HHS Public Access

Author manuscript

Innov Pharm. Author manuscript; available in PMC 2019 November 20.

Published in final edited form as:

Innov Pharm. 2018 ; 9(2): . doi:10.24926/iip.v9i2.1055.

Engaging with In-need Rural Patient Populations through Public Health Partnerships

Wes Nuffer, PharmD[1], **Tara Trujillo, MNM**[2], **Christy Harmon, PharmD**[1], **Megan Thompson, PharmD**[1]

[1]University of Colorado Skaggs School of Pharmacy & Pharmaceutical Sciences

[2]Colorado Department of Public Health and Environment

Abstract

A public health partnership was established between a state Medicare Regional Care Collaborative Organization (RCCO), the state health department, a pharmacy school and three community pharmacies located in rural Colorado to optimize the utilization of a free public health service provided through each pharmacy. Fourth-year pharmacy students were allocated year-round by the University of Colorado to support disease management and medication therapy management (MTM) services offered to patients in three rural towns served by the RCCO. Faculty from the school of pharmacy reviewed data provided by the RCCO to identify patients who could benefit from MTM or disease state management (DSM) services. These patients were contacted and encouraged to take advantage of these free pharmacy-based services. Additionally, a number of targeted interventions were performed within these populations to optimize their health. Concerted efforts were made to improve information flow and communication between these pharmacy sites and partnering medical offices. Additionally, pharmacy students were successfully integrated in to medical offices to work alongside medical providers in these communities. This manuscript describes the implementation and coordination of this project as well as the impact these pharmacies had on the communities they served.

Keywords

pharmacy education; community pharmacy; pharmacy student; Medicare; medication therapy management; health department; academic-community partnership; RCCO; public health

Introduction

The role of the pharmacist as a valued healthcare team member who can help educate and manage patients with chronic diseases is becoming increasingly recognized by the healthcare community. Several studies have highlighted improvement in health outcomes after patients engage in pharmacist-delivered services.[1–5] Likewise, innovative models have

Corresponding author: Wesley Nuffer, PharmD, BCPS, CDE, Associate Professor, Dept. of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy & Pharmaceutical Sciences, 12850 E Montview Blvd., C238-V20-1116J, Aurora, CO 80045, Phone: 303-724-2654; Fax: 303-724-2658, Wesley.Nuffer@ucdenver.edu.

Conflicts of interests: There are no conflicts of interest to report for any of the authors or partners on this project.

utilized pharmacy students to provide education and care to specific populations of patients, and have shown a positive impact on patients' health.[6–9] The introduction of reimbursement for pharmacist-delivered medication therapy management (MTM) services for patients with Medicare Part D in 2003 was a catalyst in encouraging pharmacists to provide education and pharmaceutical expertise for patients.[10] Pharmacists are transitioning away from traditional dispensing functions and into the role of a recognized medication expert, educating patients on side effects, on the importance of adherence, and on managing their chronic diseases.

The patient-centered medical home (PCMH) model of health care is widely viewed as the future of health care in the United States.[11,12] Key aspects of this model include the utilization of primary care to deliver key healthcare services, and including the patient as a team member and decision maker. Based upon the chronic care model, all members of the health care team work together, utilizing information technology to optimize the health of the patient.[12,13] Including the pharmacist within this health care team is an essential element to this model. There have been a number of publications citing the importance of including pharmacists within the PCMH model.[14–16] The pharmacist working in the community setting has a unique role in being the most accessible health care team member, often engaging with patients monthly and seeing them at times when they are not acutely ill. While this accessibility brings distinct advantages for including the pharmacist on the medical team, the community pharmacy practice setting, separate from the medical office where the patient receives care, also represents barriers to successful inclusion for interprofessional care. While the rest of the medical team may all practice in the same building, the community pharmacist is separated geographically and often lacks complete access to the patient's medical record. Steps need to be taken to improve the information flow between the pharmacy and provider offices. This will ensure that the pharmacist has essential information needed to make clinical decisions regarding their patient, and the providers receive reports on the clinical services the pharmacist is providing and the subsequent changes that occurred during the patient interaction.

This manuscript describes a partnership between a state public health department, a regional care collaborative organization (RCCO), and a school of pharmacy to establish pharmacy-delivered care services for patients in rural Colorado. This project seeks to further demonstrate the value of the pharmacist as part of the patient-centered care team, expand the potential reimbursement for pharmacist-delivered services, and improve the information flow between local provider offices and local pharmacies.

