Improving Health of At-Risk Rural Patients project: A collaborative care model

Purpose. The design elements of the Improving Health of At-Risk Rural Patients (IHARP) care model are described.

Summary. The IHARP project evaluated the clinical, economic, and humanistic outcomes associated with the collaborative care model relative to usual care in the community. The care model was initiated in 22 level 3-certified patient-centered medical homes. The primary outcomes are the absolute change in all relevant clinical and laboratory values of patients with hypertension, hyperlipidemia, and diabetes within and between the intervention and comparator groups; the change in the absolute number of emergency department visits and hospitalizations; and the change in the cost of care among the Medicare and Medicaid intervention patients. The lessons learned during the implementation and conduction of this project over the past three years are also presented. Patient enrollment ended in December 2014, final patient care visits were concluded in the fall of 2015, and results are expected in late 2016 or early 2017.

Conclusion. This project will provide information from patients, physicians, and midlevel providers regarding their perceptions of clinical pharmacists as collaborative care team members. Data on health outcomes, health services utilization, and costs of care drawn from over 1600 Medicare beneficiaries will provide a robust assessment of the value of the IHARP care delivery model.

Keywords: ADAPT, chronic disease state management, collaborative care model, comprehensive medication management, patient-centered medical home, pharmacist, transitions of care

The Improving Health of At-Risk Rural Patients (IHARP) project is a healthcare delivery model designed to optimize the safety of medication use and improve clinical outcomes, enhance patient and healthcare provider satisfaction with care, and decrease healthcare costs by reducing emergency room and hospital use, primarily via embedding clinical pharmacists as members of primary care teams. The pharmacists’ interventions are grounded in evidence-based therapeutic guidelines, developed by the project team, and designed to provide comprehensive medication management and chronic disease management.

The IHARP model of care was implemented in over 20 predominantly rural and medically underserved counties in southwest Virginia. The health status of this region ranks in the lower half of all counties in Virginia, based on social and economic factors and access to and quality of care, as well as poor diet and low levels of exercise. In the United States, the achievement of optimal patient outcomes for many chronic conditions is low, especially among individuals of a low socioeconomic status who live in rural areas. The reasons cited for poor achievement and maintenance of the desired outcomes include a
multiplicity of patient, provider, and health-system factors.\textsuperscript{6,8,9}

Adverse drug reactions and the misuse of medications are associated with drug-related morbidity and mortality.\textsuperscript{11-15} Discrepancies in the medications documented in physician and institutional medical records as well as the self-report of medications by patients are a problem in many clinical settings.\textsuperscript{16,17} Pharmacists have contributed to improved clinical outcomes for patients through the provision of comprehensive medication management and chronic disease management, both of which include medication reconciliation.\textsuperscript{18-21} Their efforts have reduced healthcare service utilization (i.e., hospitalizations and emergency department [ED] visits) and generated cost savings to healthcare institutions and health insurance plans.\textsuperscript{20-26}

The IHARP model uses comprehensive medication management and chronic disease management to improve patient outcomes and contain or reduce costs by embedding clinical pharmacists with the patient-centered medical home (PCMH) teams in 22 Carilion Clinic primary care practices, interfacing them with hospital pharmacists at 7 Carilion Clinic regional hospitals and community pharmacists at 30 independent and chain pharmacies throughout the region. The primary goals were to (1) improve healthcare delivery to high-cost, high-risk patients with multiple chronic diseases, (2) achieve better clinical health outcomes for individual patients, and (3) reduce hospital and ED visits by enhancing and coordinating the provision of comprehensive medication management and chronic disease management.

\textbf{Study design}

A quasi-experimental design, with intervention and matched comparator groups, was used to assess the impact of the IHARP model on clinical and health services utilization measures (i.e., hospital and ED use) within Carilion Clinic. Medicare claims data will be used to quantify hospital and ED use and healthcare costs in the intervention group for the year before and the final year of project participation. Patient satisfaction was assessed only in the intervention group using a posttest design. Physicians’, clinic staff members’, and pharmacists’ perceptions of IHARP were also evaluated (Table 1).

