Contents lists available at ScienceDirect

Exploratory Research in Clinical and Social Pharmacy

OPEN ACCESS

A descriptive analysis of primary care providers' interest in clinical pharmacy services

Belyin Gutierrez Euceda *, Stefanie P. Ferreri, Lori T. Armistead

UNC Eshelman School of Pharmacy, 301 Pharmacy Lane, Chapel Hill, NC 27599-7475, United States

ARTICLE INFO

ABSTRACT

Background: Various clinical pharmacy services exist to improve the health outcomes of patients. However, there are numerous barriers to their implementation and execution, especially in outpatient settings. As pharmacists design and implement clinical pharmacy services in outpatient settings, they often do not consider the needs of providers until after service development.

Objectives: The purpose of this study was to assess primary care providers' (PCPs') perceptions of clinical pharmacy services and their clinical pharmacy support needs.

Methods: A web-based survey was distributed via email to PCPs across North Carolina (NC). Survey dissemination was completed in two phases. Data analysis consisted of mixed methods – quantitative and qualitative. Descriptive statistics were used to analyze demographic differences within each phase as well as the ranking of medication classes/disease states by providers. Qualitative data analysis through inductive coding was done to assess provider perceptions of clinical pharmacy services.

Results: The response rate of the survey was 19.7%. Providers with previous experience with a clinical pharmacist rated overall services as positive. 62.9% of PCPs ($N = 80$) provided their perception of the positive attributes (pros) of clinical pharmacy services. 53.5% of PCPs ($N = 68$) provided their perception of the negative attributes (cons) of clinical pharmacy services. The top three medication classes/disease states that providers indicated they would value clinical pharmacy services for were: comprehensive medication management (CMM), diabetes medication management, and anticoagulation medication management. Of the remaining areas assessed, statin and steroid management ranked the lowest.

Conclusions: The results from this study demonstrated that clinical pharmacy services are valued by PCPs. They also highlighted how pharmacists can best contribute to collaborative care in outpatient settings. As pharmacists, we should aim to implement the clinical pharmacy services that PCPs would value most.

Introduction

As the US population ages, the number of patients at risk of experiencing medication errors or adverse effects increases with the number of medications they take. Polypharmacy is a growing concern that cannot be adequately managed by the dwindling number of primary care providers (PCPs) in the US, which contributes to poorer patient health outcomes and quality of life.[1,2] Additionally, increased medication use and associated errors currently cost the US healthcare system approximately $20 billion annually.[3] While this trend is concerning, there are multiple ways that pharmacists can be integrated into healthcare teams, which can lead to optimized medication use, decreased healthcare utilization, and better patient outcomes.[4] For example, pharmacist integration can help impact key quality metrics, such as the Centers for Medicare and Medicaid Services (CMS) Merit based Incentive Program (MIPS) and Health information

Effectiveness Data and Information Set (HEDIS) measures, that primary care practices may be targeting to improve patient outcomes.[5,6] Other aspects of the quadruple aim of healthcare – enhancing patient experience, reducing costs, and improving the work life of healthcare providers – can also be impacted by pharmacist integration.[7–9]

A variety of clinical pharmacy services are currently provided in outpatient settings. These services are provided by consultant pharmacists in long term care settings, community pharmacists via comprehensive medication reviews, and ambulatory care pharmacists through comprehensive medication management (CMM), transitions of care (TOC), and disease state management services. Many of these services have positively impacted patient outcomes but are often not fully utilized due to existing barriers, such as the cost of embedding a pharmacist in a clinic, the inability of pharmacists to bill for clinical services, and inadequate understanding of how pharmacists can assist in providing patient care.[10–12]

* Corresponding author.
E-mail addresses: gutierrez.belyin@gmail.com (B. Gutierrez Euceda), stefanie_ferreri@unc.edu (S.P. Ferreri), lori_armistead@unc.edu (L.T. Armistead).

As the number of patients with chronic diseases and multiple medications continues to increase, patient care demands of PCPs are also increasing, creating space for pharmacy practice evolution.[1] However, little is known about the types of clinical services PCPs want pharmacists to provide. As pharmacists attempt to design and implement clinical pharmacy services in outpatient settings, they often do not consider the perspectives and needs of providers until after service development. Therefore, the objectives of this study are to examine the medication therapy areas and/or chronic disease states that PCPs want assistance with most and to understand PCPs' general perceptions of clinical pharmacy services.

Methods

Study design/procedures

A web-based survey (Qualtrics XM 2022) consisting of 14 questions, was developed. This survey included five demographic questions, six questions about previous experience with clinical pharmacists, two questions on medication classes or chronic disease states they would value clinical pharmacist assistance with, and one question on the current quality metrics their practice is using. The survey consisted of a mix of open ended, Likert scale, ranking, and multiple-choice questions. The survey questions were developed by a team of physicians, pharmacists, and researchers for use in an ongoing opioid and benzodiazepine deprescribing study (UNC IRB#19–2920), a cluster randomized trial examining a novel targeted consultant pharmacy practice model.[13] A list of survey questions is provided in **Appendix A**.