Background

The Colorado Department of Public Health and Environment (CDPHE) is a state agency that provides infrastructure and support for the systemic deployment of evidence-based interventions across the state. One such intervention, particularly important to reducing morbidity and mortality due to chronic disease is scaling up efforts that integrate community pharmacists into care teams to provide accessible, quality medication optimization and disease management supports, particularly for those with diabetes and cardiovascular disease. The department works with partners, including RCCOs, higher education,

community-based organizations and others to model and sustain disease prevention and management programming.

The Colorado RCCO Integrated Community Health Partners (ICHP) is a partnership between Beacon Health, the Colorado Community Managed Care Network (CCMCN), and providers practicing in the Southeast region of Colorado. This organization is responsible for providing care coordination to patients on Medicaid in this Southeast area. Demographically, this area has a large Hispanic population and has disproportionately high rates of diabetes and cardiovascular disease. ICHP's goal is to integrate multiple healthcare resources to provide a high level of care with the patients as the central focus.

The University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS) is committed to providing pharmacist support across the entire state of Colorado. All students entering the Doctor of Pharmacy (PharmD) curriculum are required to spend at least one six-week rotation living and working in a rural Colorado community, to experience the diversity of rural pharmacy and to provide care to underserved populations. The SSPPS has established a network of disease state management (DSM) pharmacy clinics in these rural areas where students work 48 weeks out of each year delivering education and management to the communities these pharmacies serve. This network has been previously described, and was established specifically to provide a resource to rural communities and to create an advanced learning environment for students who rotate through these sites.[6]

Program Implementation

Initial implementation of this project involved a series of conference calls held to orient team members on the goals of the project and the various roles and responsibilities of each entity. This included ICHP and CCMCN, who were responsible for providing Medicare and Medicaid data which could be used to identify potential patients who would benefit from pharmacy MTM services, pharmacists from each of the three target locations (La Junta, Alamosa and Buena Vista, Colorado, all part of the ICHP network region), representatives from CDPHE, and faculty from the SSPPS. The target locations were served by ICHP, but were not part of a formal PCMH model. ICHP claims data and diagnostic codes specific to diabetes and hypertension were used to identify potential patients already working with one of these three pharmacies who could benefit from MTM services. Case managers from ICHP contacted these clients to gauge their interest in receiving pharmacist MTM interventions. Interested patients' contact information was then forwarded to the local pharmacies for follow-up by the pharmacist or pharmacy student on site. Of note, all three of these pharmacies belonged to the SSPPS DSM network, and received a dedicated line of fourth-year pharmacy students (P4s) year-round to support the education and DSM initiatives. Patients were scheduled for MTM appointments at the pharmacies with a focus on medication adherence and performing a comprehensive medication review (CMR), along with the option to enroll in the six-month individualized education programs for diabetes and/or hypertension. Encounter notes generated by the pharmacist or student performing these services were sent to the patient's primary care provider, including any recommendations for therapy changes, laboratory monitoring or maintenance exams. These notes were built into the community pharmacy network electronic health record (EHR) as

APSO (Assessment-Plan-Subjective-Objective) notes, a modified SOAP note that prioritizes assessment and plan first, followed by the subjective and objective information. In order to make a complete assessment of the patient, students were trained to obtain an accurate medication list for each patient, including over-the-counter and herbal products. Patient lab measurements were also requested as needed from provider offices, and if not available, were recommended to be performed in order to help gauge kidney function and other essential parameters that may impact drug therapies. The six-month education programs focused on a variety of different modules delivered to patients by pharmacy students on a monthly basis, based upon each patient's individual needs and interest. The specific modules used at these clinics are listed in Table 1. Similar encounter notes were generated and sent to the patient's PCP after completion of each individual visit.

Major changes were implemented in the second year of the project due to sub-optimal patient enrollment and only modest successes. Patient acceptance rates for MTM services were low, around 5%, and the pharmacists provided feedback that they were not receiving referrals for extended periods of time. Analysis of the first year highlighted the need for better coordination across the various partners involved in the project, and as a result a centralized public health pharmacist was hired by the SSPPS to focus on information flow and recruitment for the project. While this pharmacist's salary was supported by grant funding, the intention of the project was to demonstrate the impact she could have across the pharmacy network resulting in cost savings that would more than justify the salary costs. The modified information flow is depicted in Figure 1, and this addition produced significant improvements to the program. Additional changes involved expanding the diagnostic codes used to identify ICHP patients to subcategories of both hypertension and diabetes and expanding the search to any patients who had filled a prescription at the participating pharmacies as opposed to a 90% pharmacy utilization that was previously used, both of which successfully generated a much greater number of eligible patients.

