



Research Article

Primary Care Provider Use of Embedded Pharmacist Services and Perspectives on Collaborative Practice Agreements

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Abstract

Purpose: Embedded Pharmacists (EPs) can be integrated into primary care settings, utilizing Collaborative Practice Agreements (CPAs), to work directly with patients to manage their medication regimens. Current literature analyzing EP services and provider perceptions on CPAs is limited. The objectives of this study are to: (1) characterize the current use of and services provided by EPs in primary care, and (2) describe perceptions of primary care providers (PCPs) without EPs on CPA utilization by community and embedded pharmacists. **Methods:** This cross-sectional study was a secondary analysis of a survey of PCPs practicing in the state of Connecticut. **Results:** Of 222 respondents, 64 (29%) indicated they had an EP at their practice site. Of the respondents with EPs, 53% indicated their EP is shared between multiple sites. The top three topics that physicians typically initiate contact with EPs about were most appropriate medication selection (56%), comprehensive medication review (55.8%), medication therapy plans (55.1%). PCPs without EPs were significantly more comfortable signing a CPA with an EP (67%) than community pharmacists (CPs) (47%) to monitor and manage medications for patients with uncontrolled diabetes and hypertension ($p=0.004$). Of the PCPs without an EP, 75% agree that EPs using a CPA would decrease workload burden, whereas only 54% agree that CPs using a CPA would decrease workload burden ($p<0.001$). **Conclusion:** EPs enhance collaboration in primary care by addressing complex medication needs and alleviating physician workload. Expanding their integration offers an opportunity to improve patient outcomes and provider satisfaction while strengthening the primary care workforce.

Keywords: Pharmacists; Delivery of Health Care; Integrated; Practice Patterns; Pharmacists'; Primary Health Care; Clinical Pharmacy Service; Patient Care Team

Introduction

The primary care workforce is under pressure from rising demands due to a rapidly aging population with a high volume of chronic diseases. While the need for Primary Care Providers

(PCPs) is growing exponentially, the number of PCPs per capita is falling [1,2]. This widening gap creates an opportunity for pharmacists to collaborate with PCPs as members of primary care teams. Integrating pharmacists into primary care practices can help to address all aspects of the Quadruple Aim, which is a vital framework for advancing healthcare. The four aims are: (1) improving population health, (2) improving patient experience, (3) decreasing healthcare costs, and (4) improving the work-life

balance of providers [3,4].

For the purposes of our survey, Embedded Pharmacists (EPs) were defined as pharmacists who have clinical training and experience working as healthcare team members within a primary care practice or clinic. EPs are directly integrated into the primary care team and provide direct patient care responsibilities focused on comprehensive medication management and monitoring. EPs optimize patient outcomes and increase provider satisfactions [5]. In many states, EPs usually have Collaborative Practice Agreements (CPAs) with PCPs to manage patient's medication regimens. Through integration into the primary care team, EPs are an accessible resource for patients and providers alike.

During a series of appointments with EPs, patients receive individualized care to optimize their health and strive to reach therapeutic goals [6]. Usually, EPs meet with patients who have uncontrolled, chronic conditions (e.g., diabetes [7], hypertension [8], asthma [9], and smoking cessation [10]) that require frequent follow-up between PCP appointments. With the help of an EP and frequent monitoring, patients can achieve therapeutic outcomes to optimize their health and achieve the practice's outcome measure goals [11]. At each appointment, the EP can work closely with the patient to discuss their medication regimen, adjust dosages or order new medications, and order laboratory tests to make clinical decisions [11,12].

PCPs also benefit from the services of an EP that result in improved workplace satisfaction and decreased clinical workload [13]. Integration of EPs in primary care settings has been shown to address four specific drivers of provider burnout, including workload and job demands, efficiency and resources, meaning in work, and social support and community at work [14]. Also, EPs can help reduce provider workload by managing complex patients and conducting more frequent follow-up appointments. Patients can schedule medication-specific visits directly with the EP, freeing up time in PCPs' schedules [15].