\textbf{Study population and setting}

The IHARP care model was initiated in 8 clinics in January 2013 with two clinical pharmacists. In July 2013, an additional three clinical pharmacists were embedded in 14 additional clinics. All clinics were level 3-certified PCMHs that used the same electronic medical record (EMR) as that used by the hospitals (Epic, Epic Systems, Verona, WI). These clinics were not associated with family medicine residency programs. Only 2 of the 22 primary care clinics had a clinical pharmacist embedded in the practices before the initiation of this project. The patient population was predominantly female, white, and over age 65 years.

Patients were included in the project if they were age 18 years or older; primarily used the English language for oral and written communication; had a telephone line available; had been diagnosed with at least two chronic diseases, at least one of which had to be one of the seven targeted diseases (diabetes, hypertension, hyperlipidemia, chronic obstructive pulmonary disease, asthma, congestive heart failure, and depression); were prescribed at least four long-term medications; and had a primary care physician within the Carilion Clinic network. Patients who were currently hospitalized, hospitalized within the past 14 days due to a chronic disease exacerbation, had three or more ED or hospital admissions in the past year, or were referred by their primary care physician were eligible to participate. Patients were excluded if they had a terminal condition with a life expectancy of no more than six months.

\textbf{Patient identification and recruitment}

\textit{Intervention group.} The patient identification process was facilitated by the development of an electronic screening tool that identified potentially eligible patients in each of the hospitals. The algorithm drew from EMR data to identify hospitalized patients who met the core eligibility criteria: age 18 years or older, taking at least four long-term medications, and having at least two chronic diseases. A study coordinator provided hospital-based pharmacists with matching patient listings to ascertain if the patients met all of the eligibility criteria.
Table 1. Summary of Study Measures and Data Collection Schedule

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Baseline</th>
<th>6 mo</th>
<th>12 mo</th>
<th>18 mo</th>
<th>24 mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication-related problems, number and type identified and resolved</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Clinical outcomes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Change in HbA\textsubscript{1c} from baseline to follow-up; proportion of patients at goal HbA\textsubscript{1c}</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Change in SBP and DBP from baseline to follow-up; proportion of patients at goal SBP and goal DBP</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Change in LDL-C, HDL-C, triglycerides, total cholesterol from baseline to follow-up; proportion of patients at LDL-C goal</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Number of HF-related ED and hospital visits</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Number of asthma- and COPD-related ED and hospital visits</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Utilization outcome</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Humanistic outcomes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Patient satisfaction</td>
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<td>Physician and staff satisfaction</td>
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<td>X</td>
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<tr>
<td>Pharmacist and provider experience</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*HbA\textsubscript{1c} = glycosylated hemoglobin, SBP = systolic blood pressure, DBP = diastolic blood pressure, LDL-C = low-density-lipoprotein cholesterol, HDL-C = high-density-lipoprotein cholesterol, HF = heart failure, ED = emergency department, COPD = chronic obstructive pulmonary disease.

Patients referred by their primary care physician in any of the 22 participating practices were evaluated by the clinical pharmacist in the practice to ensure that the patients met the eligibility criteria.

**Comparator group.** A retrospective chart review of the clinics that did not have an IHARP clinical pharmacist serving on the team was performed using the electronic eligibility criteria assessment algorithm to identify the comparator patient population. The comparator group has been selected, via propensity matching, from this population of patients based on the following variables: age, sex, race, insurance type, and baseline number of comorbidities.

**Data collection tool and documentation system**

The Carilion Clinic EMR was customized to serve as the data collection tool, capturing pharmacists’ activities involving medication-related problems (MRPs) and preventive health measures (e.g., flu and pneumococcal vaccinations, tobacco cessation services, depression screening) and the provision of comprehensive medication management. The pharmacist MRP assessment and intervention documentation module included identification of and interventions recommended to resolve MRPs. The Carilion Clinic information technology group was instrumental in transforming the core elements of comprehensive medication management into this customized EMR documentation module. After completing the EMR training module, community pharmacists were granted read-only access to the complete EMR, including the data collected for patients who identified their pharmacy as the patient’s primary pharmacy. They also had a secure messaging platform for communication with other IHARP pharmacists.

