

A Quality Improvement Project Implementing PrEP Academic Detailing to Impact Provider
Knowledge, Attitudes, and Behavior in a Primary Care Setting:

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Author Note

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Abstract

Background: In 2012 the U.S. Food and Drug Administration (FDA) approved the drug emtricitabine/tenofovir for use as Human Immunodeficiency Virus (HIV) pre-exposure prophylaxis (PrEP) after proving to be safe and effective at preventing HIV in multiple peer-reviewed studies. Despite the proven safety and value of PrEP treatment, use remains low in practice. Research has shown that low clinical use corresponds to low levels of understanding of PrEP among providers. Academic detailing is a method of innovation diffusion through provider education that results in changes in knowledge and practice. The purpose of this project was to investigate the effects of academic detailing on primary care provider knowledge, attitudes, and willingness to prescribe PrEP.

Methods: An academic detailing session was provided by the Florida Department of Health in Broward County to primary care providers (PCPs) at a private clinic in the Southeastern US. The Conceptual Model of Nursing and Population Health (CMNPH) and the Promoting Action on Research Implementation in Health Services Framework (PARIHS) were used as guides for project design and evidence-based practice implementation. There were five participants in the academic detailing session including: a physician, a physician assistant (PA), and three medical students. PCP PrEP knowledge, attitudes, and behaviors were measured using pre and post intervention surveys. PrEP prescription, HIV/Sexually Transmitted Infection (STI) screening, and HIV testing were measured using aggregate data queries for the time periods of four and eight weeks before and four and eight weeks after the educational intervention. No personal identifying information was obtained.

Results: Pre and post surveys were analyzed using Wilcoxon signed rank testing to examine differences between matched pairs of ordinal data. Significant PrEP screening and HIV/STI

testing were analyzed pre and post intervention using paired t tests to compare pre and post intervention practices. Significant differences were found in the results ($Z = 2.03, 1.84, \text{ and } 1.83$ respectively, $p > 0.1$) The academic detailing intervention significantly improved knowledge, attitudes, and behaviors of primary care providers and medical students regarding PrEP. The mean of active qualifying ICD 10 codes prior to the intervention versus post intervention were 5 (sd = 5.64) vs. 4.2 (sd = 4.87) respectively. No significant difference was found between active ICD 10 codes for patient visits before compared to after the intervention ($t(9) = 1.12, p > .1$).

Conclusions: This project found that academic detailing improved provider self-reported knowledge, attitudes, and behaviors regarding PrEP. However, self-reported survey scores were not correlated with changes in clinical practice based on ICD 10 codes. Additional clinical implications may include fostering clinical outreach and cooperation between the county health department and local primary care clinics. Further research is needed on the effects of PrEP academic detailing on clinical practice.

Keywords: PrEP, Pre-exposure prophylaxis, HIV prevention, Primary care providers, nurse practitioners, academic detailing, HIV population health

HIV Screening and Prophylaxis

HIV is a global pandemic associated with high mortality and morbidity. New developments in research and treatment help clinicians screen for and prevent infection, thus averting lifelong treatment and associated comorbidities of this deadly disease. One new biomedical regimen involves pre-exposure prophylaxis (PrEP) medication for HIV negative high-risk individuals to prevent primary exposure. Prior to approval of PrEP by the FDA sex education, risk behavior counseling, and condoms had been the primary tools for clinicians to help prevent HIV. Despite the development and FDA approval of PrEP, many clinicians are unaware of PrEP, associate its use with stereotypes and stigmas, have unresolved concerns, or are unsure of how to proceed with integrating the regimen into practice. Education and training for primary care providers in the U.S. regarding screening, treatment, and appropriate clinical applications for PrEP will ultimately serve to reduce HIV transmission and improve care for high risk populations.

Problem Statement

Although the number of new HIV diagnoses in the U.S. has decreased by 9% between 2010 and 2014, HIV continues to be a persistent health care crisis in our country and globally. An estimated 1.2 million people are living with HIV in the U.S.; approximately 13% of them do not know that they are infected. Men who have sex with men (MSM) are disproportionately affected by HIV, accounting for 67% of all new infections. Additionally, African Americans and Hispanic/Latinos make up a combined 69% of total new HIV infections, which is significantly disproportionate to their combined 31% of the total US population (CDC, 2016).

In 2012 the FDA approved the HIV drug emtricitabine 200 mg/tenofovir disoproxil fumarate 300 mg (FTC/TDF) as the only daily medication regimen for HIV pre-exposure

prophylaxis (PrEP) The most common side effects include abdominal pain, headaches, and weight loss (FDA, 2012). Many primary care providers believe that it is outside of their scope or breadth of knowledge to treat persons who are affected by the epidemic of HIV and Acquired Immune Deficiency Syndrome (AIDS). And many are unaware of the development of PrEP as a tool to prevent infection. Primary prevention is preferable to secondary prevention (screening and testing for HIV) because the initial infection can be prevented in most cases by utilizing PrEP. A referral to an infectious disease specialist is only required if there are positive HIV tests or presence of other infections outside the scope of primary care. Both the CDC and the US-branch of the International Antiviral Society have developed guidelines and quality improvement strategies for HIV risk screening and initiating PrEP treatment for HIV negative individuals at high risk individuals in the primary care setting (US Public Health Service, 2014; Marrazzo et al, 2014). However, knowledge of high risk screening and PrEP treatment among primary care providers is low (Blumenthal et al., 2016). Of the providers who are aware of PrEP, many are concerned about side effects and risk compensation among patients (Desai, 2016; Blumenthal et al., 2016). Providers' concerns contradict the evidence that appropriate screening and PrEP treatment with reduced barriers to care significantly reduces new HIV transmission rates especially among MSM and specifically among minorities (Grant et al., 2014). However, there is evidence that providers preconceived attitudes, stigma, and stereotypes may play a role in the utilization of PrEP (Calabrese et al., 2014; Edelman et al., 2017; Lelutiu-Weinberger & Golub, 2016; Lippman et al., 2015; Maloney et al., 2017). Despite barriers and challenges, HIV prevention methods utilizing PrEP have been shown to reduce HIV transmission rates and the results of these early programs can serve to inspire and inform providers and patients alike (Liu et al., 2014)

Purpose and Rationale

In primary clinics in South Florida it was noted that there is a lack of knowledge regarding PrEP among primary care providers and medical students. Additionally, there is a lack of awareness of the educational resources available for providers. Providers often must search online or consult with colleagues when asked about PrEP by a patient. Patients have also expressed fear of judgement or rejection from providers due to their high-risk behaviors or lifestyles when bringing up PrEP in the clinical setting. Experts in the field of HIV and AIDS agree that PrEP is effective in prevention of HIV and that nurses should adopt an active role in educating and advocating for its use (Treston et al., 2015; Rowniak, 2015). The development of PrEP is another tool for Nurse Practitioners (NPs) to use in the prevention of HIV and NPs in primary care are prepared and positioned to facilitate education and communication among patients, the community, and other health care providers regarding PrEP. The goal of this project is to address a gap in primary care provider knowledge regarding PrEP and encourage widespread implementation of PrEP in practice to reduce new HIV transmission rates among high risk individuals.

Background and Significance

The efficacy of PrEP is supported by many randomized controlled trials that have been conducted worldwide. Peterson et al. (2007) conducted a study among African women comparing TDF versus placebo and found no significant reduction of HIV infection. Grant et al. (2010) then conducted the PrEP study which found that the combination of FTC and TDF could reduce the incidence of infection by as much as 92% among MSM with high compliance to treatment regimens. Additionally, two studies investigating FTC/TDF use among heterosexual people in Africa in 2012 demonstrated a reduction of HIV transmission between 62-75% versus

placebo (Baeten et al., 2012; Thigpen et al., 2012). Two studies evaluating TDF, FTC/TDF, and a tenofovir vaginal gel resulted in low adherence to treatment and therefore low efficacy among African women (Van Damme et al., 2012; Marrazzo et al., 2015). The promising findings from some of the initial studies led to further research of PrEP use among high risk individuals including IV drug users with similar results of decreased HIV infection correlated with increased adherence to the medication regimen (Choopanya et al., 2013; Grohskopf et al., 2013; McCormack et al., 2016; Molina et al., 2015).

Once the safety and efficacy of PrEP was established and verified by multiple systematic reviews (Fonner et al., 2016; Jiang et al., 2014; Koechlin et al., 2016; Marcus et al., 2014; Sowicz et al., 2014; Spinner et al., 2016), other studies sought to explore implementation barriers and factors. The PrEPARE study investigated barriers among MSM and found that cost, perceived risk of medication, or perceived lack of risk of infection were the major barriers for patients who were offered screening and treatment (King et al., 2014). While many studies have been done on the MSM population, there has been less research focusing on the primary care providers and the role they play in HIV prevention. Ayala et al. (2013) concluded that the barriers to care, including the providers of such care, need to be explored extensively to understand and overcome the lack of uptake of PrEP treatment within the healthcare setting. Calabrese et al. (2016) explored barriers from the perspective of providers, which included financial coverage, implementation logistics, eligibility, adherence concerns, side effects, and risk compensation.

Additional studies have sought to further explore provider attitudes and perceptions concerning PrEP treatment (Blumenthal et al., 2015; Desai et al., 2016; Finocchiaro-Kessler et al., 2016; Hakre et al., 2016; Puro et al., 2013; Tellalian et al., 2013). These studies focus on primary care providers as a critical population to ensure successful PrEP implementation and

ultimately lead to the reduction in HIV transmission globally that is possible through its use.

Primary care providers can play a central role in implementing PrEP treatment in practice. This implementation involves collaboration with public health agencies and community action groups to reach those at most risk of HIV infection (Norton, 2013). Additionally, providers must understand the medication, its risks and benefits, and the follow-up care associated with its use.

