

Methods

Good Value Pharmacy is a locally-owned and family-operated pharmacy that serves approximately 1,000 people. The pharmacy has four 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, which consists of two hospitals, one hospice, one Aging and Disability Resource Center (ADRC), four skilled nursing facilities (SNFs), two home health agencies (HHAs), two physician practices, one pharmacy, and two personal care agencies. In April 2012, the Coalition performed a root cause analysis which, along with the published literature, implied that such 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 readmissions within 30 days of discharge for the nine-month period between July 1, 2012 and 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 responders who had been hospitalized at least once indicated some kind of difficulty following discharge (Table 1), and 23.4% of responders indicated some difficulty with medication.

Table 1: Survey Questions

After leaving the hospital did you (or your relative) have any of the following difficulties?	Number of Responses to Question	Percent of “Yes” Responses to Question
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%

Good Value Pharmacy decided to implement an intervention which they called Patient Adherence and Competency of Therapy (PACT), and has conducted that intervention since.

PACT has two components:

- Packaging medications according to physician orders and patient-specific characteristics and desires with an eye to simplifying drug regimens and improving adherence.
- Frequent education and follow-up to identify non-adherence and barriers to adherence and to motivate patients.

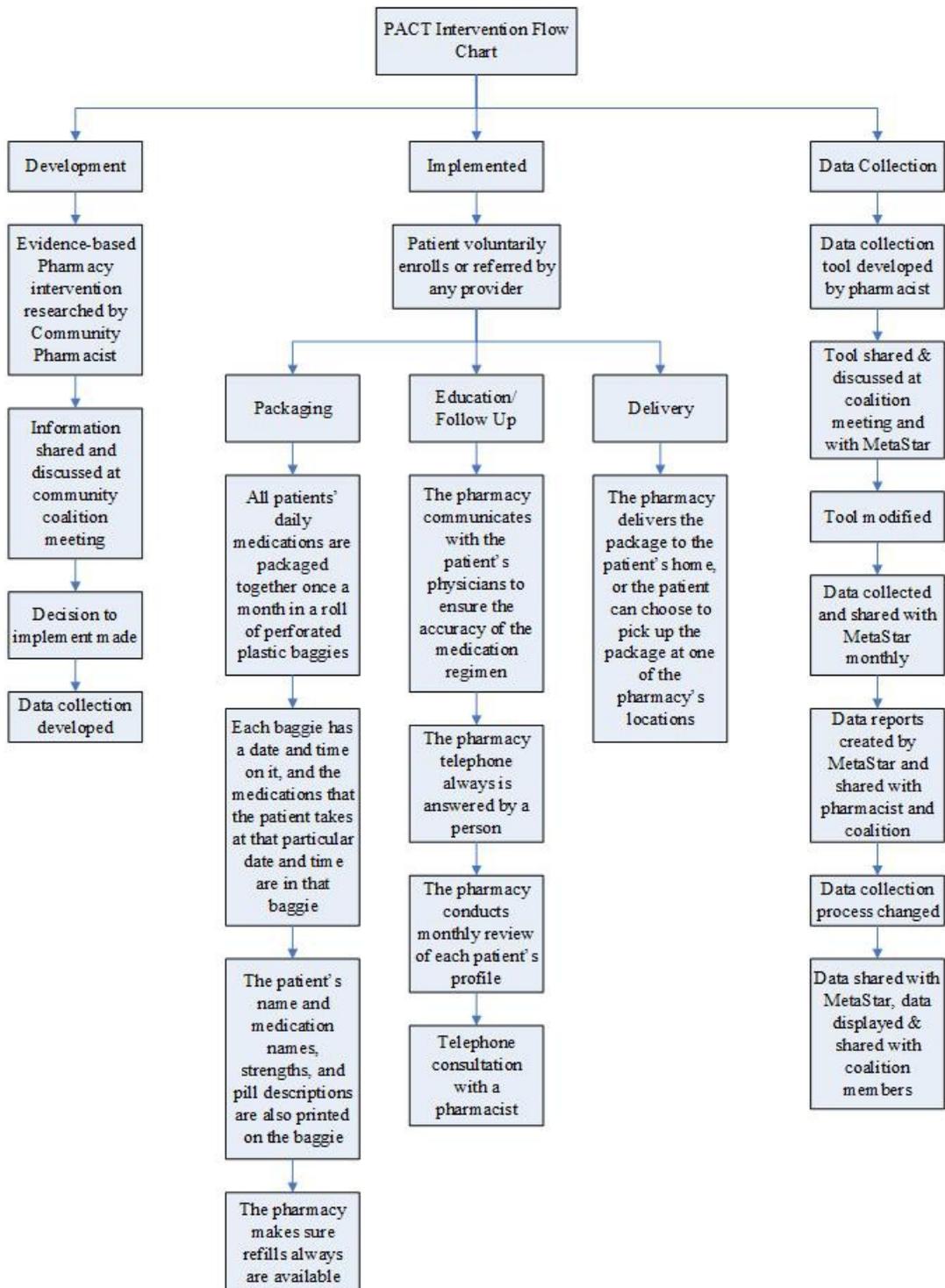
The pharmacy also delivers medication to its patients’ homes six days a week.

