

Periodic health examination, 1992 update: 3. HIV antibody screening

Canadian Task Force on the Periodic Health Examination

Human immunodeficiency virus (HIV) antibody screening may reduce the incidence of acquired immunodeficiency syndrome (AIDS) through counselling to prevent HIV transmission and may delay the onset of AIDS through treatment of asymptomatic HIV-positive patients (Fig. 1). In this article the Canadian Task Force on the Periodic Health Examination reviews the evidence regarding these benefits and makes recommendations about screening.

Target population

Before discussing screening methods the target population must be considered. Behaviours that increase risk include having many sexual partners, receiving anal intercourse, sharing needles during injection drug use and receiving blood or blood products before the introduction of universal HIV antibody screening of these products by blood banks.

Homosexual or bisexual men, prostitutes, injection drug users, people receiving blood products between 1978 and 1985, sexual contacts of people with HIV infection and people from countries with a high prevalence of HIV infection have been identified as members of high-risk groups. Other people, including those attending sexually transmitted disease (STD) clinics without other acknowledged risk factors,¹ prisoners,² migrant farm workers³ and pregnant women in the northeastern United States served by inner-city hospitals, may also have higher seroprevalence rates than the general population.⁴ However, the results of seroprevalence studies involving these groups are contradictory, and the rates remain substantially lower than those in the high-risk groups.

The precise identification of who should undergo HIV antibody screening is difficult and is the weakest link in the decision regarding such screening. There are problems in both the frequency with

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which physicians ask the necessary questions and the quality of responses. A 1987 study found that only 10% of primary care physicians asked their patients about risk factors for HIV infection.⁵ Despite improvements over the past 5 years, the sexual history was routinely obtained by less than half of the physicians surveyed in more recent studies.^{6,7}

In addition, variation in seropositivity rates across studies is due to different patient characteristics in the risk groups rather than practices associated with increased risk. For example, among injection drug users in New York City, who have a seropositivity rate of at least 57%,⁸ the rate was higher among black and Hispanic people, those who had a more recent last injection, those with a higher proportion of injections in "shooting galleries," those with sexual partners who used injection drugs, those who had receptive anal intercourse and those who had low income.^{9,10}

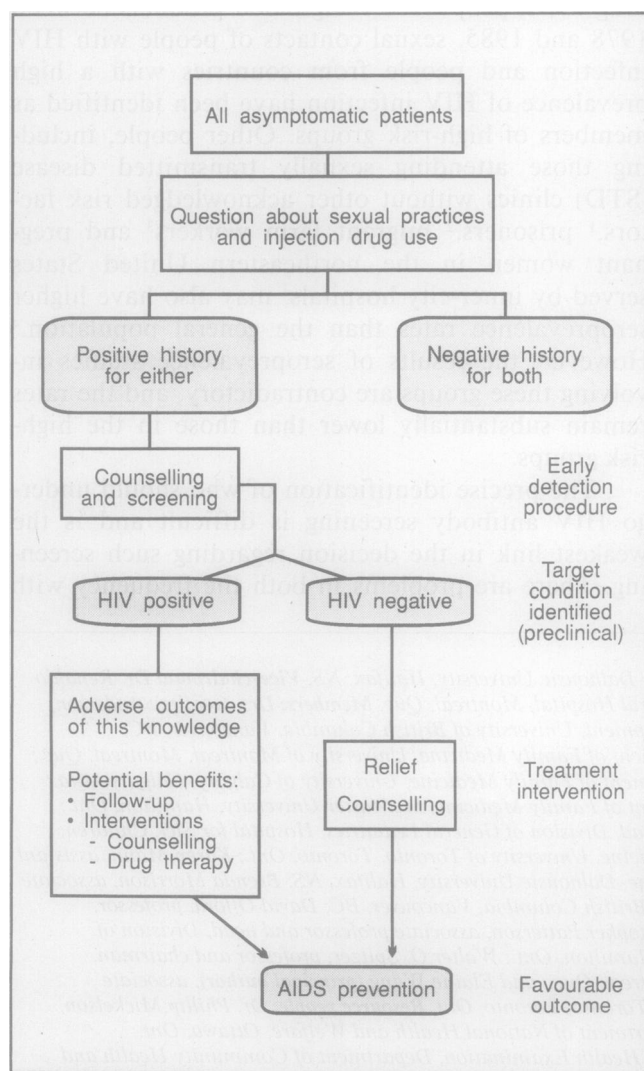


Fig. 1: Proposed scheme for human immunodeficiency virus (HIV) antibody screening and treatment of asymptomatic patients seen by primary care physicians during a periodic health examination.

Finally, the responses given to screening questionnaires may be inaccurate. In addition to worries about self-incrimination, barriers to obtaining accurate information may include illiteracy, race or ethnic background, language and socioeconomic status.¹¹ Risk factors were acknowledged in less than 60% of HIV-positive parturient women;¹²⁻¹⁵ in one study none of the women indicated any risk factor. The addition of counselling did not improve the sensitivity of questionnaires to target seropositive women.¹⁶ The lack of sensitivity of targetted screening has been the argument for universal screening of pregnant women. Targetted screening for premarital testing or in STD clinics has low sensitivity and specificity;^{11,17,18} in one study 98% of clinic attendees admitted to at least one risk factor.¹¹

A complete sexual history, including specific practices and modifying conditions, and a complete drug-use history, including types of drugs and routes of administration, should be obtained for all patients as part of a clinical assessment. The contents of such a history are described in guidelines from the CMA and other groups.¹⁹⁻²¹ It is important to update this history. Assuming that screening will be selective the sensitivity and specificity of these guidelines in identifying patients at increased risk will probably not be high, given the previous findings, but will likely be higher than if the history were not obtained.

Increased patient acceptance of routine testing and the poor accuracy of targetted screening would support routine screening if an elevated seroprevalence rate were suspected.^{11-13,15,18} Once the decision is made to screen, informed consent must be obtained, and counselling before the test and after receipt of the results must be arranged. Such counselling is an important component of the testing procedure. More seropositive people may be detected through voluntary rather than mandatory testing.^{17,22} Although not formally studied, confidentiality is likely to increase the number of those willing to be tested.

