HIV Testing of At Risk Patients in a Large Integrated Health Care System

Douglas K. Owens, MD, MS [1,2], Vandana Sundaram, MPH [1,2], Laura C. Lazzeroni, PhD [3], Lena R. Douglass, BS [1], Patricia Tempio, BS [1], Mark Holodniy, MD [1,4], Gillian D. Sanders, PhD [2,5], Vera M. Shadle, MHA, MHS [6], Valerie C. McWhorter, MD [7], Teodora Agoncillo, BS [7], Noreen Haren, MPH [8], Darlene Chavis [8], Leila H. Borowsky, MPH [1], Elizabeth M. Yano, PhD [9,10], Peter Jensen, MD [6], Michael S. Simberkoff, MD [8], and Samuel A. Bozzette, MD, PhD [7]

[1] VA Palo Alto Healthcare System, Palo Alto, CA, USA; [2]Center for Primary Care and Outcomes Research, Department of Medicine, Stanford University, 117 Encina Commons, Stanford, CA 94305-6019, USA; [3]Department of Health Research and Policy, School of Medicine, Stanford University, Stanford, CA, USA; [4] Division of Infectious Diseases & Geographic Medicine, Stanford School of Medicine, Stanford, CA, USA; [5]Duke Clinical Research Institute, Duke University, Durham, NC, USA; [6] VA San Francisco Healthcare System, San Francisco, CA, USA; [7] VA San Diego Healthcare System, San Diego, CA, USA; [8] VA New York Harbor Healthcare System, New York, NY, USA; [9] VA Greater Los Angeles Healthcare System, Sepulveda, CA, USA; [10]Department of Health Services, UCLA School of Public Health, Los Angeles, CA, USA.

OBJECTIVE: Early identification of HIV infection is critical for patients to receive life-prolonging treatment and risk-reduction counseling. Understanding HIV screening practices and barriers to HIV testing is an important prelude to designing successful HIV screening programs. Our objective was to evaluate current practice patterns for identification of HIV.

METHODS: We used a retrospective cohort analysis of 13,991 at-risk patients seen at 4 large Department of Veterans Affairs (VA) health-care systems. We also reviewed 1,100 medical records of tested patients. We assessed HIV testing rates among at-risk patients, the rationale for HIV testing, and predictors of HIV testing and of HIV infection.

RESULTS: Of the 13,991 patients at risk for HIV, only 36% had been HIV-tested. The prevalence of HIV ranged from 1% to 20% among tested patients at the 4 sites. Approximately 90% of patients who were tested had a documented reason for testing.

CONCLUSION: One-half to two-thirds of patients at risk for HIV had not been tested within our selected VA sites. Among tested patients, the rationale for HIV testing was well documented. Further testing of at-risk patients could clearly benefit patients who have unidentified HIV infection by providing earlier access to life-prolonging therapy.

INTRODUCTION

Early identification of HIV disease is essential for both clinical care and prevention of HIV transmission. Antiretroviral therapy has dramatically improved survival with HIV-1 disease,[1,2] and the initiation of therapy early provides a substantial increase in life expectancy compared to therapy begun late in the course of disease.[3] Early identification also contributes to reduced HIV transmission[3] because appropriately devised counseling reduces risk behaviors,[4–6] people who become aware they have HIV change their behavior,[7] and antiretroviral therapy reduces viral load, which provides an additional reduction in transmission.[3] Finally, screening for HIV is cost effective,[3,8,9] even when the prevalence of HIV is as low as 0.05%, which would include the vast majority of health-care settings.

Despite the clear individual and public health advantages of early identification of HIV infection, data from the Centers for Disease Control and Prevention (CDC) indicate that between 42% and 59% of the approximately 850,000 to 950,000 people with HIV/AIDS infection have either not been identified or are not receiving treatment.[10] The CDC also estimates that as many as 20,000 new HIV infections are attributable to transmission from individuals who did not know they were infected with HIV.[11] Surveillance data from the CDC indicate that 43% of HIV-positive patients first learned they had HIV within a year of developing AIDS,[12] and other studies have found that approximately 40% of patients have a CD4 lymphocyte count of less than 200 cells/μL at the time of diagnosis, an indication of advanced disease.[13,14] Thus, many people are diagnosed late in the disease process, which indicates that current approaches to early identification are inadequate. This evidence led the CDC to recommend recently that all adolescents and adults in the United States between the ages of 13 and 64 years of age be tested for HIV.[15]

