Reducing readmissions with pharmacist-integrated care in Medicare value-based programs

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https://doi.org/10.1093/ajhp/zxae300

Purpose: Pharmacy transitions of care (ToC) programs have been shown to decrease 30-day hospital readmissions and improve patient outcomes, but there is limited published data on the impact of pharmacist-integrated ToC services beyond 30 days. The objective of this study was to evaluate the impact of pharmacist-integrated ToC and population health services on 30-, 60-, and 90-day all-cause readmissions in a Medicare value-based program (MV-BP) population and to compare mean times to first readmission with and without pharmacist care.

Methods: A retrospective observational chart review was conducted to identify eligible hospital discharge encounters (DEs). Patients 18 years of age or older enrolled in an MV-BP were assigned to 4 study groups (a control group or one of 3 intervention arms) based on the pharmacy ToC services they received from either an inpatient ToC pharmacist or a dedicated population health pharmacist (PHP).

Results: Among 1,065 eligible DEs, 90-day follow-up was completed in 1,039 cases. The control group (n = 213) had a 90-day readmission rate of 34.74%. Intervention arm 1 (n = 201) had no significant reduction in 90-day readmissions, with a rate of 29.85% (odds ratio [OR], 0.94; 95% CI, 0.61-1.47; $P = 0.80$), while intervention arms 2 (n = 209), and 3 (n = 416) had significantly lower rates of readmission: 9.57% (OR, 0.26; 95% CI, 0.15-0.46; $P < 0.01$), and 17.07% (OR, 0.41; 95% CI, 0.27-0.61; $P < 0.01$), respectively.

Conclusion: A combination of ToC and PHP services reduced 30-, 60-, and 90-day readmission rates in an MV-BP population. These results support the expansion of pharmacy-based ToC to minimize readmissions within 90 days for this Medicare population.

Keywords: Medicare, population health, readmission, ToC, transitions of care, value-based program

Am J Health-Syst Pharm. 2025;82:419-426

Transitions of care (ToC) entail coordinating care to ensure optimal continuity of care. Hospital discharge, when patients transition from one healthcare setting to another, is a vulnerable time period well known to involve an increased risk of medication errors and subsequent adverse events.[1] These potential medication-related problems may result from a lack of care coordination, contribute to hospital readmissions, and lead to increased healthcare expenditures.[2,3]

To address rising healthcare costs and suboptimal quality of care, Medicare has introduced value-based payment programs, heralding a change to the US healthcare reimbursement payment system. Unlike the traditional fee-for-service payment model, the Hospital Readmissions Reduction Program (HRRP) and Bundled Payments for Care Improvement-Advanced (BPCI-A) are Medicare value-based programs (MV-BPs) that financially incentivize hospitals to prevent avoidable readmissions, improve patient outcomes, and enhance the patient experience of care.

Implemented in 2012, the HRRP aimed to decrease hospitals' unplanned 30-day readmissions for conditions that typically result in higher readmission rates among Medicare beneficiaries.[4] This established program only targets specific medical conditions and surgical procedures (ie, heart failure, acute myocardial infarction, pneumonia, chronic obstructive pulmonary disease, and total hip arthroplasty, total knee arthroplasty, and coronary artery bypass graft procedures).[4] Hospitals with excess unplanned readmissions are penalized and receive lower reimbursement for all Medicare admissions in the subsequent year. Currently, the reimbursement penalty is capped at 3%.[5]

Similarly, the BPCI-A program, introduced in 2018, aims to redesign care for Medicare beneficiaries by promoting care coordination and holding healthcare providers financially accountable for the care provided. The BPCI-A Model Year 4 (for 2021) had a total of 8 Clinical Episode Service Line Groups (CESLGs) and 34 clinical episode categories (ie, 30 inpatient, 3 outpatient, and 1 multisetting).[6] This voluntary initiative combines payments for hospital and healthcare provider services into one bundled payment amount based on the expected costs of any services a beneficiary might receive during the 90-day-duration episode of care (EoC). Participating healthcare providers may receive payment that could be less than expected if the actual cost of care is higher than the estimated cost during the clinical episode.[6]

