Journal of Primary Care & Community Health
Volume 9: 1–5

DOI: 10.1177/2150132718759213
journals.sagepub.com/home/jpc
SAGE

Impact of a Pharmacist-Provided Spirometry Service on Access to Results in a Primary Care Setting

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Abstract

Objectives: The primary objective of this study was to determine the effect of a pharmacist-provided spirometry service within a federally qualified health center on the percentage of spirometry referrals completed with results reviewed by the ordering provider. Secondary objectives evaluated differences between internal and external referrals, medication recommendations made by the pharmacist, and revenue brought in by the service. **Methods:** Chart reviews were completed to determine the referral completion rates between patients who received a spirometry referral before (December 2014–September 2015) and after (January 2016–October 2016) the implementation of the pharmacy-provided spirometry service. Chart reviews were also used to determine the number and completion rate among referrals for internal and external services in the postimplementation time frame. Chart reviews also assessed medication recommendations made by the pharmacist. **Results:** The results demonstrate an increase in referral completion rate from 38.1% to 47.0% (P = .08) between the pre- and postimplementation time frames. In the postimplementation time frame, there was a statistically significant difference in the percentage of referrals completed between in-house referrals and external referrals (70.0% and 40.9%, respectively, P = .0004). Comparing clinics with and without the spirometry service, there was a statistically significant difference in the total number of spirometry referrals (1.13% and 0.59%, respectively, P < .0001) and the percent of referrals completed (0.55% and 0.27%, respectively, P = .0002). **Conclusion:** The results suggest that offering spirometry within the primary care setting helps to increase the rate of completed spirometry tests with results available to the primary care provider. Additionally, the results show that there is an increased completion rate in patients who receive an internal spirometry referral, which may be due to reduced barriers in obtaining this testing. Overall, these results demonstrate that providing spirometry in the primary care setting helps to increase spirometry results obtained and could be beneficial in other primary care settings.

Keywords

spirometry, ambulatory care, primary care, access to results, asthma, chronic obstructive pulmonary disease (COPD), referral, pharmacist

Introduction

Asthma and chronic obstructive pulmonary disease (COPD) are common, chronic health conditions that require proper diagnosis and management to improve patients' quality of life and prevent exacerbations. Proper diagnosis with spirometry testing is crucial. Underdiagnosis can lead to disease progression and increased hospitalizations, while overdiagnosis can lead to excess health care costs and unnecessary medication use. Spirometry testing is the gold standard for diagnosis and management of both asthma and COPD.[1-3]

Studies show that it is important to have properly performed and interpreted spirometry in the primary care setting. Objective assessments of pulmonary function are important to obtain, as medical history and physical examination are not reliable measures for proper diagnosis or current lung status. In one study that evaluated the role of spirometry in primary care by Laughlen et al,[4] one-third of

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children diagnosed with moderate-to-severe asthma were reclassified to a more severe asthma category after spirometry testing. Another study looking at the effect of primary care spirometry showed that of 1508 patients screened, 97 new treatments were prescribed to 64 patients. This study shows that spirometry can improve the patient's medication regimen without requiring input from a specialist referral.[5] Despite strong evidence to support the importance of spirometry, this testing is not commonly completed or used in the primary care setting. In a 2010 survey, only 21% of primary care physicians routinely use spirometry when caring for children and 50% of family physicians were comfortable interpreting results.[6] Spirometry testing is an important tool to aid in accurate diagnosis and improved medication regimens, which can lead to improvement in lung function, increased exercise capacity, reduced exacerbations, and overall enhanced quality of life. The results from these studies support the importance of having properly trained clinicians available in the primary care setting to complete spirometry testing.

Pharmacists have been performing spirometry screening in various settings. A retrospective study by Cawley and Warning[7] supported many benefits of pharmacists providing spirometry screening, including better convenience, preventing the delay of diagnosis, optimizing drug therapy, and optimizing teaching of delivery devices and lifestyle initiatives. This study showed that pharmacists were able to perform quality spirometry testing based on the American Thoracic Society/European Respiratory Society guidelines.[7]

Recognizing the need for spirometry testing along with the capability of pharmacists to provide quality spirometry testing, PrimaryOne Health (P1H) initiated a spirometry service provided by onsite clinical pharmacists. The spirometry service allows providers to refer their patients for the test within the clinic without having to refer to an external specialist. The clinical pharmacists and pharmacy resident were trained to perform valid spirometry by a representative of the device company and they received additional on-the-job training for interpreting spirometry results. No other staff were completing spirometry at P1H prior to or during this study. This study aimed to assess the impact of pharmacists providing spirometry testing within a federally qualified health center (FQHC). The primary objective is to determine the effect on percentage of spirometry referrals completed with results reviewed by the ordering primary care provider. The study also assessed medication recommendations that were provided based on spirometry results, the impact on the number of spirometry referrals ordered between clinics with and without the spirometry service, the completion rate between internal and external referrals, and revenue generated by the service.