To help understand how to improve early identification of HIV infection, we undertook a study to evaluate the existing practice patterns for the identification of HIV infection at selected sites within the Department of Veterans Affairs (VA). The VA is one of the largest health-care systems in the United

States, and quality of care in the VA compares favorably with private-sector delivery systems.[16–18] The VA is also the largest provider of HIV health care in the United States and one of the largest providers of HIV care in the world, with over 19,000 HIV-infected patients in care.[19] Because of the large number of patients served, testing in large health-care delivery systems is of special importance.[13] We evaluated whether patients at risk for HIV were being tested, the rationale for testing in those who were tested, predictors of testing, and predictors of HIV infection in 4 large VA health care centers.

METHODS

We used 2 approaches to assess existing practice patterns for HIV screening and testing in the VA: (1) an analysis of a cohort of at-risk patients and (2) an analysis of a cohort of tested patients for a 1-year period. Our analysis of tested patients used both a computer-based analysis of a cohort of all HIV-tested patients for a 1-year period and a detailed medical record review of a subset of these patients.

We chose 4 large VA Health Care Systems that were geographically dispersed (3 on the west coast and 1 on the east coast) and that had estimated HIV prevalence that varied from 0.5% to 2.1%, based on the VA Immunology Case Registry.[20] These centers cared for between approximately 180 and 1,000 patients with HIV each. The research was approved by the institutional review board at each site. We took extensive precautions to protect patient confidentiality. The funders had no role in the design, conduct, interpretation, or reporting of this study.

Analysis of At-Risk Cohort

We used the VA Medical Inpatient and Outpatient Data Sets of the National Patient Care Database to select a cohort of VA patients who were seen between October 1, 1998, and September 30, 1999, at 4 VA medical centers and were at risk for HIV infection. We defined patients to be at risk for HIV infection if their record contained ICD-9 codes[21] for substance use (specifically, alcohol use, amphetamine use, barbiturate use, cannabis use, cocaine use, opioid use, hallucinogen use, other drug use, and unspecified and drug psychosis), hepatitis B, hepatitis C, all viral hepatitis (other than hepatitis B or C), or sexually transmitted disease at any visit during this time period. Because there is controversy about which ICD-9 codes put patients at increased risk, in sensitivity analyses, we used successively more restrictive definitions of risk factors, with the most restrictive definition including only cocaine, opiate, or amphetamine use. We also collected data on demographic characteristics and selected comorbid conditions (e.g., pneumonia/influenza, septicemia, chronic liver disease) for the cohort.

We determined whether these patients had been tested for HIV within the VA during the 5-year period from October 1, 1995, to September 30, 2000, by using the Veterans Health Information Systems and Technology Architecture (VISTA). We included the 3 years prior to October 1, 1998, because if a patient had been tested during this time, a repeat HIV test may not have been necessary. A test result was considered positive or indeterminate on the basis of the Western blot test result. It was not feasible for us to determine whether patients at risk had been tested outside the VA.

Analysis of Tested Cohort

We obtained HIV testing information from VISTA for the cohort of patients who received an HIV test from October 1, 1998, to September 30, 1999, at the 4 VA medical centers. We matched this cohort to data from the VA Medical Inpatient and Outpatient Data Sets, for the period between October 1, 1995, and September 30, 1999, to obtain data on demographics, comorbid conditions, and risk factors based on ICD-9 diagnoses codes.[21] We excluded patients who were nonveterans and for whom gender information was inconsistent.

We chose a random subsample of the cohort of HIV-tested patients for a detailed medical record review. We conducted 275 medical record reviews each at the 4 health care centers. The medical record review assessed if the patient had a documented risk factor for HIV, the indications for testing, and the documentation of informed consent and pre- and posttest counseling. We trained chart abstractors at each site and reabstracted a random sample of 10% of charts to ensure quality and consistency of abstractions across sites.