Studies have demonstrated that pharmacy transitions of care (ToC) programs can reduce hospital readmissions and improve patient outcomes.[1,7-17] Medicare beneficiaries' rate of readmissions within 30 days was approximately 17.8% in 2015, which was a 3.7% reduction compared to 2007 (21.5%).[1] However, studies evaluating readmission reduction have found conflicting results by focusing on specific disease states (eg, chronic obstructive pulmonary disease, heart failure) and few have assessed readmission rates beyond 30 days and time to first readmission.[7-10,16] However, recently studies have begun to evaluate the MV-BP, targeting specific disease states or the population as a whole.[16-17]

Given the well-known risks associated with ToC and the financial risks faced by Memorial Healthcare System (MHS),[4-6] a team of population health registered nurses (PHRNs) were assembled to facilitate care coordination for MV-BP populations. This initiative evolved to include a pharmacy ToC/population health program. This integrated program combines on-site pharmacy ToC services with pharmacy population health clinical services, strategically addressing the needs of MV-BP populations. This study aims to evaluate the effectiveness of the pharmacy ToC/population health program in reducing readmission rates beyond the traditional 30 days to align with the goals of the BPCI-A programs, and time to first readmission, which has not been previously studied.

KEY POINTS

- The integration of a pharmacist transitions of care (ToC)/population health program to a population health registered nurse care coordination team resulted in significant reductions in 90-day readmission rates ranging from 34.74% to 17.07%.
- The results highlight the effectiveness of pharmacy ToC programs beyond the traditional 30 days within a Medicare value-based program population.
- Beyond readmission reduction, an overall increase in the mean time to first readmission was observed in the intervention groups versus the control group (29 vs 24 days), emphasizing the program's impact on healthcare outcomes.

Methods

Study design and setting. This was a retrospective observational chart review study conducted at MHS, a large multihospital healthcare system in the state of Florida. Our healthcare system consists of 5 hospitals targeting MV-BPs. Additional information regarding MHS and the program structure has been previously described.[18] Briefly, in 2016, ToC pharmacy services were initiated in multiple hospitals within MHS, and by 2017, all hospitals had implemented on-site ToC pharmacy services varying in operational hours, type of services, and model of services. The observed variations underscored the need for standardized workflows, leading to the establishment of a pharmacy task force to provide guidance and ensure consistent service provision with the aim of enhancing quality and standardization within the healthcare system. In June 2020, a population health pharmacy (PHP) program utilizing a centralized telehealth model was pilot tested, featuring 1 PHP full-time equivalent (FTE) conducting 7-day telephonic postdischarge follow-ups with the BPCI-A patient population. All pharmacy services were provided in addition to care management PHRN team. The study was exempted by the MHS institutional review board.

Data source and study population. To identify hospital discharge encounters (DEs) from patients enrolled in the HRRP or BPCI-A program and with active care management episodes from October 1, 2020, to April 30, 2021, a report generated by the Epic electronic health record system (Epic Systems, Verona, WI) was utilized. This report collected the demographic characteristics of MV-BP patients. All DEs identified during this time were reviewed to exclude DEs from PHP services based on predefined exclusion criteria, such as being under hospice care, transferred to another acute or long-term acute care facility, or discharged from an emergency department (ED) without hospital admission. Furthermore, patients who did not receive PHP services were excluded if the

Medicare value-based EoC had ended or expired during the hospital admission or follow-up EoC period. DEs that did not meet the PHP program's exclusion criteria were classified as eligible discharge encounters to receive PHP services and were categorized as either "anchor discharge encounters" (ADEs) or "readmission discharge encounters" (RDEs). The first hospital admissions within the prespecified study period were labeled as ADEs, and any subsequent hospital admissions within the same period were labeled as RDEs. ADEs were included in this study and assigned to one of 4 groups for data analysis based on the pharmacy services received. The control group received care management intervention from the PHRN team without supporting pharmacy services. ADEs in intervention arm 1 received inpatient ToC pharmacy services in addition to PHRN services. ADEs in intervention arm 2, received PHP services in addition to PHRN services. ADEs who received both inpatient ToC and PHP services in addition to PHRN services were assigned to intervention arm 3.