The clinical pharmacy services provided in La Junta were transitioned from the community pharmacy into a 501(c)(3) community migrant health center, to increase overall patient activity and to take advantage of having the pharmacist and students located in the same building as other practitioners. A second-year "kick-off" meeting was held in the rural town of Pueblo, Colorado, where ICHP's headquarters are based, and was attended by key representatives from ICHP, the three pharmacies, the SSPPS, and CDPHE. Roles and responsibilities were again outlined at this meeting, and the centralized pharmacist was introduced in her role of coordinating the project, in order to keep the program fresh in everyone's mind and to help with patient recruitment and information flow. This centralized pharmacist and additional faculty from the SSPPS traveled to each of the rural locations to meet with the primary medical clinics in an effort to explain the program to providers, facilitate referrals, and optimize submission of encounter notes, lab requests and other vital information needed at the pharmacy for these MTM encounters. For those patients who had mobility or geographic barriers that made face-to-face consultations difficult, a remote MTM consultation option was offered by telephone. The centralized pharmacist also began to implement a number of targeted interventions for patients engaged with these clinics, including transitioning patients from brand Crestor to generic rosuvastatin, initiating statin therapy for patients with diabetes at high risk of cardiovascular disease, and screening

patients' vaccine history in order to administer the PPSV23 pneumococcal vaccine to identified candidates.

Program Results

155 unique patients received disease state management services conducted across the three pharmacy sites during the first two years of funding. These patients received 1184 hour-long consultation visits, structured monthly for 6 months and then quarterly thereafter. Of note, this includes both patients referred into the program from ICHP or local providers as well as pharmacy patients who opted in. For each of the patient visits, encounter notes were submitted to the primary care provider identified by the patient.

Objective lab measurements of full lipid profiles, blood pressures, and hemoglobin A1C were all measured utilizing point-of-care technology at the pharmacy and tracked as part of the six month DSM program in which these three sites participated. Patients who received both baseline and six month values across all twelve pharmacy sites that provided these services were statistically analyzed using Wilcoxon signed-rank test (SAS, Cary, NC) to evaluate the impact on patient health outcomes that the education programs held. Table 2 outlines these results. There were statistically significant improvements in patients' systolic and diastolic blood pressures, total cholesterol, and hemoglobin A1C values.

Over the first two funding years, these three collaborative DSM pharmacy sites have trained 64 pharmacy students in six-week rotation blocks. Feedback from students has been extremely positive, citing collaborative opportunities with providers and expanded scope of practice compared with traditional community pharmacy experiences. An example quote from one pharmacy student was as follows: *"Great job providing constructive feedback and encouraging me to set goals and meet them and helping me strive to push my comfort levels by slowly passing over the reins on conducting patient clinic visits as well as providing great advice and insight on managing a pharmacy and handling conflict in the workplace. I learned a ton from this rotation."*

One unexpected result of this collaboration has been the successful integration of these pharmacy students into the medical clinics, where the students work directly with physicians, nurses, physician assistants, and other providers in these rural towns on a once a week basis. One clinic in Cedaredge, Colorado valued the student support so much that they lobbied with the school to receive an additional student on site such that the students traded sites throughout the week, covering both the clinic and the pharmacy full-time.

The targeted rosuvastatin prescription change initiative identified 16 patients across the three pharmacy sites eligible to change from brand Crestor to generic rosuvastatin. In consultations with the providers, seven of these (44%) were successfully changed to the generic therapy, representing an estimated cost savings of $6,500/year to the ICHP organization, or $929 per patient per year. While this is a service pharmacists are able to implement in most states across the country, this specific initiative focused pharmacists' attention on this particular alternative in an effort to save the system money. The statin initiation initiative identified 190 patients across the sites eligible for therapy, and 51

(26.8%) were successfully started on statin therapy. Based on statin therapy trials' estimates on the number needed to treat (NNT) for these drugs, this would successfully prevent one heart attack over the next five years.[17] Finally, the pneumococcal immunization initiative successfully immunized 32 patients out of 45 potential candidates (71% success rate) across the three communities.