Participants/setting

The survey was distributed to PCPs from practices across 29 counties in North Carolina (NC). To be eligible to participate in the survey, participants needed to be a physician, physician assistant, or nurse practitioner practicing in a primary care practice located in NC.

Survey distribution

The survey distribution was conducted in two phases. In phase one, the survey was sent to University of North Carolina Physicians Network (UNCPN) PCPs from 15 clinics participating in the opioid and benzodiazepine deprescribing study. Those providers were given an incentive to participate in the survey as part of the larger study. Phase two was executed through a stand alone survey that was distributed to 109 practices across NC, representing a larger variety of healthcare organizations. The survey was conducted from November 1 through November 18, 2021. Providers were sent weekly reminders to complete the survey. The study was reviewed and exempted by the UNC Institutional Review Board for Research (IRB #21–1699).

Endpoints

The primary endpoint of this survey was to identify the types of clinical pharmacy services that providers would most value. Secondary endpoints included identifying the perspectives providers have on working with pharmacists providing clinical services, perceived positive attributes (pros) and negative attributes (cons) of clinical pharmacy services, and the chronic disease related outcome metrics their practices track.

Data analysis

All data were collected via a Qualtrics-based survey and downloaded to an Excel file prior to analysis. Demographic data were analyzed using descriptive statistics. For both phases of the survey, the difference in categorical response patterns of the PCPs' satisfaction with prior pharmacist services was determined using chi-square with a significance level of 0.05 to compare clinician role, years of experience, and county designation to satisfaction with pharmacy services. This analysis was only conducted for the participants who had indicated prior experience with clinical pharmacy services ($N = 31$, 64.6% phase one; $N = 51$, 64.1% phase two). A one-way ANOVA was used to demonstrate these differences at a significance level of 0.05. These values were analyzed separately for the two phases since satisfaction was measured differently for each phase.

Questions yielding quantitative responses were also analyzed separately for the two phases of survey dissemination. The survey question asking providers to rank medication classes/chronic diseases was revised prior to phase two distribution, with the two versions of the survey having slightly different lists of medication classes and disease states to select from (**Appendix A**). The question about outcome metrics was only asked of phase two providers.

All qualitative analyses for the two versions of the survey were conducted with combined data sets as the questions were the same. Responses listing the providers' perceived pros and cons of clinical pharmacy services were coded with in-vivo and descriptive codes by two researchers (BG, LTA), grouped into categories and themes, and then reviewed collaboratively until consensus was reached.

One incomplete survey response was included in the final analysis. This response was included because at least one question about clinical pharmacy services was answered. SPSS (Statistical software version 27, 2020) and Microsoft Excel (Excel version 16.58, 2022) were used for data analysis.[14,15]

Results

Demographics

A total of 645 providers from 124 clinics across NC were invited by email to participate in the online survey (phase one = 84; phase two = 561), with 127 responses received (phase one = 48, RR = 57.1%; phase two = 79, RR = 14.1%; Total RR = 19.7%). Characteristics of the survey participants are shown in Table 1. Most of the providers who responded to the survey were family physicians (40.9%), had 5–9 years of experience (24.4%), were female (72.4%), were 34–44 years old (35.7%), and practiced in a suburban county (48.8%). 17 of NC's 100 counties were represented.

Ranking clinical pharmacy services

Providers were asked to select the medication classes/chronic conditions for which they would value assistance from pharmacists, and then rank the services they selected from most desired to least desired. A lower ranking score indicated providers ranked that option highly (e.g., 1 = top choice, 10 = bottom choice). The top three medication classes/disease states selected by phase one providers ($N = 48$), in order of prevalence, were: 1) CMM ($N = 35$, 72.9%) with an average ranking score of 2.1; 2) diabetes medication management ($N = 29$, 60.4%) with an average ranking score of 2.1; and 3) anticoagulation management ($N = 28$, 58.3%) with an average ranking score of 2.4. The top three medication classes/disease states for phase two ($N = 79$), in order of prevalence, were: 1) diabetes medication management ($N = 40$, 50.6%) with an average ranking score of 2.3; 2) CMM ($N = 38$, 48.1%) with an average ranking score of 2.1; and 3) anticoagulation management ($N = 30$, 38.0%) with an average ranking score of 2.6. The lowest ranked medication classes with which providers desired clinical pharmacist support were steroids and statins, with one provider even stating, "Never dyslipidemia advice. Sheesh. I am already sick of discussing the benefits with patients. IF they were willing to take them, they would be on them. LOL." [participant 48]. Notably, this provider was otherwise very positive about clinical pharmacy services.

Providers were also given the option to list other medication classes/chronic disease states for which they would like to receive help. Responses included: managing medication side effects, chronic pain, and psychiatric medications. Full results are shown in Tables 2 and 3 and in Figs. 1 and 2.

Table 1
Demographics of PCP survey respondents for Phase 1 and 2.