Intervention. This study utilized two distinct pharmacy services: ToC pharmacy services and PHP services. Various models were used to support inpatient ToC services, with 4 out of 5 hospitals utilizing dedicated pharmacists (4 FTEs). In contrast, one out of 5 hospitals adopted an alternative approach, utilizing an expanded scope of a decentralized pharmacist FTE to assist with discharges and other clinical tasks. Meanwhile, PHP services were initially pilot tested using a single PHP pharmacist FTE within a centrally located team. Examination of the data pertaining to the delivery rate and discharge volume demonstrated the imperative need for an extra pharmacist to fulfill the burgeoning demand for this service. Subsequently, it became evident that a dedicated resource for clinical oversight and leadership was essential. Thus, 2 additional FTEs, comprising a clinical specialist and a clinical manager, were appointed. The service underwent rigorous refinement and formalization, with a primary team objective centered on ensuring a follow-up visit within 7 days of patient discharge.

Upon patient admission, the ToC pharmacist performed an intake assessment and reviewed the discharge medication list when a discharge order was placed by the attending physician or specialist while recommending therapy changes as clinically indicated. Additionally, ToC pharmacists provided discharge education to patients or their caregiver. To support the work of the inpatient ToC pharmacists and provide a seamless transition to the ambulatory or long-term care settings, PHPs provided postdischarge telehealth outreaches within 7 days of discharge and longitudinally throughout the risk period (90 days). During the teleisit, PHPs conducted post-discharge comprehensive medication reviews (CMRs). The CMRs included patient assessments for health literacy, medication adherence (including barriers to adherence), and identification and resolution of medication therapy problems. To ensure comprehensive care coordination, ToC pharmacists and PHPs collaborated with PHRNs, care managers, social workers, and medication access specialists to improve care coordination for targeted MV-BP patients.

A collaborative effort involving diverse healthcare professionals, including pharmacists and nonpharmacists, was employed to support the BPCI-A patient population, and coordinated by a multidisciplinary task force, with on-site ToC pharmacists offering predischarge medication clarification and education. Post discharge, PHRNs, as a part of the services offered to the control group and intervention groups, conducted care coordination outreaches, while PHPs provided ongoing postdischarge support, including medication education, optimization, and adherence assistance, with medication access specialists contributing to resolving medication access barriers, optimizing team efficiency, and ensuring appropriate specialized care to address the complex issues faced by this at-risk population. The ToC and PHP programs are available across all MHS hospitals and the decentralized PHP telehealth center, with pharmacists working 8-hour shifts from Monday to Friday to provide optimal care. Greater detail regarding the roles and responsibilities of the interprofessional team involved in caring for this patient population have been described.[18]