Future Directions

The successes seen in integrating free pharmacy MTM and disease management services to patients in rural communities that lack many of the resources seen in urban areas are encouraging, and the feedback from patients, providers, and students are all extremely positive regarding this project. The program is now in its third and final funded year, and the focus is currently on collecting and analyzing data, including objective lab measurements, health-related quality of life, financial savings estimates, and feedback from patients, providers, and students. The positive impact this program has demonstrated in these rural underserved areas can be used as a template, and there are plans to approach other Colorado regional care collaborative organizations to reproduce these successes in another region, as well as sharing the model, together with generated patient manuals and suggested increased reimbursement rates with health departments, pharmacy organizations, and third-party insurance companies across the nation. The services in this area will continue to be supported with a dedicated stream of 4th year pharmacy students.

Discussion

This manuscript describes a partnership focused on optimizing the utilization of a valuable pharmacy resource established in three rural underserved areas of Colorado. These DSM clinics have been in place for several years, and are supported by the SSPPS with the year-round placement of P4 students to oversee and manage their operations. This project is unique in that it uses this existing network of DSM pharmacy sites to help support available health care services in these rural areas by identifying patients who could benefit from these services and working to enroll patients into the programs. It also focuses on the pharmacist's role as part of the patient-centered interprofessional team by working to integrate the services provided at these pharmacies into part of the patient's overall care, and by communicating these interventions directly back to the patient's medical provider. By utilizing data generated by the Colorado state Medicare and Medicaid RCCO, these pharmacies are able to identify and provide services to patients in need. The statistically significant improvement in patient health outcomes in those patients who participated in the six-month DSM program documents the value these pharmacy services hold. Of note, these data are consistent with earlier published data on these pharmacy DSM clinics in their improvement in patient health outcomes.[6]

There are several areas of note with this collaborative project. The initiatives to improve communications and information flow between the pharmacy and the medical office is critical in order to include the pharmacist within the PCMH model. There are manuscripts documenting the value of having a pharmacist on the team, but most of these models include a clinical pharmacist within the practice.[1,18] Integrating the community pharmacist into this

model is more difficult, with co-location and communication barriers cited as major challenges to the successful PCMH.[19–21] Establishing a good line of communication and data sharing, so that the pharmacist can access pertinent labs, allergies, and other data from the medical record, and so that the providers know what services and areas the pharmacist focused on with the patient is essential. This was accomplished in various ways, depending on the preferences of the local medical clinic in each community, including secure emails, facsimiles transmissions, and verbal contacts through back clinic telephone lines. Faculty from the SSPPS engaged with several medical clinics to explore sharing EMR access between the clinic and the local pharmacy, but due to the high variability of software options being used across the state this was not yet accomplished. Utilizing pharmacy students to help support these services also accomplishes several goals. Students are integrated into this innovative model of care, and are trained to collaborate as part of an interprofessional team and expand their role beyond the traditional dispensing function. The student support also greatly reduces the time requirement of the pharmacist, which is important because the current reimbursement for MTM services does not support the duration of time spent with the patients, which averages around 60 minutes. The program also meets the triple aim of better care, as described by the Institute for Healthcare Improvement, by improving public health access to care, enriching the individual patient's experience, and reducing overall costs.[22] Part of the concluding portion of this program will be to develop expanded reimbursement models that support extended pharmacist engagement time and more in-depth interventions, with higher reimbursements. Finally, integrating pharmacy students directly into the medical clinic develops interprofessional trust, encouraging primary care providers to more fully utilize extended members of the care team, and assists in the flow of information, improving communication and shared decision-making.

The centralized pharmacist role in coordinating these efforts represents a new area of pharmacy practice that has started to be recognized nationally. There are a number of public health initiatives that pharmacists can be key members in addressing, including immunizations, health screenings, and adherence education. The targeted interventions that are described here are only a few of many cost-saving initiatives a pharmacist can make with a population of patients, saving both substantial money and potentially patient lives. A follow-up publication will quantify the financial impact that the services offered through these pharmacies represents, which would more than cover this pharmacist's salary expenses. As robotics and highly trained technicians continue to take over many of the pharmacist's traditional roles in community practice, it will be important to establish these new areas of expertise to continue to demonstrate the pharmacist's value.

