

Training Internal Medicine Residents to Provide Care and Treatment for Human Immunodeficiency Virus-1-Infected Patients

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Background. Human immunodeficiency virus (HIV) infection is now considered a chronic infection manageable on antiretroviral therapy. If trained in HIV care, primary care physicians would be well suited to work in consultation with infectious disease specialists to provide care for HIV patients.

Methods. Human immunodeficiency virus training was incorporated into our internal medicine residency program. All residents were given an internally developed preprogram survey about HIV infection to establish a baseline level of HIV knowledge; at the end of 1 year, a postprogram survey was distributed. These results were compared. Human immunodeficiency virus didactic lectures were mandatory for attendance. Human immunodeficiency virus training included methods of testing, treatment including all classes of antiretroviral therapy, and prevention methods. Additional, mandatory online training modules were used. All program year-2 residents were assigned to an outpatient HIV clinical rotation.

Results. Eighty-three residents participated. Residents received either 1 or 2 years of training. Results of preprogram scores and postprogram scores were calculated for each resident. Year 1-test scores preprogram were 52.2% vs postprogram 87.1%; year 2-test scores preprogram were 56.3% vs postprogram 89.8% (both $P < .0001$). There was no difference in posttest scores among residents who attended a clinical rotation.

Conclusions. Residents showed significant improvement in HIV knowledge between preprogram and postprogram test scores. Postgraduate surveys showed among those who completed the survey, and most found the program helpful to in their current practice.

Keywords. HIV testing; HIV training; HIV treatment; medical residency.

The ranks of the Infectious Diseases (ID) human immunodeficiency virus (HIV) specialist physicians are changing. Today, approximately 45% of HIV patients are managed by ID HIV specialist physicians, whereas the other 55% are managed by internal medicine (IM) physicians (primary care physicians [PCPs]) or nonphysician providers such as nurse practitioners or physician assistants experienced in HIV care and treatment [1]. Of the many changes that have occurred over the past 30+ years in HIV care, the most impactful are the advances made in antiretroviral therapy (ART). The HIV clinician had to be skilled in constructing new and, hopefully, tolerable second, third, fourth, and “salvage” therapy regimens [2]. After 30 years of research,

we have HAART capable of targeting almost every reproductive site in the HIV life cycle with rapid, durable, long-lasting viral suppression and few side effects [3]. Fewer side effects improved patient tolerability, adherence, and compliance, and that has translated into long-lasting immune reconstitution [4].

The HIV specialists who provided care during the first half of the epidemic are now approaching retirement age, if not retired already [5]. Today, there are fewer IM graduates choosing to pursue the subspecialty of ID. As of 2015, less than half of all ID fellowship programs in the United States were filled [6, 7]. The problem facing us is an imminent decrease in the number of HIV providers. There are an estimated 1.2 million HIV patients in the United States with approximately 50 000 new infections per year. Previously, the number of HIV deaths per year and the numbers of new infections kept a steady pace among the number of HIV specialists able to provide care [8]. Today, however, HIV patients are living longer, fewer are dying from acquired immune deficiency syndrome (AIDS)-related deaths, and, increasingly, they are living to older age where problems such as hypertension, cardiovascular disease, and other age-related problems are taking precedence over the problems faced by an HIV patient in the past [9].

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Human immunodeficiency virus training included in IM residency programs may help to overcome the potential gap that will be created by the predicted decreasing numbers of HIV specialists in the future. Training IM primary care residents in the fundamentals of HIV care has gained momentum in recent years. There is growing evidence to suggest that IM PCPs want to provide HIV care themselves but not without comprehensive HIV training to competently provide it [9]. In a multicity survey conducted in 2006, researchers found medical residents felt ill prepared to competently provide HIV care even though 77% stated they planned on providing it in the future. Training deficiencies in HIV risk assessment, testing, counseling, and initial management of HIV patients were cited as obstacles to providing competent HIV care [10]. We developed a proof-of-concept, HIV training program incorporated into our existing IM residency program. A team of HIV experts who developed and implemented the program created the project.

MATERIALS AND METHODS

Ascension St. John Hospital is a 700-bed, academic teaching hospital that serves a predominantly low-income, minority population located on the east side of Detroit. The planning team for our 2-year program included the Chief of the Division of Infectious Disease, the Chairman of the Internal Medicine Department, and the Program Director for our Internal Medicine Residency Program. A certified HIV Nurse Practitioner served as coordinator for the program, and an epidemiologist/statistician provided statistical analysis for the data collected.