Although resources for providers are available, many note a lack of consistent education and availability of training, which affects providers' willingness to implement PrEP into practice (Karris, 2014; Silapaswan, 2017; Tripathi, 2012). Educating and training providers is crucial to inform them of the current scientific evidence regarding PrEP treatment (Tripathi, 2012). One educational intervention method, academic detailing or clinical outreach, is a proven method of improving provider knowledge, attitudes, and behavior. Academic detailing involves academically based peer specialists customizing an educational session based on needs of the audience and is rooted in current evidence-based practice (Avorn, 2017). Despite improvement of provider knowledge, attitudes, and practice change regarding HIV and other topics, there is little research evaluating the effect of academic detailing regarding PrEP. Evaluating the efficacy of this education intervention within a group of primary care providers and medical students may offer insight into the effect of provider understanding and willingness to screen for and use PrEP in clinical practice. The following PICO question was used to guide a search of the literature for evidence to support an academic detailing intervention to promote use of PrEP: Among Primary Care Providers how does HIV PrEP academic detailing compared to no academic detailing affect provider understanding of PrEP and willingness to implement into practice?

Search Strategy

Databases searched for the literature review included Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, and The Cochrane Library.

CINAHL

The initial searches of *PrEP*, *academic detailing*, *HIV prevention*, and *clinical outreach* yielded 24,195 results in CINAHL (Appendix A). Further keywords and Boolean phrases used in the search included; *HIV*, *HIV prophylaxis*, *biochemical prophylaxis*, *pre-exposure prophylaxis*, *educational outreach*, *nurse*, *nurse practitioner*, *tenofovir*, *TDF-FTC*, *providers*, *primary care*, *attitudes*, *knowledge*, *education*, *training*, and *high-risk HIV prevention*. By setting limits to English language, humans, age 18 and older, publication date from 2007-2017, and combining terms resulted in a final yield of 4 key studies retained for synthesis (Appendix D).

Cochrane Library

Using the same keywords and Boolean phrases as the above search yielded a total of 637 results in The Cochrane Library (Appendix B). By setting limits to English language, humans, age 18 and older, publication date from 2007-2017, and combining terms resulted in a final yield of 3 non-duplicate articles retained for final review (Appendix D).

PubMed

Searching the keywords and Boolean phrases described above yielded 211 results in PubMed (Appendix C). By setting limits to English language, humans, age 18 and older, publication date from 2007-2017, and combining terms resulted in a final yield of 4 articles retained for review that were not found in the other searches (Appendix D).

For grey literature search, ASU library One-Search was used with the above-named keyword combinations to find relevant studies and journal articles. This search option combines literature from a wide array of publications including CINAHL, Cochrane, and PubMed.

Additionally, an ancestry search of pertinent study citations revealed 1 study that was not found in the original searches but has been included in this synthesis due to significance for the purposes of this project.

Exclusion criteria included published dates before 2007, non-English language, literature from non-peer reviewed journals, or those not involving the study or discussion of academic detailing or clinical outreach. Studies included involved academic detailing interventions in a variety of outpatient settings.

12 studies were chosen from the literature review to examine homogeneity and common themes and differences. (Appendix D). Findings were consistent throughout the literature that academic detailing is effective at improving provider knowledge, skills, and practice behaviors.

Critical Appraisal and Synthesis of Evidence

A total of 12 studies were retained and evaluated for this review, all of which are pertinent to the project PICO question (Appendix D). They have all been published in peer reviewed journals and have been cited in the literature concerning academic detailing and clinical outreach, especially with relation to HIV education and training. Results within studies were compared to previous findings in the literature, and both common and diverging themes were discussed. Study designs included 2 quantitative, 2 qualitative, 6 mixed methods, 1 controlled trial, and 2 systematic reviews. The research methods used for all studies were appropriate and scientifically sound with explicit data analysis and conclusions. All the 12 studies denied bias or conflicts of interest among the authors and their respective funding sources (Bashook et al., 2010; Bokhour et al., 2015; Cook et al., 2009; Culyba et al., 2011; Dreisbach et al., 2014; Felderman-Taylor et al., 2007; Flodgren et al., 2011; Gallagher et al., 2017; Lubelcheck et al., 2013; Meehan et al., 2009; Myers et al., 2012; O'Brien et al., 2007).

The studies were published between 2007 and 2017 and all had participants from the United States; two of the studies also included international participants. Sample sizes within the studies ranged from 18 to 11,921 participants and included physicians, nurses, nurse practitioners, PAs, graduate students, social workers, pharmacists, epidemiologists, and other health care providers and office staff. The conceptual framework and theoretical basis for the studies were not all consistent with 4 using adult learning theory, 3 novel models, 2 utilizing Kirkpatrick's typology, 2 used diffusion of innovation theory, and 1 used the PARIHS model for evidence-based practice implementation. The variables were highly diverse among the selected studies, but common outcomes included knowledge, skills, attitudes, and practice changes. Despite the heterogeneity of study variables, findings and conclusions were consistent that academic detailing is an effective intervention to improve provider knowledge, attitudes, skills, and practice implementation (Appendix E, Synthesis Table).

Conclusions about Evidence

All studies reviewed, including the 2 systematic reviews, demonstrated the effectiveness of academic detailing interventions, particularly with regards to HIV education. However, it was difficult to make parallel comparisons of outcomes when variables differed greatly from study to study. Researchers have addressed this issue with a literature review comparing components of academic detailing and establishing consistency through expert consensus. These researchers found that components of academic detailing should be standardized and evaluated to ensure best outcomes are possible. Expert consensus was reached using the Delphi method to standardize critical components of the intervention (Van Hoof et al, 2015; Yeh et al., 2016). Academic detailing is effective and can improve provider knowledge, skills, attitudes, and clinical practice.

Diffusion of Innovation Theory

PrEP is a new and innovative tool for providers to use for HIV prevention (Krakower et al., 2015). However, many of the current barriers and concerns providers express are common when an innovation is being disseminated. The Theory of Diffusion of Innovations evaluates the spread of new ideas and identifies four main determinants that affect the diffusion or spread of an innovation. These include the innovation itself, time, communication channels, and the social system. If an innovation is deemed advantageous, simple, feasible, and observable then the ease and speed with which it is disseminated and adopted increases. The first 2.5% of those within a system to adopt an innovation are the innovators who take risks and are eager to try new things. The next 13.5% of adopters are early adopters who act as leaders in the system. The next 34% of those who adopt the innovation are the early majority who are crucial to the success of an innovation as they are often the interpersonal link within a system. The final 2 groups to adopt an innovation consist of the late adopters at 34% and the laggards at 16 % (Rogers, 2002). Opinion leaders are the early adopters and increase the effectiveness of academic detailing interventions to improve uptake of evidence-based practice (Flodgren et al., 2011). Nurses are often opinion leaders and innovators within the healthcare system and play a crucial current and future role in the successful diffusion of PrEP innovations (Liu et al., 2014, Treston et al, 2015).

Contribution of Nursing Theory to Utility of the Evidence

HIV is a multifaceted disease process that can be altered by the care offered by primary care providers to high risk populations. The Conceptual Model of Nursing and Population Health (CMNPH) serves as the conceptual framework for this project (Appendix F). This model draws influence primarily from the Institute for Healthcare Improvement (IHI) Population Health Model and encompasses four multidimensional determinants of population health including upstream factors, population factors, health care system factors, and nursing activities, as well as

the concept of population health outcomes (Fawcett & Ellenbecker, 2015). Within the dimension of health care system factors are the providers of care. Academic detailing interventions concerning HIV prevention and PrEP serve to improve provider knowledge, skills, and culturally competent care. Interventions based on evidence-based care should be applied to all dimensions within the model to ensure best patient outcomes. Approaching HIV prevention from a population health standpoint provides a basis for analysis of interactions within and between population health determinants, interventions, and ultimately patient outcomes.

Evidence Based Practice Model Chosen to Guide Project Development

The Promoting Action on Research Implementation in Health Services Framework (PARIHS) Evidence Based Practice (EBP) Model was chosen to guide the intervention selection and implementation in this project. The PARIHS model consists of three elements: evidence, context, and facilitation (Appendix G). The model was developed over the past two decades to display the complexities of integrating evidence into practice. The model takes a step back from individual application and looks at the overall interplay of the many factors affecting EBP in real world implementation. The element of evidence is defined as the knowledge in question and how it is perceived within the literature, within the clinical setting, and among clinicians and patients alike. Context within the PARIHS model examines the culture and environment wherein the research is being evaluated. And lastly the element of facilitation is defined as the roles and system characteristics that will support implementation of an EBP change within an organization (Rycroft-Malone, 2004).

The PARIHS model operates on a continuum with movement between low and high points for each element; the higher measurement being a predictor of successful EBP implementation. This model is highly applicable to a population-based health prevention

approach to HIV. It has demonstrated utility for navigating the unpredictable nature of EBP change and is well-suited for engaging necessary stakeholders and for multidisciplinary collaboration (Schaffer et al., 2013). The evidence to support PrEP treatment for high risk individuals in the primary care setting scores high on the continuum according to the PARIHS model. This project will evaluate primary care provider knowledge of this high-level evidence for PrEP implementation. And, through application of an effective academic detailing intervention, the project outcomes will be found to be congruent with research findings as evidenced by an improvement in the knowledge and attitudes of the clinicians. This context for the intervention is supported by previous research utilizing the PARIHS model to guide academic detailing to increase HIV testing (Bokhour et al., 2014). The academic detailing intervention will evaluate whether provider education can effect changes in provider knowledge, attitudes, and behaviors regarding PrEP, thus evaluating the effect the domain of evidence has on the other PARIHS domains of context and facilitation. Providers may be more engaged as stakeholders when they understand the context of the evidence behind PrEP and therefore serve as opinion leaders on PrEP. According to the PARIHS model, PrEP uptake is more likely to be sustained in clinical practice if it is relevant to the context and capabilities of the organization. The clinical site chosen for the academic detailing intervention has a high population of individuals at risk for HIV, according to county HIV statistics and clinical demographics. The context for implementation of PrEP is further facilitated by adequate resources and a supportive organizational culture, all key elements needed to improve PrEP screening and use in the community. Through critical appraisal and implementation of the evidence, providers could become leaders and catalysts for change within their practice. Knowledgeable providers who offer culturally competent preventative care to patients at high risk of HIV transmission with

PrEP may ultimately reduce HIV transmission rates, and the associated costs of treating a lifelong disease, as well as improve patient/provider rapport and confidence.