Methods

This study is an institutional review board–approved, retrospective chart review at P1H in collaboration with The Ohio State University College of Pharmacy from December 1, 2014 to October 31, 2016.

P1H is an FQHC recognized as a National Committee for Quality Assurance Tier 3 patient-centered medical home. P1H has 10 health centers and serves culturally and socioeconomically diverse patient populations throughout central Ohio. More than 30,000 unique patients are seen within P1H each year. The pharmacists at P1H began offering spirometry testing in January 2016 at 2 of the 10 clinic locations. Providers from all clinics are able to refer patients to this service. Patients were eligible for inclusion in the study if they (1) had a spirometry referral ordered in the study period and (2) were 18 years of age or older. Patients were not eligible if they had a referral for any other breathing test.

This research compares data from before and after implementation of the pharmacist-provided spirometry service. The preimplementation time frame included patients who received a referral between December 1, 2014 and September 30, 2015. The postimplementation time frame included patients between January 1, 2016 and October 31, 2016. The period of October 1, 2015 to December 31, 2015 was excluded because the new service was purposefully being piloted with only a few patients and providers.

In each time frame, patient lists were generated from the electronic medical record (EMR) based on referrals ordered for spirometry testing. After determining eligible patients from the preimplementation time frame, chart reviews were completed to assess patient demographics, referral status, and location from where the referral was ordered. In the postimplementation time frame, if the referral was completed within P1H, chart reviews also included medication recommendations and status of medication recommendation.

Revenue generated by the service was assessed through a Revenue Detail Report provided by the billing department.

Patient characteristics in each time frame were analyzed using Fisher's exact tests, Student's *t* tests, or Mann-Wilcoxon rank tests as appropriate.

Results

Patient demographics were similar with no statistical differences between the pre- and postimplementation time frames (Table 1).

The preimplementation time frame had 168 referrals ordered and 64 completed. The postimplementation time frame had 236 referrals ordered and 111 completed, which was not a statistically significant difference ($P = .08$). When evaluating the postimplementation time frame, there was a

Table 1. Patient Demographics.

	Preimplementation	Postimplementation	*P*
Gender, n (%)			.24[a]
Female	104 (61.9)	160 (69.0)	
Male	64 (38.1)	76 (31.0)	
Age, y			
Mean (SD)	49.4 (13.6)	49.8 (13.2)	.74[b]
Median (interquartile range)	50.5 (40.0-58.0)	52.0 (40.8-59.0)	.77[c]
Ethnicity, n (%)			.24[a]
Hispanic	15 (8.9)	32 (13.6)	
African American	71 (42.3)	81 (34.3)	
Caucasian	76 (45.2)	117 (49.6)	
Other	6 (3.6)	6 (2.5)	
Smoking status, n (%)			.65[a]
Current smoker	92 (54.8)	118 (50.0)	
Former smoker	30 (17.9)	47 (19.9)	
Nonsmoker	46 (27.4)	71 (30.1)	
Primary insurance, n (%)			.36[a]
Medicaid	116 (69.0)	149 (63.1)	
Medicare	35 (20.8)	52 (22.0)	
Private	1 (0.0)	6 (2.5)	
Uninsured	16 (9.5)	29 (12.3)	

[a]Two-sided Fisher's exact test. The significance level was .05.
[b]Two-sided Student's *t* tests. The significance level was .05.
[c]Two-sided Mann-Wilcoxon-Whitney rank tests. The significance level was .05.

Table 2. Referral Completion Rates.

	Preimplementation	Postimplementation
Total referrals[a]	64/168 (38.1%)	111/236 (47.0%)
In-house referrals	—	35/50 (70.0%)[b]
External referrals	64/168 (38.1%)	76/186 (40.9%)[b]

[a]$P = .08$. Two-sided Fisher's exact test. The significance level was .05.
[b]$P < .001$. Two-sided Fisher's exact test. The significance level was .05.

statistically significant difference in the completion rate for internal versus external referrals (35/50, 70.0% and 76/186, 40.9% respectively, $P < .001$) (Table 2).

Comparing clinics with and without the spirometry service available at that specific site adjusted for unique patient visits, there was a statistically significant difference in the total number of referrals ordered and total percentage of referrals completed (Table 3).

During the postimplementation time frame, medication recommendations were assessed for patients who received in-house spirometry testing. Of the 35 patients receiving the pharmacist-provided spirometry service, 16 (45.7%) required medication recommendations to align their regimens with evidence-based guidelines. Recommendations included the need for additional medication or deprescribing when necessary. In total, 23 recommendations were made to providers and 20 of these recommendations were accepted.

The average revenue generated per billable test was $101.12.