	Phase 1 ($n = 48$)	Phase 2 ($n = 79$)	TOTAL ($n = 127$)
DEMOGRAPHICS	n (%)	n (%)	n (%)
Clinician Role			
Family Physician	14 (29.2%)	38 (48.1%)	52 (40.9%)
Geriatrician	0 (0%)	5 (6.3%)	5 (3.9%)
Internist	14 (29.2%)	5 (6.3%)	19 (15.0%)
Nurse Practitioner	10 (20.8%)	18 (22.8%)	28 (22.0%)
Physician Assistant	9 (18.8%)	4 (5.1%)	13 (10.2%)
Pediatrician	0 (0%)	7 (8.9%)	7 (5.5%)
Other	1 (2.1%)	2 (2.5%)	3 (2.4%)
Years of Experience			
<5 years	5 (10.4%)	19 (24.1%)	24 (18.9%)
5–9 years	13 (27.1%)	18 (22.8%)	31 (24.4%)
10–14 years	9 (18.8%)	15 (18.9%)	24 (18.9%)
15–19 years	5 (10.4%)	4 (5.1%)	9 (7.1%)
20–24 years	8 (16.7%)	12 (15.2%)	20 (15.7%)
25 years or more	8 (16.7%)	11 (13.9%)	19 (15.0%)
Prefer not to answer	0 (0%)	0 (0%)	0 (0%)
Sex			
Male	13 (27.1%)	21 (26.6%)	34 (26.8%)
Female	35 (72.9%)	57 (72.1%)	92 (72.4%)
Prefer not to answer	0 (0%)	1 (1.3%)	1 (0.8%)
Age			
34 years and under	6 (12.5%)	17 (21.8%)	23 (18.3%)
35–44 years	19 (35.6%)	27 (33.3%)	45 (35.7%)
45–54 years	15 (31.3%)	20 (25.6%)	35 (27.8%)
55–64 years	7 (14.6%)	10 (12.8%)	17 (13.5%)
65 years and older	1 (2.1%)	4 (5.1%)	5 (3.9%)
Prefer not to answer	0 (0%)	1 (1.3%)	1 (0.79%)
County Designation (Practice Location)*			
Rural	17 (35.4%)	14 (17.7%)	31 (24.4%)
Suburban	17 (35.4%)	45 (57%)	62 (48.8%)
Urban	14 (29.2%)	20 (25.3%)	34 (26.8%)
Previous Experience with a Clinical Pharmacist?			
Yes	31 (64.6%)	51 (64.1%)	81 (64.3%)

* Rural: Average population density of 250 per square mile or less; Urban: Average population density between 250 and 750 per square mile or less; Suburban: Average population density that exceeds 750 per square mile or less About Us. NC Rural Center. Accessed March 12, 2022. https://www.ncruralcenter.org/about-us/.

Table 2
Medication/disease states ranked by Phase 1 PCPs.

	N (Percent)	Average Ranking Score
Comprehensive medication management	35 (72.9%)	2.1
Diabetes medication management	29 (60.4%)	2.3
Anticoagulation management	28 (58.3%)	2.4
Smoking cessation	23 (47.9%)	2.7
Asthma	18 (37.5%)	2.7
Hypertension management	17 (35.4%)	3.7
Dyslipidemia	11 (22.9%)	4.8
Vaccines	10 (20.8%)	5.3
Other*	4 (8.3%)	2.3

* "Other" responses included: COPD, opioids/benzodiazepines, guidance in side effects, pain management.

Previous experience with clinical pharmacist support services

Of the 127 survey respondents, 81 (63.8%) had previous experience of working with a pharmacist providing clinical services. Phase two providers were also asked to list the medication classes/disease states that pharmacists have helped them with in the past, identifying diabetes medication management, CMM, anticoagulation, and hypertension management as the main areas. See **Appendix B** for a full list.

Overall, phase one providers who had previous experience with clinical pharmacy services rated these services as "very good" on a 4-point Likert scale that consisted of very good, good, fair, and poor ($N = 37$ RR = 77.1%). Twenty ranked those services as very good (54.1%), twelve (32.4%) ranked them as good, five (13.5%) as fair, and none as poor. Phase two providers rated the services as an average of 8.9 on a 10-point

Table 3
Medication/Disease States Ranked by Phase 2 PCPs.

	N (Percent)	Average Ranking Score
Diabetes medication management	40 (50.6%)	2.3
Comprehensive medication management	38 (48.1%)	2.1
Anticoagulation management	30 (38.0%)	2.6
Transitions of care (TOC)	28 (35.4%)	3.6
Tobacco cessation	28 (35.4%)	5.0
Hypertension management	27 (34.2%)	3.9
COPD medication management	23 (29.1%)	3.9
Antidepressant management	22 (27.8%)	3.9
Asthma medication management	16 (20.3%)	4.0
Statin therapy management/dyslipidemia	15 (19.0%)	5.3
Steroid management	2 (2.5%)	7.0
Other*	5 (6.3%)	2.6

* "Other" responses included: Cost options for various medications, psychiatric medications.

scale, with 1 = poor and 10 = excellent ($N = 51$, 64.1%). There were no significant differences in provider satisfaction in either phase based on clinician role, years of experience, or county.