Methods

Intervention

Successful HIV prevention including PrEP in the primary care setting requires engagement and collaboration with primary care providers. This project focused on evaluating their knowledge, attitudes, and practices related to the use of PrEP, then providing a brief training intervention to assess changes in perceptions or plans to implement PrEP treatment in practice. The intervention consisted of training provided by academic detailing professionals from Florida Department of Health partnered with the federally funded Aids Education and Training Centers (AETC) that serve to train providers regarding HIV and AIDS prevention and treatment. Additionally, pre and post training surveys were included to evaluate efficacy of the training session.

Population

Participants were recruited by direct invitation to participate in a brief academic detailing session offered during lunch at a primary care office in Broward County, Florida. There were five participants in the academic detailing session including: a physician, a PA, and three medical students. The physician and the PA work at the clinic and the three medical students were completing clinical rotations in a primary care setting. Response rate was 100% for survey questions both pre and post intervention. The intervention took place the first week of the medical students' primary care rotation, which ended eight weeks afterwards. Therefore, data collection for practice changes corresponded to this eight-week period. No personal identifying information was obtained. This study was approved by the IRB at Arizona State University.

Measures

The primary outcomes of PCP PrEP knowledge, attitudes, and behaviors were measured using pre and post intervention self-reporting provider surveys. Permission was obtained from the author of a 2017 study to utilize this survey, which has been shown to be valid and reliable for the purposes of outcomes measurements and thematic constructs related to this project. The survey was created from previous research and theory, reviewed by a panel of experts, and pilot tested. Reliability testing for the survey demonstrated Cronbach's alpha scores of 0.71, 0.80, and 0.95 for knowledge, attitudes, and behaviors respectively (Walsh & Petroll, 2017). Knowledge scores were assessed using general knowledge questions regarding PrEP and were coded as 0 for incorrect and 1 for correct. Attitude and behaviors regarding PrEP were assessed using a 5-point Likert scale, with higher scores indicating positive attitudes and increased comfort using PrEP in practice respectively. Questions nine to fifteen were reverse coded per the survey author's instructions.

HIV/STI screening and risk assessment data was obtained through data queries from the medical records. Qualifying ICD 10 codes were obtained based on the CDC providers' supplement on PrEP (CDC, 2014). Active ICD 10 codes were categorized for patients that had visits 8 weeks before the intervention and 8 weeks afterwards. Table 1 below shows included ICD 10 codes. No CPT codes to assess HIV testing/procedures could be obtained from data queries due to format of the electronic health records system.

Table 1.

Category/Diagnosis Description	ICD 10 Codes
Contact with or exposure to communicable diseases	Z20.2, Z20.5, Z20.6, Z20.9, Z20.818, Z20.828, Z77.21
Needlestick/IV drug use	W46, W46.0, W46.1
Other prophylactic measures	Z79, Z51.81, Z51.89, Z79.899
HIV disease	B20, Z21
HIV screening	Z11.4
Hepatitis B	B16.0, B16.1, B16.2, B16.9, B17.0, B18.0, B18.1
STI Screening	Z11.3, Z11.59, Z11.8, Z13.9
Pregnancy Testing	Z32.0
Sexual Counseling	Z70.0, Z70.1, Z70.3
High Risk Sexual Behavior	Z72.51, Z72.52, Z72.53

Data Analysis

Data analysis was performed using SPSS version 23. Results from the survey were entered into SPSS and analyzed using nonparametric tests due to inability to assume normal distribution of the ordinal data with a small sample size (n=5). For the purposes of this study, due to the importance of detecting small to moderate differences with a small sample among survey participants, significance was tested at the $p < 0.10$ to assess trend.

Results from data analysis of surveys were then compared to electronic health report aggregate data queries for HIV/STI screening and HIV risk to assess actual clinical practice changes. Active ICD 10 codes corresponding to ten categories based on the ICD 10 codes listed in the CDC PrEP guidelines, were collected for patient visits eight weeks prior and eight weeks post academic detailing intervention. This data was analyzed using paired t tests due to ratio data queried with assumed normal distribution and a large patient sample in the electronic health record. There were no missing data.

Results

The sample population included one MD, a PA, and three medical students. Demographic data was not gathered due to the small sample size ($n=5$), and limited usefulness and generalizability to population of primary care providers. Knowledge scores prior to the academic detailing session had a range of five, with a possible seven points and had a mean of four and standard deviation 2.35. Knowledge scores after the intervention were all seven ($\bar{x} = 7, s = 0$). Attitude scores prior to the intervention had a mean of 31.8 with a range of six and standard deviation of 2.39. Attitudes scores after the intervention had a mean of 34.4 with a range of three and standard deviation of 1.14. Behavior scores prior to the intervention had a mean of 36.8 with a range of 17 and standard deviation of 7.19. Behavior scores after the intervention had a mean of 42.6 with a range of nine and standard deviation of 3.78.

Wilcoxon tests examined the trends of provider self-rated scores of knowledge, attitudes, and behaviors regarding PrEP before and after the academic detailing intervention. The significance level was set at $\alpha = 0.1$. Significant differences were found in the results for knowledge when comparing pre and post test scores with $Z = -2.03, p = 0.042$. Significant differences were found in providers' pre and post intervention attitudes as well, with $Z = -1.84,$

$p = 0.66$. Significant differences were also found when comparing behavior scores pre and post intervention with $Z = -1.83$, $p = 0.68$. The academic detailing intervention significantly improved knowledge, attitudes, and behaviors of primary care providers and medical students regarding PrEP (fig. 1).

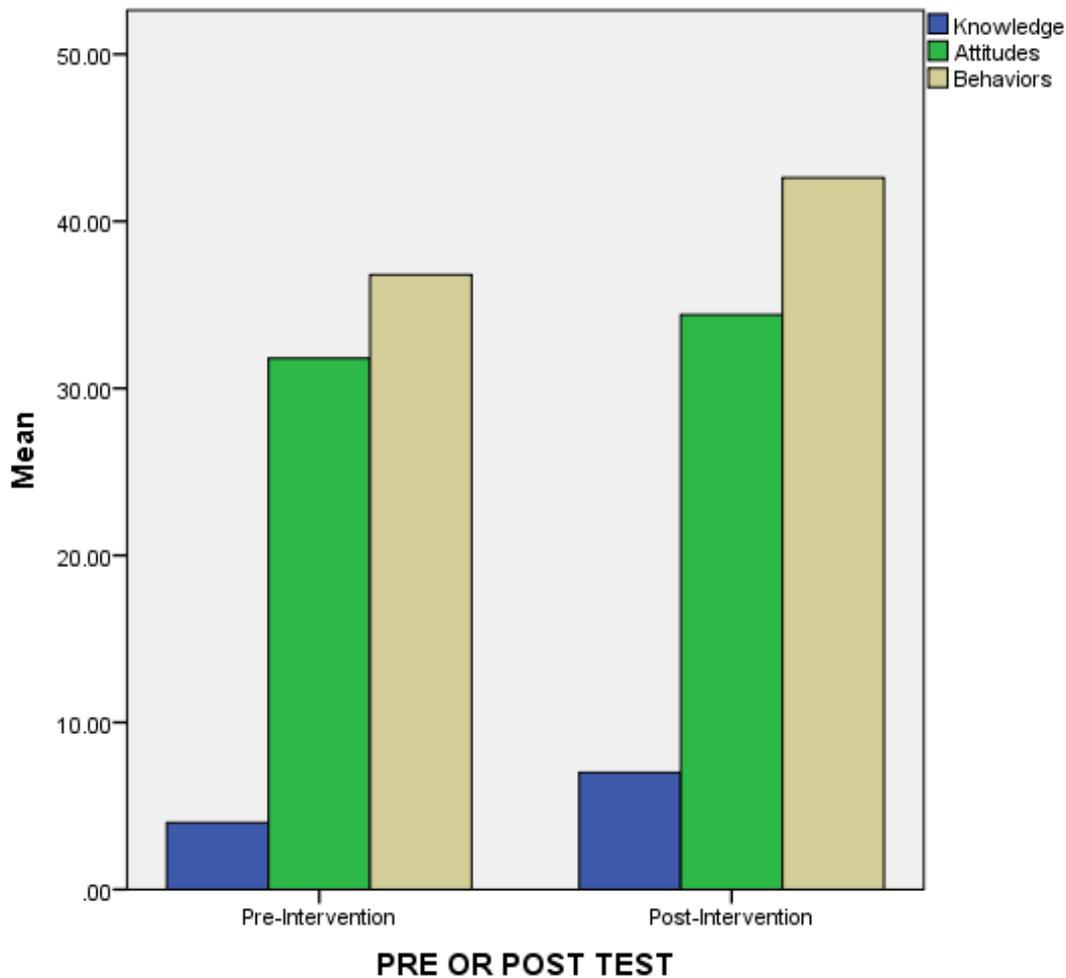


Figure 1. PCP knowledge, attitudes, and behavior scores regarding PrEP (pre and post intervention).

A paired-samples t test was calculated to compare mean HIV screening and high-risk assessment for patients before and after the academic detailing intervention. The mean of active qualifying ICD 10 codes prior to the intervention was 5 (sd = 5.64), and the mean of active

qualifying ICD 10 codes post intervention was 4.2 (sd = 4.87). No significant difference was found between active ICD 10 codes for patient visits before compared to after the intervention ($t(9) = 1.12, p > .1$).

Discussion

Significance

An academic detailing intervention regarding PrEP had a significant effect on the knowledge, attitudes, and behaviors of primary care providers. This finding supports the use of the PARIHS framework for innovative diffusion of evidence-based practice. The domains within the PARIHS framework of evidence, context, and facilitation are parallel to the academic detailing approach and are supported by research demonstrating efficacy (Avorn, 2017). Utilizing this method can be an effective way to increase the utilization of PrEP and uptake of use among high risk population through affecting the knowledge, attitudes, and behaviors of primary care providers.