We considered the rationale for testing to be documented if patients had an ICD-9 risk factor defined as above (including alcohol use); if the provider documented a risk factor or another reason for the test, such as clinical presentation suggestive of HIV infection (including opportunistic infection, hepatitis B, hepatitis C, or sexually transmitted diseases); or if the patient requested testing. At the time when testing was done in our study, guidelines for screening recommended risk-based testing; as noted, these recommendations have now changed.

To determine predictors of HIV testing in the at-risk cohort, and predictors of HIV infection in the tested cohort, we conducted single predictor analyses and forward-stepwise logistic regression models that included all the variables that were statistically significant in the single predictor analysis at a significance level of $P<.05$. We used forward-stepwise logistic regression because collinearity among variables precluded us from starting with the entire set of predictors, as is required in backward selection.

RESULTS

Analysis of At-Risk Cohort

Between October 1, 1998, and September 30, 1999, 13,991 unique patients were seen at the 4 VA medical centers that fit our broadest definition of risk behaviors, which included substance abuse (including alcohol), hepatitis, or sexually transmitted diseases (Table 1). Of these patients, only 5,076 (36%) were HIV-tested within the VA during a 5-year period from October 1, 1995, to September 30, 2000; testing ranged from 32% to 40% by site ($P<.01$) (Table 2). When we used a more restrictive definition of risk behaviors, the total number of patients who met the definition decreased and the proportion that had been tested increased modestly (Table 1). Even with the most restrictive definition of at-risk, over half of patients had not been tested within the VA. Among all at-risk

Table 1. Proportion of at-risk patients tested for HIV

At-risk definition	Number at risk	Number tested	% tested
Alcohol use, substance use,* hepatitis,[†] sexually transmitted diseases	13,991	5,076	36
Substance use,* hepatitis,[†] sexually transmitted diseases	9,703	4,085	42
Cocaine use, opiate use, amphetamine use, hepatitis B, hepatitis C, sexually transmitted diseases	7,540	3,387	45
Cocaine use, opiate use, amphetamine use	4,658	2,258	48

Substance use includes amphetamine use, barbiturate use, cannabis use, cocaine use, opioid use, hallucinogen use, other drug use, and unspecified and drug psychosis.
[†]*Includes all viral hepatitis.*

patients, HIV testing was more likely among younger age groups, in patients who were African American, in patients who had hepatitis or sexually transmitted diseases, or in those who used cocaine or opiates (Table 3).

Of the 5,076 at-risk patients who were HIV-tested during a 5-year period, 339 (6%) were HIV-infected, ranging from 1% to 19% by site (Table 2). HIV infection was more likely among patients 30–39 [adjusted OR 12.8 (95% confidence interval, CI: 1.72–95.40)], 40–49 [adjusted OR 10.8 (1.48–79.21)], and 50–59 years of age [8.8 (1.20–64.93)], respectively, relative to those >=70 years of age, among African Americans compared to whites [adjusted OR 2.5 (1.87–3.24)], and among patients with hepatitis B virus infection [adjusted OR 2.7 (1.82–3.92)]. In this cohort of HIV-infected patients, in which all patients had an identifiable risk factor, patients with hepatitis C virus infection were not more likely than other patients to have HIV infection.

Table 2. Demographic characteristics and HIV testing results among at-risk cohort

	Site 1 n=4,239	Site 2 n=3,016	Site 3 n=3,227	Site 4 n=3,192	Multi-site* n=317
Gender (%)					
Male	97	98	97	98	97
Mean age (range)	51 (23–92)	51 (21–91)	49 (20–87)	50 (22–94)	48 (27–76)
Race/ethnicity (%)					
White	52	41	55	30	50
African American	14	22	13	33	36
Hispanic	8	4	6	13	7
Other	2	1	2	1	2
Unknown	25	31	25	24	6
Tested for HIV (%)	40	34	36	32	63
HIV-positive (%)[†]	1	5	6	19	4

Percentages may not total 100 due to rounding. HIV testing was conducted from October 1, 1995, to September 30, 2000.
Multisite refers to patients seen at more than 1 facility.
[†]*Percentage based on number of HIV tests done.*