To further explore PCPs' perceptions of clinical pharmacy services, all participating providers (phases one and two) were asked to indicate two pros and two cons of working with a pharmacist.

Positive attributes (pros) of clinical pharmacy services

Eighty (63.0%) of the survey participants provided pros of clinical pharmacy services. Upon qualitative analysis of these responses, three key themes arose: 1) helpful pharmacist actions, 2) positive impact on outcomes, and 3) positive qualities embodied by the pharmacists.

Helpful actions

Five different categories of responses fit within the theme of helpful actions: medication optimization, sharing of specialty knowledge, provision of patient education and support, assessment of patients, and medication cost reduction and improved access.

The first and most common helpful action identified was *medication optimization*, which included management of chronic diseases, deprescribing, assisting with medication selection, and optimizing medication dosing. Some example responses in this category included, "[the pharmacists'] role is dedication to medication management" [participant 102] and pharmacists can "help find the most effective diabetes meds"[participant 53].

Sharing specialty knowledge, the second most listed helpful action, involved sharing knowledge and expertise on drug-drug interactions (DDIs), medication adverse effects, primary literature, guidelines, and best practices with providers. Some examples of these responses included, "they have a better understanding of interactions" [participant 27] and "[they share] new knowledge of [best practices]" [participant 38].

Provide patient education and support included educating and motivating patients and providing additional support for patients, with responses such as "assist in patient education" [participant 120] and "excellent resource for diabetic [patients]" [participant 56].

Assessment of patients involved assessing patient adherence and educational gaps and performing medication reviews. Example responses included "good med recs" [participant 1] and "reviewing medication compliance" [participant 14].

Medication cost reduction and improved access included finding the most affordable medications and improving medication access for patients. Some example responses included they "[help identify] more affordable choices" [participant 107] and "[have] knowledge of medication cost assistant programs" [participant 75].

Positive impact on outcomes

Two different categories fit under the theme of positive impact on outcomes. The first category *improves patient care,* highlighted pharmacists'
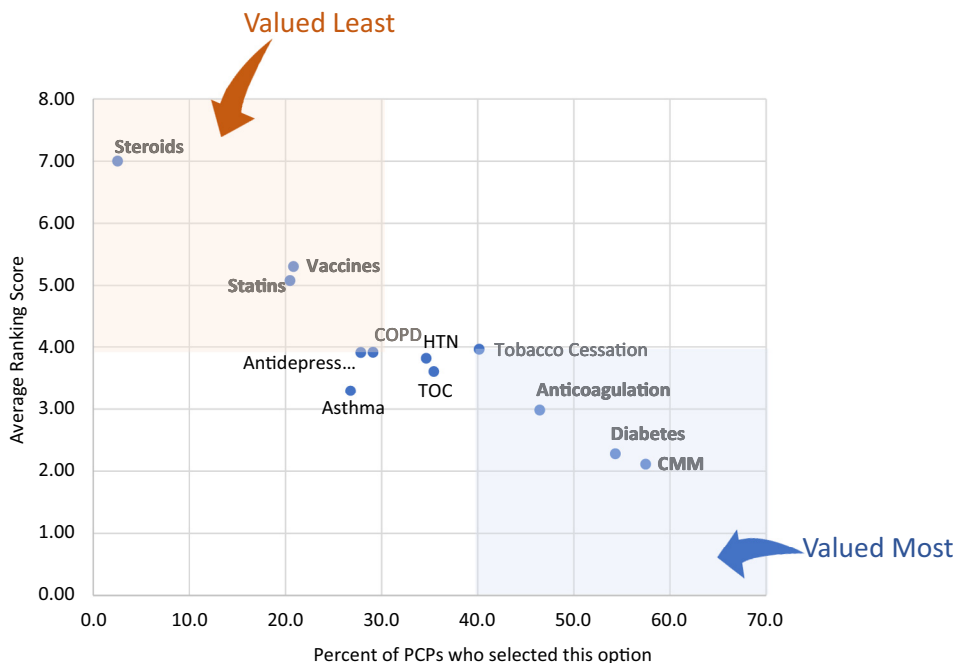
Fig. 1. Average rating score and percent selection of disease state/medication classes of Phase 1 primary care providers (PCPs) (N = 48).
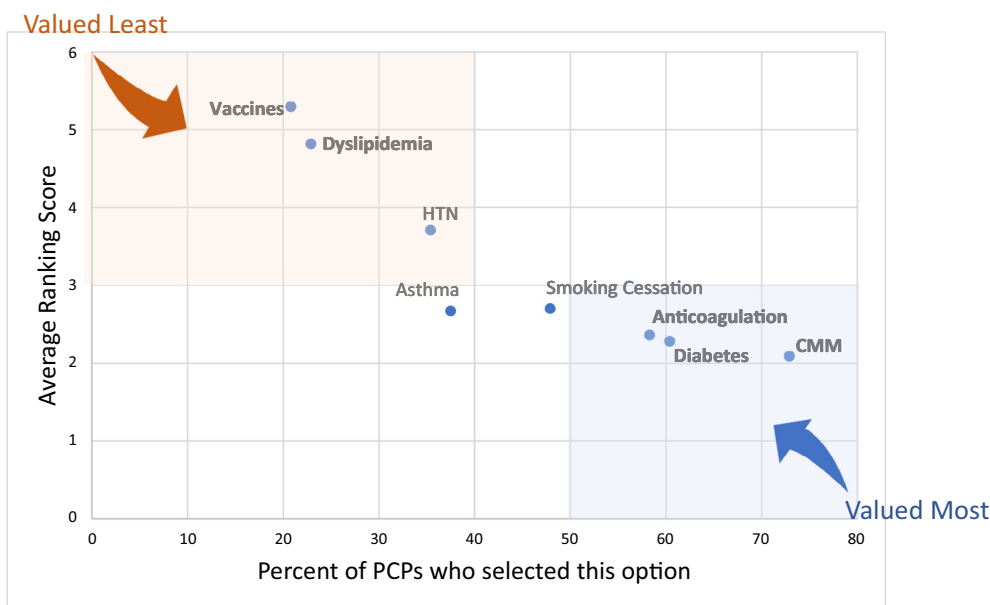
Fig. 2. Average rating score and percent selection of disease state/medication classes of Phase 2 primary care providers (PCPs) (N = 79).