**Preparation of intervention pharmacists**

A work-force development plan was crafted to prepare the pharma-
cists for their new roles, improve collaboration between pharmacists and physicians, and provide patients with high-quality comprehensive healthcare. The primary care clinical pharmacists (PCCPs) who were hired by Carilion Clinic specifically for this project did not have faculty appointments or any teaching responsibilities. Three of the pharmacists had completed a postgraduate year 1 residency, and two had practiced in ambulatory care for 2 and 10 years. The educational plan was built upon the foundation of the ADAPT program, an online educational program developed by the Canadian Pharmacist Association.27-29 The six postintroduction modules included (1) a comprehensive medication assessment approach for patients, (2) how to work collaboratively with all members of the healthcare team and how to develop a medication care plan, (3) patient interviewing, (4) evidence-based practice in clinical decision-making, (5) documentation of medication-related care, and (6) creation of a plan to implement the pharmacists’ new skills in the PCMH practice setting.

The initial group of PCCPs and hospital clinical pharmacists completed the ADAPT program in early 2013; the second group completed the course in early 2014. Consequently, the traditional role of hospital clinical pharmacists was expanded, and a new set of roles and responsibilities was created to foster the affiliation of PCCPs with the primary care practices (appendix).

The PCCPs were embedded in three to five practices, depending on their patient panel size and geographic proximity. Each PCCP spent one to two days a week in each of his or her clinics; an average of 33 hours per week was devoted to direct patient care. Other tasks included documentation of patient care, follow-up with providers to coordinate care, and completion of administrative tasks. Time studies were conducted during the implementation and maintenance phases of the project.

The community pharmacists received American Pharmacists Association’s medication therapy management training certification through the provision of a customized onsite educational program provided by Virginia Commonwealth University School of Pharmacy faculty. The critical elements of this training included a primer on evidence-based practice, motivational interviewing, assessment of patients for MRPs, and the development of the individual patient care plan. These pharmacists also received training from the Carilion Clinic information technology group so they could access the EpicCare Link to review patient information and securely communicate with their colleagues in the hospital and primary care practices.

**Pharmacist intervention**

The IHARP care model is a closed-loop custodianship of medication management. Once a patient was identified, an evidence-based medication care plan was developed that followed patients throughout their Carilion Clinic care experiences. Care plans included a list of the patient’s diseases, pertinent laboratory test results compared against goals, and medications used to treat the chronic diseases. Also included in the care plans were lifestyle and medication optimization recommendations, as well as monitoring plans for each of the chronic diseases (e.g., frequency of measurement for blood pressure, glycosylated hemoglobin [HbA₁c] values, and blood glucose concentrations; observations such as weight for patients with congestive heart failure and foot or eye examinations for patients with diabetes). Medication optimization was monitored under the stewardship of the PCCP and disease status response was updated based on feedback from the patient, care coordinators, and primary care providers. The pharmacists were integrated with other healthcare disciplines across care transitions to facilitate optimization of the patient’s healthcare and medication-related outcomes and to ensure coordination of care plans. The hospital clinical pharmacists met face-to-face with the patient shortly after admission and as part of the discharge planning process to monitor the medication care plan. They also introduced patients to their PCCP who contacted them within 72 hours of discharge to assess their transition into the community. Nonacute MRPs identified by the hospital care team were conveyed to the PCCP via an electronic or telephone handoff. Hospital clinical pharmacists also notified network community pharmacists by fax when one of their patients was being discharged. The hospital clinical pharmacists provided the hospital discharge summary and current medication list.

The IHARP plan included PCCP phone contact within 72 hours after any hospital discharge. If this was the first patient contact, a follow-up face-to-face visit was scheduled within 14 days, with subsequent interactions (face-to-face or via telephone) at least every three months. At the initial visit, the PCCP performed a structured interview to obtain a medication history, identify any MRPs, and devise recommended modifications to the patient’s care plan. The structured interview included medication reconciliation via a motivational interviewing approach, as well as assessment of medication adherence via the ASK-12 survey,30 depression screening via the Patient Health Questionnaires (PHQ-2 and PHQ-9);31 physical counting of medications as a follow-up, if warranted; and an assessment of the patient’s clinical disease status, which included a review of all symptoms and signs, relevant laboratory test results, and adjunct monitoring measures. Finally, patients were asked if they had seen any other physicians or been in an ED or hospital since their last visit.