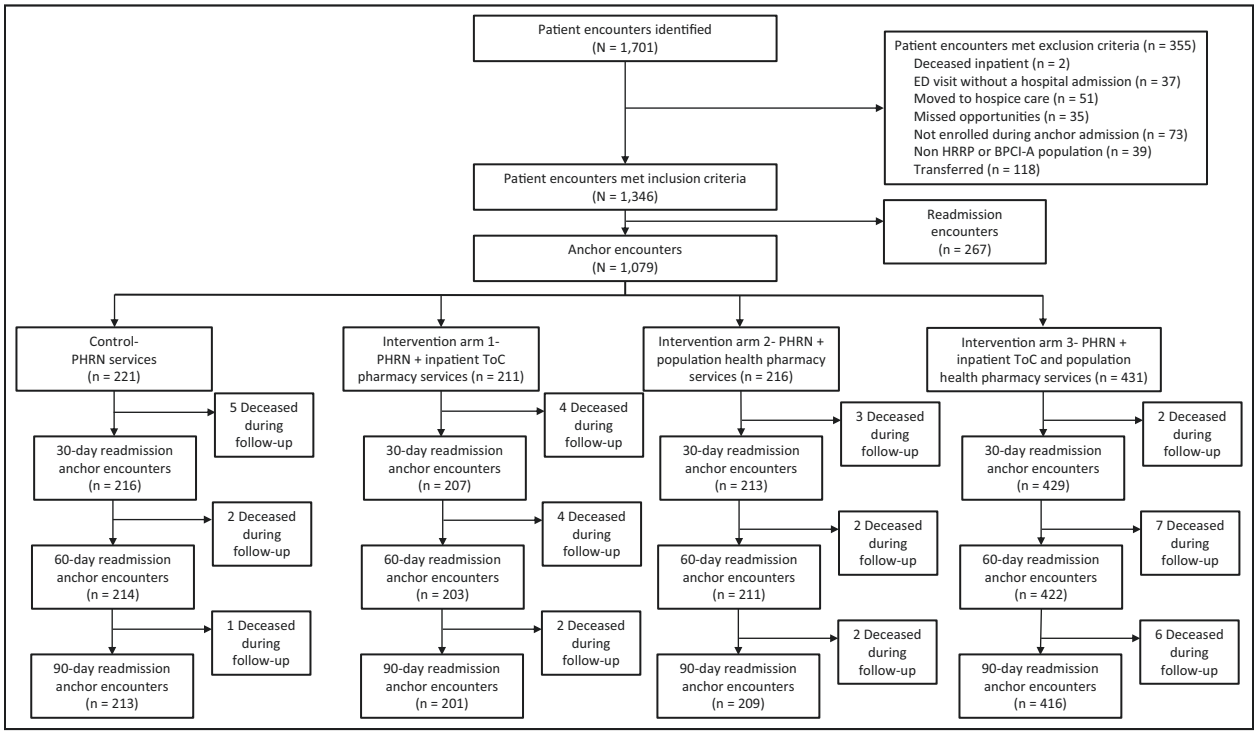
Outcome measures. The primary outcome measures of this study were to determine the proportion of all-cause readmissions within 30, 60, and 90 days following the ADE discharge date, assessed categorically as binary. ADEs that resulted in at least 1 hospital readmission during the defined post-ADE follow-up period were considered readmissions for data analysis. The secondary outcome measure was the mean number of days to readmission within 90 days from the ADE discharge date.

Statistical analysis. The study employed descriptive statistics to evaluate differences in demographics and clinical characteristics between the control and intervention groups. The Kruskal-Wallis test was applied to assess baseline differences in age distribution, while a χ^2 test was used for gender, race, language, socioeconomic status, hospital or ED readmission risk, and CESLG. Multivariable logistic regression models were used to compare readmission rates between the 4 study groups for 30-day, 60-day, and 90-day follow-up periods while controlling for age, race, sex, socioeconomic status, hospital or ED readmission risk, and CESLG. To test for time to first readmission, the Kruskal-Wallis test was utilized, and a multivariable linear regression model was employed to evaluate the impact of time to first readmission on readmission risk while controlling for the same covariates used in the logistic readmission rate analyses.

Results

Patient characteristics. Out of the 1,701 DEs identified during the

Figure 1. Flow diagram detailing anchor discharge encounter selection by group. BPCI-A indicates Bundled Payments for Care Improvement-Advanced; ED, emergency department; HRRP, Hospital Readmissions Reduction Program; PHRN, population health registered nurse; ToC, transitions of care.



study period, 355 were excluded as they met the exclusion criteria of the population health program. Consequently, 1,346 were considered for allocation to the study groups. After excluding 267 RDEs, 1,079 DEs were classified as ADEs and then distributed among 4 study groups based on the pharmacy services received. Patients deceased during the 30-, 60-, and 90-day follow-up periods were excluded from the analyses (Figure 1). A total of 1,065 patients were assessed, and their characteristics are presented in Table 1. Additionally, Table 2 provides a summary of the number of readmissions and results for mean time to first readmission.