Limitations

To assess changes in practice, only active ICD 10 codes for visits could be queried instead of ICD 10 discharge diagnoses codes due to the nature of the electronic database. This may skew results or limit the data collected, because the patient may not have been seen or treated for the issue specified with the active ICD 10 code at the time of the visit. Additionally, assumptions about causality based on ICD 10 codes and the PrEP academic detailing cannot be made. The small sample size of participants in the intervention was also a limitation that may affect the generalizability of the results. Despite these limitations, the results indicate that

academic detailing on PrEP is effective for increasing providers' knowledge, attitudes, and behaviors regarding PrEP and may lead to future research in this area.

Conclusions

This purpose of this project was to affect the domain of Healthcare System Factors within the CMNPH (appendix F), specifically the dimension of primary care providers within this domain. The results of the project demonstrate that innovative evidence-based practice regarding PrEP can be disseminated using academic detailing to effect changes on providers' knowledge, attitudes, and behaviors. These findings support findings from the literature that academic detailing is an effective and innovative method to disseminate guidelines and best practice information to improve providers' knowledge, attitudes, and behaviors. A future research goal based on the findings of this include a large-scale assessment of PrEP academic detailing in the area.

The academic detailing session intervention has created a communication and networking liaison between the clinic and the Florida Department of Health that is sustainable and provides a mutually beneficial collaborative relationship. The clinic now has access to experts on PrEP, who can share the latest evidence-based practice without commercial bias and can address future training and educational needs. Additionally, the health department can expand their mission of HIV prevention through PrEP academic detailing within the community. Additional benefits of the partnership may also include the clinic gaining access to resources and expertise in other health fields and disease topics, as well as further partnership for community health promotion.

Most current research regarding PrEP is focused within the CMNPH domains of upstream factors and population health. Future research should focus on other dimensions and domains within this model and evaluate effects on population health outcomes. Further research

regarding nursing activities and interventions may help provide cohesion among these domains.

Some suggestions for future research include; evaluating the secondary outcomes of patient sexual risk reduction due to screening and counseling, using motivational interviewing and SBIRT in sexual health screening to increase PrEP uptake, and efficacy of PrEP use in practice.

Development and testing of innovative electronic applications and automated HIV risk screenings may also reduce provider burden, facilitate identification of people who could benefit from PrEP who are then offered the medication, and increase the uptake of PrEP for appropriate populations.

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Appendix A

Search Strategy 1

CINAHL

The screenshot shows the EBSCOhost search interface. At the top, there are navigation tabs: "New Search", "Publications", "CINAHL Headings", "Evidence-Based Care Sheets", and "More". The search bar contains "Searching: CINAHL Plus with Full Text" and "Suggest Subject Terms". Below the search bar, there are three input fields for search terms, each with a "Select a Field (option...)" dropdown and a "Search" button. The "Search History/Alerts" section is visible, showing a list of search results with columns for "Search ID#", "Search Terms", "Search Options", and "Actions".

Search ID#	Search Terms	Search Options	Actions
S14	nurse AND pre-exposure prophylaxis	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (445) View Details Edit
S13	HIV prevention AND academic detailing	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (9,888) View Details Edit
S12	prep AND academic detailing	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (26) View Details Edit
S11	review AND academic detailing	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (13,340) View Details Edit

The screenshot shows the EBSCOhost search interface displaying a list of search results. The results are organized in a table with columns for "Search ID#", "Search Terms", "Search Options", and "Actions".

Search ID#	Search Terms	Search Options	Actions
S9	HIV prophylaxis AND provider AND academic detailing	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (89) View Details Edit
S8	hiv AND prophylaxis AND provider	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (114) View Details Edit
S7	Primary care AND Pre-exposure prophylaxis	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (5,911) View Details Edit
S6	clinical outreach AND HIV	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (13,078) View Details Edit
S5	HIV prevention AND education AND providers	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (4,185) View Details Edit
S4	HIV prevention AND education AND provider	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (3,516) View Details Edit
S3	academic detailing AND HIV	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (1,206) View Details Edit
S2	preP AND provider AND education	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (14) View Details Edit
S1	pre-exposure prophylaxis AND education	Limiters - English Language Expanders - Apply related words, Apply equivalent subjects Search modes - Find any of my search terms	View Results (1,305) View Details Edit

Appendix B

Search Strategy 2

The Cochrane Library

The screenshot shows the Cochrane Library search manager interface. The browser address bar indicates the URL: onlinelibrary.wiley.com.ezproxy1.lib.asu.edu/cochranelibrary/search/advanced?hiddenFields.strategySortBy=last-modified-date;desc&hiddenFields:. The Cochrane Library logo and tagline "Trusted evidence. Informed decisions. Better health." are visible at the top. Below the navigation tabs (Search, Search Manager, Medical Terms (MeSH), Browse), there is a search manager interface with a table of search terms and their result counts.

Search Term	Count
#1 pre-exposure prophylaxis	263
#2 pre-exposure prophylaxis ti,ab,kw (Word variations have been searched)	250
#3 academic detailing ti,ab,kw (Word variations have been searched)	336
#4 Provider education outreach ti,ab,kw (Word variations have been searched)	37
#5 Educational outreach ti,ab,kw (Word variations have been searched)	227
#6 HIV prevention education ti,ab,kw (Word variations have been searched)	562
#7 pre-exposure prophylaxis provider attitudes ti,ab,kw (Word variations have been searched)	1
#8 prep provider education ti,ab,kw (Word variations have been searched)	4
#9 academic detailing HIV ti,ab,kw (Word variations have been searched)	2
#10 HIV provider education ti,ab,kw (Word variations have been searched)	55
#11 academic detailing HIV prevention ti,ab,kw (Word variations have been searched)	1
#12 HIV prophylaxis provider ti,ab,kw (Word variations have been searched)	15
#13 prep provider knowledge ti,ab,kw (Word variations have been searched)	4
#14 pre-exposure prophylaxis outreach ti,ab,kw (Word variations have been searched)	0
#15 pre-exposure prophylaxis intervention ti,ab,kw (Word variations have been searched)	43

Appendix C

Search Strategy 3

PubMed

History [Download history](#) [Clear history](#)

Search	Add to builder	Query	Items found	Time
#39	Add	Search (pre-exposure prophylaxis) AND physician	77	10:49:10
#38	Add	Search ((Hiv) AND prevention) AND prophylaxis) AND provider	797	10:48:19
#34	Add	Search ((PEP) AND Provider) AND knowledge	23	10:47:27
#21	Add	Search ((hiv) AND prophylaxis) AND provider	819	10:43:21
#19	Add	Search (academic detailing) AND HIV prevention	3	10:15:46
#18	Add	Search academic detailing	595	10:15:08
#15	Add	Search (clinical outreach) AND HIV	188	10:14:39
#14	Add	Search ((education) AND hiv prevention) AND providers OR providers	97913	09:47:51
#13	Add	Search ((education) AND HIV prevention) AND Provider OR providers	98090	09:47:43
#12	Add	Search ((education) AND HIV prevention) AND Provider) OR providers	98090	09:46:37
#9	Add	Search (academic detailing) AND HIV	10	09:44:02
#6	Add	Search ((prep) AND providers) AND education	46	09:42:14
#7	Add	Search ((prep) AND provider) AND education	17	09:40:51
#6	Add	Search pre-exposure prophylaxis provider attitudes	18	09:36:51
#5	Add	Search psychometric provider hiv	15	09:35:41
#4	Add	Search psychometric provider	344	09:35:24
#3	Add	Search psychometric prep provider Schema all	0	09:35:18
#2	Add	Search psychometric prep provider	0	09:35:18
#1	Add	Search psychometric hiv prevention provider	1	09:35:03

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Appendix D

Table 1

Evaluation Table

Citation	Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement	Data Analysis	Findings	Decision for Use in Practice/Application to Practice
<p>Bashook, P. G. (2010). Outcomes of AIDS education and training center HIV/AIDS skill-building workshop on provider practices. <i>AIDS Education & Prevention</i>, 22(1), 49-60.</p> <p>Supported via grant from HRSA. The pilot study was presented at the Ryan White HIV/AIDS Program Grantee Meeting, Washington, DC, August 2008.</p> <p>United States, Midwest AETC training centers</p> <p>No Bias, IRB not mentioned</p>	<p>Diffusion of Innovation Theory (Rogers)</p>	<p>Design: mixed method</p> <p>Purpose: What are the effects of participating in a skills-building workshop upon participants' practices?</p> <p>Method: Participants in 230 HIV/AIDS skills building workshops held from July 2007 to June 2008 were contacted via e-mail 4-6 weeks post program., survey and open-ended questions</p>	<p>N = 2949 n=631</p> <p>Inclusion criteria: Attended HIV/AIDS at MAETC</p>	<p>IV1-gender IV2-ethnicity/race IV3-Patient care responsibilities IV4-HIV specialty IV5-Training topic</p> <p>DV1-Changes in practice (knowledge/attitudes) DV2-clinical systems changes</p>	<p>Internet survey Via surveymonkey.com</p> <p>Communication via email, open ended questions</p>	<p>Coded changes reported (practice vs systems changes)</p> <p>Consistency of coding change statements determined by 3 evaluators independently code all 411 change events.</p> <p>mKappa interrater coding reliability was .77 with a .06 error rate, suggesting that coding was highly reliable for classifying these open-ended statements into practice changes</p>	<p>DV1=73% DV2=27%</p>	<p><i>Strengths</i>= Large sample size</p> <p><i>Weaknesses</i>= Self-reported responses. Possible cognitive loading of questions. Low response rate of 22%, bias to HIV providers. Time limitation, follow up 4-6 weeks, only looked at workshop format of education</p> <p><i>Conclusion</i>=HIV academic detailing workshops affect patient care and clinical system changes</p> <p><i>Clinical significance:</i> HIV related Academic detailing helps improve patient care and clinical practice</p>