MRPs were categorized according to a modification of the Hepler and Strand32 classification and included the following main categories: nonadherence, needs additional drug...
therapy, dosage too low, unnecessary drug therapy, adverse drug reaction, dosage too high, and ineffective drug. In addition, discrepancies identified during medication reconciliation, including issues related to dose, dosage form, incorrect instructions, omission, and duplication, were documented. The interventions necessary to resolve the MRPs were captured and categorized as follows: discontinue drug, add drug, increase dose, decrease dose, change drug, adherence or medication/disease-related education, cost-related change, and monitoring required. Once the physician endorsed the revised care plan, the PCCP implemented the plan at the earliest opportunity.

Comprehensive medication management and chronic disease management were the primary components of the IHARP intervention because they are well defined and associated with positive outcomes. Comprehensive medication management involves the identification and resolution of MRPs through comprehensive medication review, medication reconciliation, generation of a medication care plan, preparation of a personal medication record, and collaboration with other members of the care team to monitor and optimize medication-related patient health outcomes. The comprehensive medication management sessions addressed patient-specific problems or concerns and empowered patients to self-manage their medication use.

Health education and medication counseling were provided during all comprehensive medication management sessions. PCCPs were integrated into the primary care clinic teams so that they could collaborate with providers to optimize patient outcomes directly as well as via telephone or secure electronic messaging. The PCCP was the coordinator of the care plan with partnering community pharmacists. The clinical pharmacists coordinated their intervention strategies to optimize medication reconciliation, improve patients’ understanding of their diseases and the role of medication therapy in their care, and optimize patients’ adherence with their medication and other therapeutic interventions. Adherence was assessed by patient interview, the pharmacist’s interpretation of the patient’s completion of the ASK-12 tool (GlaxoSmithKline), and physical counting of medications, if warranted. Patients who reported adherence issues due to medication cost were provided assistance through a robust medication assistance program (MAP). The MAP staff applies to manufacturers’ MAPs on the behalf of patients. Manufacturers’ MAPs have varying eligibility requirements, and patients not eligible for manufacturer programs that supply the medications at no charge can still be helped through the provision of copayment assistance cards or direction to the lowest cost retail pharmacy for a particular medication. Staff in the MAP offices worked with PCCPs to identify alternative therapies for which patients would qualify for manufacturer assistance. Transitions of care from hospital to ambulatory care settings were facilitated through the provision of MAP services to ensure that gaps in medication access did not adversely impact patient care outcomes.

The expectations for community pharmacists who participated in the IHARP network were to regularly assess patient disease control and issues with medication adherence. The IHARP network community pharmacists were to provide focused counseling based on the patients’ self-assessment of their signs and symptoms and then communicate their assessment of the patients’ clinical status to the PCCP by fax or secure electronic messaging. The goal was to provide PCCPs with early identification of patients who were experiencing worsening of their conditions. It was also envisioned that community pharmacists would assess patient medication adherence and, in collaboration with the PCCP, seek to resolve this MRP. They were to notify the patient’s PCCP of any new medications prescribed by non-Carilion Clinic physicians or providers to enhance the accuracy of the medication record. Finally, network community pharmacists had the option to provide medication therapy management for patients referred by a PCCP. A payment schedule was developed and implemented in fall 2013 for all services performed.