The intervention was led by a pharmacist at the community pharmacy, and was underwritten by the pharmacy. It already was being used for a limited number of pharmacy customers. There were no ethical issues identified. The components of the intervention are outlined in Table 2.

Table 2: Intervention Components of PACT

Packaging	Education/ Follow Up	Delivery
All patients' daily medications are packaged together once a month in a roll of perforated 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 has a date and time on it, and the medications that the patient takes at that particular date and time are in that baggie.	The pharmacy conducts monthly review of each patient's profile before packaging.	
The patient's name and medication names, strengths, and pill descriptions are also printed on the baggie.	Pharmacy calls patient whenever there is a new or changed medication.	
The pharmacy makes sure refills always are available		

Figure 1: Intervention Steps



The pharmacy has offered the opportunity to participate in PACT to all Medicare beneficiaries it serves, in order to maximize the number of data points for determining the effectiveness of the program. All patients who have volunteered to be in the program have been accepted.

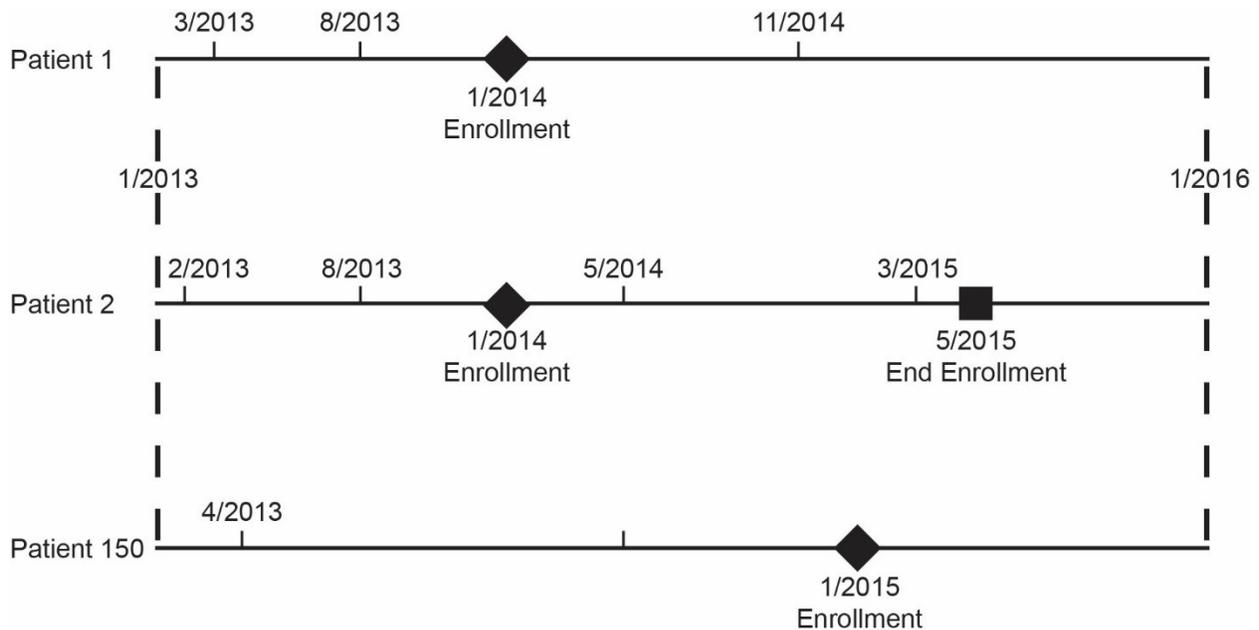
A monthly review of each participating patient’s profile confirms that the interventions were being implemented for that patient.