ability to improve patient care through activities such as disease and medication monitoring and provision of patient follow up, with responses such as "improved continuity and follow-up" [participant 91] and "better monitoring of medications in high-risk patients" [participant 57].

Reduces provider burden included improving provider efficiency, helping with administrative tasks, and giving providers more time with their patients. Some examples of these responses included "allow me to have more time with patients" [participant 60] and "second set of eyes on medications" [participant 124].

Positive qualities

This theme involved responses from providers who described the general benefits of having clinical support from a pharmacist. Examples of

these responses included "always helpful" [participant 95] and "detailed recommendations" [participant 26].

Negative attributes (cons) of clinical pharmacy services

Sixty-eight (53.5%) survey participants provided cons, or perceived negatives, of clinical pharmacy services. Upon qualitative analysis of these responses, five key themes arose. In order of prevalence, they were: 1) limited knowledge and experience, 2) new health care provider (HCP) for patients to become adjusted to, 3) narrow scope of practice and limited time, 4) cost and reimbursement issues, 5) challenging to work with within a collaborative team. Several participants gave a response of "none" for this question.

Limited knowledge and experience was defined as pharmacists lacking clinical knowledge, appropriate training, and/or adequate experience with the providers' patients, causing their recommendations to not always be appropriate. An example of these responses was "they often don't know the patient" [participant 23].

The theme of *new HCP for patients to become adjusted to* means that the pharmacist would be a new clinician patients would have to get used to, creating barriers to care. Some examples of these responses were "patient hesitation/uncertainty to engage with new provider" [participant 68] and "overwhelming for patient to work with many clinicians" [participant 97].

Narrow scope of practice and limited time highlighted providers' view that pharmacists' skills were limited by not being able to perform physical exams or prescribe autonomously. The reality that some pharmacists only work part-time and/or support many providers in a clinic also led to the perception that pharmacists are often unavailable when providers need them. Some example responses for this theme were "unable to prescribe" [participant 94] and "lack of availability" [participant 95].

The *cost and reimbursement issues* theme highlighted the inability of pharmacists to adequately bill for services in NC and are therefore often unable to receive enough reimbursement to offset the cost of their services. Some examples of responses included in this theme were "cannot bill for services" [participant 83] and "figuring out reimbursement" [participant 97].

Challenging to work with within a collaborative team was defined as providers expressing challenges of working with a pharmacist in practice. Some example responses were "adds more hassle to my day" [participant 48] and "challenging to coordinate services in a busy schedule" [participant 92].

Twenty providers (29.4%) answered "none" when asked to indicate if there were any cons of clinical pharmacy services, with some taking the opportunity to further highlight their positive view of them: "I would like more access to these services" [participant 27], and in favor of expanding the health care team" [participant 37]. Full results of the pros and cons listed by the providers are provided in **Appendix B.**

Outcome metrics used

Providers in phase two were also asked to indicate key outcome metrics or medication related outcomes their practices monitor. Although 79 providers answered this question, the responses received were not standardized enough to produce meaningful results. Full results are provided in **Appendix C.**

Additional comments on clinical pharmacy services

Providers were also asked to provide any additional comments they would like to share. The 28 (22.0%) responses received included both positive and negative comments. Examples of positive comments were "Very beneficial. In my experience, clinical pharmacists are better trained at managing medications for the conditions listed above than are APPs like NPs and PAs" [participant 60] and "Every primary care clinic should have an embedded pharmacist" [participant 62]. An example of a negative comment was "Pharmacists should not 'manage' my patients' medications – that is my job and my decisions" [participant 69].