Screening

Accuracy

Screening for HIV infection currently involves detection of antibodies to the virus. Diagnosis requires two steps. The first involves the use of one of a number of commercially available enzyme-linked immunosorbent assay (ELISA) kits, which are highly sensitive but whose specificity is reduced by cross-reactions of the serum to components other than HIV antigens. ELISA tests are easy to perform and inexpensive. The second step involves a confirmatory and more specific test, such as the Western blot

technique, radioimmunoprecipitation assay and immunofluorescence assay, if the ELISA results are repeatedly positive. These confirmatory tests are not done first because they are labour intensive and expensive. The sensitivity of the first and second steps has been described to be essentially 100%.²³

The predictive value of a positive test result depends on the sensitivity and specificity of the method and the prevalence of illness in the population (the prior probability).²⁴ The positive predictive value will be lower and the proportion of false-positive results higher in a population with a low rate of HIV infection than in one with a high rate, even if the tests are equally accurate.²⁵ Given a test sensitivity of 99.9% and a specificity of 99.995%, 6 and 158 seropositive subjects would be correctly identified for every false-positive result in populations with HIV seropositivity rates of 0.03% (parturient women in Ontario) and 0.8% (parturient women in inner cities of the northeastern United States) respectively. In the first group the trauma to the one person falsely identified as being seropositive may offset the advantage to the six who were truly seropositive. The prevalence rate at which the ratio of false-positive to true-positive results is acceptable is not yet defined, but the latter population of parturient women would be a likely target group.

False-negative results after combined testing with ELISA and the Western blot technique do occur, not because of problems with the tests but, rather, because of the delay in antibody development after HIV exposure. This period is usually less than 6 months.²⁶ Antibodies may also be absent in the late stages of HIV infection, when few or no antibodies are produced; this is obviously not an issue in screening asymptomatic people.

In neonates false-positive results may occur if only the antibody and not the virus itself is passed to the neonate.^{27,28} Thus, viral DNA detection through a polymerase chain reaction or virus isolation is required for diagnosis. In addition, serologic assays in such cases may be insensitive because of a poor antibody response to transplacental infection in some neonates.^{28,29} False-positive results also occur because of errors in specimen identification and contamination in the laboratory.

Other diagnostic methods, such as p24-antigen detection, virus isolation and the polymerase chain reaction, are more costly, less available and not more effective than other methods except in the specific situations described previously.^{26,30-32} They are, therefore, not acceptable alternatives for screening. The accuracy of HIV antibody screening is excellent compared with that of other tools currently available for medical screening. Concern about possible misuses of the test must be separated from challenges to the accuracy of the test.³³

Associated risks

Psychologic risks: Unlike the labelling consequences of other abnormal laboratory test results, implications of HIV seropositivity go beyond the infection and relate to behaviours that increase the risk of infection. Being identified as a homosexual man may subject a person to discrimination and prejudice. In addition, behaviours such as illicit injection drug use and prostitution place the seropositive person at risk for legal prosecution.

There may be exogenous and endogenous consequences attached to the stigma of being identified as HIV positive. Discrimination in employment, housing, education, health insurance and access to medical care have occurred.³⁴ Rejection, particularly by family and friends, reduces needed support. Depression and anger are significantly more common in subjects aware of their serologic status than in those unaware of it.³⁵ A depressive reaction may be transient; in one study, only half of the original 30% of patients continued to have suicidal thoughts 2 months after being informed of their serologic status.³⁶ In the United States the diagnosis of AIDS may be helpful to patients with HIV-related illness because it may assure access to social benefits and legal protection from discrimination.³⁷ In Canada this may be less of an advantage because of universal access to health care.

False reassurance: A false-negative result may falsely reassure people in whom HIV antibody has not yet developed after infection.²⁶ Testing should be repeated after 6 months in seronegative people whose behaviour during the previous 6 months put them at risk so that antibody will have had time to develop.

Whether patients who have been engaging in high-risk behaviour are reassured and encouraged to continue these behaviours after receiving a negative test result is unknown but appears to be unlikely. Studies of counselling suggest a reduction in behaviour known to transmit the virus, although this reduction is often greater among HIV-positive than HIV-negative people.^{35,38-41} Counselling sessions that accompany serologic testing must include education against this false reassurance of seronegative people at high risk.

Benefits

The benefits to people identified as seropositive will be discussed in the following section. In asymptomatic people with a history of risk factors, a knowledge of being truly seronegative may provide a great deal of relief and affect future plans with respect to marriage, children, employment, insurance and protection of sexual partners.

Effects of early intervention

Efficacy of drug therapy

In one study zidovudine (AZT) was found to delay the onset of AIDS in people with asymptomatic HIV infection who had a CD4 count of less than $0.5 \times 10^9/L$.⁴² AIDS developed within 2 years in 33 (8%) of 428 patients randomly assigned to receive placebo, as compared with 11 (2%) of 453 given a low dose (500 mg/d) of AZT and 14 (3%) of 457 given a high dose (1500 mg/d). Unlike patients with AIDS and symptomatic HIV infection receiving a high dose of AZT, those given a low dose did not have significant bone marrow suppression. The relative risk for AIDS over 2 years was 2.8 times higher in the placebo group than in the AZT treatment groups, a difference that was clinically and statistically significant ($p < 0.002$). The study further revealed a reduction from 50% to 13% in the incidence of *Pneumocystis carinii* pneumonia over 2 years after a policy was implemented for aerosol pentamidine prophylaxis in patients with a CD4 count of less than $0.2 \times 10^9/L$.

