The Role of Ambulatory Care Pharmacists in an HIV Multidisciplinary Team within a Free and Bilingual Clinic

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Abstract
Objective: *Describe the role and integration of ambulatory care pharmacists in a Human Immunodeficiency Virus (HIV) clinic within a free and bilingual clinic with regards to types of interventions made during the patient-pharmacist visit.*
Design: *Retrospective, single-centered, chart review.*
Setting: *Free, bilingual clinic in Richmond, VA.*
Participants: *Thirty-two adult patients with diagnosed HIV receiving care in the clinic between June 30, 2010 and January 26, 2011.*
Main Outcome Measure: *Types of interventions documented during the patient-pharmacist visit, categorized as medication review, patient education, or adherence monitoring.*
Results: *Total of 32 patients accounted for 55 patient-pharmacist visits and 296 interventions. The most common interventions were medication review (66.9%), patient education (23.3%), and adherence monitoring (9.8%). Post-hoc analysis suggests Hispanic patients are more likely to be diagnosed with Acquired Immune Deficiency Syndrome (AIDS) (P = 0.01), have current or history of opportunistic infection (OI) (P=0.01), and have current or history of OI prophylaxis (P = 0.03). Adherence monitoring was less common amongst the non-Hispanics (7.1%) compared to the Hispanic sub-population (16.5%), (P = 0.04).*
Conclusion: *The role of ambulatory care pharmacists in a free and bilingual clinic goes beyond adherence monitoring. Pharmacists can be a valuable part of the patient care team by providing medication review and patient education for HIV and other co-morbidities within free clinics. Further research is warranted to assess outcomes and to further explore the underlying barriers to early HIV diagnosis and adherence within the Hispanic population.*

Introduction

Since the worldwide outbreak of the Human Immunodeficiency Virus (HIV) epidemic in the early 1980s, there has been an increased need for antiretroviral therapy (ART), enhanced patient monitoring, and education regarding treatment and prevention for those with the disease and the public. Patients infected with HIV are now living longer, partly due to the advances in ART. These advances have significantly decreased pill burden and improved adherence. This has resulted in improved quality of life and survival rates.[1,2]

Pharmacists provide direct patient care within a variety of multidisciplinary healthcare settings.[3] Ambulatory care pharmacists in HIV clinics play an integral role in optimizing medication therapy and improving patient outcomes when working as part of a multidisciplinary team.[4,5,6,7,8,9] March, et al. described the impact of pharmacists' interventions on patient outcomes in a federally funded HIV clinic in Los Angeles, CA. At the conclusion of the study, patients being followed by the pharmacists in the clinic had a significant improvement in CD4 count, viral load (VL), and drug-related toxicities.[4] Although advances in ART have led to extended life expectancy in HIV patients, the long-term use of these medications has been associated with metabolic abnormalities which may increase the risk for developing chronic condition such as diabetes and dyslipidemia.[1,2,10] Evidence supports the benefit of ambulatory care pharmacists providing chronic disease state management to both HIV and non-HIV infected patients by optimizing and monitoring treatment plans, educating patients and providers, increasing adherence rates, and promoting cost effective treatment.[3,4,5,11,12]

Free clinics are a common safety-net for the uninsured to receive healthcare services.[13] Based on a national survey of free clinics, 23.1% of free clinics provide HIV services.[14] Literature describing the role ambulatory care pharmacists

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working in safety-net clinics is limited mostly to Federally Qualified Healthcare Centers (FQHC) and community health centers.[3,8,15,16,17,18] There is an increased need to further describe and understand the role of ambulatory care pharmacists within unique practice settings, such as free clinics.

The primary outcome of the study was to describe the role and integration of ambulatory care pharmacists in a HIV clinic within a free and bilingual clinic and describe the types of interventions made by the pharmacists. Secondary outcomes included change in CD4 count, VL, adherence rate, ART or HIV complications, and time spent during the patient-pharmacist visit.