Discussion

There was a higher completion rate of spirometry referrals after implementation of the pharmacist-provided spirometry service as compared with before the service, demonstrated by an 8.9% difference in completed referrals between the pre- and postimplementation time frames. This result may not have gained statistical significance due to a large portion of patients still receiving external referrals in the postimplementation time frame. While this result is not statistically significant, it is clinically meaningful because the pharmacist-provided spirometry service contributed to 47 more patients receiving spirometry results. Additionally, there were 68 more referrals ordered in the postimplementation time frame. These results match our hypothesis that having this pharmacy service increases provider awareness of the need for spirometry and referral completion rates.

In the postimplementation time frame, there was a statistically and clinically significant difference in completion rate and access to results for internal referrals (70.0%) compared with external referrals (40.9%). This difference could be attributed to barriers that may be present when patients have to complete a spirometry test at an outside facility, such as finding a clinic that accepts their insurance,

Table 3. Referrals Ordered in Postimplementation Time Frame.

	Clinics With Spirometry (Total Unique Patient Visits = 10 189)	Clinics Without Spirometry (Total unique Patient Visits = 20 462)	*P*
Total referrals % (n)	1.13 (115)	0.59 (121)	<.0001
Referrals completed % (n)	0.55 (56)	0.27 (55)	.0002

increased costs associated with seeing a specialist, scheduling through another facility, and delay or lack of external results being communicated to the ordering provider. There are no known studies that assessed completion rates for internal specialty referrals; however, other studies have assessed external completion rates and found that patients with Medicaid had a significantly lower rate of completed referral visits compared with their insured counterparts.[8,9] Reasons for missed appointments align with expected barriers in our clinic.[10] Compared to these studies, our study had a higher rate of Medicaid patients (63% vs 11%-32%) which is likely contributing to the lower completion rate for external referrals in our study (40.9% vs 50%-82%). Additionally, for external referrals in both time frames, there were results that were not received within the 6-month referral window that was used for this study. Poor communication between the primary care provider and specialist has been shown in other studies.[11,12] The study noted that the physical separation between providers might impact access and communication problems.[12] The in-house spirometry service provides immediate results to the provider within the same EMR after completion of the spirometry test. The pharmacist's availability within the clinics and their access to a shared EMR could prevent some patient access issues and communication problems that may arise with external specialists. Finally, providing the in-house service may overcome barriers that patients may face to schedule and complete the spirometry screening.

While the in-house spirometry service has an excellent completion rate compared with external referrals, the service may be an underutilized resource. The number of internal referrals (50) was less than 25% of the total number of referrals (238) in the postimplementation time frame. One limitation is that spirometry is only offered at 2 clinic sites, which may be difficult for some patients who cannot travel to another clinic. Another limitation may be provider awareness despite initial education. Results show that there is a statistically significant difference in the total number of referrals ordered and completed in clinics that offer the spirometry service compared with those clinics without it. Providers that work within a clinic that offers the spirometry service may have more awareness of the service and patients may have more ease in completing the test at their usual clinic site. Future education to the providers and expansion of the service to other clinic locations may provide additional benefits for patients who qualify for a spirometry test and could remedy these limitations.

Pharmacists are a great resource for completing spirometry testing because they have existing relationships with the providers, medication knowledge, and can provide comprehensive care during the appointment.[7,11] Almost half (45.7%) of the patients that received spirometry from the pharmacist in this study required an evidenced-based medication regimen change, which consisted of prescribing necessary medications and discontinuing medications that were not indicated based on spirometry results. Pharmacists were able to provide 23 recommendations that were highly accepted (87%) by the providers. In addition to providing spirometry results, pharmacists are able to collaborate with the primary care provider to assess results and provide evidenced-based medication recommendations.

There are limitations to this study. This study was retrospective, and all information collected was limited to documentation in our EMR. This study compared clinics with and without the service, which have many variables that could impact differences in referrals (such as patient population, number of providers, provider preferences, etc). However, we corrected for size of the clinic based on the total number of unique patient visits in our comparison. Finally, the quality of spirometry performed was not assessed, however, in this practice any results that are below quality grade B are not used for interpretation.

Finally, this study was conducted at a FQHC that serves a higher proportion of uninsured and Medicaid patients than general primary care practices. These results may be generalizable to other FQHCs or practices with a similar patient population but may not be generalizable to all primary care settings.

Despite these limitations, this study adds important knowledge about the expanded role pharmacists can have in the primary care setting and show that implementation of this service was associated with a higher rate of referrals ordered and completed in an underserved population.

Conclusion

Offering a pharmacist-provided in-house spirometry service within a primary care setting in a FQHC was associated with increased completion of spirometry referrals. Pharmacists are

able to provide evidence-based medication recommendations and reimbursement exists that makes this service sustainable. There is a need for properly trained providers for spirometry testing in the primary care setting and this study demonstrates that pharmacists are well-suited to offer this service to improve patient access to care and provide evidenced-based medication education and recommendations.

Authors' Note

At the time of this project, Dr. Mueller was a PGY2 Pharmacy Resident at The Ohio State University College of Pharmacy and PrimaryOne Health.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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