Table 3. Predictors of HIV testing among at-risk cohort

Risk factor	Adjusted odds ratio	95% confidence interval
Age group (years) (relative to >=70-year-olds)		
20–29	4.7*	3.37–6.67
30–39	4.7*	3.75–5.93
40–49	4.2*	3.42–5.19
50–59	3.6*	2.89–4.39
60–69	2.1*	1.69–2.69
Race/ethnicity (relative to white)		
African American	1.2*	1.10–1.34
Hispanic	1.2[†]	1.02–1.34
Asian	1.1	0.73–1.56
American Indian	1.4	0.83–2.26
Hepatitis (relative to none)		
Hepatitis C	2.4*	2.16–2.67
Hepatitis B	1.8*	1.36–2.47
Hepatitis B and C	2.5*	1.90–3.18
Cocaine use	1.6*	1.45–1.76
Opiate use	1.6*	1.42–1.77
Sexually transmitted diseases	1.6*	1.31–1.92

Gender, site, alcohol use, and amphetamine use were significant in the single predictor model but not significant in the stepwise logistic regression analysis.
$P<.01$.
[†]*$P<.05$.*

Analysis of Tested Cohort

There were 4,810 unique patients who received an HIV test at the 4 VA medical centers during the period between October 1, 1998, and September 30, 1999. Of these, 4,791 (99.6%) patients could be matched to data from the National Patient Care Database. We excluded 512 of these patients because they were either nonveterans (485) or had inconsistent values for gender (27). We used information from the database to evaluate the characteristics of the remaining 4,279 patients, and to gain further clinical detail, we reviewed the charts of a random sample of 1,100 of these patients drawn equally from each of the 4 medical centers.

The 4,279 tested patients were predominantly male (94%) and between the ages of 40 and 59 years (62%). The overall HIV

Table 4. Medical record review of tested patients: HIV test results and process of care

	Site 1 % n=275	Site 2 % n=275	Site 3 % n=275	Site 4 % n=275	Total % n=1,100
Testing rationale documented	93	95	95	78	90
HIV test positive*	1	3	6	20	8
Documentation of prior HIV test	35	39	23	22	30
Documentation of informed consent*	45	100	99.6	76	80
Documentation of pretest counseling*	14	10	87	57	42
Documentation of posttest counseling*	8	5	82	45	35

$P<0.01$ for comparison between sites.

Table 5. Predictors of HIV infection among tested patients from medical record review

Risk factor	Adjusted odds ratio	95% confidence interval
Age group (years) (relative to 40–49-year-olds)		
20–29	0.1	0.02–1.43
30–39	1.4	0.70–2.93
50–59	0.4*	0.20–0.81
>=60	0.1[†]	0.03–0.37
Race/ethnicity (relative to white)		
African American	2.8[†]	1.40–5.46
Hispanic	1.7	0.65–4.39
Other	2.5	0.53–12.01
Insurance[‡]		
Yes	2.4[†]	1.30–4.52
Site (relative to site 1)		
Site 2	2.0	0.46–8.23
Site 3	3.6	0.98–13.5
Site 4	12.9[†]	3.71–45.17
Men who have sex with men		
Yes	15.4[†]	7.03–33.72
Prior HIV test done		
Yes	0.2[†]	0.08–0.45
Opportunistic infection		
Yes	4.4[†]	1.80–10.81

*$P<.05$.

[†]$P<.01$.

[‡]*Patient had additional insurance coverage at the time of HIV testing (Medicare, Medicaid, other public coverage, or private coverage).*

infection rate among the tested patients was 6%, ranging from 1% to 18% by site ($P<.01$). HIV infection was more likely among males compared to females [adjusted OR 7.2 (2.23–23.12)] and African Americans compared to whites [adjusted OR 1.9 (1.4–2.64)], and varied by site. HIV infection was less likely among the ages 50–59 [adjusted OR 0.6 (0.41–0.83)] and patients >=60 years old [adjusted OR 0.21 (0.13–0.35)] compared to 40–49-year-olds, and among patients who used alcohol [adjusted OR 0.4 (0.32–0.61)] compared to those who did not (patients may have had other drug use) or those who used amphetamines [adjusted OR 0.4 (0.15–0.83)] compared to those who did not. These comparisons were based only on tested patients, most of whom had risk factors, and thus reflect the relative importance of risk factors in this group; they do not indicate, for example, that amphetamine use would not be a risk factor if assessed in a group with no other risk factors.