There are limitations with this project. As mentioned, current reimbursement rates limit the amount of engagement a pharmacist can have with patients to support the labor costs involved with the care, and better reimbursement rates are needed to reproduce this work with pharmacists. The state of Colorado worked to change the pharmacist law to allow other providers to supervise pharmacy students and promote this integration into provider offices; states that do not recognize other providers as pharmacy preceptors may have difficulty establishing this type of integration. Finally, dedicating students year-round to sites can be challenging for pharmacy programs, as it limits the students' ability to choose their own rotations. Committing students for every rotation can be challenging to a pharmacy

curriculum if this model has not been implemented before. Nevertheless, the data suggest that the impact these sites can have may make the challenge worthwhile.

Conclusion

A successful collaboration between a state RCCO, state health department, a school of pharmacy and three rural healthcare systems has been established. Information flow between the pharmacy and medical clinics in three Colorado rural towns has been improved, and patients identified with a need for services were successfully enrolled in pharmacy MTM services. The essential role of a centralized, public health pharmacist to help coordinate these efforts was also established. Further benefits of integrating students into medical clinics to improve their experiential education were accomplished as an additional benefit. A report that includes expanded reimbursement models for pharmacists engaged in these services is currently underway, as are plans for expanding this model to other areas of Colorado and across the United States.

Acknowledgements

This publication was supported by the Cooperative Agreement Number, DP004796–05, funded by the Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services.

The three pharmacies: Buena Vista Drugs in Buena Vista, CO, Valley-wide Health Systems in La Junta, CO and Valley-wide Health Systems in Alamosa, CO are acknowledged for their support and work on this project. The RCCO Organization Integrated Community Health Partners based in Pueblo, CO is acknowledged for their partnership and support in providing eligible patient data for the project. Local medical providers in the three rural Colorado towns (Buena Vista, Alamosa, La Junta) are also acknowledged for their support on this project.

Funding/support: This project was supported through funding from the Colorado Department of Public Health and Environment

References

1. Chisholm-Burns MA, Kim Lee J, Spivey CA, et al. US pharmacists' effect as team members on patient care: systematic review and meta-analyses. Med Care. 2010;48(10):923–933. [PubMed: 20720510]
2. Ragucci KR, Fermo JD, Wessell AM, Chumney EC. Effectiveness of pharmacist-administered diabetes mellitus education and management services. Pharmacotherapy. 2005;25(12):1809–1816. [PubMed: 16305300]
3. Brummel A, Lustig A, Westrich K, et al. Best Practices: Improving Patient Outcomes and Costs in an ACO Through Comprehensive Medication Therapy Management. Journal of managed care & specialty pharmacy. 2014;20(12):1152–1158.
4. Santschi V, Chiolero A, Burnand B, Colosimo AL, Paradis G. Impact of pharmacist care in the management of cardiovascular disease risk factors: a systematic review and meta-analysis of randomized trials. Arch Intern Med. 2011;171(16):1441–1453. [PubMed: 21911628]
5. George J, McNamara K, Stewart K. The roles of community pharmacists in cardiovascular disease prevention and management. Australas Med J. 2011;4(5):266–272. [PubMed: 23393519]
6. Nuffer W, McCollum M, Ellis SL, Turner CJ. Further development of pharmacy student-facilitated diabetes management clinics. Am J Pharm Educ. 2012;76(3):50. [PubMed: 22544967]
7. Nuffer W, Gilliam E, Thompson M, Griend JV. Establishment and Implementation of a Required Medication Therapy Management Advanced Pharmacy Practice Experience. Am J Pharm Educ. 2017;81(2):36. [PubMed: 28381896]