At first, 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 that PACT improves their medication use. However, this survey eventually was terminated because it was time-consuming, and because there was concern that recall bias was affecting the accuracy of results.

The hypothesis was that the interventions would lead to improved medication adherence by recently-discharged patients, which in turn would make it less likely that their condition would deteriorate so as to necessitate another admission.

The study is an experimental study in which patients volunteer for the PACT interventions. Patient hospital admission rates after joining the study are compared to their admission rates for an equivalent period prior to the time they joined the study (Figure 2). Each patient serves as his/her own control.

Figure 2: Example Patient PACT Phase Timelines



The null hypothesis is that there is no association between participation in the PACT program and the likelihood of hospitalization. The primary outcome measures for the intervention were the number of admissions and readmissions. For each patient in the study population, the number

of admissions post-enrollment in the program is compared with the number of admissions for the same period of time pre-enrollment. This procedure is identical for readmissions.

The post-enrollment and pre-enrollment aggregates then were compared using both 95% confidence intervals (CI) of the means and paired t-tests. Paired t-tests were paired on the patient level and compared the outcome measure between the two phases. These t-tests were only conducted if the 95% CI produced for the experiment suggested that there may be a statistically significant difference.

Study Population

Since the beginning of the intervention PACT has impacted 263 patients. As of June 2016, PACT membership included 193 current enrollees. Of those enrollees, 167 were Medicare beneficiaries. This study included 150 of those beneficiaries (Figure 3) and the 17 excluded Medicare patients were new to the study as of January 1, 2016. Since these patients were potentially enrolled for less than six months they were removed from our study population. Reasons for patient disenrollment are described in .

Figure 3: Study Attribution Diagram

Table 3: Reason for Discontinuation

Reason for Discontinuation	Beneficiaries
Unsure of reason for discontinuation	18
ALF/SNF/rehab/hospice	16
Deceased	16
Moved	8
Changed back to bottles	8
Transferred to another pharmacy	4
	70

Results

Study Data

Study data came from two sources; a list of patients enrolled in the study and a data file representing the Medicare Part A claims for the state of Wisconsin. The patient list was provided by Good Value Pharmacy and contained information about each of the enrolled patients, including their enrollment date, their date of discontinuity, and their Medicare HIC ID. This ID was used to query the Part A claims data set. The Part A data was provided by the QIN-QIO National Coordinating Center and contained information regarding each admission for every Medicare Fee for Service Beneficiary in the state of Wisconsin from January 1, 2013 to January 1, 2016.

Analysis Methodology

The IDs were used to filter the Part A data set so that only encounters pertaining to the patients who took part in the PACT intervention were included. From these encounter data we were able to compute the number of admissions/readmissions that occurred for each patient during the two distinct phases of the study, the “Before PACT” phase which was the time leading up to their enrollment in the PACT program, and the “During PACT” phase which was the time from the patients enrollment in the PACT program till their disenrollment. In addition to the admission and readmission computation that occurred for each patient, we were also able to use the time stamps of our Part A data set and the Patient List to determine the duration of time that each patient was in each phase of the study.

For reference we have provided the average number of admissions and readmissions (Figure 4), however using these data alone would lead to misleading results, as the time patients spent in each phase of the study would not be controlled for (Error: Reference source not found). In order to control for this duration variation we developed two techniques.