Our review of 1,100 medical records provided further detail about the reasons for and process of testing. The rationale for testing was documented in 90% of the patients, ranging from 78% to 95% by site. In the remaining patients, the reason for testing was unclear. The prevalence of HIV infection among the tested patients included in the chart review was similar to the overall group of tested patients, with 8% of patients testing positive (ranging from 1% to 20% by site, $P<.01$, Table 4). Documentation of informed consent and pre- and posttest counseling varied among sites (Table 4). HIV infection was more likely among patients aged 30 to 49, African Americans, men who have sex with men, and patients with a history of an opportunistic infection, and varied by site (Table 5).

DISCUSSION

Our study aimed to assess the degree to which the veteran population at risk was tested for HIV and whether testing was based on identifiable risk behaviors among patients who were tested. Our reviews of testing were performed in 4 relatively large VA Health Care Systems that care for substantial numbers of patients with HIV. Although these sites are not likely to be representative of all VA centers, we have no reason to believe that testing or screening would be more extensive at other VA centers than in the ones included in our study.

The most important finding of our study is that only about one-third to one-half of patients we identified as being at risk for HIV, based on ICD-9 diagnoses of substance abuse, hepatitis, or sexually transmitted diseases, had been tested for HIV within a 5-year period in the VA. This finding was consistent in the 4 sites we studied. Even when we used more restrictive definitions of risk factors, slightly less than one-half of at-risk patients had been tested within the VA. Because the finding was consistent across our 4 study sites, and because we have no reason to believe that testing rates would be higher at smaller VA centers with less-active HIV programs, we believe that rates of testing of at-risk patients are likely to be too low in many VA centers. Our finding of low testing rates is of concern because early identification of HIV infection enables patients to access life-prolonging therapy at the earliest appropriate time. Our result is also consistent with studies from non-VA settings that indicate that patients with HIV are often identified late in the course of disease.[12–14] For example, Klein and colleagues[13] found that 43% of patients diagnosed in a large health maintenance organization had CD4 counts of less than 200 cells/μL. They also found that risk factors were present before diagnosis in about 25% of patients; our focus was whether testing occurred when risk factors were known.

We evaluated testing of at-risk patients during the period from 1995 to 2000, which raises the question of whether testing practices have changed since that time. Two recent analyses suggest strongly that they have not. An analysis of a cohort of 3,760 HIV antiretroviral naïve patients presenting for HIV care in the VA found that 55% presented late in the course of disease, with CD4 counts less than 200 cells/mm^3, and 40% of the patients had used VA services before, for a median duration of 3.7 years.[22] These findings suggest that a large proportion of patients were both in care and were not identified until late in the course of disease. Furthermore, only about 11% of the HIV-infected patients had clinical symptoms or findings suggestive of HIV infection prior to diagnosis, which highlights the importance of testing patients based on risk behaviors. In addition, an analysis of a national sample of at-risk patients seen in primary care in the VA during 2004 to 2005 found lower rates of testing than in our study (Gifford and Asch, unpublished).

We had no way to determine whether patients had been tested in non-VA facilities or whether patients had been offered testing and refused. However, unlike the military, there are few if any disincentives for testing within the VA, and our experience is that it is rare for patients to be tested elsewhere and refuse testing at the VA.

We found that among patients who were tested, the rationale for testing was clear and based on risk behaviors or patient request for approximately 90% of patients. Site 4 had a modestly lower rate of documentation of the rationale for testing, but a higher prevalence of positive tests than other sites, which suggests that testing in this site did identify patients at risk. We do not know why documentation rates were lower in site 4. Overall, testing was most often performed

because of documentation of substance abuse, with patient request and infection with hepatitis C as other important reasons for testing. Because some clinicians may not document risk behaviors, or because patients may not volunteer risk behaviors, the rate of appropriate testing may be even higher than we estimated. Consistent with non-VA populations, race (African American), age (30 to 49), risk behaviors (men who have sex with men), and a history of opportunistic infections were strong predictors of HIV infection (Table 5).[23–26]