8. McGivney MS, Hall DL, Stoehr GP, Donegan TE. An introductory pharmacy practice experience providing pharmaceutical care to elderly patients. Am J Pharm Educ. 2011;75(8):159. [PubMed: 22102749]
9. Shogbon AO, Lundquist LM. Student pharmacists' clinical interventions in advanced pharmacy practice experiences at a community nonteaching hospital. Am J Pharm Educ. 2014;78(3):50. [PubMed: 24761011]
10. United States Congress. H.R.1- Medicare Prescription Drug, Improvement, and Modernization Act of 2003. 2003; https://www.congress.gov/bill/108thcongress/house-bill/1. Accessed 8/1/2018
11. Long T Patient-Centered Medical Home: the future of healthcare delivery? Postgrad Med J 2014; 90 (1067) pp 486–487. [PubMed: 25140005]
12. Green E, Wendland J, Carver M, Hughes Rinker C, et al. Lessons Learned from Implementing the Patient-Centered Medical Home. Int J Telemed Appl 2012; 103685. [PubMed: 22969797]
13. Nutting P, Miller W, Crabtree B, Jaen C, et al. Initial Lessons From the First National Demonstration Project on Practice Transformation to a Patient-Centered Medical Home. Ann Fam Med 2009; 7 (3): 254–260. [PubMed: 19433844]
14. Smith M, Bates DW, Bodenheimer T, Cleary PD. Why pharmacists belong in the medical home. Health Aff (Millwood). 2010;29(5):906–913. [PubMed: 20439879]
15. Adams AJ, Clark DR, DeLander GE, et al. Report of the AACP task force on patient-centered medical homes and accountable care organizations. Am J Pharm Educ. 2013;77(7):142. [PubMed: 24052645]
16. Isetts BJ, Brummel AR, de Oliveira DR, Moen DW. Managing drug-related morbidity and mortality in the patient-centered medical home. Med Care. 2012;50(11):997–1001. [PubMed: 23047790]
17. Thompson A, Temple N. The case for statins: has it really been made? J R Soc Med. 2004; 97 (10): 461–464. [PubMed: 15459255]
18. Scott MA, Hitch B, Ray L, Colvin G. Integration of pharmacists into a patient-centered medical home. Journal of the American Pharmacists Association : JAPhA. 2011;51(2):161–166. [PubMed: 21382805]
19. Patterson BJ, Solimeo SL, Stewart KR, Rosenthal GE, Kaboli PJ, Lund BC. Perceptions of pharmacists' integration into patient-centered medical home teams. Research in social & administrative pharmacy : RSAP. 2015;11(1):85–95. [PubMed: 24954185]
20. Hohmeier KMM, Powers M, Lengel A. The patient-centered medical home and community pharmacists' perceptions. J Pharm Technol. 2012;28(4):151–155.
21. Friedman A, Howard J, Shaw EK, Cohen DJ, Shahidi L, Ferrante JM. Facilitators and Barriers to Care Coordination in Patient-centered Medical Homes (PCMHs) from Coordinators' Perspectives. Journal of the American Board of Family Medicine : JABFM. 2016;29(1):90–101. [PubMed: 26769881]
22. Institute for Healthcare Improvement. IHI Triple Aim Initiative. 2018; http://www.ihi.org/engage/initiatives/TripleAim/Pages/default.aspx. Accessed 8/1/2018.