The objectives of this study are to: (1) characterize the current use of and services provided by EPs in primary care, and (2) describe perceptions of PCPs without EPs regarding CPA utilization by community and embedded pharmacists.

Methods

This study is a secondary analysis from a survey of primary care providers (e.g., physicians, Advanced Practice Registered Nurse (APRN), and Physician Assistants (PA)) in Connecticut. The survey development and methods are described in a previous publication [16]. The survey was distributed electronically using Qualtrics. Online survey responses were collected for 5 weeks between December 2020 and January 2021.

This secondary analysis focuses on the utilization of embedded pharmacists. The study population included PCPs with active licenses who were currently practicing adult primary care in the state of Connecticut. The data source was the state licensure database, which did not include information about PCPs who were retired, part-time, no longer practicing in the state, or no longer working in primary care settings. Therefore, we used responses on returned surveys to determine the study population.

The total number of respondents (N=222) answered core questions as well as branched questions depending on previous work experience with an EP. PCPs who indicated working with an EP (N=64) answered questions to identify the services that EPs provided. PCPs who did not work with an EP (N=158) answered scenario-based questions to gauge perceptions of EPs and questions related to facilitators and barriers of embedded pharmacist CPA utilization.

The UConn Institutional Review Board determined this study to be exempt because responses were completely anonymous.

Results

Survey Response and Demographics

A total of 782 surveys were received, however, 206 were ineligible based on not meeting inclusion criteria listed above and 354 were incomplete for analysis. Therefore, a convenience sample of 222 completed surveys was analyzed.

The demographics for the 222 respondents are shown in Table 1. Most respondents were primary care physicians (41%) and nurse practitioners (46%) who worked in office practice settings (57%). Of the 222 respondents, 64 (29%) indicated they had an EP at their practice site.

Discipline	
Nurse Practitioner (APRN)	46% (101)
Physician (MD or DO)	41% (92)
Physician Assistant (PA)	13% (29)
Practice Setting	
Office Practice	57% (126)
Community Health Center	24% (52)
Hospital Outpatient Clinic	16% (34)
Other Primary Care Setting	4% (8)
Practice Size	
1-3 PCPs	30% (66)
4-7 PCPs	35% (77)
8-11 PCPs	14% (30)
12 or more PCPs	22% (49)
PCP Training / Specialty	
Family Medicine	51% (113)
Internal Medicine	49% (108)
Geriatric Medicine	1% (1)
PCP Years of Practice	
5 years or less	32% (70)
6-10 years	16% (35)
11-15 years	12% (25)
16 -20 years	10% (22)
More than 20 years	30% (66)
Presence of Embedded Pharmacist(s)	
Yes	29% (64)
No	71% (158)

Table 1: Respondent Demographics (N=222).

Demographics of Embedded Pharmacists

The employment status of embedded pharmacists was also collected. Of the respondents with EP (N=64), 70.3% had a full-time pharmacist (40 hours per week) and 50% of respondents had a part-time pharmacist (<40 hours per week). These percentages reflect the fact that some respondents had EP who only work full-time, only work part-time, or a combination of the two.

The survey also obtained the distribution of EPs shared among multiple practice sites. Of the 64 respondents, 53% indicated their EP is shared between multiple practice sites. Half of respondents with shared EPs indicated EPs were shared between 2-4 practice locations, and the other half indicated the EPs were shared between more than 4 practice locations. For EPs who were shared in four or more locations, their practice sites were physician office practices (29%), community health clinics (47%), and hospital outpatient clinics (24%).

Services Provided by Embedded Pharmacists in Primary Care

Table 2 highlights the type of PCP who initiates contact with an embedded pharmacist regarding certain pharmacist services.