Methods

This study was a single-centered, retrospective chart review in an HIV clinic within a free and bilingual clinic. CrossOver Health Center is the largest freestanding clinic in Richmond, VA. It has been in existence for over 25 years and provides a variety of free medical, laboratory, and pharmacy services for the qualifying uninsured population in the area. The Therapeutic Intervention Preventative Services (TIPS) clinic at CrossOver is a Human Resources and Services Administration (HRSA)-funded program through the Ryan White Grant and was established to provide specialized care for HIV patients. The TIPS clinic operates three days a week and has approximately150 active patients. The TIPS team is comprised of a medical doctor, nurse practitioner, social worker, and medical assistant. In June 2010, an ambulatory care pharmacist practicing in academia joined the TIPS clinic and was later joined by a bilingual Post-Graduate Year 2 (PGY-2) Ambulatory Care pharmacy resident in September 2010. During the study, the pharmacy team practiced one half day per week in the TIPS clinic, establishing clinical pharmacy services and expanding the multidisciplinary model. The study was approved by the Institutional Review Board at Virginia Commonwealth University and by the CrossOver Health Center medical director, assistant medical director, and medical director of the TIPS clinic.

Patients included in this study were current patients of the TIPS clinic of at least 18 years of age with a documented patient-pharmacist visit between June 30, 2010 and January 26, 2011. Exclusion criteria included patients who were pregnant or imprisoned at any time during the study period. Data was collected through a chart review after the study time period using a study specific data collection sheet (Appendix A).

Patients seen in the clinic were scheduled to see either a medical provider for follow-up or the medical assistant for lab tests. Patients were asked for verbal consent by one of the team members prior to the visit with the pharmacist. A patient-pharmacist visit was defined as a face-to-face interview between the patient and the pharmacist during the appointment with the HIV clinic provider. On certain occasions, patients were scheduled for pharmacy-only visits, specifically for management for other co-morbid conditions, adherence monitoring, and preparation of medication boxes. These were also considered patient-pharmacist visits. After the patient-pharmacist visit, the pharmacist discussed the patient and specific recommendations with the HIV medical provider. Visit details and recommendations were also documented in the patient's medical chart using a standardized pharmacy progress note.

The primary outcome of the study was to describe the types of interventions documented by the pharmacists. Interventions were categorized as medication review, patient education, or adherence monitoring. Only interventions that occurred during the patient-pharmacist visit were included in the study. A visit could have one, multiple, or no interventions. For the purpose of this study, medication review was defined as medication reconciliation; medication education on new or current ART or non-ART medications; initiating, discontinuing, or adjusting current ART or non-ART medication doses; assessing immunization history; or drug-drug interaction monitoring. Patient education included education on HIV, OI, co-morbidities, lifestyle changes, and smoking cessation. Adherence monitoring included the pharmacist assisting in filling medication boxes, pharmacy refill monitoring, or both.

Secondary outcomes included change in CD4 count, VL, adherence rate, ART and HIV complications, and time (minutes) spent during the patient-pharmacist visit. As described in the Department of Health and Human Services Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents, CD4 count is a surrogate marker of immune function, predictor of disease progression and survival, and an indicator for starting ART or opportunistic infection (OI) prophylaxis.[19] VL is important in assessing treatment response to ART. A low VL is associated with improved clinical outcomes.[19] Change in CD4 count and VL from baseline was defined as the most recent documented value prior to the first intervention compared to the post-intervention value defined as the last documented value after the patient-pharmacist visit but prior to the study end date of January 26, 2011. In order to better quantify change in adherence rate, only patients who received pharmacist-provided medication boxes were included in this part of the analysis. In addition, the baseline self-reported rate prior to the first medication box fill was compared to the average of all adherence rates documented after the first intervention but prior to the study end date. Adherence was calculated by using the following formula used in the study by March, et al: ([number of ART doses taken in a given month]/[total number of ART doses patient should have taken in the month])*100.[4]

Furthermore, change in number of ART and HIV complications was compared from baseline (six months prior to the initial intervention) to post-intervention up until the study end date. An ART complication was defined as a documented adverse event, allergic reaction, or drug-drug interaction. A HIV complication was defined as an emergency room visit for a HIV-related cause, hospitalization, new OI, initiation of OI prophylaxis, or death.

Patient demographics and characteristics such as gender, age, ethnicity, co-morbidities, documentation of previously failed ART regimen(s), diagnosis of Acquired Immune Deficiency Syndrome (AIDS), and history of OI diagnosis or prophylaxis were also documented. Patient-specific data was de-identified, kept in the clinic, and was accessible only by study-approved investigators.