A team of HIV experts from our ID division developed the design, based on a proof-of-concept model. The team developed the curriculum keeping in mind the most salient and comprehensive HIV fundamentals needed by non-ID physician practicing internists to provide care for the noncritical HIV patient seen in their primary care practice. A deliberate emphasis was placed on the 2006 revised recommendations for HIV testing on all adults, adolescents, and pregnant women in any practice setting, including the primary care setting as set forth by the Centers for Disease Control and Prevention [11]. In addition, reliance on the 2013 *Primary Care Guidelines for the Management of Persons Infected with HIV* was used to incorporate the primary care and HIV needs for persons living with HIV (PLWH) receiving their healthcare in a primary care setting [12].

Eighty-three medical residents participated in HIV training by incorporating all aspects of HIV care, treatment, testing, and prevention into their regularly scheduled residency program. For incoming program year (PGY)-1 residents and returning PGY-2s, all received 2-full years of HIV training. For PGY-3 residents, their training period was over just 1 year because of funding constraints.

Data collected included the following: pre- and posteducation HIV knowledge questionnaire test scores; resident evaluations of the lectures and their clinical experience; and scores from the online HIV learning module's posttests for the Hopkins modules 1 and 2. The postgraduation data collection was a survey administered via SurveyMonkey. Data analysis included descriptive statistics and paired *t* tests to compare pre- and posttest scores. All data were analyzed using SPSS version 23.0, and a *P* value of 0.05 or less was considered significant.

The HIV training program consisted of a 1-hour HIV lecture, taught by an ID physician and followed by a question and answer period. The frequency of these HIV-specific lectures was once every other month during a regularly scheduled resident noon conference. To supplement this training, each resident was required to complete an online HIV training module [13, 14]. Upon completion of each module, the trainee completed an online posttest. Results of these tests were recorded for each resident in their HIV training file. Finally, all PGY-2 residents were assigned a clinical rotation with an ID physician in our HIV clinic. This was completed during the resident's ambulatory rotations. The resident was required to see HIV patients once a week for 4 weeks.

Pretest Human Immunodeficiency Virus Knowledge Questionnaire

A pretest knowledge questionnaire was given to all incoming residents at the start month of their residency before exposure to any HIV training. A total of 53 medical residents completed the pretest knowledge questionnaire. The purpose of the questionnaire was to ascertain each resident's existing level of basic HIV knowledge before exposure to the HIV lecture series. Pre-education HIV knowledge tests were compared with posteducation HIV knowledge tests to see whether knowledge increased. At the start of the second year of the program, 19 PGY-1 residents entered our residency program, and they were given the same pretest questionnaire as the incoming class before them.

The pretest questionnaire was composed of 15 basic HIV knowledge questions. The posttest, more comprehensive questionnaire contained 25 questions reflecting all topics covered during that training year.

Human Immunodeficiency Virus Lectures

The planning team chose HIV lectures topics. The topics chosen were thought to introduce the resident to the basics of HIV infection including its genomic makeup, transmissibility, testing, treatment, and prevention. Didactic lectures included the following topics: Immunopathogenesis; Initial Evaluation of the HIV Patient; the Primary Care Needs of the HIV Patient, HIV Care Management after Diagnosis; Antiretroviral Therapy; Special Needs of Women including Pregnancy; and Screening for the Common Complications of HIV Infection. The lecture training did include material on HAART as well as drug medication interactions that can occur from chronically administered non-HIV medications.

At the end of each training year, a summary review lecture was given during a regularly scheduled morning report. After this final review, the 25-item HIV posttest questionnaire was distributed. These scores were recorded in each resident's HIV file. At the completion of both a pretest and the posttest questionnaire, scores were compared and analyzed.

During the second year of training, lecture topics included the following: HIV Immunopathogenesis; Routine HIV Screening and Testing; Common Skin and Ocular Problems Seen in HIV; Interpretation and Evaluation of HIV Test Results; Post-Exposure Prophylaxis; and Vaccine Use in HIV Patients. After the first year's format, an end-of-the-year final recap lecture was given during a morning report followed by distribution of the posttest HIV knowledge questionnaire.