Data collection

In addition to capturing MRPs, the interventions recommended by PCCPs to resolve the MRPs, the acceptance rate of these interventions by the clinic providers, and clinical, economic, and humanistic data were collected. Routinely collected clinical measures (e.g., blood pressure, HbA1c, low-density lipoprotein [LDL] cholesterol, high-density lipoprotein cholesterol, triglycerides, total cholesterol) were downloaded from the EMR on a monthly basis. The estimated cost avoidances associated with the PCCPs’ recommended interventions were assessed at each patient encounter using a standardized approach as part of the EMR documentation module and aggregated monthly. These interventions were categorized according to their impact: (1) improved quality of care, (2) estimated reduction in drug product costs as the result of discontinuation or a change in medication, (3) avoidance of a physician office visit, (4) avoidance of generation of a new prescription, and (5) avoidance of an ED visit or a hospitalization. The costs associated with each of these events as originally proposed was updated to reflect inflation in healthcare costs. The intervention group’s ED visits and hospitalizations as documented in the Carilion Clinic EMR were tabulated every six months. Patient satisfaction was assessed every six months with a mailed survey. Physician and clinic staff perceptions of PCCPs’ impact on quality of care and workflow and practice efficiency were evaluated every six to nine months. IHARP pharmacists and nonpharmacist care team members were interviewed at the midpoint and end of the project period to obtain feedback about IHARP implementation and...
strategies to facilitate pharmacist integration with care teams.

**Fidelity of comprehensive medication management delivery**

A representative sample of 100–125 patients’ EMR data was provided to an independent, three-member multidisciplinary panel on three occasions during the project period. The panel comprised two ambulatory care pharmacy faculty members with over 10 years of experience delivering direct patient care and one nationally prominent physician familiar with comprehensive medication management and chronic disease management. Their review was supported by the fidelity review guide (eAppendix, available at www.ajhp.org), which included instructions for navigating the EpicCare Link system and the explicit instructions they were to follow for documenting the results of their assessment. They also were provided with the IHARP MRP documentation user manual, which provided guidance on selecting reviewer evaluation categories and described the documentation expectations of PCCPs. Using a 5-point Likert scale, each evaluator indicated his or her degree of agreement with the PCCPs’ identification and classification of MRPs, the appropriateness of the PCCPs’ recommended interventions to resolve the MRPs, and the estimated cost avoidance the PCCPs assigned to each intervention. Reviewer feedback was used to further standardize documentation among PCCPs and to clarify aspects of the documentation guide. The reviewers’ agreement with the PCCPs’ categorization of the MRP type and the appropriateness of the PCCPs’ recommended interventions and their categorization of the estimated cost avoidance increased subsequent to the first fidelity review. The findings of the reviewers’ assessment of individual PCCP’s fidelity with the IHARP model suggest a high degree of consistency among the PCCPs and their multiple practices. Improvements in documentation practices and identification of MRPs during the project were observed, indicating the feedback and retraining provided to PCCPs after the first review and internal data validation were effective in this quality-improvement process.

**Primary outcomes**

The primary clinical outcome is the absolute change in all relevant clinical and laboratory test values of patients with hypertension, hyperlipidemia, or diabetes from the baseline value to the last observed value within and between the intervention and comparator groups. The last observed value as recorded in the EMR occurred a minimum of 6 months after the first visit with a maximum of 24 months. The primary health services utilization outcome is the change in the absolute number of ED visits and hospitalizations in the 12 months before and during participation among the intervention and comparator groups. The primary economic outcome is the change in the cost of care among the Medicare intervention patients during the 12 months before participation compared to costs during the 12 months after enrollment. This information will be extracted from claims data provided by the Centers for Medicare and Medicaid Services for Medicare beneficiaries.

**Secondary outcomes**

Four secondary clinical outcomes will be assessed. The first one is the proportion of patients who achieve the desired clinical outcome goals at 6, 12, 18, and 24 months among those in the intervention and comparator groups as well as those who had uncontrolled hypertension, diabetes, or hyperlipidemia at baseline. The second is the absolute change in clinical and laboratory test values at 6, 12, 18, and 24 months among those in the intervention and comparator groups as well as those who had uncontrolled hypertension, diabetes, or hyperlipidemia at baseline. The impact of health insurance status on absolute change as well as proportion of patients who achieve desired clinical outcomes at 6, 12, 18, and 24 months will be compared. Finally, the differences in health services utilization (ED visits and hospital admissions) in the 12 months before and during 6, 12, and up to 24 months in the intervention and comparator groups will be tabulated.