The duration limited technique restricts the study duration to 6 months before and 6 months after the time of patient enrollment. Only admissions or readmissions that occur during this one-year period are included, thus ensuring the time duration for each phase is equivalent for each patient and across patients.

The duration based normalization technique uses new measures that are defined by the ratios of admissions per year and readmission per year — for each patient. These ratios effectively normalize the admissions allow for the entire set of patient encounters to be used.

For each technique 95% confidence intervals were created to estimate there mean for each phase. To test for statistical significance a paired t-test was used. Analysis was done by using SAS Enterprise Guide 5.1 (SAS Institute, Cary NC) and Excel (Microsoft, Redmond WA).

Unadjusted Counts

When analyzing the total number of admissions (and readmissions) that occurred during the two study phases we actually saw an increase, from 100 observed patient admissions to 178 (readmissions increased from 21 to 60). The corresponding increase mean number of admissions and readmissions is depicted in Figure 4. 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 two different study phases (Error: Reference source not found). Controlling for this variation is the focus of the next two analysis sections.

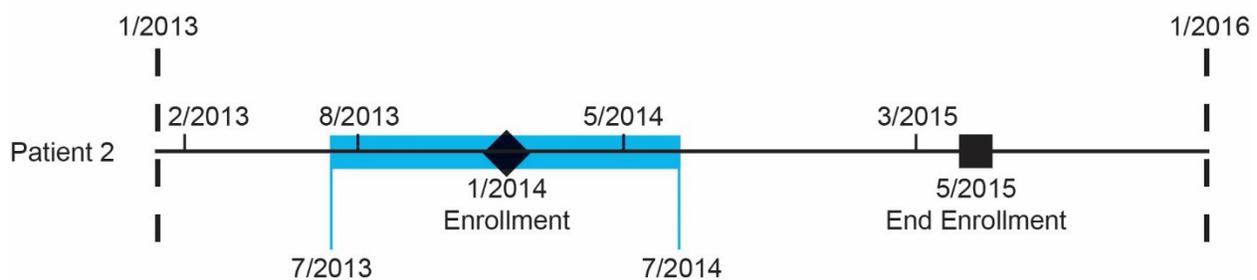
Figure 4: Unadjusted Admissions and Readmissions Per Patient.

Figure 5: Average Patient Enrollment Duration

Duration Limited Technique

By limiting the study period to only a year centered on the patient's enrollment date in the PACT intervention, we were able to reduce the phase duration time variation (Figure 6). The Before PACT phase started six months prior to the enrollment date and ended upon the enrollment date and the After PACT phase started on the enrollment date and ended on the date six months after the enrollment date. The elimination in the phase duration time variation allowed for the effectiveness of the PACT intervention to be more clearly seen ().

Figure 6: Duration Limited PACT Phase Timeline Example



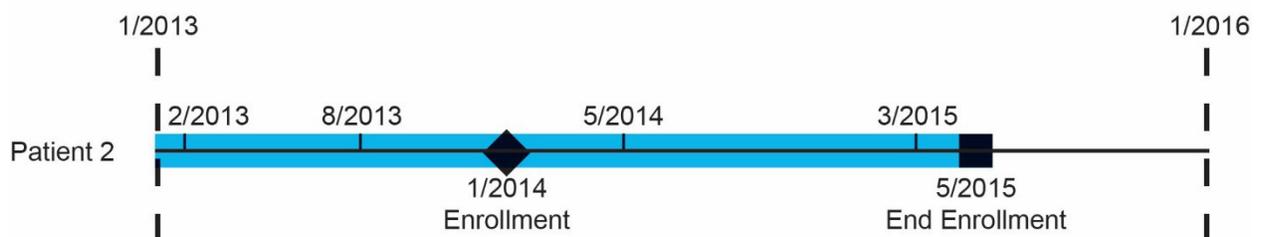
Though both admissions and readmissions graphs suggest improvements with the use of the intervention, only the admissions reduction is significant (paired t-test p -value: <0.01). also shows the decrease in mean number of readmissions. However, the reduction was not statistically significant (paired t-test p -value: >0.2)