Johns Hopkins Human Immunodeficiency Virus Training Modules 1 and 2

To supplement the lecture series, each resident was assigned to complete an online HIV training module. The modules we used were the Johns Hopkins medical training modules because they represented a comprehensive model of HIV knowledge, care, and treatment. In addition, the modules included directions for the learner to complete a posttest after the review of the material

Human Immunodeficiency Virus Clinical Rotation

The clinical rotation was completed in an outpatient Ascension St. John clinic for HIV patients. The PGY-2 residents were assigned a 1-month rotation using their ambulatory rotation. The resident was required to work in the clinic 1 day a week with an ID physician who provided one-on-one training to the resident. Residents then completed an evaluation of their clinical experience at the completion of this rotation. The main purpose of the clinical evaluation was to reflect on each resident's subjective evaluation of the clinical experience.

Comparison of the Human Immunodeficiency Virus Pre- and Posttest Knowledge Questionnaires

Our team of HIV experts compiled the questions for both the pre- and posttest HIV knowledge questionnaires. This tool was not validated. Given the combined years of HIV experience among the members of the team, however, we felt confident the questions adequately covered the most important questions needed to evaluate each resident's baseline HIV knowledge. The

posttest, a compilation of all the subjects taught throughout the year, was used to evaluate HIV knowledge acquisition.

Postprogram Follow-up Evaluation

There were 38 medical residents who graduated during the 2-year program. Of those, 19 residents received 2 years of training and 19 received 1 year of training. Approximately 6 months after completing residency, we surveyed 24 of the 38 graduates, for whom we had postresidency contact addresses. The final survey comprised 3 parts: (1) demographics; (2) what aspects of the training program the resident thought would be most helpful in postgraduate practice; and (3) graduate physicians (those not attending entering subspecialty training) were asked whether any of the knowledge gained from the HIV training was being used in their current practice areas.

RESULTS

Measurements and Data Analysis

The distribution by year of entry and postgraduate year (PGY) level is shown in [Table 1](#). Of the 83 residents who participated in the project, the overall mean age was 29.7 ± 3.2 years and 71.1% were male. For the residents who received 2 years of training, the mean percentage of lectures attended was 53.2%. For the residents who received 1 year of training, the mean percentage of lectures attended was 40.5%; for the residents who were trained during the second year of the program, the mean percentage of lectures attended was 43.1%. All residents completed the online modules, and all PGY-2 residents did the outpatient HIV clinic rotation. The results of the pre- and postproject questionnaire are shown in [Figure 1](#). There was a significant improvement in scores for all participants over each of the 2 years of the program.

Among 24 physicians contacted for the posttraining survey, 16 (66.7%) completed the final surveys, including 11 (68.8%) who were participating in subspecialty fellowships, 3 (18.8%) hospitalists and 2 (12.5%) primary care internists. Among the 16 who responded to the survey, only 8 provided individual responses to all the questions. When asked whether the individual components of the program were helpful in their current practice, 50% (4 of 8) agreed or strongly agreed that the lectures were helpful, 75% (6 of 8) agreed or strongly agreed that that the

Table 1. Distribution of Residents by Postgraduate Year (PGY) at the Start of the Program and Number of Years Completed

PGY at Start of Training	Duration of Training (1 Year)	Duration of Training (2 Years)	Totals
Not at Ascension St. John Hospital in 2012	21.7% (18)		18
Preliminary internal medicine residents	14.6% (16)		12
PGY 1		22.9% (19)	19
PGY 2		22.9% (19)	19
PGY 3	18.1% (15)		15
Totals	45	38	83

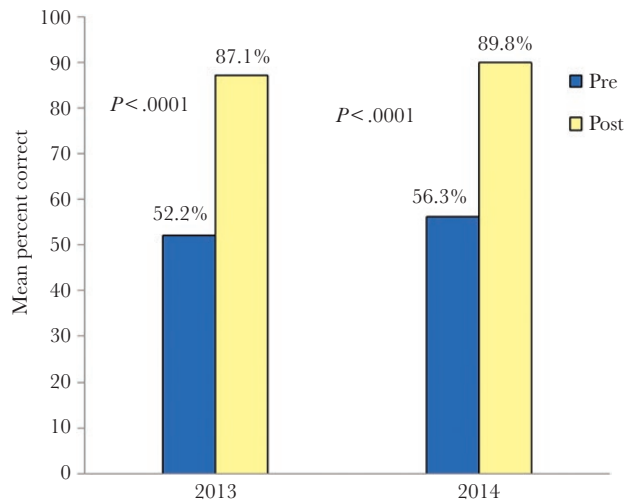


Figure 1. Mean percentage correct on pre- and postprogram questionnaires.