A post-hoc analysis was done to compare the baseline patient characteristics and demographics and primary outcomes between the non-Hispanic and Hispanic subpopulation. The definition of Hispanic used in this study was the same definition used by Centers for Disease Control and Prevention (CDC), which defines Hispanic or Latino as a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race.[20]

Data Analysis

In the primary analysis, descriptive statistics including mean, standard deviation, and percentage were used to report results for baseline, primary, and secondary outcomes. Paired student T-test and Wilcoxon Signed Rank Test were used for continuous parametric and non-parametric data, respectively, to compare patients with documented baseline and post-intervention CD4 counts, VLs, and adherence rates. Significance was two-tailed and set at $P<0.05$. During the study time period, there were two different assays used to measure VL. At the beginning, the lower sensitivity of the assay was set at <48 copies. Later on, a more sensitive assay was used and set at <20 copies/mL. For the purpose of the analysis, all VL reported as <48 copies/mL were adjusted to the more sensitive assay, <20 copies/mL. In the post-hoc analysis, the Fisher Exact test and T-test were used for nominal data and continuous parametric data, respectively.

Results

During the study time period, there were a total of 109 patient visits scheduled on days the ambulatory care pharmacists were in clinic. Of these, 34 patients (31.2%) did not show up for, cancelled, or rescheduled their visits. Of the 75 patients who showed for their appointment, two were scheduled only for labs. Therefore, the pharmacists had the opportunity to have a maximum of 73 patient-pharmacist visits during the study time period. There were a total of 55 (75.3%) documented patient-pharmacist visits with 32 different patients. Nine (28.1%) of these patients had multiple documented patient-pharmacist visits (range 2 – 5).

Patient demographics and characteristics are specified in Table 1. The mean age (±SD) of patients included in the analysis was 46.4 years (±10.2), and the majority of patients were males (62.5%) of African American descent (53.1%). The mean number of co-morbid conditions amongst the patients were 4.8 (range 0 – 11), and 40.6% of the patients were treatment-naïve. Only one patient in this study had not been started on ART during the study time period. Furthermore, 53.1% of patients in this study had a diagnosis of AIDS and 40.6% had a current or history of an OI.

Primary Outcomes

All 32 patients were included in the primary analysis and accounted for a total of 296 documented interventions. Table 2 provides a description of subcategories within each type of intervention. Medication review was the most common category of intervention (198/296; 66.9%). All patients had at least one medication review intervention during each patient-pharmacist encounter. The most common intervention under medication review was medication reconciliation and immunization recommendation. Similar to medication review, all 32 patients had at least one documented patient education intervention. This accounted for 69 (23.3%) of the total number of interventions and 43 of all 55 visits (78.2%). Adherence monitoring was documented for 10 patients and accounted for 29 (9.8%) of all interventions.

Secondary Outcomes

In the analysis of secondary outcomes (Table 3), only patients with documented baseline and post-intervention CD4 count (n = 24) and VL count (n = 23) were included. The average baseline and post-intervention CD4 counts were 444.2 cells/mm^3 and 496.4 cells/mm^3, respectively. The change in CD4 count was found to be statistically significant ($P = 0.04$). The average baseline and post-intervention VLs were 34,205 copies/mL and 3,951 copies/mL, respectively. This change in VL was not found to be statistically significant, ($P = 0.06$).

There were six patients with documented baseline and post-intervention adherence rates. At baseline, the mean percent adherence rate (± SD) was 64.2% (± 50.4) and post-intervention was 97.5% (± 4.1). However, this increase in adherence rate did not achieve statistical significance, ($P = 0.16$). None of the patients in the study had a documented ART complication at baseline, compared to one patient at the end of the study time period. This ART complication was documented as mild gastrointestinal (GI) adverse effects after improved adherence with ART regimen post-intervention. Five (15.6%) patients had baseline HIV complications accounting for seven complications in total. The most common complications were OIs, such as *Pneumocystis carinii* pneumonia (PCP) and toxoplasmosis. There were no reports of new HIV complications during the study time period amongst the 32 patients included in this study.