Recommendations about early AZT therapy must be tempered by the following considerations.^{43,44} The drug must be given to 100 patients for a year to delay the onset of opportunistic infection in 4 patients. Data are not available on other important outcomes such as survival, quality of life and adverse effects. Also, studies of HIV isolates in treated patients are showing drug resistance.⁴⁵⁻⁴⁷ Thus, more information is needed on the long-term efficacy and toxic effects of AZT in asymptomatic subjects. Finally, in a study involving symptomatic people there was no difference in survival between those given early AZT therapy and those given late therapy despite a delay in the onset of AIDS.⁴⁸ However, the finding that treatment of asymptomatic HIV infection can delay the development of AIDS suggests that the CD4 count should be monitored until it reaches a level at which AZT treatment should be started.

In a randomized trial the risk of *P. carinii* pneumonia was found to be reduced by 70% with the use of aerosol pentamidine prophylaxis in asymptomatic patients with a CD4 count of less than $0.2 \times 10^9/L$ and in patients with AIDS or advanced symptomatic HIV infection who had not had *P. carinii* pneumonia.⁴⁹ There are no published trials of primary prophylaxis with trimethoprim-sulfamethoxazole or dapsone or a similar agent in this population.⁵⁰ Previous trials have shown the efficacy of trimethoprim-sulfamethoxazole in other immunocompromised populations; however, a placebo-controlled clinical trial of this agent is unacceptable at this

time. The ease of oral administration and the lower cost make these agents an attractive alternative, and a number of them are being studied. The US Centers for Disease Control (CDC), Atlanta, recommends either oral trimethoprim-sulfamethoxazole therapy or aerosol pentamidine therapy for primary prophylaxis.⁵⁰

These studies suggest that early identification will allow follow-up and early treatment before symptoms appear when the only abnormality is a decreased CD4 count. Most randomized trials of AZT in asymptomatic people have involved only homosexual men.^{42,51} Few data are available for injection drug users or women who have acquired HIV infection heterosexually. Presumably studies have been designed to maximize sample sizes, ensure homogeneity of the population and encourage patient compliance with the regimens. However, these same factors limit the generalizability of the results. Studies involving children, for example, have found the presence of *P. carinii* pneumonia despite a CD4 count of more than $0.2 \times 10^9/L$.^{27,52} Thus, the CDC has provided guidelines for prophylaxis in children with the use of CD4 counts defined according to the age of the child.⁵³

Management of complications

The management of concurrent infectious diseases may be altered by knowledge of HIV seropositivity.⁵⁴⁻⁵⁶ Most recommendations on primary prophylaxis or treatment of these conditions are based not on the results of comparative studies but, rather, on expert opinion recognizing that conventional management is less efficacious in HIV-positive people than in HIV-negative subjects. Whether some of these interventions are doing more good than harm will require further study.

HIV-positive people are more likely than HIV-negative people to have clinical tuberculosis if they are infected with *Mycobacterium tuberculosis*^{57,58} and to be at high risk for early death from it.⁵⁹ This has prompted the CDC to recommend tuberculosis skin testing of HIV-seropositive people and isoniazid prophylaxis for those with a positive result.⁶⁰ Some have recommended screening for previous fungal infections (caused by *Cryptococcus neoformans*, *Histoplasma capsulatum* and *Coccidioides immitis*) and parasitic infections (caused by *Toxoplasma gondii*) and considering primary prophylaxis against these organisms.⁶¹ However, adverse effects, including those related to drug interactions, the development of resistance and potential effects on the underlying illness require that there be further evaluation before prophylaxis is recommended. Other interventions that may be modified once the serologic status is

known include the use of live viral vaccines, bacterial vaccines, amantadine prophylaxis and advice given about travel to areas with potential exposure to serious infections.^{54,62,63}

Efficacy of counselling

Counselling on high-risk sexual practices or on the use of condoms is expected to increase desired behaviours and in turn decrease the spread of HIV infection. No randomized trials of counselling have been conducted. Numerous cohort studies involving homosexual men, including one that enrolled over 1000 subjects,⁶⁴ have shown a statistically significant reduction in risk behaviour among those aware of their seropositive status.^{35,38,39,64-66} These studies have been justifiably criticized as biased because of the highly selected nature of the participants, who were aware of both their high-risk status and recommendations for safer sex.^{67,68} Difficulties in measuring and validating sexual behaviour is another problem. A number of studies tested all subjects and then concluded that the behaviour of those who requested their results could be generalized to all those who underwent testing — a potentially incorrect assumption. Studies of counselling people with hemophilia and injection drug users have shown reduction in risk behaviour but have the same design flaws.^{41,69-73}

Interpreting behavioural changes in cohorts of subjects requires consideration of the general reduction of risk behaviour owing to public health interventions.⁷⁴ Recognizing that cohort studies cannot eliminate important biases, one can conclude that counselling probably does reduce but does not eliminate unsafe sexual practices. That such counselling may need to be specific to the target population is obvious, because pregnant women, injection drug users and homosexual men

transmit the virus in different ways and are able to control transmission-associated behaviour in various ways.

Screening of pregnant women

HIV seroprevalence has been studied intensively among pregnant women (Table 1).^{4,12-16,75-78} A screening program in Massachusetts conducted over 6 months between 1986 and 1987 showed that the overall seroprevalence rate was 2.1 per 1000 parturient women but that the rate was four times higher among inner-city women.⁴ Seroprevalence rates in inner-city hospitals in New York and Baltimore are substantially higher, at 20 to 50 per 1000.^{12,13} In a recent review of all seroprevalence data, some of which are unpublished, CDC researchers noted that rates among women vary up to 43 per 1000.⁷⁹ In Canada the rates are 0.3 to 0.6 per 1000 and are two to three times higher among women in cities.⁷⁵⁻⁷⁷

Screening of pregnant women represents a special situation because the risk of vertical transmission to the fetus is 20% to 50%.⁸⁰ One would expect that women found to be seropositive would opt for an elective abortion. However, two studies involving injection drug users showed that seropositive women had the same rate of pregnancy and therapeutic abortion as seronegative women.^{81,82} In a study conducted in Nairobi, seropositive women planned to have more children to compensate for illness in the one-third of offspring who would have HIV infection.⁸³ Nevertheless, knowledge of seropositivity may result in (a) avoidance of certain obstetric manoeuvres (e.g., amniocentesis, chorionic villus sampling and fetal monitoring) that may increase the risk of HIV transmission, (b) earlier diagnosis of associated illnesses that might otherwise be attributed to pregnancy,^{81,84-86} (c) avoidance of breast feeding, which may be a vehicle for HIV transmission,