Johns Hopkins modules were helpful, and 62.5% (5 of 8) agreed or strongly agreed that the clinical rotation was helpful.

Data were collected and evaluated that compared the postprogram test scores of the PGY-2 residents who completed a clinical rotation with the test scores of residents who did not have that experience. There was no significant difference found between these 2 groups on postprogram test scores.

DISCUSSION

The predicted shortage of HIV ID specialists may portend the need to include fundamental HIV training into IM residency programs. In an updated policy statement, the HIV Medicine Association of the Infectious Disease Society of America recommends that steps should be taken now to prepare physicians to provide HIV primary care in the coming years due to a shortage of HIV specialists in the future [15].

Human immunodeficiency virus care can be managed successfully by the HIV patient's IM primary care provider if the provider is competently trained and if there are consultation resources readily available to them [16]. The ID HIV-trained physicians can work with and help the primary care providers by advising on optimal antiretroviral therapy, interpretation of resistance characteristics, reviewing drug interactions, and discussing newly recognized approaches from ID HIV meetings including the issues of accelerated atherosclerosis and hepatitis C management.

Modern HIV care has shifted from critical, acute care, to chronic disease management related to aging more so than HIV infection. Health maintenance measures, preventive care, screening, and counseling are all well within the purview of the IM PCP. Problems such as hypertension, hyperlipidemia, osteoporosis, obesity, alterations in glucose metabolism, and prevention measures such as smoking cessation are now problems faced by PLWH [17–19]. The PLWH patients are also facing

higher rates of non-AIDS-defining cancers such as Hodgkin's disease and anal, breast, liver, colorectal, and renal cancers.

We suggest more collaborative relationships be developed between HIV ID specialists and primary care providers today. The implication of such relationships, we believe, would prove to be invaluable to the patients and clinicians alike. If medical residents were trained in HIV care during residency, they would have the basic skills to initiate HIV screening and testing, order preliminary laboratory tests, and, when HIV infection is determined, either initiate treatment or consult with an ID specialist for therapy recommendations [20, 21]. Our study suggests that these skills can be incorporated into an IM training program resulting in expanded knowledge with eventual application of principles learned in this program. Our IM residents' knowledge base significantly improved during this training opportunity. Although our didactic presentations improved knowledge base, this was not different for those that did not experience the clinical rotation compared with those that did participate in this experience. The authors believe that the real-world experience of seeing patients can be impactful for long-term benefits. This is subjective and difficult to prove. Clinical experience with seeing more patients over time should improve management skills but would require further study to confirm.

In a literature search of US medical residency programs, we found no programs that included mandatory HIV training incorporated into medical residency curriculums. We found several programs associated with major universities, but they only offered HIV training postgraduation [22]. Of those, enrollment was limited to 3 or 4 applicants per year with program length lasting from 6 weeks to 1 year or more [23, 24]. One program, very similar to ours, offered a 5-month block of time during PGY-2 and PGY-3 to opt for HIV training [25]. In addition, the resident could take an HIV certification examination during the PGY-3 year through the American Academy of HIV Medicine. Based upon competing requirements for a resident to meet the residency essentials of the Accreditation Council for Graduate Medical Education for completion of IM training, program directors may elect to modify the approach of our program to incorporate the clinical experience into either the second year or the third year of residency. In our program, providing lectures to a combined group of second- and third-year residents worked best and did not require additional conferences beyond those already established within the curriculum. Another program, The HIV Curriculum Project, conducted between 1997 and 2000, included 3 years of training for family practice residents. All core principles of HIV care were offered including a rotation at an HIV clinic. However, this program accepted students on a voluntary basis. The strength of this program was the 3-year duration, instrument validation for HIV knowledge (pre- and postprogram), and its overall evaluation process [26].