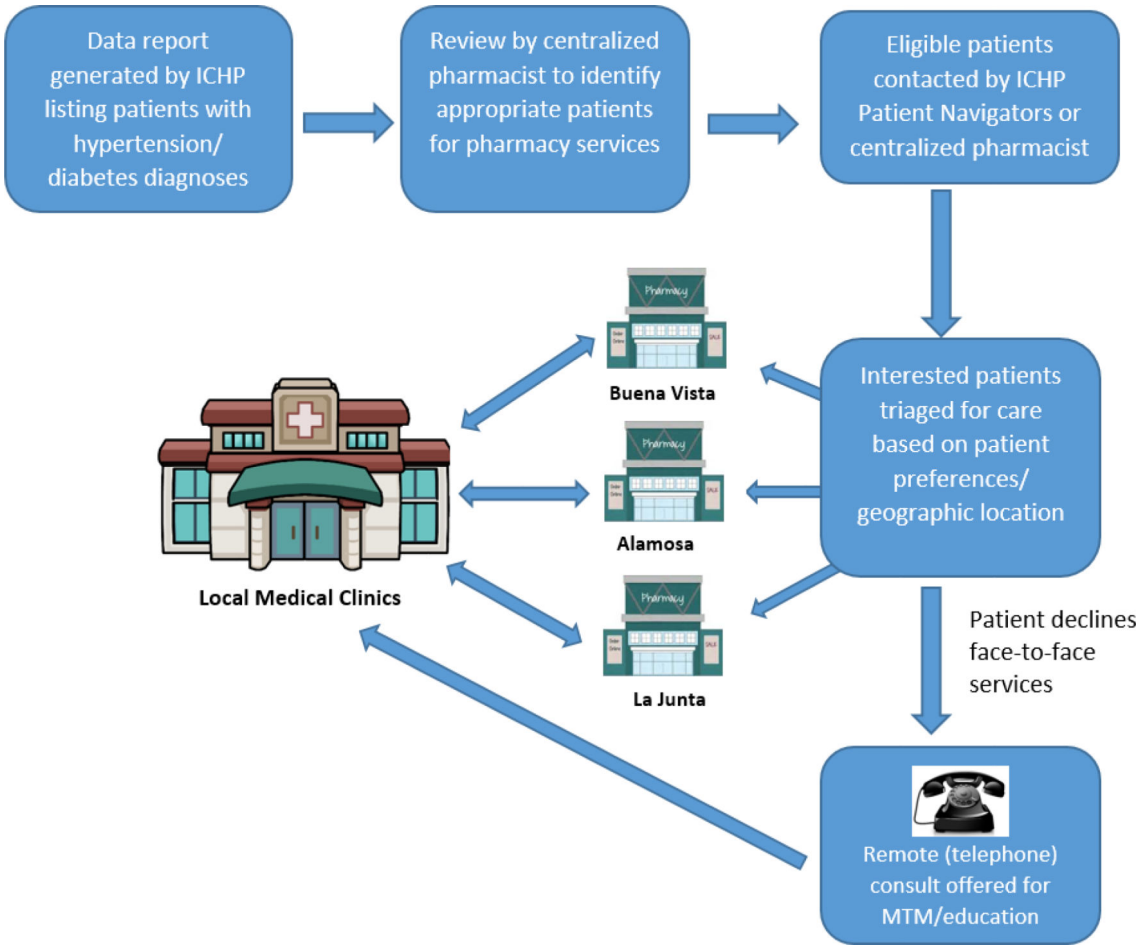

Figure 1.
Workflow for referral of patients from ICHP to three pharmacy clinics and information flow between the pharmacies and provider offices

Table 1.

Disease management education modules offered through community pharmacies

Diabetes Education Modules	Cardiovascular Disease Modules
What is diabetes	What is high blood pressure
Glucose meter training	What is high cholesterol
Exercise and physical activity with diabetes	How to monitor your blood pressure
Understand oral medications	Over-the-counter medications and blood pressure
Insulin injection	Understand cardiovascular medications
Cardiovascular care	Diet, nutrition and cardiovascular disease
Preventing long term complications	Over-the-counter and herbal cholesterol treatments
Basic medication nutrition therapy	Cardiovascular complications: heart attacks and strokes
Carb counting and label reading	Smoking cessation
Complementary and alternative medicine therapies with diabetes	Exercise and physical activity with cardiovascular disease
Weight loss with diabetes	Patient resources for cardiovascular disease
How to avoid and manage hypoglycemia	
Travelling with diabetes	
Sick day management	
Pen injector device training	
Insulin injection training	
Gestational diabetes	
Pre-diabetes	

Table 2.

Objective lab measurements before and after six months of disease education across two years of the public health project

Parameter (units)	number	Baseline, mean (SD)	6-month, mean (SD)	P value
Hemoglobin A1C (%)	224	7.9 (2.0)	7.1 (1.4)	p<0.001 *ǂ
Systolic BP (mmHg)	257	127 (16.9)	122 (17.1)	p=0.0015 *ǂ
Diastolic BP (mmHg)	257	79.4 (11.9)	76.8 (11.5)	p=0.0125 *ǂ
Total Cholesterol (mg/dl)	100	179.7(45.0)	165.3 (35.2)	p=0.02 *ǂ
LDL Cholesterol (mg/dl)	93	104.6 (39.7)	93.4 (27.3)	p=0.06 *
HDL Cholesterol (mg/dl)	99	46.6 (14.2)	45.8 (14.2)	p=0.634 *
Triglycerides (mg/dl)	96	174.4 (90.0)	158.5 (80.9)	p=0.211 *
Body mass index (kg/m^2)	173	35.2 (7.0)	33.7 (6.8)	p=0.678 *

* Wilcoxon Signed-rank test

ǂ = Reaches statistical significance

Abbreviations: BP= blood pressure, mmHg= millimeters of mercury, mg= milligram, dl= deciliter, LDL= low-density lipoproteins, HDL= high-density lipoproteins, SD= standard deviation, kg= kilogram, m^2= meters squared