Table 1: Seroprevalence rates of human immunodeficiency virus (HIV) infection among parturient women

Study	Site	Time of study	Seroprevalence rate per 1000
Hoff et al ⁴	Massachusetts	1986-87	2.1 (8.0 in inner city)
Landesman et al ¹²	New York City*	1986	20
Barbacci et al ¹³	Baltimore†	1987-88	50
Fehrs et al ¹⁴	Los Angeles County†	1988	1.7
Lindsay et al ¹⁵	Atlanta	1987-88	4 with prenatal care (14 without such care)
Wenstrom et al ¹⁶	Chicago*	1988	11
Schechter et al ⁷⁵	British Columbia and the Yukon Territory	1989	0.3 (0.4 in Vancouver and Victoria)
Hankins et al ⁷⁶	Quebec	1989	0.6 (1.8 in Montreal)
Coates et al ⁷⁷	Ontario	1989-90	0.3 (1.1 in Ottawa)
Peckham et al ⁷⁸	Britain	1988-89	0.2

*Inner-city hospital.

†Inner-city prenatal clinic.

and (d) early treatment of infected infants.⁸⁵ Previous studies of anonymous screening among parturient women have shown that the detection rate of targetted screening programs is low and that routine screening is more highly accepted than targetted screening.¹²⁻¹⁵ Using the analogy of prenatal neural tube defects, for which screening is presently being conducted, Minkoff and Landesman⁸⁶ suggested screening populations in which the HIV seroprevalence rate is 1 per 1000 or greater.

Resource implications

A cost-effectiveness analysis of HIV antibody screening is beyond the scope of this paper. Crude estimates, which take into account only the costs of ELISA and the Western blot technique, are available from the Ontario Ministry of Health. The cost of ELISA, \$14.29, is the cost of identifying a seronegative person. Since all positive results must be confirmed with the Western blot technique, the cost of identifying a seropositive person is \$38.58 (Dr. Margaret Fearon, Laboratory Services Branch, Ontario Ministry of Health: personal communication, 1991). The greater costs relate to the accompanying counselling; thus, a conservative estimate of the average cost would be \$35 (US) per person tested, given the seroprevalence rate in the general population.²²

Early intervention in HIV infection would require major resource allocations.⁸⁷ Start-up costs will be necessary for expansion of laboratory facilities to accommodate confirmatory testing and for physician education on obtaining histories and providing counselling.^{5,6,88-90} Resources will be needed to expand and staff ambulatory facilities. Assuming that there are one million asymptomatic HIV-positive people in the United States and that half will be treated, costs for outpatient clinical and laboratory monitoring, counselling, drugs and contact tracing have been estimated to be \$5 billion per year.⁸⁷

Recommendations made by other groups

The CDC reconfirmed previous recommendations for screening people in identified risk groups, including those with STDs.⁹¹ It has also made recommendations about screening to prevent perinatal HIV transmission.⁹² Women in the high-risk groups who are or may become pregnant should be offered routine testing and counselling. Similarly, testing and counselling should be offered to any woman who requests testing. However, at that time testing was not recommended for women at low risk because of difficulties in interpreting results in such a population. In addition, it was recommended that patients being treated for tuberculosis be counselled

and undergo HIV antibody testing because of the implications for management.^{56,60} The report of the Presidential Commission on the Human Immunodeficiency Virus Epidemic included consideration for screening people in correctional institutions, those planning marriage and those undergoing medical evaluation or treatment for certain diseases such as tuberculosis.⁹³ The need for consent, counselling and confidentiality of results was emphasized in that report. Subsequent recommendations have appeared for trimethoprim-sulfamethoxazole or aerosol pentamidine prophylaxis for *P. carinii* pneumonia in adults with a CD4 count of less than $0.2 \times 10^9/L$ ⁵⁰ and trimethoprim-sulfamethoxazole prophylaxis in children with a CD4 count 20% or more below the normal age-specific count.⁵³

The US Preventive Services Task Force^{94,95} made recommendations that preceded availability of the results from the AZT and pentamidine prophylaxis trials. It concluded that there was fair evidence to recommend screening in a high-risk population and in pregnant women but that there was no evidence to either include or exclude screening in a low-risk population.

An expert panel assembled by the National Institutes of Health, Bethesda, Md., reviewed the results of the multicentre study of AZT in asymptomatic people⁴² and recommended that all appropriate patients be assessed for risk factors and that voluntary, confidential testing and counselling be offered to those thought to be at risk.⁴³

Recommendations (Table 2)

Obtaining a history of sexual behaviour and injection drug use and offering counselling has limited sensitivity for identifying HIV-positive people in the general population, but its inclusion is likely to increase detection of risk behaviours. Its inclusion in the periodic health examination of asymptomatic people in the general population is based on expert opinion.

Recommendations for HIV antibody screening must consider characteristics of the screening manoeuvre, particularly sensitivity and specificity, and the availability of treatment for asymptomatic seropositive people. There is insufficient evidence to recommend the inclusion or exclusion of HIV antibody screening among pregnant women. Because the prevalence of HIV infection is lower in Canada than in the United States the generalizability of the results of US studies is questionable. Even with excellent test characteristics the positive predictive value cannot be perfect with a low prevalence rate. Screening should be considered for those in large cities because of the low sensitivity of targetted screening and better compliance with routine screening.

HIV antibody screening should be offered to people with high-risk behaviours or those in high-risk groups because of good evidence of the effectiveness of early treatment in delaying the development of AIDS and the efficacy of aerosol pentamidine prophylaxis. However, labelling is a problem, and there is no information about the long-term effects of treatment.