Of the 55 patient-pharmacist visits, visit time was documented for 45 visits (81.8%). The average patient-pharmacist visit length was 18.1 minutes (range 5 – 45 minutes). However, this time does not take into account time spent reviewing the patient's chart prior to the visit, time discussing the patients with clinic providers, and time documenting after the patient-pharmacist visit. The pharmacists in this study estimate these tasks took on average an additional 20 – 30 minutes.

Hispanic Subpopulation

Approximately one-fifth of patients in this study were Hispanic (7/32) and accounted for 15 out of the 55 patient-pharmacist visits during the study time period. In addition, four out of the seven Hispanic patients had their patient-pharmacist visit conducted in Spanish by the bilingual pharmacist. Based on the baseline patient characteristics and demographics results of the post-hoc analysis (Table 1), the non-Hispanic subpopulation was less likely to have a diagnosis of AIDS (40% versus 100%, $P = 0.01$), current or history of OI (28% versus 85.7%, $P = 0.01$), and current or history of OI prophylaxis (52% versus 100%, $P = 0.03$) compared to the Hispanic subpopulation.

Eight-five (28.7%) of the 296 total interventions occurred within the Hispanic subpopulation, (Table 2). Medication review (67.8% versus 64.7%, $P = 0.94$) and patient education (25.1% versus 18.8%, $P = 0.45$) were similar between the non-Hispanic and Hispanic subpopulations. However, in the post-hoc analysis the Hispanic subpopulation was statistically more likely to receive adherence monitoring compared to the non-Hispanic subpopulations, 16.5% versus 7.1%, $P = 0.048$.

Within the Hispanic subpopulation there was no statistically significant change in CD4 count ($P = 0.44$), VL ($P = 0.32$), and adherence rate ($P = 0.39$). The small number of Hispanic patients with documented baseline and post-intervention CD4 counts, VLs, and adherence rates limited the ability to compare the differences between the non-Hispanic and Hispanic subpopulation.

Discussion

Pharmacists are the medication experts within the healthcare field and often times one of the last healthcare professionals patients see before taking their medication. Ambulatory care pharmacists practicing in HIV clinics have traditionally worked closely with other healthcare professionals to improve medication adherence with ART.[3,4,6,7,9,12] Patients with HIV are often vulnerable to having poor medication adherence, which could be attributed to increased pill burden, adverse effects from ART, lack of disease and medication education, and low threshold between non-adherence and risk of developing resistance to ART.[1,2,19]

The results of this study help to better define the patient-pharmacist visit in an HIV clinic. In this study, a patient-pharmacist visit had one or multiple types of interventions. The most common type of intervention was medication review, followed by patient education, and adherence monitoring. The pharmacists in this study were able to document 296 interventions in 55 patient-pharmacist visits. The pharmacists provided on average five interventions during each patient-pharmacist within a relatively short visit of approximately 18 minutes. Aside from the patient-pharmacist visits, the pharmacists in this study also served as a drug information resource to clinic providers and were available for consults for patient or non-patient specific medication or disease state management questions.

Prior to the start of the service, it was believed the role of the pharmacists within the team would be adherence monitoring and providing medication boxes for patients. Adherence monitoring interventions seen during the data collection time were less frequent than what was originally anticipated. However, a patient who received an adherence monitoring intervention was more likely to be scheduled for a pharmacist-only visit and have multiple patient-pharmacists visits during the study time period. Throughout the study time period, it was also noted that interventions were more focused on medication review and patient education, which extended beyond HIV, ART, and OIs.

In this study, the number of patients were similar to those in the study by March, et al.[4] In both studies, the changes in CD4 count were found to be statistically significant. The preliminary results of this study for change in VL and adherence rates were not statistically significant. However, there appears to be a trend towards improved VL and adherence rate after the patient-pharmacist visit. The Department of Health and Human Services HIV treatment guidelines suggest adherence of up to 95% may be necessary to prevent resistance to ART and virologic failure.[19]

Therefore, the increase in adherence rate from 64.2% at baseline to 97.5% post-intervention may appear to be clinically significant. This data may suggest the positive impact ambulatory care pharmacists may have in increasing adherence rate when added to an HIV multidisciplinary team.