Discussion

This study is the first of its kind, to the best of our knowledge, that directly asked PCPs – in multiple organizations and multiple geographic locations – to identify the clinical pharmacy services they would most value in their practices. These results can help inform pharmacists on how to tailor and design services that best fit the needs of PCPs.

Our results were obtained in two phases from PCPs across NC. The top three medication classes/chronic disease states these providers would most value pharmacist support with were the same for both phases: CMM, diabetes medication management, and anticoagulation management. Notably, providers in phase two indicated the top medications/disease states they had previously received pharmacist support with included diabetes medication management, CMM, and anticoagulation management. Their positive prior experiences with these services may have influenced their desire for more of the same.

Many studies have demonstrated that pharmacist-provided medication management of the aforementioned disease states results in improved patient outcomes.[15,16] For example, Pontefract et al found that the mean change in HbA1c was -2.17% in a pharmacist-management group versus 0.48% in the usual care group ($p < 0.001$).[17] A systematic review conducted by Manzoor et al evaluated the quality of warfarin anticoagulant control when managed by a pharmacist as compared to routine care. This study demonstrated that pharmacist-managed outpatient-based anticoagulation services attained better quality of anticoagulation control and lower complication rates, which resulted in decreased healthcare utilization.[18]

Additionally, studies have demonstrated how implementation of CMM has contributed to improved outcomes.[7] In fact, a recent review article by McFarland et al highlights how CMM can positively impact all key aspects of the quadruple aim of healthcare.[7,19]

This study also sought to understand PCP perceptions of clinical pharmacy services. Our study found that most providers surveyed who had previous experience working with pharmacists had an overall positive experience, with helpful actions, positive impact on outcomes, and positive qualities embodied by the pharmacists being the attributes they find most valuable.

These findings are similar to the literature that has demonstrated that PCPs have overall positive feelings towards collaborative work with pharmacists.[20,21] For example, a study that examined and explored physician opinions about the implementation of pharmacists into primary care settings reported that 90% of providers "strongly agree" that having a pharmacist in the office makes management of patients' medications easier.[22]

Additionally, these results highlight how the perceived pros of clinical pharmacy services align with the quadruple aim. This alignment is demonstrated through the themes of *improves patient care; reduces provider burden; provide patient education and support,* and *medication cost reduction and improved access.* The other pros identified, *medication optimization, sharing specialty knowledge,* and *assessment of patients,* further support the goals of the quadruple aim.[7]

Our study also revealed some negative perceptions that some PCPs have regarding clinical pharmacy services such as, *limited knowledge and experience, new health care provider (HCP) for patients to become adjusted to, narrow scope of practice and limited time, cost and reimbursement issues*, and *challenging to work with within a collaborative team*. Almost a third of respondents, however, indicated that there were no cons to clinical pharmacy services, with several mentioning that they hoped to gain more access to these types of services. Overall, the general perception of the providers towards clinical pharmacy services was positive with an acknowledgement of barriers such as reimbursement/cost issues and scope of work limitations.

Cost and reimbursement issues are barriers for the implementation of pharmacists into primary care practices that are consistently seen in the literature. For example, a prospective, descriptive study that surveyed NC physicians supervising clinical pharmacist practitioners (CPPs) on the challenges of incorporating a pharmacist into practice found the primary barriers were limited reimbursement and billing for clinical pharmacy services.[23]

By identifying cons of clinical pharmacy services, these results identify areas for improvement when attempting to integrate clinical pharmacy services into primary care practices. One possible mechanism to minimize these issues is to use remote, or centralized, pharmacists for multiple primary care practices to reduce the cost of implementing a pharmacist into every practice within an organization.[13] Other solutions include working with a practice's existing workflow to determine the optimal way to integrate a pharmacist into the team to maximize their accessibility and usefulness, and exploring additional modes of pharmacist care delivery, such as telehealth.

One apparent contradiction that surfaced through this study was the perception by some providers that pharmacists have limited knowledge or experience, while other providers appreciated the specialty knowledge and support pharmacists can provide. This disparity in perception could possibly be resolved by exposing PCPs to more collaborative opportunities throughout their training to enhance their knowledge of the role of pharmacists and the clinical services they can provide. Pharmacy schools and residences should also ensure the highest clinical standards of the pharmacists they are training.

Another paradox that was observed was that some providers listed "lack of availability" as a con of clinical pharmacists, while other providers praised pharmacists for their availability. This disparity could be explained by differences in their previous experiences, especially in how the pharmacist services were designed and deployed. Working deliberately to design clinical pharmacy services to best fit the needs and workflow of a given clinic and prioritizing the areas the services are most needed could help mitigate this issue.