Other interventions that might be offered to those found to have HIV infection include prolonged treatment for specific secondary infections and changes in vaccination schedules. In addition, cohort studies suggest that testing followed by counselling may reduce the spread of HIV infection among injection drug users and homosexual men.

There is fair evidence to recommend HIV anti-

body screening for neonates of HIV-positive women; however, antibody screening is not specific or sensitive, and other diagnostic tests, such as the viral DNA polymerase chain reaction or virus isolation, must be done. Follow-up and vaccinations will be different for seropositive children.

There is insufficient evidence to recommend the inclusion or exclusion of HIV antibody screening in low-risk populations. The harm caused by false-positive results is balanced by any treatment benefits gained by the few seropositive people identified.

Research priorities

Despite the availability of very accurate tests HIV antibody screening is limited because of the

Table 2: Summary of manoeuvre, effectiveness, level of evidence and recommendation for HIV antibody screening

Manoeuvre	Effectiveness	Level of evidence*	Recommendation*
Obtaining history of sexual practices and injection drug use and counselling people in the general population	Limited sensitivity for identifying HIV-positive people but may be offered for patient education; it is more sensitive than if history were not obtained. Reduces but does not eliminate high-risk activities in high-risk populations.	Expert opinion ^{11,16,18} (III) Cohort studies ^{35,38-41,64-66,69-73} (II-2)	Poor evidence to include in or exclude from periodic health examination (PHE) of asymptomatic people (C)
Voluntary screening with ELISA and confirmatory test; repeat test after 6 months for seronegative people at high risk†	Combination of ELISA and Western blot technique has almost 100% sensitivity and specificity. High-risk groups: AIDS development was delayed with early treatment if CD4 count was less than $0.5 \times 10^9/L$; labelling is a problem. Pregnant women: Low rate of HIV infection in Canada raises concerns about poor positive predictive value; should be considered in large cities, where rate is highest. Infants of HIV-positive women: Risk of vertical transmission is 20% to 50%, but usual screening methods are not sensitive or specific enough. People at low risk: False-positive results may outweigh benefit of treating the few seropositive people identified.	Randomized controlled trials ^{42,49} (I) Cohort studies ^{4,12-16,75-78} (II-2) Cohort studies ²⁷⁻²⁹ (II-2) Expert opinion (III)	Good evidence to include offer of screening in PHE of asymptomatic people at high risk (A) Poor evidence to include in or exclude from PHE of asymptomatic pregnant women (C) Fair evidence to include in PHE of children of HIV-positive women (B) Poor evidence to include in or exclude from PHE of asymptomatic people at low risk (C)

*For descriptions of the levels of evidence and classification of recommendations see Appendix 1 in part 1 of the 1992 update (*Can Med Assoc J* 1992; 147: 443).

†High-risk groups include homosexual and bisexual men, prostitutes, injection drug users, people with sexually transmitted diseases, people receiving blood products between 1978 and 1985, sexual contacts of HIV-positive people and people from countries with a high prevalence rate of HIV infection. ELISA = enzyme-linked immunosorbent assay.

difficulty in identifying people who should undergo testing. Strategies that may improve such identification need to be evaluated. Educational interventions or alternative programs that would provide counselling need to be compared with the present method of individual counselling. Although the results of initial studies of pamphlets are discouraging, the efficacy of pamphlets and support groups as cheaper alternatives to individual counselling should be considered.^{96,97}

The frequency of screening needs to be studied further.

Although public education on needle-exchange programs, counselling on condom use and counselling of seropositive people reduce high-risk behaviour they do not eliminate it. Therefore, further studies in this area are needed.⁹⁸

Studies of AZT and other antiviral agents, either alone or in combination, should include patient populations other than homosexual men to allow for generalizability of the results. Such studies should examine the optimal point at which treatment should be started and the long-term effects of therapy. The incremental improvement in efficacy with the use of an immunomodulator should also be studied.⁹⁹