Strengths of Our Training Program

The program that we implemented included several strengths: didactics, online learning, and an outpatient clinical rotation. The use of these techniques allowed learning to occur by several methods, thus reinforcing what was learned in the classroom and applying that learning in a clinical setting. In addition, we found minor differences in test scores (pre- and posttest) between those receiving 1 year of training compared with those who received 2 years of training. However, we do recommend 1 year of training, preferably during PGY-2. We did not find any indication of an advantage among those who were exposed to 2 years of HIV training compared to those who received 1. Test scores were similar in both groups. All residents showed significant improvement between pre- and posttest scores. Although not collected by survey, the residents indicated a higher comfort level with caring for HIV patients based upon this experience.

Limitations of Our Training Program

One major limitation was the use of a nonvalidated questionnaire to assess the resident's HIV knowledge pre- and posttest assessment. Because the training we provided was a proof-of-concept model, we did not incorporate the stringent rules required of experimental research. A second weakness of our program was the lack of a measurable, validated attitudinal survey to assess the level of confidence residents may have gained as a direct result of HIV training they received. Areas that provided challenges in our study included the limitations of funding to support this work and evaluation in the postprogram survey. It was also challenging to carve out time within a very busy curriculum during residency to identify opportunities to participate in HIV medicine training. The residents were able to attend somewhat less than 50% of lectures, indicating competing demands from various clinical responsibilities such as either the intensive care unit rotations and other rotations with high acuity that do not permit residents to easily break away during the middle of the day to attend a didactic presentation. This might be addressed by making sure that the material is available from lectures that are recorded and available for the residents to listen to during their free time or to distribute the slide content material to the residents. Another limitation was providing only 1 month of clinical exposure for the PGY-2 residents. Evaluations suggested that the length of time was inadequate. One approach to the challenge of sufficient clinical follow-up exposure would be to extend the clinical experience by following 1–2 HIV patients throughout the residency as part of the residents' continuity of care experience that is required for their IM residency. Another model that might be considered would be to establish an HIV track within IM or family medicine residencies for which the resident could apply during their intern years or even during the match process. This could provide a way to engage residents who have expressed a special interest in HIV and in providing a continuity care experience for PLWHs.

Our study did not explore how to assure that residents post-graduation will continue to stay up-to-date on HIV treatment, which continues to evolve in a rapid fashion. One approach that can be considered would be to provide postgraduate Continuing Medical Education (CME) opportunities in the form of courses provided at the hospital or a periodic update provided by either the IM department or the infectious disease section for PCPs. The program can also make residents aware of external CME activities. The ID section of the Medical Knowledge Self-Assessment Program of the American College of Physicians provides another source for which approximately 10% of questions are related to HIV.

CONCLUSIONS

Because HIV has become a chronic condition with many clinical problems related to patients' aging as opposed to HIV infection, it is essential for the primary care provider and ID-HIV providers to work together in a collaborative fashion. This can best be accomplished by incorporating training into the educational experience to increase medical knowledge during residency as demonstrated in this study. Clinical experience will enhance the comfort level of the physician in applying this medical knowledge to clinical practice. Programs need to evaluate how they can meet the care for this population of patients that continue to grow as the prevalence of HIV grows in the United States.

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References

1. Weisner J, Chen G, Armstrong, WS, Beer L. HIV care delivery by ID physicians, other physicians, and advanced practice providers. CROI. Conference on Retroviruses and Opportunistic Infections; 2018 (Abstract 1080) Boston, MA.
2. Tashima KT, Mollan KR, Na L, et al. Regimen selection in the OPTIONS trial of HIV salvage therapy: drug resistance, prior therapy, and race-ethnicity determine the degree of regimen complexity. *HIV Clin Trials* 2015; 16:147–56.
3. Arts EJ, Hazuda DJ. HIV-1 antiretroviral drug therapy. *Cold Spring Harb Perspect Med* 2012; 2:a007161.
4. Chesney MA. Factors affecting adherence to antiretroviral therapy. *Clin Infect Dis* 2000; 30(Suppl 2):S171–6.
5. Weisner J, Beer L, West BT, Duke CC, Gremel GW, Skarbinski J. Qualifications, demographics, satisfaction, and future capacity of the HIV care provider workforce in the United States 2013–2014. *Clin Infect Dis* 2016; 63:966–75.
6. Chandrasekar P, Havlicek D, Johnson LB. Infectious diseases subspecialty: declining demand challenges and opportunities. *Clin Infect Dis* 2014; 59:1593–8.
7. Walensky RP, Del Rio C, Armstrong WS. Charting the future of infectious disease: anticipating and addressing the supply and demand mismatch. *Clin Infect Dis* 2017; 64:1299–301.
8. Gilman B, Hogan P, Trent-Adams S, et al. Gap in supply of HIV clinicians expected to increase. *HIV Specialist Magazine* 2016; (Special Issue):3–32.
9. Goldschmidt RH, Chu C. Primary care for patients with HIV infection: it's not who should provide it, it's how to provide it. *Am Fam Physician* 2016; 94:687–8.
10. Phillips KA, Cofrancesco J Jr, Sisson S, et al. A multicenter study of internal medicine residents' perceptions of training, competence, and performance in outpatient HIV care. *AIDS Patient Care STDS* 2010; 24:159–64.
11. Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *MMWR Recomm Rep* 2006; 55:1–17; quiz CE1–4.