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Services	Physician	APRN/PA	None
Who in your practice typically initiates contact with an embedded pharmacist to discuss the following patient-specific drug information questions?			
Most Appropriate Medication Selection	56.0%	38.5%	5.5%
Correct Patient Dose	54.5%	38.6%	6.8%
Patient Medication Allergy	49.4%	35.6%	14.9%
Patient Medication Interaction	53.8%	38.5%	7.2%
Patient Medication / Device Instructions	50.6%	38.8%	10.6%
Medication Affordability Assistance	46.3%	40.0%	13.8%
Who in your practice typically initiates contact with an embedded pharmacist to discuss the following medication regimen optimization topics?			
Medication Reconciliation	50.6%	38.7%	11.1%
Comprehensive Medication Review (appropriateness, effectiveness, safety, adherence)	55.8%	34.9%	9.3%
Medication Therapy Plan (add, change, or discontinue a medication / dose)	55.1%	37.1%	7.9%
Monitoring medications/labs	53.4%	37.5%	9.1%
Who in your practice typically initiates contact with an embedded pharmacist to discuss the following pharmacist services?			
Chronic Disease Medication Management	54.0%	33.3%	12.6%
Smoking Cessation	39.7%	25.6%	34.6%
Annual Wellness Visits	29.9%	22.1%	48.1%
Care Transition Visits	34.2%	22.4%	43.4%
Who in your practice typically initiates contact with an embedded pharmacist to discuss the following medication-related initiatives?			
Quality Improvement Programs	37.7%	23.4%	39.0%
Quality Performance Measures	37.0%	24.7%	38.3%
Patient Medication Safety	50.6%	30.1%	19.3%
Drug Treatment Protocols and Guidelines	52.3%	30.2%	17.4%
P&T / Formulary	44.2%	32.5%	23.4%
Medication Utilization / Budget Reports	29.2%	20.8%	50.0%
¹ N=64: This question was only presented to PCPs with an embedded pharmacist			

Table 2: Services Provided by Embedded Pharmacists in Primary Care (N=64)¹.

Patient-Specific Drug Information Questions

The top three patient-specific drug information questions that physicians typically initiate contact with EPs about were most appropriate medication selection (56.0%), patient medication interactions (53.8%), and correct patient dose (54.5%). The top three patient-specific drug information questions that APRNs/PAs typically initiate contact with EPs about were patient medication and device instructions (38.8%), medication affordability assistance (40.0%), and correct patient dose (38.6%). Additionally, no one in the practice discusses the topics of patient medication allergy (14.9%), medication affordability assistance (13.8%), and patient medication or device instructions (10.6%) with an EP.

Medication Regimen Optimization Topics

The top three medication regimen optimization topics physicians typically initiate contact with EPs about were comprehensive medication review (55.8%), medication therapy plans (55.1%), and monitoring medications/labs (53.4%). The top three medication regimen optimization topics APRNs/PAs typically initiate contact with EPs about were medication reconciliation (38.7%), monitoring medications/labs (37.5%), and medication therapy plan. Additionally, no one in the practice discusses the medication regimen optimization topics of medication reconciliation (11.1%), comprehensive medication review (9.3%) and monitoring medications/labs (9.1%) with an EP.

Pharmacist Services

The top three patient care services that physicians typically initiate contact with EPs about were chronic disease medication management (54.0%), smoking cessation (39.7%), care transition visits (34.2%). The top three patient care services that APRNs/PAs typically initiate contact with EPs about were chronic disease

medication management (33.3%), smoking cessation (25.6%), and care transition visits (22.4%). Additionally, no one in the practice discusses the patient care service of annual wellness visits (48.1%) with EPs.

Medication-Related Initiatives

The top three medication-related initiatives that physicians typically initiate contact with EPs about were drug treatment protocols and guidelines (52.3%), patient medication safety (50.6%), and P&T/formulary (44.2%). The top three medication-related initiatives that APRNs/PAs typically initiate contact with EPs about were P&T/formulary (32.5%), drug treatment protocols and guidelines (30.2%), and patient medication safety (30.1%). Additionally, no one in the practice discusses the topics of medication utilization and budget reports (50.0%), quality improvement programs (39.0%), and quality performance measures (38.3%) with an EP (Table 2).