Another goal of the study was to investigate the types of medication related outcome metrics PCP practices are using. Unfortunately, this portion of our survey yielded mixed responses, limiting what we could learn on this topic. While the literature has demonstrated that integration of a pharmacist within primary care practices can lead to improvement in outcome metrics,[22–24] this study did not provide any additional insight on this topic.

Regardless, understanding commonly used outcome metrics can help guide pharmacists in creating/tailoring clinical pharmacy services to fit the need of PCPs.

The limitations of this study include the narrow generalizability of the results, small sample size, subjectivity of the participating PCPs, and anonymity of the survey. A total of 645 providers throughout NC were invited to participate in the survey and only 127 responded (19.7% RR). There was a higher response rate for phase one versus phase two because providers in phase one were already committed to the deprescribing study and received an incentive for completing the survey. The response rates in phase two was not as high, likely due to a lack of incentive for survey completion and absence of an existing relationship with the researchers. Sampling bias could have also played a role since phase two participants were recruited through generic email communications. Additionally, the survey was anonymous which made it difficult to conduct specific analyses on why a given PCP valued certain services. Their past or current experiences with clinical pharmacy services may have influenced which medications/disease states they wanted pharmacist assistance with in the future. However, no noticeable correlation between past experiences and future clinical support needs were uncovered in this study. Other factors, including their experiences with individual pharmacists and types of other ancillary staff members in their clinics (e.g., diabetes specialists, medication assistance specialists) may have also influenced the clinical pharmacy supports they desired.

While 24.4% of the survey participants practiced in rural areas, indicating some diversity of geographical setting, only 17 of NC's 100 counties were represented. Therefore, the results from this study may not be fully applicable to other parts of NC that were not represented. Additionally, providers who were invited to participate in the survey were mainly associated with two large academic healthcare institutions in NC ($N =$ 534, 82.8%), further impacting generalizability. The findings from this study may also not be generalizable to other practices outside of NC due to different healthcare practices, operational structures, and state laws that may impact the types of services that pharmacists can provide.

Based on the results of this study, future research should be aimed at increasing generalizability. The surveyed population should be expanded to include more PCPs across NC as well as other states. Additional questions, such as what *mode of service delivery* (e.g., embedded clinical services; telehealth services; remote, centralized services; consultant services) providers would most value, could further help pharmacists tailor their services to meet the needs of providers *and* simultaneously reduce the costs of providing clinical services.

To receive more specific responses about PCPs' needs and wants in terms of clinical pharmacy services, focus groups could also be conducted with providers. With a larger sample size, sub-analyses could assess differences in PCP values/needs based on county designation of rural, suburban, and urban or PCP-specific demographics. Such analyses could determine if and how PCPs' needs, and values change based on their location and/or other variables. Other future research could include a more in-depth analysis of the different outcome metrics that are targeted by different primary care clinics.

Conclusion

This research can provide pharmacists with knowledge about the clinical pharmacy services that are most valued by PCPs so they can, in turn, direct their efforts towards creating those types of services. The PCPs surveyed had an overall positive view of clinical pharmacy services; however, they also referenced certain barriers to implementation of these services. Future studies should aim to identify cost-effective methods at providing these services as their incorporation could help improve patient outcomes and provider satisfaction. Additionally, this study highlighted some areas for improvement of pharmacist-provider collaborative relationships as well as how to best continue, improve, and/or implement clinical pharmacy services. For example, pharmacists should ensure they are up to date on the most recent and relevant clinical information and work to develop clinical support services providers actually want in a way that is useful to providers and are sustainable.

CRediT authorship contribution statement

Belyin Gutierrez Euceda: Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing. **Stefanie P. Ferreri:** Conceptualization, Writing – review & editing, Supervision. **Lori T. Armistead:** Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing, Supervision.

Declaration of Competing Interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.rcsop.2023.100267.

References

1. Tannenbaum C, Tsuyuki RT. The expanding scope of pharmacists' practice: implications for physicians. CMAJ 2013;185(14):1228–1232. https://doi.org/10.1503/cmaj.121990.
2. New Findings Confirm Predictions on Physician Shortage. AAMC. Accessed April 4, 2021: https://www.aamc.org/news-insights/press-releases/new-findings-confirm-predictions-physician-shortage.
3. Rodziewicz TL, Houseman B, Hipskind JE. *Medical Error Reduction and Prevention.* StatPearls Publishing. 2021.Accessed March 17, 2021: https://www.ncbi.nlm.nih.gov/books/NBK499956/.
4. 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. https://doi.org/10.1097/MLR.0b013e3181e57962.
5. Joseph T, Hale GM, Eltaki SM, et al. Integration strategies of pharmacists in primary care-based accountable care organizations: a report from the accountable care organization research network, services, and education. J Manag Care Spec Pharm 2017;23(5):541–548. https://doi.org/10.18553/jmcp.2017.23.5.541.

6. Isetts BJ, Schondelmeyer SW, Artz MB, et al. Clinical and economic outcomes of medication therapy management services: the Minnesota experience. J Am Pharm Assoc JAPhA 2008;48(2):203–214. https://doi.org/10.1331/JAPhA.2008.07108.