Primary outcome: 30-day readmission analysis. The 30-day readmission analysis included 1,065 patient ADEs. Figure 2 shows the unadjusted 30-day, 60-day, and 90-day all-cause readmissions. After adjusting for confounders, the multivariable logistic regression analysis revealed that the intervention arms had a statistically significantly lower all-cause readmission rate (10.84%) compared to the control group (22.69%) ($P < 0.01$), indicating a 55% reduction in the odds of readmission (odds ratio [OR], 0.45; 95% CI, 0.31-0.67).

60-day readmission analysis. For the 60-day readmission analysis, 1,050 patient ADEs were evaluated. The control group had a readmission rate of 31.31%, whereas the intervention arms had a statistically significantly lower readmission rate of 16.27% ($P < 0.01$), indicating a 52% reduction in the odds of readmission (OR, 0.48; 95% CI, 0.34-0.69).

90-day readmission analysis. Finally, the 90-day readmission analysis included 1,039 patient ADEs. The intervention arms had a statistically significantly lower all-cause readmission rate (18.28%) compared to the control group (34.74%) ($P < 0.01$), indicating a 51% reduction in the odds of readmission (OR, 0.49; 95% CI, 0.34-0.70).

Secondary outcome. After adjusting for confounders, the multivariable linear regression analysis showed an increase in the time to first readmission during the 90-day follow-up period of 5 days (95% CI, 2.13-6.73 days) with pharmacist intervention: 29 days in the intervention arms overall versus 24 days in the control group to ($P < 0.01$).

Subgroup analysis. ***30-day readmission analysis.*** The multivariable analysis of the odds of readmission per intervention arm is presented in Figure 3. Compared to the control group's 30-day readmission rate of 22.69%, intervention arms 2 and 3 achieved statistically significant reductions in readmission rates, with rates of 2.82% ($P < 0.01$) and 8.86% ($P < 0.01$), respectively; the corresponding reductions in the odds of readmission were about 89% (OR, 0.11; 95% CI, 0.05-0.27) and 63% (OR, 0.37; 95% CI, 0.23-0.60). Intervention arm 1 did not experience a statistically significant reduction in

Table 1. Characteristics of Adult Patients by Study Group (n = 1,065)

Characteristic	Control (PHRN services)	Intervention arm 1 (PHRN + Inpatient ToC pharmacy services	Intervention arm 2 (PHRN + PHP pharmacy services	Intervention arm 3 (PHRN + inpatient ToC and PHP pharmacy services	*P* value
Age, mean (SD), yr	74 (13)	74 (13)	75 (12)	76 (12)	0.06
Female, No. (%)	121 (56)	116 (56)	107 (54)	252 (59)	0.31
Race, No. (%)					0.48
Hispanic	42 (19)	46 (22)	40 (19)	115 (27)	
White or Caucasian	118 (55)	110 (53)	126 (59)	221 (52)	
Black or African American	40 (19)	41 (20)	30 (14)	71 (17)	
Other	16 (7)	10 (6)	17 (8)	22 (5)	
Language, No. (%)					0.01
English	181 (84)	165 (80)	189 (89)	348 (81)	
Spanish	29 (13)	33 (16)	16 (8)	71 (17)	
Other	6 (3)	9 (4)	8 (4)	10 (2)	
Socioeconomic status (Medicaid), No. (%)	77 (36)	75 (36)	47 (22)	150 (35)	<0.01
CESLG, No. (%)					<0.01
Cardiac care	64 (30)	44 (21)	40 (19)	93 (22)	
Cardiac procedures	23 (11)	6 (3)	33 (15)	22 (5)	
Neurological care	14 (6)	19 (9)	15 (7)	31 (7)	
Orthopedics	5 (2)	12 (6)	23 (11)	35 (8)	
Medical & critical care	102 (47)	123 (59)	94 (44)	239 (56)	
Other	8 (4)	3 (1)	8 (4)	9 (2)	
Hospital or ED admission risk, No. (%)[a]					<0.01
Low	35 (16)	32 (15)	59 (28)	96 (22)	
Medium	36 (17)	32 (15)	50 (23)	84 (20)	
High	145 (67)	143 (69)	104 (49)	249 (58)	