PCP Perceptions of Embedded vs Community Pharmacist CPA Use

PCPs without EPs have significantly different perceptions on the utilization of CPAs with community pharmacists (CPs) versus EPs, as highlighted in Table 3. Only 34% of PCPs without EPs are aware that CPs can utilize CPAs, while 53% are aware that EPs can utilize CPAs ($p<0.001$). PCPs without EPs are significantly more comfortable signing a CPA with an EP (67%) than CPs (47%) to monitor and manage medications for patients with uncontrolled diabetes and hypertension ($p=0.004$). PCPs without an EP are more likely to recommend collaboration with an EP utilizing a CPA to a PCP colleague (77%) than a CP utilizing a CPA (59%) ($p=0.007$). Of the PCPs without an EP, 75% agree that EPs using a CPA would decrease their workload burden, whereas only 54% agree that CPs using a CPA would decrease their workload burden ($p<0.001$).

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Level of Agreement	CPA With Community Pharmacist	CPA With Embedded Pharmacist	p-value
	Awareness		< 0.001
Strongly Agree / Agree	34% (54)	53% (83)	
Strongly Disagree / Disagree	66% (104)	47% (75)	
	Comfort Level of Utilization		0.004
Strongly Agree / Agree	47% (74)	67% (96)	
Strongly Disagree / Disagree	53% (84)	33% (52)	
	Willingness to Recommend Utilization to PCP Colleagues		0.007
Strongly Agree / Agree	59% (93)	77% (121)	
Strongly Disagree / Disagree	41% (65)	23% (37)	
	Workload Reduction		< 0.001
Strongly Agree / Agree	54% (86)	75% (118)	
Strongly Disagree / Disagree	46% (72)	25% (40)	
¹N=158: This question was only given to PCPs without an embedded pharmacist			

Table 3: Perceptions of PCPs without Embedded Pharmacists on the Utilization of Collaborative Practice Agreements (CPAs) with Community and Embedded Pharmacists (N=158)¹.

Facilitators and Barriers of Embedded Pharmacist CPA Utilization

Tables 4 and 5 identify factors that would promote and limit the utilization of CPAs with EPs, specifically to manage medications for uncontrolled diabetes and hypertension. The top three most common facilitators selected were: EP is viewed by patients as a member of primary care practice's team (78%), EP is available for other medication-related questions from PCPs (73%), and EP monitoring reports provide more timely data between PCP visits (72%). The top three most common barriers selected were: lack of EP's available time to appropriately monitor and manage the patient's medications (63%), lack of EP training/experience monitoring patients and managing medications with CPAs (56%), and lack of patient follow-up with EP services (51%).

What percentage of PCPs without embedded pharmacists believe the following statements are factors that would promote their utilization of CPAs with embedded pharmacists? (N=158)	Level of Agreement
Embedded pharmacist is viewed by patients as a member of primary care practice's team	78% (123)
Embedded pharmacist is available for other medication-related questions/needs from PCPs	73% (115)
Embedded pharmacist monitoring reports provide more timely data between PCP visits	72% (114)
Embedded pharmacist medication adjustments result in improved patient outcomes	70% (111)
Positive feedback from your patients about the embedded pharmacist service	61% (96)
Embedded pharmacist service allows PCP to see more acute patients	52% (82)

Table 4: Facilitators of Embedded Pharmacist CPA Utilization.

What percentage of PCPs believe the following statements are barriers of CPAs with embedded pharmacists? (N=158)	Level of Agreement
Lack of embedded pharmacist's available time to appropriately monitor and manage the patients' medications	63% (99)
Lack of embedded pharmacist's training/experience monitoring patients and managing medications with CPAs	56% (89)
Lack of patient follow-up with embedded pharmacist service	51% (81)
Poor documentation of embedded pharmacist activities in patient EHR	47% (75)
Patients do not view embedded pharmacists as a member of PCP care team	47% (74)
Lack of payment for embedded pharmacist service	46% (72)
Embedded pharmacist medication adjustments do not improve patient outcomes	40% (63)

Table 5: Barriers of Embedded Pharmacist CPA Utilization.