**Statistical analysis**

Descriptive statistics (means, frequencies, ranges, and standard deviations) will be reported for all clinical outcome measures. Bivariate analyses (t test and chi-square analysis) will be used to measure baseline differences among the intervention and comparator groups. Both linear mixed models (for continuous measures) and generalized estimating equation models (for dichotomous measures) will be used to measure the impact of the IHARP model on the outcomes of interest while controlling for sociodemographic and health-related variables. The a priori significance level is 0.05. The statistical software used for data analysis is SAS version 9.4 (SAS Institute, Cary, NC).

**Ethics and consent**

This project received exempt approval as a quality-improvement, quality assurance project from the Carilion Clinic and Virginia Commonwealth University institutional review boards before the initiation of patient enrollment. Patients were free to withdraw from the project at any time. Confidentiality of project data was rigorously maintained and documented as specified in the business associates agreement. After conclusion of the quality-improvement project, exempt approval was obtained from the Virginia Commonwealth University’s institutional review board for the investigators’ secondary analysis of existing data, documents, and records.

**Challenges and lessons learned**

This project was the first evaluation of pharmacist collaborative care to be conducted in a rural, non-
academic medical center–associated PCMH medical group and is one of the first to investigate the impact of comprehensive medication management and chronic disease management in patients with multiple chronic diseases. This project implemented pharmacist-led care strategies that have been shown to provide value when targeted to manage single chronic diseases. The IHARP project will help the healthcare community ascertain the value of this care model.

The primary challenges observed during this project predominantly arose during the integration of PCCPs into primary care practices and the development of the network of community pharmacies and pharmacists. The paradigm shift in the use of the pharmacist work force was not easy. The shift of focus from acute care to continuity of care as well as the change in metrics from “standard pharmacy work” to the number of MRPs identified and the impact of recommended interventions on patient clinical outcomes, health services utilization, and cost of care was not readily accepted by the Carilion Clinic staff and administration and hospital pharmacists.

The role of a clinical pharmacist on the healthcare team was foreign to most participating primary care physicians, midlevel providers, and care coordinators at the start of the project. Gaining acceptance as members of the team required time and patience. Since PCCPs spent no more than one to two days each week in a given practice, an extensive period of time was needed to build rapport with staff and incorporate the PCCP into the patient flow within the practice. PCCPs needed to learn the workflow responsibilities and personalities of individuals in each practice to avoid professional encroachment. Becoming an effective collaborator with physicians and midlevel providers also necessitated that the PCCPs had a track record of sound medication recommendations and effective interactions with patients, including follow-up on extended tasks such as insulin or blood pressure medication adjustment. Placing a pharmacist in a PCMH seemed to be ideal for identifying and managing MRPs, as the pharmacist could consult with a patient’s physician in real time. However, we found that the PCCPs often had to consult with a patient’s specialists to solve MRPs, and this interaction sometimes resulted in the modification of additional medication therapies in addition to the one originally targeted.

Working with a PCCP was a new experience for almost all patients in the intervention group. Their reaction to their PCCP was often confusion since they already knew “their pharmacist” in the community pharmacy setting. It was important to communicate that there is an active collaboration between their PCCP, physician, and community pharmacist. Medication affordability was an issue for many patients. Carilion Clinic’s three MAP offices were a useful resource; however, the collection of necessary information, documents, signatures, and prescriptions often was best accomplished in the PCMH. Devising a process to optimize the flow of information between the PCCPs and MAP offices required substantial communication and ultimately made the process more efficient.

The national community pharmacy corporation that was an enthusiastic partner during the conceptualization of the project ultimately decided to not participate. This decision created a large vacuum, since the corporation had the largest number of pharmacies in the region. We then approached a number of independent community pharmacies and multiple other chain pharmacy corporations to build a community pharmacy network. This smaller network did not share common electronic data systems or a consistent management philosophy; ultimately, fewer than 15% of patients in the intervention group designated one of these pharmacies as their primary pharmacy.

The second community pharmacy challenge related to the lack of allocation of staff time within those pharmacies to interact with patients as envisioned. The community pharmacists were reluctant to allocate time to interpret a patient’s clinical status and communicate that to other IHARP team members. Admittedly, the multiple steps required to gain access to the patient’s information in the EMR and the functionality of EpicCare Link proved to be cumbersome and were rarely utilized. Thus, the role of community pharmacists serving as frontline sentinels to alert PCCPs of medication changes, emerging MRPs, and worsening of patients’ clinical conditions was never realized.