A post-hoc analysis was performed to compare the non-Hispanic and Hispanic subpopulations in this study. Hispanics in the United States account for more than 19% of new HIV diagnosis, making them the second most common ethnic group of new cases of HIV after African Americans.[21]

According to the U.S. Census Bureau of 2009, Hispanics are the fastest growing ethnic group in this country and account for 15.8% of the total U.S. population as well as over a quarter of the country's population living below the federal poverty level.[22,23] In Richmond, VA, Hispanics represent 6.3% of the city's total population, which is a 95% growth in the Hispanic population since 2000.[24] However, an alarming 38% of Hispanics living in Richmond live below the federal poverty line, a number that is disproportionately higher than the national average.[24,25] A national survey of free clinics estimates that Hispanics represent 25.1% of patients seen in these types of clinics.[14] In this study, the number of Hispanic patients (21.9%) represented a larger percentage of the Hispanic population from what is estimated in the city of Richmond and even the country. However, it is similar to the number of Hispanics patients receiving care within free clinics making this a unique ethnic group to further analyze within the context of this study.

In the post-hoc analysis, the Hispanic subpopulation all had a confirmed diagnosis of AIDS, and most had a current or history of an OI. These findings were consistent with the literature which has found that compared to non-Hispanics, Hispanics are 50% more likely to be diagnosed late with HIV putting them at a higher risk of being diagnosed with AIDS during or soon after diagnosis.[26,27] The post-hoc analysis also found adherence monitoring to be more common within the Hispanic subpopulation compared to the non-Hispanics. This may suggest potential barriers to early detection and the need for more emphasis on adherence to ART within this population.[1,26,27] This may present as an opportunity for ambulatory care pharmacists, particularly bilingual pharmacists, to play an important role in addressing barriers that may lead to poor adherence within the Hispanic population.

As described earlier, Hispanics represent the fastest growing ethnic group in the country and are more likely to be uninsured and seek care in free clinics.[14,22,23] However, there is limited literature describing the role of ambulatory care pharmacists working in free clinics and with a large Hispanic population.[21,28] Based on the results of this study, ambulatory care pharmacists working with HIV patients within a free clinic must be well-trained with regards to pharmacotherapy and disease state knowledge extending beyond HIV. By working in free clinics, pharmacists are likely to serve diverse patient populations.[14] This may require further understanding and recognition of underlying language, cultural, economic, access, and psychological barriers. This further highlights the added value of bilingual pharmacists and the importance of cultural competency.

One of the limitations of this study was its retrospective, cross-sectional design. The primary outcomes and some secondary outcomes were descriptive in nature. The study was not specifically designed to assess outcomes such as change in CD4 count, VL, and adherence rate making these results more preliminary in nature. The Department of Health and Human Services HIV guidelines recommend checking a CD4 count and VL every three months initially.[19]

Based on this, the duration of the study was relatively short for assessing change in CD4 count and VL. As a result, 25% of patients seen towards the end of the study time period were not included in the analysis because there were no post-intervention CD4 count and VL documented.

In addition, the ambulatory care pharmacists were only present in the TIPS clinic one half day a week. There were at least two and a half other days of clinic during which there were no pharmacists present. A more consistent presence during the clinic days would have increased the number of patient-pharmacist visits and could have potentially provided more data for the primary and secondary analysis. Also, this could have also allowed for a greater number of Hispanic patients to be included in the study and during the post-hoc analysis in order to better compare the non-Hispanic and Hispanic subpopulations.

Conclusion

This study described the integration and potential role of ambulatory care pharmacists working in a multidisciplinary team within an HIV clinic in a free and bilingual clinic. The ambulatory care pharmacists in this study went beyond adherence monitoring and provided medication review and education for both ART and non-ART as well as for HIV and non-HIV related co-morbidities. There is a need for more rigorous studies to better determine the impact of ambulatory care pharmacists in a free clinic setting on HIV patient outcomes. This study was not specifically designed to measure differences within the non-Hispanic and Hispanic subpopulation. However, the post-hoc analysis suggests differences between the two groups, which may affect patient outcomes. Further studies are also warranted looking closely at the Hispanic population in order to better understand the underlying detection and adherence barriers and how it can be addressed in order to provide better care for the HIV-infected Hispanics living in the US.