Discussion

Use of Embedded Pharmacists in Primary Care

Data quantifying the employment models of EPs is currently scarce. Current literature focuses on the roles, benefits, and clinical impact of EPs rather than employment models [17-22]. Our findings support the variability of EP integration within primary care settings, revealing that some practices employ full-time EPs, part-time EPs, or share EPs across multiple sites. The majority (70.3%) of respondents reported a full-time pharmacist that suggests many practices see sufficient value in pharmacist services to support a 40-hour-per-week role. Since 50% of respondents also reported a part-time pharmacist, it appears that some practices operate under a hybrid model where pharmacist services are split between full-time and part-time roles. This may also indicate that the pharmacist is employed full time but shared among multiple practice sites on a part time basis.

In this study, we found that 53% of respondents reported that their EPs were shared between multiple practice sites. This suggests that no one office has sufficient patient volume for a full time EP. Community health clinic had the highest proportion of shared EPs, suggesting that these settings may have flexible staffing arrangements that allow for EPs to be shared across multiple locations. Further research to understand the factors influencing EP utilization — such as financial resources, patient volume, and specific practice needs — may provide more clarity on how EP services are structured across different settings.

Embedded Pharmacists Services

The literature currently discusses several key services provided by EPs in primary care, including chronic disease management, medication therapy monitoring, comprehensive medication reviews, and drug therapy optimization. For example, Hirsch, et al. (2014) demonstrated that pharmacist-physician collaborative

medication therapy management improved hypertension control, showing the value of embedding pharmacists in addressing chronic conditions [18]. Similarly, Anderegg, et al. (2018) found that pharmacists significantly contributed to blood pressure control in patients with diabetes or chronic kidney disease by providing focused therapeutic adjustments and monitoring [23]. The top services identified in our survey closely align with prior published literature detailing the services of EPs. The similarity between our findings and published literature suggests well established roles and services of EPs in primary care settings.

Identifying underutilized areas of pharmacist involvement reveals additional opportunities to expand their impact on patient care workflows and practice efficiency. The services identified in our study as the least frequently contacted are underutilized; however, existing evidence underscores the potential for pharmacists to contribute significantly to these areas. Contrary to the results of our survey, other studies have demonstrated the effectiveness of pharmacist-led interventions to increase smoking cessation rates. Pharmacists actively lead cessation efforts in settings like ambulatory care, managed care, and community pharmacies with most services delivered via appointment-based, individual, face-to-face sessions [24]. Pharmacists can recommend and manage nicotine replacement therapies, prescribe smoking cessation medications, and provide ongoing counselling and support to address behavioral and psychological challenges associated with smoking cessation [25]. Expanding pharmacists' involvement in these underutilized areas can enhance primary care services, improve patient outcomes, and optimize healthcare resources. Therefore, despite our findings, existing literature supports that pharmacists are well-equipped to provide these services when integrated into primary care teams.

Current research on pharmacist-led transition of care services primarily focuses on the discharge from the inpatient setting. Pharmacists specializing in transitions of care are instrumental

in reducing hospital readmissions and emergency department visits by ensuring accurate medication reconciliation and patient education [26]. Despite their qualifications, our findings suggest EPs are underutilized in care transition visits in the outpatient primary care setting. Collaboration and communication between transition of care pharmacists and primary care EPs could promote improved patient outcomes by ensuring adherence to the optimized medication regimens initiated after discharge.

In the pharmacist services section of our survey, the data shows that EPs are not widely utilized for Annual Wellness Visits (AWVs). Conversely, a prior meta-analysis shows PCPs frequently involve pharmacists in Medicare AWVs, aligning with their focus on preventive care and chronic disease management [27]. AWVs include a review of the patient's medical and family history, assessment of health status and functional ability, a comprehensive medication review, and the collection of biometric data such as height, weight, and blood pressure. It also involves counseling on preventive services and curating a personalized prevention plan to support long-term health management. Pharmacists can contribute to AWVs by conducting comprehensive medication reviews, identifying potential drug interactions, and providing patient counseling, thereby enhancing the quality of preventive care services. Two plausible explanations for the low percentage of EPs contacted for AWVs are (1) providers may be unaware of EP qualifications and (2) the lack of provider status for pharmacists under Medicare complicates the ability for them to bill for this service.