Our central finding that only about one-third to one-half of patients at risk had been tested raises the question of whether there are barriers to HIV testing. Current VA regulations require informed consent for testing and pre- and posttest counseling; documentation of consent and counseling was variable. The regulations for pre- and posttest counseling specify required elements of counseling and have been interpreted at many VA health care systems as requiring face-to-face counseling by specially trained personnel. In this respect, testing for HIV is nearly unique among medical conditions, with much more cumbersome requirements for diagnosis than diseases, such as hepatitis C virus infection, which do not require this process. The new CDC guidelines released in September 2006 recommend dropping separate informed consent for HIV testing.[15] In related research, we have found that the time required for informed consent and counseling are significant barriers to testing,[27] as have others.[28] We also note, however, that the quality-of-care literature finds that failure to perform indicated tests and interventions is common across many diseases in many health-care delivery systems,[29] so other factors may be important.

We cannot determine which barriers are responsible for the low testing rates, but we believe that methods for pre- and posttest counseling should be reexamined. Furthermore, the availability of rapid HIV tests that may eliminate the need for a second visit should also be considered as an approach to HIV testing. Procedures developed almost 20 years ago may now present an important impediment to testing. The CDC has revised its screening guidelines and recommends that separate informed consent not be required for testing.

In conclusion, we examined practice patterns for HIV testing in a large integrated health-care system with a notable record in improving quality of care[16] and a specific focus on improving quality of care for patients with HIV. The VA may, therefore, be better positioned to address the identification of HIV infection than many health-care systems. Nonetheless, although the vast majority of patients who were tested for HIV were tested for a well-documented reason, a substantial proportion of at-risk patients had not been tested. In these patients, a critical opportunity to provide early therapy and risk-reduction counseling for HIV-infected patients may have been missed. This finding suggests that substantially more ambitious programs for testing will be needed if more at-risk patients are to be identified early in the course of HIV infection.[3,9] The dramatic advances in therapy for HIV warrant robust new approaches to identify patients early in the course of HIV disease so that they may receive the full benefit of life-prolonging therapy and counseling.

Corresponding Author: *Douglas K. Owens, MD, MS; VA Palo Alto Healthcare System, Palo Alto, CA, USA (e-mail: owens@stanford.edu).*

REFERENCES

1. **Palella FJ, Jr., Deloria-Knoll M, Chmiel JS, et al.** Survival benefit of initiating antiretroviral therapy in HIV-infected persons in different CD4+ cell strata. Ann Intern Med. 2003;138(8):620–6.
2. **Palella FJ, Jr., Delaney KM, Moorman AC, et al.** Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. HIV outpatient study investigators. N Engl J Med. 1998;338(13):853–60.
3. **Sanders GD, Bayoumi AM, Sundaram V, et al.** Cost-effectiveness of screening for HIV in the era of highly active antiretroviral therapy. N Engl J Med. 2005;352(6):570–85.
4. **Crepaz N, Lyles CM, Wolitski RJ, et al.** Do prevention interventions reduce HIV risk behaviors among people living with HIV? A meta-analytic review of controlled trials. AIDS. 2006;20(2):143–57.
5. **Kamb ML, Fishbein M, Douglas JM, Jr., et al.** Efficacy of risk-reduction counseling to prevent human immunodeficiency virus and sexually transmitted diseases: a randomized controlled trial. Project RESPECT Study Group. JAMA. 1998;280(13):1161–7.
6. **DiClemente RJ, Wingood GM.** A randomized controlled trial of an HIV sexual risk-reduction intervention for young African-American women. JAMA. 1995;274(16):1271–6.
7. **Marks G, Crepaz N, Senterfitt JW, Janssen RS.** Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. J Acquir Immune Defic Syndr. 2005;39(4):446–53.
8. **Walensky RP, Weinstein MC, Kimmel AD, et al.** Routine human immunodeficiency virus testing: an economic evaluation of current guidelines. Am J Med. 2005;118(3):292–300.
9. **Paltiel AD, Weinstein MC, Kimmel AD, et al.** Expanded screening for HIV in the United States—an analysis of cost-effectiveness. N Engl J Med. 2005;352(6):586–95.
10. **Fleming PL, Byers RH, Sweeney PA, Daniels D, Karon JM, Janssen RM.** HIV Prevalence in the United States, 2000. Final Program and Abstracts of the 9th Conference on Retroviruses and Opportunistic Infections, Seattle, Washington, February 24–28, 2002. Alexandria, Virginia: Foundation for Retrovirology and Human Health.
11. Centers for Disease Control and Prevention. Advancing HIV Prevention: New Strategies for a Changing Epidemic. Vol. Accessed on August 30, 2004: http://www.cdc.gov/hiv/partners/AHP/ahp_October03.pdf.
12. **Neal JJ, Fleming PL.** Frequency and predictors of late HIV diagnosis in the United States, 1994 through 1999. 9th Conference on Retroviruses and Opportunistic Infections. Seattle, Washington; 2002.
13. **Klein D, Hurley LB, Merrill D, Quesenberry CP, Jr.** Review of medical encounters in the 5 years before a diagnosis of HIV-1 infection: implications for early detection. J Acquir Immune Defic Syndr. 2003;32(2):143–52.
14. **Samet JH, Freedberg KA, Savetsky JB, Sullivan LM, Stein MD.** Understanding delay to medical care for HIV infection: the long-term non-presenter. AIDS. 2001;15(1):77–85.
15. **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(RR-14):1–17; quiz CE1–4.
16. **Kerr EA, Gerzoff RB, Krein SL, et al.** Diabetes care quality in the Veterans Affairs Health Care System and commercial managed care: the TRIAD study. Ann Intern Med. 2004;141(4):272–81.