References

1. Bottonari KA, Safren SA, McQuaid JR, et al. A longitudinal investigation of the impact of life stress on HIV treatment adherence. *J Behav Med*. 2010;33(6):486-95.
2. Hirsch JD, Rosenquist A, Best BM, et al. Evaluation of the first year of a pilot program in community pharmacy: HIV/AIDS medication therapy management for Medi-Cal beneficiaries. *J Manag Care Pharm*. 2009;15(1):32-41.
3. Scott JD, Abernathy KA, Diaz-Linares M, et al. HIV clinical pharmacists – the US perspective. *Farm Hosp.* 2010;34(6): 303-8.
4. March K, Mak M, Louie SG. Effects of pharmacists' interventions on patient outcomes in an HIV primary care clinic. *Am J Health Syst Pharm*. 2007;64(24):2574-8.
5. Cantwell-McNelis K, James CW. Role of clinical pharmacists in outpatient HIV clinics. *Am J Health Syst Pharm*. 2002;59(5):447-52.
6. Saberi P, Dong BJ, Johnson MO, et al. The impact of HIV clinical pharmacists on HIV treatment outcomes: a systematic review. *Patient Prefer Adherence*. 2012;6:297-322.
7. Henderson KC, Hindman J, Johnson SC, et al. Assessing the effectiveness of pharmacy-based adherence interventions on antiretroviral adherence in persons with HIV. *AIDS Patient Care STDS*. 2011;25(4):221-8.
8. Tapp H, Phillips SE, Waxman D, Alexander M, et al. Multidisciplinary Team Approach to Improved Chronic Care Management for Diabetic Patients in an Urban Safety Net Ambulatory Care Clinic. *J Am Board Fam Med*. 2012 Mar-Apr;25(2):245-6.
9. Geletko SM, Poulakos MN. Pharmaceutical services in an HIV clinic. *Am J Health Syst Pharm*. 2002 Apr 15;59(8):709-13.
10. New York State Department of Health AIDS Institute. *Long-term complications of antiretroviral therapy*. Updated May 2007. Accessed December 10, 2012 at: http://www.hivguidelines.org/clinical-guidelines/adults/long-term-complications-of-antiretroviral-therapy/.
11. Yanchick, JK. Implementation of a drug therapy monitoring clinic in a primary-care setting. *Am J Health-Syst Pharm*. 2000;(57)4:530-34.
12. Kibicho J, Owczarzak J. Pharmacists' strategies for promoting medication adherence among patients with HIV. *J Am Pharm Assoc*. 2011;51(6):746-55.
13. Darnell J. What is the role of free clinics in the safety net? *Med Care*. 2011 Nov;49(11):978-84.
14. Darnell J. Free clinics in the United States: a nationwide survey. *Arch Intern Med*. 2010 Jun 14;170(11):946-53.
15. Scott DM, Boyd ST, Stephan M, Augustine SC, et al. Outcomes of pharmacist-managed diabetes care services in a community health center. *Am J Health Syst Pharm*. 2006 Nov 1;63(21):2116-22.
16. Davidson MB, Karlan VJ, Hair TL. Effect of a pharmacist-managed diabetes care program in a free medical clinic. *Am J Med Qual*. 2000 Jul-Aug;15(4):137-42.
17. Leal S, Soto M. Chronic kidney disease risk reduction in a Hispanic population through pharmacist-based disease-state management. *Adv Chronic Kidney Dis*. 2008 Apr;15(2):162-7.
18. Shane-McWhorter L, Oderda GM. Providing diabetes education and care to underserved patients in a collaborative practice at a Utah community health center. *Pharmacotherapy*. 2005 Jan;25(1):96-109.
19. Department of Health and Human Services. *Panel on Antiretrovirals Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents*. Updated March 27, 2012. Accessed November 12, 2012 at: http://aidsinfo.nih.gov/contentfiles/lvguidelines/adultandadolescentgl.pdf.
20. Centers for Disease Control and Prevention. *Hispanic or Latino Population*. Accessed December 8, 2012 at: http://www.cdc.gov/minorityhealth/populations/REMP/hispanic.html.
21. Centers for Disease Control and Prevention. *HIV among Hispanics/Hispanics*. Accessed May 28, 2011 at:http://www.cdc.gov/hiv/hispanics/resources/factsheets/pdf/hispanic.pdf.
22. U.S. Census Bureau. *American Community Survey, 2009*. Accessed May 28, 2011 at: http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuId=&_lang=en&_ds_name=ACS_2009_5YR_G00_&ts.
23. U.S. Census Bureau. *Current Population Survey, 2009*. Accessed May 28, 2011 at: http://www.census.gov/hhes/www/cpstables/032010/pov/new01_100.htm.