Abbreviations: CESLG, Clinical Episode Service Line Group; ED, emergency department; PHP, population health pharmacist; PHRN, population health registered nurse; ToC, transitions of care.
[a]Calculated by an electronic health record–integrated risk assessment tool.

the 30-day readmission rate, with a rate of 22.71% (P = 0.73; OR, 1.08; 95% CI, 0.68-1.74).

60-day readmission analysis. The control group had a 60-day readmission rate of 31.31%. There was no significant difference in the odds of readmission in intervention arm 1, with a rate of 27.59% (P = 0.77; OR, 0.94; 95% CI, 0.60-1.45), while intervention arms 2 and 3 had significant reductions in readmission rates of 9.00% (P < 0.01) and 14.45% (P < 0.01), respectively. The demonstrated reductions in the odds of readmission were 74% (OR, 0.26; 95% CI, 0.15-0.46) and 59% (OR, 0.41; 95% CI, 0.27-0.62) for intervention arms 2 and 3, respectively.

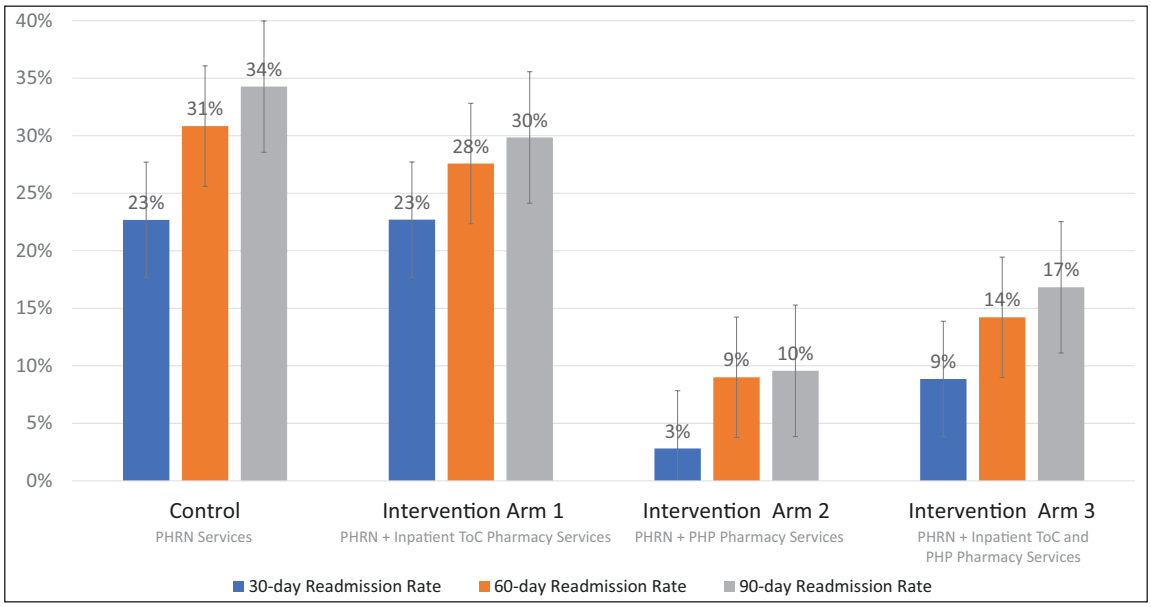
90-day readmission analysis. The control group had a 90-day readmission rate of 34.74%. Similar to results for the 60-day readmission analysis, there was no significant difference in the odds of readmission in intervention arm 1, with a rate of 29.85%

Table 2. 30-, 60-, and 90-day Readmissions and Mean Time to First Readmission by Study Group