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References

1. Quinn TC, Zaccarias FRK, St John RK: HIV and HTLV-1 infections in the Americas: a regional perspective. *Medicine* 1989; 68: 189-208
2. Gayle HD, Keeling RP, Garcia-Tunon M et al: Prevalence of the human immunodeficiency virus among university students. *N Engl J Med* 1990; 323: 1538-1541
3. AIDS surveillance — worldwide. *Can Dis Wkly Rep* 1989; 15: 261
4. Hoff R, Berardi VP, Weiblen BJ et al: Seroprevalence of human immunodeficiency virus among childbearing women. *N Engl J Med* 1988; 318: 525-530
5. Lewis CE, Freeman HE: The sexual history-taking and counseling practices of primary care physicians. *West J Med* 1987; 147: 165-167
6. Lewis CE, Montgomery K: The AIDS-related experiences and practices of primary care physicians in Los Angeles. *Am J Public Health* 1990; 80: 1511-1513
7. Mathews WC, Linn LS: AIDS prevention in primary care clinics: testing the market. *J Gen Intern Med* 1989; 4: 34-38
8. Des Jarlais DC, Friedman SR, Novick DM: HIV-1 infection among intravenous drug users in Manhattan, New York City, from 1977 through 1987. *JAMA* 1989; 261: 1008-1012
9. Schoenbaum EE, Hartel D, Selwyn PA: Risk factors for human immunodeficiency virus infection in intravenous drug users. *N Engl J Med* 1989; 321: 874-879
10. Vlahov D, Munoz A, Anthony JC et al: Association of drug injection patterns with antibody to human immunodeficiency virus type 1 among intravenous drug users in Baltimore, Maryland. *Am J Epidemiol* 1990; 132: 847-856
11. Lifson AR, Chiasson MA, Stoneburner RL: Screening for HIV infection in sexually transmitted disease clinics. *N Engl J Med* 1988; 319: 242-243
12. Landesman S, Minkoff H, Holman S: Serosurvey of human immunodeficiency virus infection in parturients. Implications for human immunodeficiency virus testing programs of pregnant women. *JAMA* 1987; 258: 2701-2703
13. Barbacci MB, Dalabetta GA, Repke JT et al: Human immunodeficiency virus infection in women attending an inner-city prenatal clinic: ineffectiveness of targeted screening. *Sex Transm Dis* 1990; 17: 122-126
14. Fehrs LJ, Hill D, Kerndt PR et al: Targeted HIV screening at a Los Angeles prenatal family planning health center. *Am J Public Health* 1991; 81: 619-622
15. Lindsay MK, Feng TI, Peterson HB et al: Routine human immunodeficiency virus infection screening in unregistered and registered inner-city parturients. *Obstet Gynecol* 1991; 77: 599-603
16. Wenstrom KD, Zuidema LJ: Determination of the seroprevalence of human immunodeficiency virus infection in gravidas by non-anonymous versus anonymous testing. *Obstet Gynecol* 1989; 74: 558-561
17. Turnock BJ, Kelly CJ: Mandatory premarital testing for human immunodeficiency virus. The Illinois experience. *JAMA* 1989; 261: 3415-3418
18. Human immunodeficiency virus infection in the United States: a review of current knowledge. *MMWR* 1987; 36: 1-48
19. Chateauvert M, Duffie A, Gilmore N: *Human Immunodeficiency Virus Antibody Testing. Counselling Guidelines from the Canadian Medical Association*, CMA, Ottawa, 1990
20. Rinaldi RC: *HIV Blood Test Counselling: AMA Physician Guidelines*, American Medical Association, Chicago, 1988
21. Kess S, Bresolin L, Henning J: *HIV Early Care. AMA Physician Guidelines*, American Medical Association, Chicago, 1991
22. Petersen LR, White CR and the Premarital Screening Study Group: Premarital screening for antibodies to human immunodeficiency virus type 1 in the United States. *Am J Public Health* 1990; 80: 1087-1090
23. Update: serologic testing for antibody to human immunodeficiency virus. *MMWR* 1988; 36: 833-845
24. Weinstein MC: *Clinical Decision Analysis*, Saunders, Philadelphia, 1980
25. Meyer KB, Pauker SG: Screening for HIV: Can we afford the false positive rate? *N Engl J Med* 1987; 317: 238-241
26. Horsburgh CR, Ou CY, Jason J et al: Duration of human immunodeficiency virus infection before detection of antibody. *Lancet* 1989; 2: 637-640
27. Pizzo PA: Pediatric AIDS: problems within problems. *J Infect Dis* 1990; 161: 316-325
28. Husson RN, Comeau AM, Hoff R: Diagnosis of human immunodeficiency virus infection in infants and children. *Pediatrics* 1990; 86: 1-10
29. Walter EB, McKinney RE, Lane BA et al: Interpretation of Western blots of specimens from children infected with immunodeficiency virus type 1: implications for prognosis and diagnosis. *J Pediatr* 1990; 117 (2 pt 1): 255-258
30. Dodd RY, Fang CT: The Western immunoblot procedure for HIV antibodies and its interpretation. *Arch Pathol Lab Med* 1990; 114: 240-245
31. Jackson JB, MacDonald KL, Cadwell J et al: Absence of HIV infection in blood donors with indeterminate Western blot tests for antibody to HIV-1. *N Engl J Med* 1990; 322: 217-222
32. Busch MP, Taylor PE, Lenes BA et al: Screening of selected male blood donors for p24 antigen of human immunodeficiency virus type 1. *N Engl J Med* 1990; 323: 1308-1312