AETC-aids education and training centers, AIDS-acquired immunodeficiency syndrome, CDC – Us Centers for Disease Control and Prevention, DV – dependent variable, EBP-evidence based practice, EOJ-educational outreach visits, HCP-healthcare provider, HIV- human immunodeficiency virus, HRSA-health resources and services administration, IV – independent variable, N – number of participants, n – subset of participants, NIH-national institutes of health, PARIHS-Promoting action on research implementation framework, PLWH-people living with HIV, PrEP-pre-exposure prophylaxis, QIO, quality improvement organization, RA-risk assessment, tx – treatment

Citation	Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement	Data Analysis	Findings	Decision for Use in Practice/Application to Practice
<p>Bokhour, B. G., Saifu, H., Goetz, M. B., Fix, G. M., Burgess, J., Fletcher, M. D., . . . Asch, S. M. (2015). The role of evidence and context for implementing a multimodal intervention to increase HIV testing. <i>Implementation Science : IS</i>, 10(1), 22-22. doi:10.1186/s13012-015-0214-4</p> <p>USA</p> <p>The VA central IRB approved the study.</p> <p>No bias or conflicts of interest noted</p>	<p>PARIHS model for EBP implementation</p>	<p>Design: Mixed method study.</p> <p>Purpose: to understand barriers and facilitators to implementation of HIV testing. Then examine how different contextual factors and perception of evidence relate to the relative success of the implementation efforts</p> <p>Method: Qualitative evaluation team and project leadership team (intervention)</p>	<p>N=50 n=41</p> <p>Inclusion criteria: Providers, complete postintervention interview</p> <p>Exclusion criteria: Non-responders, non-providers .</p> <p>Setting: intervention 2009–2011 in 15 primary care clinics at VA Medical Centers in three regions of the country, staffed by physicians, PAs and NPs working in teams with nurses and clerk to serve predominantly male, military veterans.</p>	<p>Qualitative: IV1: Role</p> <p>DV1: Context DV2: Evidence</p> <p>Quantitative: DV1: HIV testing</p> <p>Intervention: EHR reminders, academic detailing, social marketing, and quarterly feedback reports.</p>	<p>1) semi-structured interviews via telephone in 2009–2011 and lasted 20–25 min</p>	<p>Data coded by barriers and facilitators described by the participants to identify major themes.</p> <p>PARIHS model and constructs used as framework to organize and interpret findings.</p> <p>In quantitative study, HIV testing rates were calculated at baseline and 6 months for each site using logistic regression</p>	<p>kappa coefficient 0.89 for evidence, 0.78 for context = high interrater reliability</p> <p>Barriers and facilitators to HIV testing identified.</p> <p>HIV testing improved overall, especially at sites with high rated evidence and context for EBP implementation</p>	<p><i>Strengths</i>= Strong reliability and clear correlations.</p> <p><i>Weaknesses</i>= Not clear if results are generalizable, limited geographic location, limited sample size,</p> <p><i>Conclusion</i>=Interventions to increase HIV testing can be successful using academic detailing and proven QI techniques</p> <p><i>Clinical significance:</i> Academic detailing can help change providers perceptions of evidence</p>

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<p>Cook, P. F., Friedman, R., Lord, A., & Bradley-Springer, L. A. (2009). Outcomes of multimodal training for healthcare professionals at an AIDS education and training center. <i>Evaluation & the Health Professions</i>, 32(1), 3-22. doi:10.1177/0163278708328736</p> <p>USA</p> <p>Financial support from HRSA grant</p> <p>Approved by the Colorado Multiple IRB</p>	<p>Kirkpatrick's typology (Expanded Outcomes Typology)</p>	<p>Design: Quantitative</p> <p>Purpose: 1) test relationships between practice behavior and satisfaction, knowledge, and intention to change. 2) test whether trainees report higher levels of practice behaviors in multiple AETC trainings, 3) determine whether HCP who participated in interactive (versus didactic) types of trainings had higher scores and/or a faster rate of change on the measure of self-reported practice behavior.</p> <p>Method: Questionnaires, evaluation surveys</p>	<p>N= 14,238 N=2,112</p> <p>Inclusion criteria: completed a demographic Participant Information Form (PIF), provided a valid and consistent identification number on that form, completed an MPAETC evaluation form with a matching ID number, and completed the same set of steps for at least two education programs during the study timeframe .</p> <p>Exclusion Criteria: Did not meet inclusion criteria above</p> <p>Setting: AETC in Colorado (Mountain Plains) from July 1, 2006 through December 31, 2007, during which the MPAETC provided 1,346 trainings in which there were 16,613 educational encounters with HCP</p>	<p>IV1-training amount IV2-training type</p> <p>DV1-Trainee satisfaction DV2-Knowledge DV3-Intention to change DV4=Practice behavior</p>	<p>Every 4-week HIV testing with computer assisted data collection with CPS.</p> <p>Data collected on case report forms</p>	<p>Cronbach's alpha for internal consistency high for survey items, reliability high.</p> <p>HLM 6.0 used for primary data analysis</p> <p>SPSS 16 used for further evaluation</p>	<p>Trainee satisfaction did not change after multiple trainings nor predict practice behaviors although there was correlation with intent to change behavior.</p> <p>Neither pretraining or post training knowledge predicted practice behaviors.</p> <p>Repeated trainings had little effect on knowledge and practice change.</p> <p>Interactional and one on one trainings had more of an effect on practice change than didactic only programs</p>	<p><i>Strengths</i>= large sample size, reliable and valid instrument used</p> <p><i>Weaknesses</i>= Self-reported measurements, target population not typical</p> <p><i>Conclusion</i>=Trainings had significant effect on practice change, however satisfaction with training and knowledge were not predictive of change</p> <p><i>Clinical significance:</i> Interactive and one on one trainings are effective for HIV education of providers and ultimately affect change in practice behavior</p>

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<p>Culyba, R. J., McGee, B. T., & Weyer, D. (2011). Changing HIV clinical knowledge and skill in context: The impact of longitudinal training in the southeast united states. <i>Journal of the Association of Nurses in AIDS Care</i>, 22(2), 128-139. doi:10.1016/j.jana.2010.07.005</p> <p>No conflicts of interest or bias</p> <p>US</p> <p>Approved by the Emory University IRB with a waiver of written informed consent.</p> <p>Funded by HRSA grant</p>	<p>Adult Learning Theory and active learning methods</p>	<p>Design: Mixed method longitudinal study</p> <p>Purpose: improve the HIV related knowledge and skills of clinical and nonclinical service providers at community-based health centers</p> <p>Method: The effect of an on-site longitudinal training program for HIV care providers was evaluated using pre- and 3-month post-program knowledge and skills tests, a post-training evaluation questionnaire, and a post-program focus group</p>	<p>N=144 n=42 (pre and post) n2=23 (2nd year of training)</p> <p>Inclusion criteria: Participants in AETC training in Southeast region, Complete pre and post testing, then complete focus group</p> <p>Exclusion Criteria: Did not complete criteria above</p> <p>Setting: 6 training sites in Georgia, Alabama, Tennessee, and North Carolina from 2002 to 2009.</p>	<p>IV1-Race IV2-Gender IV3-Profession</p> <p>DV1-knowledge DV2 skills</p> <p>Qualitative: Knowledge or practice changes and challenges to providing care</p>	<p>Used Provider assessment tool (PAT)</p>	<p>Likert scale PAT analyzed according to cluster sampling Methods</p> <p>data were managed and analyzed using SPSS v16.0 and SAS v9.1; data from the participant information and evaluation forms were cleaned in SAS and analyzed with SPSS, and qualitative data from focus groups were organized using Atlas.ti v5.2.</p>	<p>Average of score improvement within a year. Mean 4.33 (95% CI) p=0.001</p> <p>Mean 1.96 (95% CI) after another year of training</p> <p>81.8% self-reported knowledge and skill increase, 84.2% intent to change.</p> <p>No correlation in PAT score vs self-reported knowledge score</p> <p>Adequate internal reliability (Cronbach's alpha 0.792)</p>	<p><i>Strengths</i>= validated and reliable tool</p> <p><i>Weaknesses</i>= PAT not validated outside of this area. External effects on variables, some missing information, educators involved in focus groups.</p> <p><i>Conclusion</i>= training increased knowledge and skills and improved capacity of providers to meet patient care needs across all sites despite patient HIV infection variations</p> <p><i>Clinical significance:</i> longitudinal training increased HIV-related knowledge and skills. And increased provider capacity and behavior despite the potential lack of resources in the clinics</p>