24. U.S. Census Bureau. *Richmond city, Virginia*. Accessed December 2, 2012 at:http://quickfacts.census.gov/qfd/states/51/51760.html.
25. United Nations Alliance of Civilizations. *Hispanic Liaison Office, Richmond, Virginia*. Accessed December 2, 2012 at: http://www.unaoc.org/ibis/2011/04/11/hispanic-liaison-office-richmond-virginia/.
26. Chen NE, Gallant JE, Page KR. A systematic review of HIV/AIDS survival and delayed diagnosis among Hispanics in the United States. *J Immigr Minor Health*. 2012;14(1):65-81.
27. Duran D, Usman HR, Beltrami J, et al. HIV counseling and testing among Hispanics at CDC-funded sites in the United States, 2007. *Am J Public Health*. 2010;100(suppl 1):S152-8.
28. Kaiser Family Foundation. *Latinos and HIV/AIDS Fact Sheet*. July 2012. Accessed December 2, 2012 at: http://www.kff.org/hivaids/upload/6007-10.pdf.

Appendix A

The Role of Ambulatory Care Pharmacists in an HIV Multidisciplinary Team within a Free and Bilingual Clinic

Data Collection Form

Patient Demographics and Characteristics
Gender: M F
Age (at time of first intervention):_________
Ethnicity: Caucasian African-American Hispanic Asian Other: _____________
Co-morbidities: DM HTN Dyslipidemia CHF Hypothyroidism Other: ____________________
Treatment Naïve: Yes No
Diagnosis of AIDS: Yes No
History of OI or OI prophylaxis: Yes No
Primary Outcome
Number of Intervention: Patient education ____ Adherence monitoring ____ Medication review ____
Secondary Outcome
CD4+ cell count (baseline): ________ CD4+ cell count (post-intervention): ________
Viral load count (baseline): _________ Viral load count (post-intervention): ________
Adherence rate (baseline): _________ Adherence rate (post-intervention): ________
ARV complications (baseline): ________ ARV complications (post-intervention): ________
HIV complications (baseline): ________ HIV complications (post-intervention): ________
Missed appointments (baseline): _______ Missed appointments (post-intervention): _______
Counseled in Spanish: Yes No
Total time of pharmacist-patient contact: ________

Abbreviations: ARV, antiretroviral; CHF, congestive heart failure; DM, diabetes mellitus; F, female; HIV, human immunodeficiency virus; HTN, hypertension; M, male; OI, opportunistic infection

Table 1. Patient Characteristics and Demographics; including Non-Hispanic and Hispanic Subpopulations				
Demographic	**Study Population (n=32)**	**Non-Hispanic Subpopulation (n = 25)**	**Hispanic Subpopulation (n=7)**	***P*[a]**
Age (years), mean ± SD	46.4 ± 10.2	48.8 ± 9.2	39.9 ± 13.9	0.05[b]
Gender (male), No. (%)	20 (62.5)	16 (64)	4 (57)	1.00
Ethnicity, No. (%)				
African American	17 (53.1)	17 (68)	-	-
Caucasian	8 (25)	8 (32)	-	-
Hispanic	7 (21.9)	-	7 (100)	-
Co-morbid Conditions, mean (range)	4.8 (0-11)	5.4 (0-11)	3 (0-8)	
Diabetes Mellitus	8 (25)	6 (24)	2 (28.6)	1.00
Hypertension	12 (37.5)	9 (36)	3 (42.9)	1.00
Dyslipidemia	12 (37.5)	10 (40)	2 (28.6)	0.68
Tobacco Use	10 (31.3)	10(40)	0 (0)	0.07
Depression	9 (28.1)	8 (32)	1 (14.3)	0.64
Hypothyroidism	3 (9.4)	2 (8)	1 (14.3)	0.54
Hepatitis B	2 (6.3)	2 (8)	0 (0)	1.00
Treatment Naïve, No. (%)	13 (40.6)	10 (40)	3 (42.9)	0.56
Diagnosis of AIDS, No. (%)	17 (53.1)	10 (40)	7 (100)	0.01
Current/History of OI, No. (%)	13 (40.6)	7 (28)	6 (85.7)	0.01
Current/History of OI Prophylaxis, No. (%)	20 (62.5)	13 (52)	7 (100)	0.03