33. Bayer R, Levine C, Wolf SM: HIV antibody screening. An ethical framework for evaluating proposed programs. *JAMA* 1986; 256: 1768-1774
34. Hermann DHJ: *Torts: Private Lawsuits About AIDS*, Yale U Pr, New Haven, Conn, 1987: 153-172
35. McCusker J, Stoddard AM, Mayer KH: Effects of HIV antibody test knowledge on subsequent sexual behaviors in a cohort of homosexually active men. *Am J Public Health* 1988; 78: 462-467
36. Perry S, Jacobsberg L, Fishman B: Suicidal ideation and HIV testing. *JAMA* 1990; 263: 679-682
37. Soskolne CL: Proportion of new AIDS case reports attributable to the 1987 CDC revised surveillance case definition: Canada-United States differences. *Can J Public Health* 1989; 80: 380-381
38. Schechter MT, Craib KJP, Willoughby B et al: Patterns of sexual behavior and condom use in a cohort of homosexual men. *Am J Public Health* 1988; 78: 1535-1538
39. Van Griensven GJP, de Vroome EMM, Tielman RAP: Effect of human immunodeficiency virus (HIV) antibody knowledge on high-risk sexual behavior with steady and nonsteady sexual partners among homosexual men. *Am J Epidemiol* 1989; 129: 596-603
40. Idem: Impact of HIV antibody testing on changes in sexual behavior among homosexual men in the Netherlands. *Am J Public Health* 1988; 78: 1575-1561
41. Robertson JR, Skidmore CA, Roberts JJK: HIV infection in intravenous drug users: a follow-up study indicating changes in risk-taking behaviour. *Br J Addict* 1988; 83: 387-391
42. Volberding PA, Lagakos SW, Koch MA et al: Zidovudine in asymptomatic human immunodeficiency virus infection. A controlled trial in persons with fewer than 500 CD4-positive cells per cubic millimeter. *N Engl J Med* 1990; 322: 941-949
43. Recommendations for zidovudine: early infection. *JAMA* 1990; 263: 1606, 1609
44. Cotton P: Controversy continues as experts ponder zidovudine's role in early HIV infection. *Ibid*: 1605
45. Richman DD, Grimes JM, Lagakos SW: Effect of stage of disease and drug dose on zidovudine susceptibilities of isolates of human immunodeficiency virus. *J Acquir Immune Defic Syndr* 1990; 3: 743-746
46. Rooke R, Tremblay M, Soudeyns H et al: Isolation of drug-resistant variants of HIV-1 from patients on long-term zidovudine therapy. *AIDS* 1989; 3: 411-415
47. Larder BA, Darby G, Richman DD: HIV with reduced sensitivity to zidovudine (AZT) isolated during prolonged therapy. *Science* 1989; 243: 1731-1734
48. Hamilton JD, Hartigan PM, Simberkoff MS et al: A controlled trial of early versus late treatment with zidovudine in symptomatic human immunodeficiency virus infection. Results of the Veterans Affairs Cooperative Study. *N Engl J Med* 1992; 326: 437-443
49. Hirschel B, Lazzarin A, Chopard P et al: A controlled study of inhaled pentamidine for primary prevention of *Pneumocystis carinii* pneumonia. *N Engl J Med* 1991; 324: 1079-1083
50. Guidelines for prophylaxis against *Pneumocystis carinii* pneumonia for persons infected with human immunodeficiency virus. *MMWR* 1989; 38: 1-9
51. Pedersen C, Sandstrom E, Petersen CS et al: The efficacy of inosine pranobex in preventing the acquired immunodeficiency syndrome in patients with human immunodeficiency virus infection. *N Engl J Med* 1990; 322: 1757-1763
52. Leibovitz E, Rigaud M, Pollack H et al: *Pneumocystis carinii* pneumonia in infants infected with the human immunodeficiency virus with more than 450 CD4 T lymphocytes per cubic millimeter. *N Engl J Med* 1990; 323: 531-533
53. Guidelines for prophylaxis against *Pneumocystis carinii* pneumonia for children infected with human immunodeficiency virus. *MMWR* 1991; 40 (RR-2): 1-13
54. Fineberg HV: Screening for HIV infection and public health policy. *Law Med Health Care* 1990; 18: 29-32
55. Recommendations for diagnosing and treating syphilis in HIV-infected patients. *MMWR* 1988; 37: 600-602, 607-608
56. Tuberculosis and human immunodeficiency virus infection: recommendations of the Advisory Committee for the Elimination of Tuberculosis. *MMWR* 1989; 38: 236-238, 243-250
57. Barnes PF, Bloch AB, Davidson PT et al: Tuberculosis in patients with human immunodeficiency virus infection. *N Engl J Med* 1991; 324: 1644-1650
58. Selwyn PA, Hartel D, Lewis VA: A prospective study of the risk of tuberculosis among intravenous drug users with human immunodeficiency virus infection. *N Engl J Med* 1989; 320: 545-550
59. Small PM, Schecter GF, Goodman PC et al: Treatment of tuberculosis in patients with advanced human immunodeficiency virus infection. *N Engl J Med* 1991; 324: 289-294
60. Purified protein derivative (PPD)-tuberculin anergy and HIV infection. Guidelines for anergy testing and management of anergic persons at risk of tuberculosis. *MMWR* 1991; 40: 27-33
61. Girard PM, Pocidalo JJ, Murray JF: Primary prophylaxis against common infectious diseases in persons with human immunodeficiency virus infection. *Am Rev Respir Dis* 1991; 143: 447-450
62. Recommendations of the Immunization Practices Advisory Committee. Pneumococcal polysaccharide vaccine. *MMWR* 1989; 38: 64-76
63. Krasinski K, Borkowsky W: Measles and measles immunity in children infected with human immunodeficiency virus. *JAMA* 1989; 261: 2512-2516
64. Fox R, Odaka NJ, Brookmeyer R et al: Effect of HIV antibody disclosure on subsequent sexual activity in homosexual men. *AIDS* 1987; 1: 241-246
65. Frazer IH, McCamish M, Hay I et al: Influence of human immunodeficiency virus antibody testing on sexual behaviour in a "high-risk" population in a "low-risk" city. *Med J Aust* 1988; 149: 365-368
66. Van Griensven GJP, de Vroome EMM, Goudsmit JAAP et al: Changes in sexual behaviour and the fall in incidence of HIV infection among homosexual men. *BMJ* 1989; 298: 218-221
67. Cates W, Handsfield HH: HIV counselling and testing: Does it work? *Am J Public Health* 1988; 78: 1533-1534
68. Miller D, Pinching AJ: HIV tests and counselling: current issues. *AIDS* 1989; 3 (suppl 1): S187-S193
69. Kim HC, Raska K, Clemow L: Human immunodeficiency virus infection in sexually active wives of infected hemophilic men. *Am J Med* 1988; 85: 472-476
70. Laurian Y, Peynet J, Verroust F: HIV infection in sexual partners of HIV-seropositive patients with hemophilia [C]. *N Engl J Med* 1989; 320: 183
71. Casadonte PP: Psychological and behavioral impact among intravenous drug users of learning HIV test results. *Int J Addict* 1990; 25: 409-426
72. Martin GS, Serpelloni G, Galvan U et al: Behavioural change in injecting drug users: evaluation of an HIV/AIDS education programme. *AIDS Care* 1990; 2: 275-279
73. McKeganey N: Being positive: drug injectors' experiences of HIV infection. *Br J Addict* 1990; 85: 1113-1124
74. Becker MH, Joseph JG: AIDS and behavioral change to reduce risk: a review. *Am J Public Health* 1988; 78: 394-410
75. Schechter MT, Ballem PJ, Buskard NA et al: An anonymous seroprevalence survey of HIV infection among pregnant women in British Columbia and the Yukon Territory. *Can Med Assoc J* 1990; 143: 1187-1192
76. Hankins CA, Laberge C, Lapointe N et al: HIV infection among Quebec women giving birth to live infants. *Can Med Assoc J* 1990; 143: 885-893
77. Coates RA, Frank JW, Arshinoff R et al: The Ontario HIV seroprevalence study of childbearing women: results from the first year of testing. *Clin Invest Med* 1992; 15: 1-7