Readmissions	Control (PHRN services)	Intervention arm 1 (PHRN + Inpatient ToC pharmacy services	Intervention arm 2 (PHRN + PHP pharmacy services	Intervention arm 3 (PHRN + inpatient ToC and PHP pharmacy services
30-day anchor encounters	216	207	213	429
30-day readmissions, No. (%)	50 (23)	47 (23)	6 (3)	39 (9)
P value[a]		0.73	<0.01	<0.01
60-day anchor encounters	214	203	211	422
60-day readmissions, No. (%)	67 (31)	56 (28)	19 (9)	61 (14)
P value[a]		0.77	<0.01	<0.01
90-day anchor encounters	213	201	209	416
90-day readmissions, No. (%)	74 (34)	60 (30)	20 (10)	71 (17)
P value[a]		0.80	<0.01	<0.01
Mean time to first readmission, days	24	20	38	34
P value[a]		0.38	0.01	<0.01

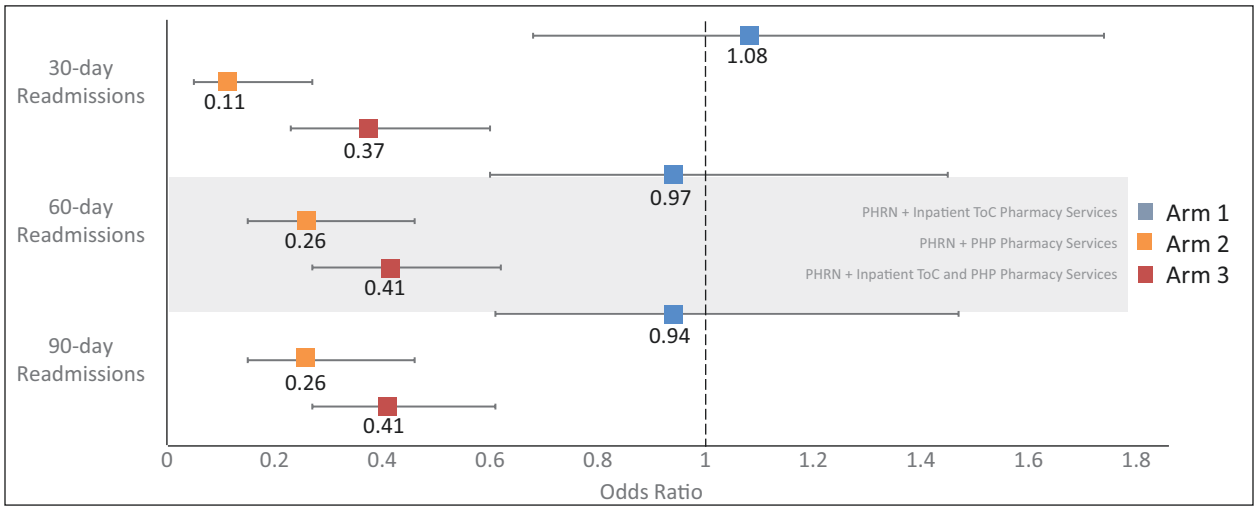
Abbreviations: PHP, population health pharmacist; PHRN, population health registered nurse; ToC, transitions of care.
[a]All *P* values are for comparison to control group.

Figure 2. Unadjusted readmission rates in the control group and 3 intervention arms. PHP indicates population health pharmacist; PHRN, population health registered nurse; ToC, transitions of care.



(P = 0.80; OR, 0.94; 95% CI, 0.61-1.47). Intervention arms 2 and 3 maintained significant reductions in readmission rates, with rates of 9.57% (P < 0.01) and 17.07% (P < 0.01), respectively. The demonstrated reductions in the odds of readmission were 74% (OR, 0.26; 95% CI, 0.15-0.46) and 59% (OR, 0.41; 95% CI, 0.27-0.61) for intervention arms 2 and 3, respectively.

Figure 3. Forest plot presenting odds ratios for 30-, 60-, and 90-day readmission in the 3 interventions arms. PHP indicates population health pharmacist; PHRN, population health registered nurse; ToC, transitions of care.