[a]*P*-value based on Fisher Exact comparing non-Hispanic and Hispanic subpopulation, [b]*P*-value based on T-test comparing non-Hispanic and Hispanic subpopulation

Abbreviation used: AIDS, Acquired Immune Deficiency Syndrome; No., number of patients; OI, opportunistic infection; SD, standard deviation

Table 2. Primary Endpoint: Pharmacists' Interventions including Non-Hispanic and Hispanic Subpopulations				
Intervention	**Study Population (n = 32) No. (%)**	**Non-Hispanic Subpopulation (n=25) No. (%)**	**Hispanic Subpopulation (n=7) No. (%)**	***P*[a]**
Total Interventions	**296**	**211 (71.3)**	**85 (28.7)**	**-**
Medication Review	**198 (66.9)**	**143 (67.8)**	**55 (64.7)**	**0.94**
Medication Reconciliation	54 (27.3)	39 (27.3)	15 (27.3)	-
Medication education	21 (10.6)	17 (11.9)	4 (7.3)	-
Immunization Recommendations	54 (27.3)	36 (25.2)	18 (37.2)	-
Laboratory Referral	20 (10.1)	16 (11.2)	4 (7.2)	-
Medication Dosing[b]	48 (24.2)	35 (24.5)	13 (23.6)	-
Other	1 (0.3)	0 (0)	1 (1.8)	-
Patient Education	**69 (23.3)**	**53 (25.1)**	**16 (18.8)**	**0.45**
Adherence Education	26 (37.7)	17 (32.1)	9 (56.3)	-
TLC	14 (20.3)	10 (18.9)	4 (25)	-
Smoking Cessation	17 (24.6)	17 (32.1)	0 (0)	-
Other	12 (17.4)	9 (17)	3 (18.8)	-
Adherence Monitoring	**29 (9.8)**	**15 (7.1)**	**14 (16.5)**	**0.04**
Medication Box	10 (34.5)	5 (33.3)	5 (35.7)	-
Medication List for Patient	6 (20.7)	2 (13.3)	4 (28.6)	-
Prescription Refill Request	8 (27.6)	5 (33.3)	3 (21.4)	-
Other	5 (17.2)	3 (20)	2 (14.3)	-

[a]P-value based on T-test comparing the non-Hispanic and Hispanic subpopulation; [b]Recommendation to start, stop, or change dose of a medication

Abbreviation used: No., number of interventions; TLC, therapeutic lifestyle changes

Table 3. Secondary Outcome, Including Hispanic Subpopulation[a]							
	Study Population				**Hispanic Subpopulation**		
Outcome	**Baseline**	**Post-Intervention**	***P*[b]**	**Outcome**	**Baseline**	**Post-Intervention**	***P*[b]**
CD4 count (cells/mm^3), mean ± SD (n=24)	444.2 ± 249.2	496.4 ± 251.8	0.042	**CD4 count** (cells/mm^3), mean ± SD (n=4)	374 ± 270.7	414 ± 222.4	0.44
VL (copies/mL), mean ± SD (n=23)	34,205 ± 83,262.8	3,951 ± 17,410.1	0.061[c]	**VL** (copies/mL), mean ± SD (n=4)	69, 095 ± 110,505.0	21,845 ± 37,784.7	0.32[c]
Adherence rate, mean % ± SD (n=6)	64.2 ± 50.0	97.5 ± 4.1	0.162	**Adherence rate**, mean % ± SD (n=3)	61.7 ± 53.9	95.2 ± 5.0	0.39

[a]Only patients with both a baseline and post-intervention value documented for each outcome were included in secondary analysis, n indicated for each outcome; [b]Paired student T-test; [c]Wilcoxon Signed Rank Test

Abbreviation used: SD, standard deviation; VL, viral load