78. Peckham CS, Tedder RS, Briggs M et al: Prevalence of maternal HIV infection based on unlinked anonymous testing of newborn babies. *Lancet* 1990; 335: 516-519
79. Shapiro CN, Schulz SL, Lee NC et al: Review of human immunodeficiency virus infection in women in the United States. *Obstet Gynecol* 1989; 74: 800-808
80. Nolan K: Human immunodeficiency virus infection, women, and pregnancy. Ethical issues. *Obstet Gynecol Clin North Am* 1990; 17: 651-668
81. Selwyn PA, Schoenbaum EE, Davenney K et al: Prospective study of human immunodeficiency virus infection and pregnancy outcomes in intravenous drug users. *JAMA* 1989; 261: 1289-1294
82. Johnstone FD, Brettell RP, MacCallum LR et al: Women's knowledge of their HIV antibody state: its effect on their decision whether to continue the pregnancy. *BMJ* 1990; 300: 23-24
83. Temmerman M, Moses S, Kiragu D et al: Impact of single session post-partum counselling of HIV infected women on their subsequent reproductive behaviour. *AIDS Care* 1990; 2: 247-252
84. Biggar RJ, Pahwa S, Minkoff H et al: Immunosuppression in pregnant women infected with human immunodeficiency virus. *Am J Obstet Gynecol* 1989; 161: 1239-1244
85. Tuomala R: Human immunodeficiency virus education and screening of prenatal patients. *Obstet Gynecol Clin North Am* 1990; 17: 571-583
86. Minkoff HL, Landesman SH: The case of routinely offering prenatal testing for human immunodeficiency virus. *Am J Obstet Gynecol* 1988; 159: 793-796
87. Arno PS, Shenson D, Segal NF et al: Economic and policy implications of early intervention in HIV disease. *JAMA* 1989; 262: 1493-1498
88. Schlumpberger JM, Murray J: A controlled study of variation among family physicians in HIV screening recommendations. *J Fam Pract* 1990; 30: 169-173
89. Rhodes T, Gallagher M, Foy C et al: Prevention in practice: obstacles and opportunities. *AIDS Care* 1989; 1: 257-267
90. Boyd JS, Kerr S, Maw RD et al: Knowledge of HIV infection and AIDS, and attitudes to testing and counselling among general practitioners in Northern Ireland. *Br J Gen Pract* 1990; 40: 158-160
91. Public health service guidelines for counseling and antibody testing to prevent HIV infection and AIDS. *MMWR* 1987; 36: 509-515
92. Recommendations for assisting in the prevention of perinatal transmission of human T-lymphotropic virus type III/lymphadenopathy-associated virus and acquired immunodeficiency syndrome. *MMWR* 1985; 34: 721-726, 731-732
93. *Report of the Presidential Commission on the Human Immunodeficiency Virus Epidemic*, Washington, 1988
94. Horsburgh CR, Douglas JM, LaForce FM: Screening for infection with human immunodeficiency virus. In Fisher M (ed): *Guide to Clinical Preventive Services: an Assessment of the Effectiveness of 169 Interventions. Report of the US Preventive Services Task Force*, Williams & Wilkins, Baltimore, 1989: 139-146
95. Horsburgh CR, Douglas JM, Laforce FM: Counseling to prevent human immunodeficiency virus infection and other sexually transmitted diseases. *Ibid*: 331-339
96. Sherr L, Hedge B: The impact and use of written leaflets as a counselling alternative in mass antenatal HIV screening. *AIDS Care* 1990; 2: 235-245
97. Hedge B, Glover LF: Group intervention with HIV seropositive patients and their partners. *AIDS Care* 1990; 2: 147-154
98. Birch S, Stoddart G: Promoting healthy behaviour: the importance of economic analysis in policy formulation for AIDS prevention. *Health Policy* 1990; 16: 187-197
99. Kweder SL, Schnur RA, Cooper EC: Inosine pranobex — Is a single positive trial enough [E]? *N Engl J Med* 1990; 322: 1807-1809

Conferences

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Other Conferences • Conférences diverses

Sept. 30–Nov. 25, 1992: Legal Issues in Medical

Practice / Aspects juridiques de la pratique de la médecine (cosponsored by the Corporation professionnelle des médecins du Québec)

McGill University Faculty of Law

Eight 2-hour lectures, one per week.

Richard Golick or Denise Savoie, Faculty of Law, McGill University, PO Box 306, 3674 Peel St., Montreal, PQ H3A 1W9; (514) 398-4991 or 398-8369, fax (514) 398-8453

Oct. 2–3, 1992: Endourology and Uteroscopy Course

St. Joseph's Health Centre, London, Ont.

Dr. John Denstedt, Division of Urology, Rm. 1-421,

St. Joseph's Hospital, 268 Grosvenor St., London, ON

N6A 4V2, (519) 646-6036; or Biomedical

Communications, PO Box 224, Komoka, ON N0L 1R0,

(519) 471-0300

Oct. 15–17, 1992: Reframing Women's Health:

Multidisciplinary Research and Practice (sponsored by the Center for Research on Women and Gender, University of Illinois at Chicago)

Chicago Marriott Downtown

UIC Conferences and Institutes (M/C 607), PO Box 6998, Chicago, IL 60680; (312) 996-5225, fax (312) 996-5227

Oct. 19–20, 1992: Canadian Association of Road Safety

Professionals International Conference — Airbags and

Seat Belts: Evaluation and Implications for Public

Policy (sponsored by Transport Canada and the Société

de l'assurance automobile du Québec and followed on Oct. 21 by a public forum)

Hôtel Radisson Gouverneurs, Montreal

Association québécoise du transport et des routes, 300–

6455 Christophe-Colombe Ave., Montreal, PQ

H2S 2G5; (514) 274-3573, fax (514) 274-9608

Oct. 24–25, 1992: Interventional Neuroradiology:

Complications Associated with Current Techniques

Johns Hopkins Medical Institutions, Thomas B. Turner Building, Baltimore

CME credits available.

Conference coordinator, Johns Hopkins Medical

Institutions, Office of Continuing Education, Turner

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(410) 955-2959

Oct. 26–30, 1992: Magnetic Resonance Imaging and CT

Update: Annual Postgraduate Course

Hyatt Regency Hotel, Cambridge, Mass.

Department of Continuing Medical Education, Harvard

Medical School, PO Box 825, Boston, MA 02117;

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