Secondary outcome. Compared to the control group's mean time to first readmission of 24 days, intervention arm 1 experienced a shorter time to first readmission of 20 days, (P = 0.38). Notwithstanding the shorter time to first readmission observed for intervention arm 1, interventions arms 2 and 3 had extended mean times to first readmission of 38 days (95% CI, 1.79-13.15 days; P = 0.01) and 34 days (95% CI, 1.26-6.21), respectively.

Discussion

This study aimed to evaluate the impact of pharmacy-integrated ToC and population health services on all-cause readmissions and time to first readmission within a multihospital healthcare system, specifically targeting the MV-BP population over an extended 90-day period. The findings presented indicate that these interventions can significantly reduce all-cause readmission rates and increase the time to first readmission. This study adds to the existing literature on the impact of pharmacist-integrated ToC services[8-16] and extends the validity of the reduction of readmission up to 90 days following an ADE.

The examination of potential factors influencing higher readmission rates revealed several noteworthy observations. Low socioeconomic status (defined as eligibility for Medicaid) was associated with an increased risk of readmission. Cardiac care was the only CESLG associated with a statistically significant increase in readmission risk. Additionally, patients classified under the medium- or high-risk category using the hospital or ED admission risk assessment method, which was able to be validated based on the results of this study, had an increased risk of readmission when compared to the low-risk category. There was a higher numerical risk for medium-risk patients and a statistically significant increased risk of readmission for high-risk patients to be readmitted for any cause. Future studies focusing on specific causes for readmissions in this patient population could help further refine these interventions to better target at-risk populations.

Given the lack of published articles assessing readmissions targeting the MV-BP population and conflicting evidence on the impact of pharmacist-integrated ToC programs in hospital readmission, this study provides valuable insights into the effectiveness of these interventions in reducing readmission rates. The study was able to capture a diverse range of patients of varying illness severity and acuity, allowing the identification of specific populations that could benefit from targeted population health and ToC services.

Limitations. Our study had several limitations that should be considered. Firstly, readmissions to other healthcare systems or hospitals were not captured in the Epic-generated report, meaning that any hospitalizations that occurred outside our healthcare system were not accounted for. Secondly, a factor that might have contributed to the lack of a statistically significant reduction in readmissions and a decrease in time to first readmission in intervention arm 1 was the inability of certain patients to access population health services, likely influenced by early readmission within 1 to 2 days of discharge. This challenge may have been heightened by the impact of the COVID-19 pandemic and apprehension about seeking follow-up care in the outpatient setting. As this study was done retrospectively, future trials should focus on using prospective designs to establish causality between ToC and PHP services and readmission rates in the MV-BP population.

Conclusion

Pharmacist-integrated ToC and population health services can significantly reduce all-cause readmission rates at 30, 60, and 90 days in the MV-BP population. This study offers

evidence-based support for the integration and expansion of pharmacy ToC and population health services to minimize the risk of hospital readmissions in a 90-day follow-up period and to increase the time to first readmission in this Medicare population.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

Disclosures

The authors have declared no potential conflicts of interest.

Additional information

This work was presented at the 2021 ASHP Midyear Conference, the 2022 Florida Society of Health-System Pharmacists (FSHP) Florida Residency Conference, and the 2022 FSHP Best Practice Showcase. The authors submitted the following CRediT author statement: Dor Partosh: Conceptualization, Methodology, Investigation, Data curation, Writing - Original Draft, Writing - Review & Editing, Visualization; Lazara Cabrera Ricabal: Conceptualization, Methodology, Resources, Data curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Supervision, Project administration; Diana C. Beltran: Conceptualization, Methodology, Writing - Review & Editing, Supervision; Sade Simmons: Conceptualization, Methodology, Writing - Review & Editing, Supervision; Fatimah Sherbeny: Software, Validation, Formal analysis; Dovena Lazaridis: Conceptualization, Methodology, Formal analysis, Resources, Writing - Review & Editing, Supervision, Project administration. Dr. Partosh had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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