PCP Perceptions of Embedded vs Community Pharmacist CPA Use

In this study, we found PCPs are significantly more aware of utilizing a CPA with an EP than a CP. Furthermore, PCPs are significantly more comfortable utilizing a CPA with an EP than a CP to monitor and manage medications for patients with uncontrolled diabetes and hypertension. One plausible factor may be that PCPs are willing to have EPs work in office as a direct team member where they can develop trusted working relationships with both patients and providers, as opposed to off-site CPs. This sentiment is supported by our survey responses. The two top facilitators that would promote the utilization of a CPA with an EP are: (1) patients view the EP as part of the primary care team and (2) the PCP receives positive feedback from patients about EP services.

Our study shows PCPs are significantly more willing to recommend CPA utilization with an EP over a CP. Published literature supports our findings on PCP's willingness to recommend CPAs with EPs to their colleagues. A prior study, which analyzed 114 PCPs who reported working directly with a clinical pharmacist in their primary care practice, found that PCPs strongly agreed that they

would recommend a clinical pharmacist to other practices to assist with medication management [28]. In our study, top facilitators for EP utilization were the EP being available for other medication-related questions and medication adjustments resulting in improved patient outcomes.

Our findings reveal that providers believe EPs using CPAs can significantly reduce their workload. Similarly, a previous study that interviewed 16 PCPs found that Comprehensive Medication Management (CMM) positively impacted their work-life by decreasing workload, providing reassurance that patients were receiving better care, reducing mental exhaustion, enhancing professional learning, increasing provider access, and helping achieve quality measures [15]. Additionally, our survey showed that EPs are frequently contacted about CMM services not only by physicians but also by APRNs and PAs. This highlights the integral role EPs play in supporting the healthcare team. Our research also suggests that PCPs with access to EP services believe these partnerships allow them to focus on more acute patients, creating a more efficient and collaborative care model that benefits both providers and patients.

A limitation of this study was the recruitment method using a state-wide licensure database with insufficient data to identify exclusion criteria for a targeted study sample. The survey was conducted in one state where most PCPs are primarily compensated under fee-for-service payments so results may not be generalized to PCPs with several value-based care payment models. Also, the survey was distributed during the COVID-19 pandemic that may have limited responses.

Another limitation of this study is the small number of PCP respondents with EPs working in their practice site (N=64). In our state, there seemed to be a small number of respondents with EPs which may potentially limit the external applicability of our data to a region with many EPs.

Conclusion

The perceptions of PCPs without EPs show a positive outlook for the future integration of EPs in primary care. The results of our survey show that EPs are healthcare professionals valued and recommended by primary care providers. Many PCPs are comfortable with the use of CPAs with EPs, are willing to recommend them to colleagues, and believe they would reduce their workload compared to a CPA with CPs. However, some providers are still hesitant to implement the services of an EP. Further research should be conducted analyzing the cost-savings associated with implementing EPs in primary care settings. Additionally, future policy changes – especially payment for pharmacist clinical services – can enable broader utilization of EPs to enhance care delivery and provider efficiency.

Moving forward, it is imperative to continue educating providers on the benefits of EPs by showcasing optimization and improvements in patient outcomes, healthcare costs, population health data, and provider satisfaction. It is crucial to highlight that the services of an EP are complimentary to that of a PCP and work to elevate both the patient and provider experience. When EPs work at the top of their license and partner with PCPs to utilize CPAs in primary care settings, they can fill the gap in the primary care workforce and alleviate pressure from PCPs to help improve patient outcomes. With EPs as members of the primary care team, there is an opportunity to address the growing population of patients with chronic disease states requiring complex medication management and improve healthcare outcomes.

Ethical Considerations

The UConn Institutional Review Board determined this study to be exempt because responses were completely anonymous.

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