7. Bodenheimer T, Sinsky C. From triple to quadruple aim: care of the patient requires care of the provider. Ann Fam Med 2014;12(6):573–576. https://doi.org/10.1370/afm.1713.

8. Funk KA, Pestka DL, Roth McClurg MT, Carroll JK, Sorensen TD. Primary care providers believe that comprehensive medication management improves their work-life. J Am Board Fam Med JABFM 2019;32(4):462–473. https://doi.org/10.3122/jabfm.2019.04.180376.

9. McFarland MS, Lamb K, Hughes J, Thomas A, Gatwood J, Hathaway J. Perceptions of integration of the clinical pharmacist into the patient care medical home model. J Healthc Qual Off Publ Natl Assoc Healthc Qual 2018;40(5):265–273. https://doi.org/10.1097/JHQ.0000000000000114.

10. Slazak E, Cardinal C, Will S, Clark CM, Daly CJ, Jacobs DM. Pharmacist-led transitions-of-care services in primary care settings: opportunities, experiences, and challenges. J Am Pharm Assoc 2020;60(3):443–449. https://doi.org/10.1016/j.japh.2019.11.016.

11. Ferreri SP, Hughes TD, Snyder ME. Medication therapy management: current challenges. Integr Pharm Res Pract 2020;9:71–81. https://doi.org/10.2147/IPRP.S179628.

12. Gordon C, Unni E, Montuoro J, Ogborn DB. Community pharmacist-led clinical services: physician's understanding, perceptions and readiness to collaborate in a Midwestern state in the United States†. Int J Pharm Pract 2018;26(5):407–413. https://doi.org/10.1111/ijpp.12421.

13. Armistead LT, Hughes TD, Larson CK, Busby-Whitehead J, Ferreri SP. Integrating targeted consultant pharmacists into a new collaborative care model to reduce the risk of falls in older adults owing to the overuse of opioids and benzodiazepines. J Am Pharm Assoc JAPhA 2021;61(1):e16–e18. https://doi.org/10.1016/j.japh.2020.08.038.

14. IBM SPSS Statistics. Published October 20, 2020. Accessed March 18, 2022: https://www.ibm.com/support/pages/how-cite-ibm-spss-statistics-or-earlier-versions-spss.

15. Butt M, Mhd Ali A, Bakry MM, Mustafa N. Impact of a pharmacist led diabetes mellitus intervention on HbA1c, medication adherence and quality of life: a randomised

controlled study. Saudi Pharm J SPJ 2016;24(1):40–48. https://doi.org/10.1016/j.jsps.2015.02.023.

16. Choe HM, Mitrovich S, Dubay D, Hayward RA, Krein SL, Vijan S. Proactive case management of high-risk patients with type 2 diabetes mellitus by a clinical pharmacist: a randomized controlled trial. Am J Manag Care 2005;11(4):253–260.

17. Pontefract BA, King BS, Gothard DM, King CA. Impact of pharmacist-led diabetes management in primary care clinics. Innov Pharm 2018;9(2):1–8. https://doi.org/10.24926/iip.v9i2.985.

18. Manzoor BS, Cheng WH, Lee JC, Uppuluri EM, Nutescu EA. Quality of pharmacist-managed anticoagulation therapy in long-term ambulatory settings: a systematic review. Ann Pharmacother 2017;51(12):1122–1137. https://doi.org/10.1177/1060028017721241.

19. McFarland MS, Buck ML, Crannage E, et al. Assessing the impact of comprehensive medication management on achievement of the quadruple aim. Am J Med 2021;134(4):456–461. https://doi.org/10.1016/j.amjmed.2020.12.008.

20. Pottie K, Farrell B, Haydt S, et al. Integrating pharmacists into family practice teams. Can Fam Physician 2008;54(12):1714-1717.e5.

21. Makowsky MJ, Schindel TJ, Rosenthal M, Campbell K, Tsuyuki RT, Madill HM. Collaboration between pharmacists, physicians and nurse practitioners: a qualitative investigation of working relationships in the inpatient medical setting. J Interprof Care 2009;23(2):169–184. https://doi.org/10.1080/13561820802602552.

22. Moreno G, Lonowski S, Fu J, et al. Physician experiences with clinical pharmacists in primary care teams. J Am Pharm Assoc 2017;57(6):686–691. https://doi.org/10.1016/j.japh.2017.06.018.

23. Williams CR, Woodall T, Wilson CG, et al. Physician perceptions of integrating advanced practice pharmacists into practice. J Am Pharm Assoc JAPhA 2018;58(1):73-78.e2. https://doi.org/10.1016/j.japh.2017.10.014.

24. Kutz TL, Roszhart JM, Hale M, Dolan V, Suchomski G, Jaeger C. Improving comprehensive care for patients with diabetes. BMJ Open Qual 2018;7(4), e000101. https://doi.org/10.1136/bmjoq-2017-000101.