17. **Jha AK, Perlin JB, Kizer KW, Dudley RA.** Effect of the transformation of the Veterans Affairs Health Care System on the quality of care. N Engl J Med. 2003;348(22):2218–27.

18. **Asch SM, McGlynn EA, Hogan MM, et al.** Comparison of quality of care for patients in the Veterans Health Administration and patients in a national sample. Ann Intern Med. 2004;141(12):938–45.

19. Center for Quality Management in Public Health. (U.S. Department of Veterans Affairs, Public Health Strategic Health Care Group, Center for Quality Management in Public Health). Caring for Veterans with HIV Disease: Characteristics of Veterans in VA Care, Fiscal Year 2002. 2003.

20. **Backus L, Mole L, Chang S, Deyton L.** The immunology case registry. J Clin Epidemiol. 2001;54 Suppl 1:S12–5.

21. The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM). 4th edition. Washington, DC: U.S. Department of Health and Human Services, Public Health Service, Health Care Financing Administration; 1991.

22. **Gandhi N, Skanderson M, Gordon K, Concato J, Justice A.** Delayed Presentation for HIV Care Among Veterans: An Opportunity for Intervention. 13th Conference on Retroviruses and Opportunistic Infections. Denver, Colorado, USA; 2006.

23. **Lopez J, Welvaart H, Ford W, Kerndt P.** HIV prevalence and risk behaviors among patients attending Los Angeles County Tuberculosis Clinics: 1993–1996. Ann Epidemiol. 1998;8(3):168–74.

24. **Shlay JC, Blackburn D, O'Keefe K, Raevsky C, Evans M, Cohn DL.** Human immunodeficiency virus seroprevalence and risk assessment of a homeless population in Denver. Sex Transm Dis. 1996;23(4):304–11.

25. **Woods WJ, Lindan CP, Hudes ES, Boscarino JA, Clark WW, Avins AL.** HIV infection and risk behaviors in two cross-sectional surveys of heterosexuals in alcoholism treatment. J Stud Alcohol. 2000;61(2):262–6.

26. **Kurata J, Ounanian L, Chetkovich D, Taylor A, Yates D, Werblun M.** Seroprevalence of human immunodeficiency virus among family practice outpatients. J Am Board Fam Pract. 1993;6(4):347–52.

27. **Sundaram V, Douglass LR, Lazzeroni LC, Sanders GD, Tempio P, Bergen MR.** A randomized trial of an intervention to improve HIV Screening (Abstract). Med Decis Making. 2002;22(6):542.

28. **Rotheram-Borus MJ, Leibowitz AA, Etzel MA.** Routine, rapid HIV testing. AIDS Educ Prev. 2006;18(3):273–80.

29. **Asch SM, Kerr EA, Keesey J, et al.** Who is at greatest risk for receiving poor-quality health care? N Engl J Med. 2006;354(11):1147–56.