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<p>Dreisbach, S., Burnside, H., Hsu, K., Smock, L., Coury-Doniger, P., Hall, C., . . . Thrun, M. (2014). Improving HIV/STD prevention in the care of persons living with HIV through a national training program. <i>AIDS Patient Care and STDs</i>, 28(1), 15-21. doi:10.1089/apc.2013.0094</p> <p>United States</p> <p>Colorado Multiple IRB approval</p> <p>CDC funding</p> <p>No competing financial interests or bias</p>	<p>ASI curriculum:</p>	<p>Design: Quantitative descriptive study</p> <p>Purpose: (ask screen, intervene) ASI curriculum developed to increase provider knowledge, skills, and motivation to incorporate RA (risk assessment) and prevention services into the care of PLWH.</p> <p>Method: didactic presentations with case studies, group discussion, and skills practice. Survey after intervention, then 3-6 month follow up survey. Gift card drawing incentive</p>	<p>N=2558 n=320</p> <p>Inclusion criteria: medical and social service providers who care for PLWH, particularly providers serving racial and ethnic minorities disproportionately impacted by HIV.</p> <p>Exclusion criteria: Non-responders, did not meet criteria above</p> <p>Setting: Oct 2007 to Dec 2010 137 sites.</p>	<p>IV1-Gender IV2-race IV3-ethnicity IV4-profession IV5-patient population IV6-minority population PLWH</p> <p>DV1-knowledge DV2-skills DV3-Intent for practice change DV4-Perceived patient barriers</p>	<p>Survey based on ASI</p>	<p>Descriptive statistics summarized demographic, occupational, and satisfaction data. Likert scale confidence levels to demonstrate ASI learning objectives were treated as interval variables; means were calculated to measure changes in confidence pre- to immediately post-course and pre-course to 3–6 month follow-up. Paired two-tailed Student’s t-test was used to test the significance of changes at the 0.05 confidence level. Chi-square comparison of proportions was used to compare characteristics of respondents and non-respondents. Open-ended responses were coded by two evaluators and discrepancies reviewed by a third to reach consensus.</p>	<p>71% self-reported increased confidence before training to demonstrate ASI knowledge and performing ASI skills, practice changes in 75.2%</p> <p>Biggest barrier was time</p>	<p>Strengths= Good sample size, valid data</p> <p>Weaknesses= self-reported measures and a 30% response rate to the 3–6 month follow-up survey, not generalizable, no control</p> <p>Conclusion= training program for HIV providers increases self-reported capacity to incorporate HIV/STD prevention into the care of PLWH.</p> <p>Clinical significance: a national training program can (1) reach providers who deliver services to PLWH; (2) widely disseminate recommended practices; (3) increase confidence in knowledge and skills for incorporating HIV/STD prevention into the care of PLWH; and (4) increase self-reported frequency of using recommended practices.</p>

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<p>Felderman-Taylor, J., & Valverde, M. (2007). A structured interview approach to evaluate HIV training for medical care providers. <i>Journal of the Association of Nurses in AIDS Care</i>, 18(4), 12-21. doi:10.1016/j.jana.2007.05.006</p> <p>United States</p> <p>Training and support from HRSA and Special Project of National Significance (SPNS)</p> <p>New Mexico State University IRB</p> <p>Consent obtained twice</p>	<p>Kirkpatrick's Learning and Training Evaluation Model</p>	<p>Design: Qualitative</p> <p>Purpose: The purpose of this study was to evaluate the self-perceived impact of the SPNS trainings on provider attitudes and behavior while staying within considerable time and resource constraints.</p> <p>Method: HIV/AIDS education trainings and self-reported changes in provider behavior resulting from the trainings were evaluated in a structured interview and survey with 24 health care providers</p>	<p>N=112 n=24</p> <p>Inclusion criteria: (a) physician or advanced practice clinician, (b) attended 1 or more SPNS training between January 2002 and May 2004, (c) cared for at least 1 HIV-infected patient in the last year, and (d) still resided in the area.</p> <p>Exclusion criteria: Did not meet criteria above</p> <p>Setting: Camino de Vida Center for HIV Services, and the New Mexico AETC</p>	<p>IV1=demographics IV2=value of training</p> <p>DV1=Detecting or intervening with patients, e.g., identifying or treating patients at earlier stages of HIV DV2= Initial screening for HIV DV3=Willingness to treat HIV patients DV4= Providing sensitive and appropriate services DV5=HIV medications and side effects DV6=Adherence issues DV7=Identifying and managing coinfections DV8=Documentation of cases or charting</p>	<p>15-minute structured interview tool was developed based on one that had been created and used on a much larger scale in the 1990s by The Measurement Group</p>	<p>Descriptive statistics were used to analyze the sociodemographic data, and the open-ended questions were manually analyzed and categorized by an independent coder. A second researcher who had not participated in the interviews checked the accuracy of the categorizations.</p>	<p>Percent of providers who believed improvements due to training DV1=92% DV2=83% DV3=75% DV4=75% DV5=75% DV6=63% DV7=50% DV8=29%</p> <p>the majority of the providers believed they gained knowledge about HIV/AIDS care,</p> <p>Providers rated low interest in HIV risk assessment and expressed dissatisfaction with this training</p>	<p><i>Strengths</i>= more data focused than previous Likert scales. Level 2 on Kirkpatrick's model.</p> <p><i>Weaknesses</i>= Self-reported data, small convenience sample, timing variation from intervention to survey, no inferential stats</p> <p><i>Conclusion</i>= HIV Training effective</p> <p><i>Clinical significance</i>: HIV training helps improve provider practice, however further research is needed in risk assessment training</p>

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<p>Flodgren, G., Parmelli, E., Doumit, G., Gattellari, M., O'Brien, M. A., Grimshaw, J., & Eccles, M. P. (2011). Local opinion leaders: Effects on professional practice and health care outcomes. <i>The Cochrane Database of Systematic Reviews</i>, (8), CD000125</p> <p>Ten trials were based in the US, six in Canada, one in China, and one in Argentina and Uruguay.</p> <p>Assessed each study for bias using tools. Did include studies with high risk of bias and poor methodological quality</p> <p>No conflicts of interest</p> <p>Supported by internal and external academic and professional sites.</p>	<p>Social Learning Theory and Innovation Diffusion Theory</p>	<p>Design: Systematic review</p> <p>Purpose: To assess the effectiveness of the use of local opinion leaders in improving professional practice and patient outcomes.</p> <p>Method: Authors searched Cochrane EPOC Group Trials Register, the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, HMIC, Science Citation Index, Social Science Citation Index, ISI Conference Proceedings and World Cat Dissertations up to 5 May 2009, reference lists of included articles also searched.</p>	<p>N=595 n=18</p> <p>Inclusion criteria: RCTs investigating the effectiveness of using opinion leaders to disseminate EBP and reporting objective measures of professional performance and/or health outcomes.</p> <p>Exclusion criteria: Did not involve healthcare professionals as opinion leaders, not RCT.</p> <p>Setting: RCTs conducted in 296 hospitals and 318 PCPs</p>	<p>DV1) 5 RCTs compared opinion leaders alone to no intervention, DV2) 2 RCTs compared opinion leaders alone to a single intervention, DV3) 4 RCTs compared opinion leaders with one or more additional intervention(s) to the one or more additional intervention(s), DV4) 10 RCTs compared opinion leaders as part of multiple interventions to no intervention,</p>	<p>Literature review: Graded evidence. High quality, Moderate quality, . Low quality, and Very low quality.</p>	<p>Two review authors independently extracted data from each study and assessed its risk of bias. For each trial, they calculated the median risk difference (RD) for compliance with desired practice, adjusting for baseline where data were available. Then reported the median adjusted RD for each of the main comparisons.</p> <p>No statistical measurement of heterogeneity</p>	<p>RD 15% -72% The median adjusted RD for the main comparisons were: DV1) +0.09; DV2) +0.14; DV3) +0.10 DV4) +0.10. Overall, across all 18 studies the median adjusted RD was +0.12 representing a 12% absolute increase in compliance in the intervention group.</p>	<p>Level 1 Evidence</p> <p><i>Strengths=</i> High level evidence from respected peer reviewed source</p> <p><i>Weaknesses=</i> Heterogenous studies, different outcomes, setting, and interventions measured. Opinion leader role not defined/consistent</p> <p><i>Conclusion=</i> Opinion leaders alone or in combination with other interventions may successfully promote evidence-based practice, but effectiveness varies both within and between studies.</p> <p><i>Clinical significance:</i> Opinion leaders can help improve practice. The effect is similar to academic detailing. When part of multidisciplinary group and combined with intervention, may have most effect on outcomes.</p>

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<p>Gallagher, D. M., Hirschhorn, L. R., Lorenz, L. S., & Piya, P. (2017). Developing a Community of Practice for HIV Care. <i>Journal of Continuing Education in the Health Professions</i>, 37(1), 27-36. doi:10.1097/ceh.000000000000141</p> <p>United States</p> <p>The Institutional Review Board of the University of Massachusetts Medical School</p> <p>No bias noted</p>	<p>Conceptual framework for a community of practice (CoP) in HIV care</p>	<p>Design: Mixed method study</p> <p>Purpose: Assess the extent to which NEAETC has been successful in delivering education that more actively engages participants in their own learning and understand, from the perspective of program participants, the benefits and challenges associated with the program.</p> <p>Method: analysis of routinely collected program data combined with semi structured interviews.</p>	<p>N=107 n=30</p> <p>Inclusion criteria: membership in one of the six HRSA-targeted disciplines (physicians, nurses, PAs, nurse practitioners, clinical pharmacists, and dentists and dental professionals) and participation in at least 10 NEAETC trainings between 2009 and 2013</p> <p>Exclusion criteria: Not above professional, did not attend at least 10 trainings</p> <p>Setting: Northeast U.S. AETC sites 2010 to 2014</p>	<p>Quantitative data: IV1 – role IV2-sex IV3-practice setting IV4- years as HIV provider IV5-race</p> <p>DV1- training levels, DV2 - training modalities DV3 - participant numbers</p> <p>Qualitative data: HIV work of providers, their motivations for staying in the field, HIV trainings they have attended, reported value of NEAETC in meeting their HIV education needs, ways in which the trainings have contributed to their ability to provide quality care as individuals and as team members, strengths of NEAETC offerings, and suggestions for improvement</p>	<p>Routine AETC data for quantitative portion and semi structured interviews (27 by phone, 3 in person)</p>	<p>The lead evaluator drafted an initial set of codes and descriptions with a sample of coded interviews. The first three coauthors reviewed and commented on the code book as they iteratively discussed the data and coding process, and reviewed transcripts and output. By the third round of discussions, the team reached consensus on code labels, definitions, and use. Two authors coded all transcripts using atlas.ti qualitative data analysis software version 7.5.10</p>	<p>IV1) 39-38% physicians (2010-2014) 15-14% RNs (2010-2014) IV2) 37% M 63% F IV3) Urban 97%, rural 3% IV4) <10=23% 10-19=27% 20-29=33% >30=17% IV5) Asian=7% Black=10% Hispanic=7% White= 77%</p> <p>Saturation not reached due to small sample</p> <p>six main themes: information, pedagogical modalities, empowerment, benefits to patients, challenges, and suggestions for improvement</p>	<p><i>Strengths=</i> Highly peer reviewed with reproduced results consistent with literature</p> <p><i>Weaknesses=</i> Low sample not random, may exclude rural providers</p> <p><i>Conclusion=</i> NEAETC’s strategies of adopting active learning modalities and adapting content to local needs seem to have been successfully implemented and these changes contributed to knowledge translation among HIV providers at different stages of experience and across sites.</p> <p><i>Clinical significance:</i> Found NEAETC trainings improved patient outcomes such as higher rates of viral suppression and successful in developing communities of practice (CoPs)</p>