12. Aberg JA, Gallant JE, Ghanem KG, et al. Primary care guidelines for the management of persons infected with HIV: 2013 update by the HIV medicine association of the Infectious Diseases Society of America. *Clin Infect Dis* **2014**; 58:e1–34.
13. Rastegar DA, Berkenbilt GV. Human immunodeficiency virus infection, part 1: screening, testing, and post-exposure prophylaxis. *John Hopkins Online Medical Modules*, 2002–2007. Baltimore, MD: John Hopkins Department of Medicine.
14. Rastegar DA, Berkenbilt GV. Human immunodeficiency virus infection, part II: natural history, preventive care and antiretroviral therapy. *John Hopkins Online Medical Modules*, 2002–2007. Baltimore, MD: John Hopkins Department of Medicine.
15. Lubinski C, Aberg J, Bardeguez AD, et al. HIV policy: the path forward—a joint position paper of the HIV Medicine Association of the Infectious Diseases Society of America and the American College of Physicians. *Clin Infect Dis* **2009**; 48:1335–44.
16. Walensky RP, Del Rio C, Armstrong WS. Charting the future of infectious disease: anticipating and addressing the supply and demand mismatch. *Clin Infect Dis* **2017**; 64:1299–301.
17. Schwarcz L, Chen MJ, Vittinghoff E, et al. Declining incidence of AIDS-defining opportunistic illnesses: results from 16 years of population-based AIDS surveillance. *AIDS* **2013**; 27:597–605.
18. Mayer KH, Loo S, Crawford PM, et al. Excess clinical comorbidity among HIV-infected patients accessing primary care in US community health centers. *Public Health Rep* **2018**; 133:109–18.
19. Mirani G, Williams PL, Chernoff M, et al. Changing trends in complications and mortality rates among US youth and young adults with HIV infection in the era of combination antiretroviral therapy. *Clin Infect Dis* **2015**; 61:1850–61.
20. Cheng QJ, Engelage EM, Grogan TR, Currier JS, Hoffman RM. Who provides primary care? An assessment for HIV patient and provider practices and preferences. *J AIDS Clin Res* **2014**; 5:366.
21. Chu C, Umanski G, Blank A, et al. HIV-infected patients and treatment outcomes: an equivalence study of community-located, primary care-based HIV treatment vs. hospital-based specialty care in the Bronx, New York. *AIDS Care* **2010**; 22:1522–9.
22. Davids A. HIV & Viral Hepatitis Fellowship Director. Family Medicine Residency of Idaho. 777 N. Raymond St. Boise Idaho. **2016**. ID: 83704-9251. <http://www.fmr.idaho.org/residency/fellowship/hiv-viral-hepatitis/>
23. Aoun-Barahat L. Program Director: Yale School of Medicine HIV Training Track. **2018**. <http://medicine.yale.edu>. Lydia.Barakat@yale.edu.
24. Yadavalli G. Program Director: Boston Medical Center, Primary Care Training Program: HIV Care Track. **2018**. <https://www.bumc.bu.edu/im-residency/leadership>.
25. Dhanireddy S. HIV Pathway Director: University of Washington, Department of Medicine. **2018**. <https://www.sdhanir@uw.edu>.
26. Feldman j, Milner M, Millis M. Training Family Practice Residents in HIV Care. *AIDS Patient Care STDS* **2004**; 18: 395–404.