Figure 7: Admissions and Readmissions for the Duration Limited Measures

Duration Normalized Technique

While the modified technique helped to reduce the phase duration time variation, it also restricted the outcome data to only come from a narrow band of all available data. In order to overcome this limitation we devised a second technique, duration normalization. Instead of limiting the count of admissions and readmissions to six month segments, we instead allowed the entire duration to be included (Figure 8). However, instead of using these admission (and readmission) counts directly we then divided them by the amount of time (in years) that the patient spent in the pertinent phase. The new measure effectively normalized for phase duration.

Figure 8: Duration Normalized PACT Phase Timeline Example



The duration normalization technique reinforces the findings from the modified technique (Figure 9). Again there seems to be a reduction trend in both admissions and readmissions. However, only the admission reduction is statistically significant (paired t-test p -value: <0.001). The reduction in readmissions is not statistically significant (paired t-test p -value: >0.1).

Figure 9: Admissions and Readmissions for the Duration Normalized Measures

Discussion

The most striking conclusion is that the intervention appears to be effective in decreasing the number of hospital admissions. This conclusion is highly significant using two different analytic approaches.

In contradistinction, the program has produced no significant differences in rates of readmission to the hospital within 30 days of discharge. We suspect that this result 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 30 days post-discharge/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 here, namely, significant decreases in admission in the absence of significant decreases in readmission. Of course, additional analysis would be needed to confirm this hypothesis.

We are unaware of any confounding, bias or imprecision in the study design, nor of any reason to believe the work would not 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 two components to the PACT intervention; packaging and patient education. 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, no analysis was done for outcomes other than admissions and readmissions — 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 find 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 made (or at least attempted) for all patients, and home visits by the pharmacist were stopped. The study did not look at how these changes might have affected the results.

Fourth, there was no stratification by subpopulation. The study did not look at the effectiveness of the intervention by age, gender, or other identifying factors.

While there was no measure for patient satisfaction, it should be noted that most patients in the PACT program are prescribed or taking at least eight medications. For many of them, the PACT program is the last resort to keep them independent in their homes. Perhaps for this reason, there has been considerable positive feedback about the program from the patients and their caregivers.

In conclusion, this program of medication packaging and patient education has been shown to decrease the odds that 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.

This report was produced by MetaStar, which represents Wisconsin in the Lake Superior Quality Innovation Network, under its contract with the Centers for Medicare & Medicaid Services.

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Appendices

Measure	Sum	Mean	StDev
Admissions Before PACT	100	0.666667	1.468181
Admissions During Pact	178	1.186667	3.648537
Admissions After Pact	1	0.006667	0.081377
Admissions 6mo Prior Enrollment	54	0.36	0.940071
Admissions 6mo After Enrollment	25	0.166667	0.495536
Readmissions Before PACT	21	0.14	0.73964
Readmissions During PACT	60	0.4	2.383275
Readmissions After PACT	0	0	0
Readmissions 6mo Prior Enrollment	17	0.113333	0.707452
Readmissions 6mo After Enrollment	7	0.046667	0.240463
Admissions Per Year Before PACT	73.52678	0.773966	1.574919
Admissions Per Year During PACT	59.17263	0.394484	1.031639
Readmissions Per Year Before PACT	19.73725	0.207761	1.040504
Readmissions Per Year During PACT	18.78136	0.125209	0.650333

	Before	During
Admissions	100	178
Readmissions	21	60

	Six Month Prior	Six Month During
Admissions	54	25
Readmissions	17	7

	Per Year Before	Per Year During
Admissions	73.5	59.1
Readmissions	19.7	18.7

		Paired t-test p-value
Pre Six Month ADM	Post Six Month ADM	0.005976837
Pre Six Month RDM	Post Six Month RDM	0.226440956
Before ADM Norm	During ADM Norm	0.000114451
Before RDM Norm	During RDM Norm	0.104680461

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