The choice of endpoint measures for two of our seven targeted diseases had to be modified because the clinicians did not routinely monitor forced expiratory volume in one minute and ejection fraction in our patients with asthma or chronic obstructive pulmonary disease and congestive heart failure patients, respectively. We replaced these outcome measures with the change in the number of disease-specific ED visits and hospitalizations in the year after enrollment compared with those in the year before patient enrollment. During the first year of the project, very few patients (<2%) had a diagnosis of depression at the time of enrollment. As a result of this small patient population and the fact that the PHQ-9, which was our sole outcome measure, was not routinely assessed in the practices, we are unable to assess the influence of pharmacist–physician collaborative care on depression.

During the course of this project, new guidelines for the management of hyperlipidemia and hypertension were released. This presented PCCPs with challenges in patient management, as the project’s LDL cholesterol and blood pressure outcome measures were based on patient goals recommended in 2012, which were no longer the goal of some providers for the patients under their care. Blood pressure goals were the least affected because they were individualized for patients from the start of the project.
The acceptance of a systolic blood pressure goal of <150 mm Hg for patients over 60 years old did require us to add this as an outcome measure, since a high proportion of our patients were elderly. The change in the goal for management of hyperlipidemia was more problematic. The shift from LDL cholesterol measurement as the target to an appropriate degree of drug therapy intensity resulted in a marked reduction in the frequency with which LDL values were measured. In addition, physicians were no longer striving to achieve goal LDL cholesterol values of <100 mg/dL.

The lessons learned during the conception, implementation, and ongoing quality-improvement evaluations of this continuity-of-care delivery model would have, if known at the outset, radically changed many components of the model. For example, transforming clinical pharmacists’ engagement with primary care practice from the previous perception of pharmacists as “specialists” for the management of polypharmacy or targeted needs such as anticoagulation management could have been optimized with earlier and more informative collaborations with primary care practice leadership. The intervention strategies appeared to work well in almost all practices, and the acceptance of these strategies by providers and patients was gratifying. The results of this project are expected to be available in late 2016 or early 2017 and will address the value of clinical pharmacists functioning as collaborative care team members. Data on health outcomes, health services utilization, and total costs of care drawn from over 1600 Medicare beneficiaries will provide a robust assessment of the value of the IHARP care delivery model.

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Disclosures

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Additional information

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Appendix—IHARP pharmacists’ roles and responsibilities

IHARP = Improving Health of At-Risk Rural Patients, PCCP = primary care clinical pharmacist.

**IHARP pharmacists’**

1. Evaluate the patient to ascertain if he or she qualifies for this new service.
2. Evaluate medication care plan in consultation with the patient’s hospitalist care team.
3. Inform the patient of any changes to the medication care plan before discharge.
4. Introduce the patient to his or her PCCP by providing a business/ appointment card and a brochure on the PCCP role and services within the primary care practice.
5. Fax the hospital discharge summary to the patient’s network community pharmacist.

**PCCPs**

1. Contact patient within 72 hours of discharge to assess the transition to home, ascertain if he or she has acquired the prescribed medications, and schedule a face-to-face appointment.
2. Integrate the medication care plan developed during hospitalization into the existing chronic disease management plan in collaboration with other members of the primary care practice team.
3. Contact patient by e-mail, telephone, or text message every three months to assess patient status and identify and resolve medication-related problems.
4. Educate health professionals on the primary care team with respect to current evidence-based disease and drug-use guidelines.
5. Assess and monitor the patient’s chronic disease status, provide comprehensive medication management, and modify medication and other therapeutic regimens based on the project’s chronic disease management documents.
6. Document all provider encounters, medication-related problems, patient interactions, and recommended interventions in the Epic healthcare record system, as well as the time spent on each activity.
7. Provide patient with disease education and medication adherence counseling.

**Community pharmacists**

1. Notify the patient’s PCCP of all new drugs prescribed.

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