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<p>Lubelchek, R. J., Hotton, A. L., Taussig, D., Amarathithada, D., & Gonzalez, M. (2013). Scaling up Routine HIV Testing at Specialty Clinics. <i>JAIDS Journal of Acquired Immune Deficiency Syndromes</i>, 64. doi:10.1097/qai.0b013e3182a90167</p> <p>United States</p> <p>No bias or conflicts of interest noted</p> <p>Supported by NIH funding</p>	<p>Adult learning theory</p>	<p>Design: Controlled trial (non-randomized)</p> <p>Purpose: Evaluate barriers to routine HIV testing and assess academic detailing to increase routine HIV testing</p> <p>Methods: Authors assessed specialty provider knowledge, attitudes, and barriers to routine HIV testing using a survey at 3 specialty clinics. Responses informed content for academic detailing presentations to clinic’s medical providers. Survey responses analyzed with descriptive statistics.</p>	<p>N=43 providers</p> <p>Inclusion criteria: Providers in 3 clinics, physicians, complete surveys</p> <p>Exclusion criteria: Did not meet criteria above</p> <p>Setting: 4 specialty clinics in Chicago April-May 2012 (hematology clinic served as control)</p>	<p>Phase 1 (assess barriers/needs of clinics)</p> <p>IV1=Providers staffing clinic IV2=sex IV3=attending/residents IV4=approximate annual patient visits</p> <p>DV1=Knowledge of HIV testing guidelines DV2=Attitudes about HIV testing DV3=Barriers to HIV testing</p> <p>Phase 2 (academic detailing) DV1=HIV testing rates</p>	<p>Survey for phase 1, survey at phase 2 after custom intervention</p>	<p>Phase 1- descriptive</p> <p>Phase 2- Proportion of patients tested among total patients eligible monthly per site, evaluated trends in testing over time using Cochran–Armitage test. Overall differences in proportion of patients tested at each clinic found using x2 tests. Logistic regression used to determine whether the odds of testing differed during the intervention and postintervention periods compared with the preintervention period. Analyzed data using SAS Version 9.2</p>	<p>Phase 1) IV1=83% (p=0.09) IV2=58% F (p=0.69) IV3=26% (p<0.001) IV4=5700=trauma, 20000 Derm, 13000 psych, hem n/a)</p> <p>DV1=42-90% x2 = 9.10, P = 0.011). DV2=barriers include confidence in HIV testing, discussing positive results, and offering universal testing</p> <p>Phase 2) HIV testing increase in psych, dermat, decrease in trauma clinic and hem control groups</p>	<p><i>Strengths=</i> Peer reviewed</p> <p><i>Weaknesses=</i> External forces affect results, differences in resident rotations, policy differences</p> <p><i>Conclusion=</i> academic detailing interventions can improve routine HIV testing</p> <p><i>Clinical significance:</i> Academic detailing may be useful as part of scaling up efforts for HIV testing/screening in primary and specialty clinics</p>

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<p>Meehan, T. P., Van Hoof, T. J., Giannotti, T. E., Tate, J. P., Elwell, A., Curry, M., & Petrillo, M. K. (2009). A descriptive study of educational outreach to promote use of quality improvement tools in primary care private practice. <i>American Journal of Medical Quality</i>, 24(2), 90-98. doi:10.1177/1062860608329797</p> <p>Funded by CMS and US department of HHS</p>	<p>Adult learning theory</p>	<p>Design: Mixed method study</p> <p>Purpose: To assess the experience of a Quality Improvement Organization (QIO) providing educational outreach to promote use of quality improvement (QI) tools in primary care private practice.</p> <p>Method: Two QIO outreach workers conducted visits with physicians and targeted staff. Data were analyzed on physician demographics, visits, and use of QI tools using standard quantitative and qualitative methods</p>	<p>N=165</p> <p>Inclusion criteria: Primary care provider in Connecticut, agree to intervention</p> <p>Exclusion criteria: Specialist, not agree to intervention</p> <p>Setting: 16 months beginning in April of 2003 in Connecticut</p>	<p>IV1-physician gender IV2-specialty IV3-year graduation from med school IV4-# physicians per practice</p> <p>DV1-#EOV DV2-# minutes EOV DV3-#QI tools adopted DV4-#baseline performance measures above median DV5-QI tools adopted DV6-Barriers</p>	<p>1) electronic contact log used by the educational outreach staff to capture information on interactions 2) written minutes of the weekly team meetings that the physician supervisor held with the outreach staff. 3)Quantitative: obtained from the 2003 <i>Folio's Directory of Connecticut Physicians</i> and the 2003 Connecticut Department of Public Health Physician Licensure database.</p>	<p>Univariate frequencies were calculated for physician characteristics, practice visits, and number of QI tools used by the physicians. Differences among groups were assessed with χ^2 tests. The association between number of visits and number of QI tools adopted was examined with linear regression. 2)Themes compared until consensus reached</p>	<p>IV1-83% M IV2-78% IM 22%FM IV3-62% 1980-1965 IV4-23.6% in solo practice, 23% 1 partner, 53.3% had 2 or more partners</p> <p>DV1-0-13 DV2-most <5 minutes, up to >25 minutes. DV3-0->5 DV4-0-1-60-40% 2-63-37% 3 or 4-70-30% (from 3-7 EOVS to 8-14 EOVS respectively) DV5-Patient education-59% Referral resources-58% Patient reminders-56% Documentation tools patient – 45% Clinician reminders-37% Clinician education materials-33% Clinician doc tools-30% Performance data reports-13%</p>	<p>Strengths= many outcomes studied, results clear.</p> <p>Weaknesses=Barriers for EOVS, data may be incomplete as was obtained from field notes, self-reported data, sample may not be representative. Did not assess knowledge, attitudes, or barriers related to EOVS, small sample.</p> <p>Conclusion=Variable success in EOVS to implement QI tools. graduates of foreign medical schools (FMS) ># of EOVS and physicians who were more recent medical school graduates or who had lower volumes of Medicare patients >#EOVs. Physicians with certain characteristics adopted more QI tools.</p> <p>Clinical significance: EOVS could target more recent medical school graduates, FMS providers, and those with less Medicare patients</p>

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Citation	Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement	Data Analysis	Findings	Decision for Use in Practice/Application to Practice
<p>Myers, J. J., Bradley-Springer, L., Kang Dufour, M., Koester, K. A., Beane, S., Warren, N., . . . Frank, L. R. (2012). Supporting the integration of HIV testing into primary care settings. <i>American Journal of Public Health, 102</i>(6), e25-e32. doi:10.2105/AJPH.2012.300767</p> <p>United States</p> <p>No bias or conflicts of interest noted</p> <p>Funding from HRSA, CDC, and AETC</p>	<p>Healthcare cooperative extension model</p>	<p>Design: Mixed method study, retrospective case study</p> <p>Purpose: To demonstrate how AETC education helped providers integrate HIV testing into routine clinical care with the goals of early diagnosis and treatment.</p> <p>Method: quantitative process data from 8 regional AETCs for July 1, 2008-June 30, 2009, and qualitative program descriptions</p>	<p>N=8 regions included in this study delivered 2709 HIV testing events for a total of 15 171 hours of training that reached 38 321 participants. n-11,921</p> <p>Inclusion criteria: Participated in one of 8 regional AETC trainings</p> <p>Exclusion criteria: Did not participate in AETC trainings in 8 regional sites</p> <p>Setting: 8 regional AETCs from July 2008-June 2009</p>	<p>IV1=training Topics IV2=number of participants IV3=training event type IV4=delivery method IV5=demographics IV6=employment area</p> <p>DV1=time spent DV2=types, and modalities of training DV3=technical assistance activities w/wo HIV testing as a topic. DV4=clinical management of HIV DV5=health care organization and delivery issues DV6= prevention and behavior change. DV7=psychosocial issues DV8= targeted populations</p>	<p>Survey for quantitative portion.</p> <p>Case reviews for qualitative portion</p>	<p>Used t test and the v2 test to evaluate the statistical significance of differences in continuous and categorical data elements (at P <0.05)</p> <p>Scored candidate cases using standardized criteria for specific themes deemed a priori to be important contributors to results at a clinic level.</p>	<p>HIV testing academic detailing sessions were longer 5.6 vs 2.0 hours; P < .001) and included more participants (14 vs 6; P < .001). They also included more skill building and were more interactive. HIV testing 20% of total trainings. Focused on health care delivery (67% vs 31%), prevention and behavior change (100% vs 21%), psychosocial issues (42% vs 23%), and targeted populations (36% vs 11%; all P < .01).</p>	<p><i>Strengths</i>= large sample size, solid methodology</p> <p><i>Weaknesses</i>= Not randomized sample, not all regional AETC participated, short time between intervention and data collection</p> <p><i>Conclusion</i>=HIV testing trainings were more diverse in terms of the level of training and concentrated more on service coordination, mental health, substance abuse, risk reduction, and hard-to-reach populations.</p> <p><i>Clinical significance:</i> AETC academic detailing improves HIV testing and changes in practice</p>

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Citation	Conceptual Framework	Design/Method	Sample/Setting	Major Variables & Definitions	Measurement	Data Analysis	Findings	Decision for Use in Practice/Application to Practice
<p>O'Brien, M. A., Rogers, S., Jamtvedt, G., Oxman, A. D., Odgaard-Jensen, J., Kristoffersen, D. T., . . . Harvey, E. L. (2007). Educational outreach visits: Effects on professional practice and health care outcomes. <i>The Cochrane Database of Systematic Reviews</i>, (4), CD000409.</p> <p>No bias or conflicts of interest noted</p> <p>North America, Europe, Asia, and Australia</p> <p>Support sources: Supportive Cancer Care Research Unit, Juravinski Cancer Centre, Canada, McMaster University, Ontario, Canada, University College London, UK, Norwegian Knowledge Centre for the Health Services, Norway, Department of Health (England) Cochrane Review Incentive Scheme 2006, UK, The Norwegian agency for development cooperation, Norway.</p>	<p>Adult learning theory, social marketing theory</p>	<p>Design: Systematic review</p> <p>Purpose: To assess the effects of EOVs on health professional practice or patient outcomes.</p> <p>Method: Researchers searched the Cochrane EPOC register to March 2007. In their original review, they searched multiple bibliographic databases including MEDLINE and CINAHL</p>	<p>N=69 n=28</p> <p>Inclusion criteria: Randomized trials of EOVs that reported an objective measure of professional performance or healthcare outcomes. An EOV was defined as a personal visit by a trained person to healthcare professionals in their own settings.</p> <p>Exclusion criteria: Non-randomized trials, intervention did not include EOV, outcomes not dichotomous, and high risk of bias</p> <p>Setting: 23 trials were based in North America, 22 in the UK, 14 in Europe, eight in Australia, 2 in Indonesia and 1 in Thailand</p>	<p>Primary Factors: DV1= the targeted behavior (prescribing versus other behaviors) DV2=baseline compliance DV3=the number of clinicians included at each visit DV4=the number of EOVs</p> <p>Secondary Factors: DV5=the complexity of the targeted behavior DV6=the seriousness of the outcome DV7=risk of bias (high versus moderate) DV8=the contribution of EOVs as a component of the intervention</p>	<p>Two reviewers independently extracted data and assessed quality. They used bubble plots and box plots to visually inspect the data.</p>	<p>Researchers conducted both quantitative and qualitative analyses. They used meta-regression to examine potential sources of heterogeneity determined a priori. Eight factors were hypothesized to explain variation across effect estimates. In primary visual and statistical analyses, they included only studies with dichotomous outcomes, with baseline data and with low or moderate risk of bias, in which the intervention included an EOV and was compared to no intervention.</p>	<p>The median adjusted risk difference (RD) in compliance with desired practice was 5.6% (interquartile range 3.0-9.0%)</p> <p>Less effect on prescribing, more variance on effects with other practice behaviors (median adjusted RD 6.0%, interquartile range 3.6% to 16.0 % for 17 comparisons)</p>	<p>Level 1 Evidence</p> <p><i>Strengths=</i> Large sample size, solid methodological approach</p> <p><i>Weaknesses=</i> Variable measurements make comparison difficult, definitions of EOV may change among studies</p> <p><i>Conclusion=</i> EOVs alone or when combined with other interventions have effects on prescribing that are relatively consistent and small, but potentially important. Their effects on other types of professional performance vary from small to modest improvements, and it is not possible from this review to explain that variation.</p> <p><i>Clinical significance:</i> EOVs, with or without additional interventions, can be effective in improving health in professional practice.</p>

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Appendix E

Synthesis Table

Studies	Bashook et al.	Bokhour et al.	Cook et al.	Culyba et al.	Dreisbach et al.	Felderman-Taylor et al.	Flodgren et al.	Gallagher et al.	Lubelcheck et al.	Meehan et al.	Myers et al.	O'Brien et al.
Study Design	Mixed methods	Mixed methods	Quantitative	Mixed methods longitudinal	Quantitative	Qualitative	Systematic review	Mixed methods	Controlled trial	Mixed methods	Mixed method retrospective	Systematic review
Year Published	2010	2014	2009	2011	2014	2007	2011	2017	2013	2009	2012	2007
Location	USA Midwest AETCs	USA VAs	Colorado, USA	Southeast USA	USA	USA	US, Canada, China, Argentina, and Uruguay.	USA	USA	Connecticut, USA	USA	Europe, North America, Asia, Australia
Sample	631	41	2112	23	320	24	18	30	43	165	11,921	28
Conceptual framework	Diffusion of innovation	PARIHS model	Kirkpatrick's typology	Adult learning and active learning	ASI curriculum	Kirkpatrick's Learning and Training Evaluation Model	Social Learning Theory and Innovation Diffusion Theory	Conceptual framework for a community of practice (CoP) in HIV care	Adult learning theory	Adult learning theory	Healthcare cooperative extension model	Adult learning theory, social marketing theory
Bias noted/ Conflicts of interest	none	none	none	none	none	none	none	none	none	none	none	none
Dependent variables	Knowledge, attitudes, clinical practice change	Context, evidence, HIV testing	Satisfaction, knowledge, intent to change, practice behavior	Knowledge and skills	Knowledge, skills, intent to change, barriers	Interventions, HIV screening, willingness to treat PWLH, provide appropriate services, medications & side effects, adherence issues, coinfection dx and management, documentation of cases or charting	Opinion Leaders and correlation with academic detailing and other interventions	Training levels, modalities, and number of participants	Knowledge, attitudes, barriers to HIV testing, HIV testing rates	Number of visits, time, QI tools adopted, performance measures, And barriers	Time spent, types of training, reasons for visits, themes, and targeted populations	Targeted behavior, visits, providers, baseline compliance, complexity, seriousness, bias, and contribution of EOY

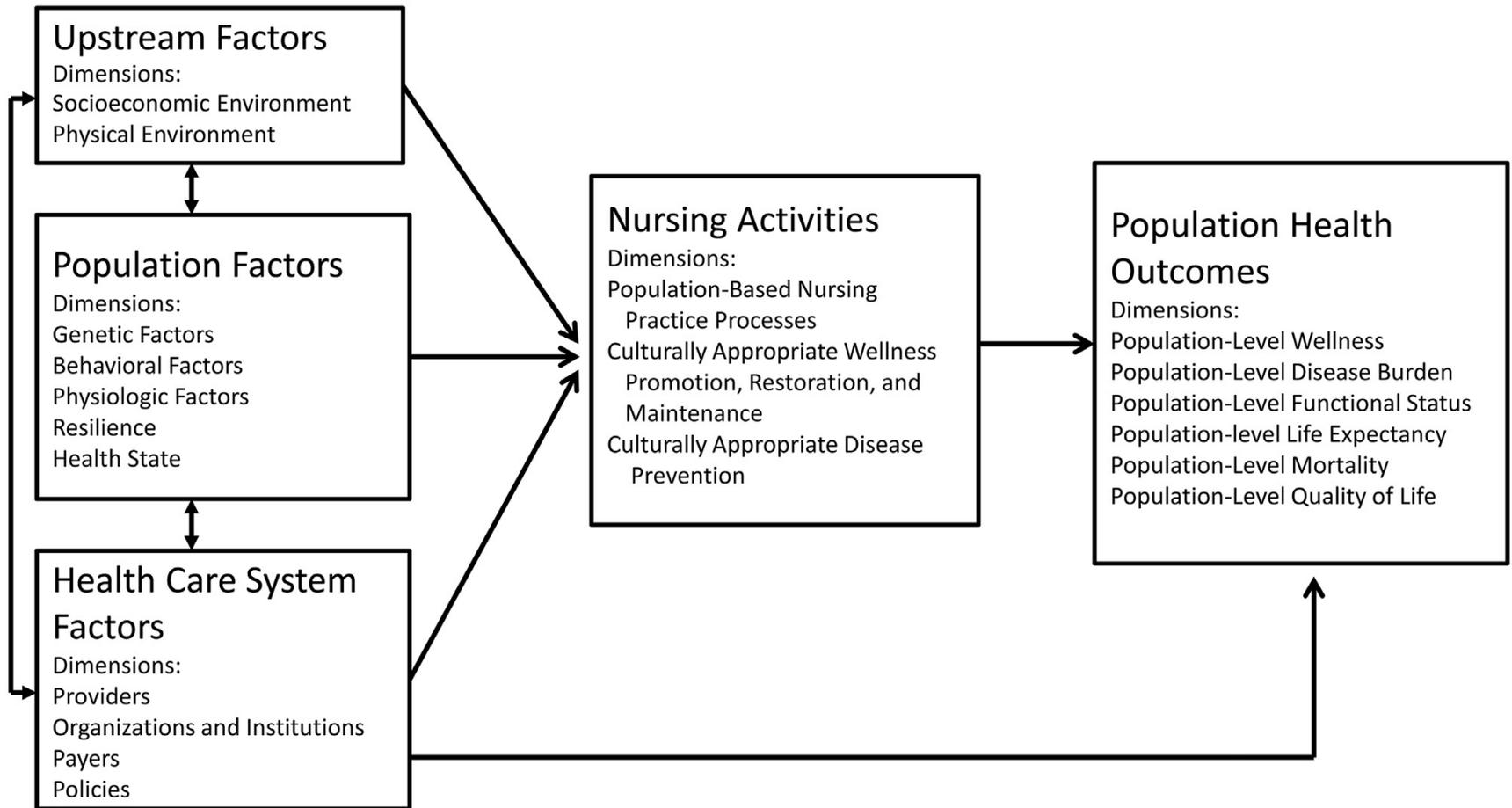
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Outcomes/ conclusions	Academic detailing improved patient care and clinical practice	Academic detailing improved providers knowledge of evidence and HIV testing	Interactive and one on one trainings predicted practice change	Academic detailing improved knowledge and skills	Improve knowledge, skills, and intent to change practice	Academic detailing improved self-reported scores in all areas	Opinion leaders can improve practice/changes especially when combined with academic detailing	Training Improved knowledge especially when content adapted	Academic detailing improved HIV testing	Certain providers more likely to benefit from academic detailing	Academic detailing improves HIV testing and practice changes	Small to modest improvements in clinical practice/compliance after EOv
Academic detailing effective?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

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Appendix F

The Conceptual Model of Nursing and Population Health (CMNPH)



Appendix G

Promoting Action on Research Implementation in Health Services Framework (PARIHS)

