ABSTRACT

This study aimed to determine the number and characteristics of the blood recipients tested for HIV infection as a result of the provincial HIV antibody screening program (directed to persons transfused between 1978 and 1985 and their contacts) and to estimate the rate of HIV seroprevalence among them. All physicians in the province of Quebec were provided with a special prescription form for HIV testing of eligible patients. Over a six-month period, a total of 6,348 special prescription forms were used. The HIV seroprevalence was 0.13% (95% confidence interval: 0.04% to 0.2%). We estimated an increase of 16.5% (12,061 tests) in the number of HIV tests related to the program. These results were consistent with those found by similar programs elsewhere in Canada but less than expected. Multiple strategies, including direct notification of transfusion recipients, particularly pediatric patients, are probably necessary to reach infected blood recipients still unaware of their infection.

ARG

Cette étude visait à déterminer le nombre et les caractéristiques des personnes transfusées entre 1978 et 1985 soumises à un test anti-VIH dans le cadre d'un programme provincial de dépistage qui leur était destiné, et à estimer la séroprévalence du VIH parmi elles. Tous les médecins de la Province de Québec ont reçu des formulaires spéciaux pour prescrire le test aux patients visés par le programme. Durant une période de six mois, un total de 6 348 formulaires spéciaux de prescription ont été utilisés. La séroprévalence du VIH était de 0,13 % (intervalle de confiance à 95 %: 0,04 % à 0,2 %). Nous avons estimé une hausse de 16,5 % dans le nombre de tests (12 061 tests) pouvant être reliée au programme. Ces résultats sont comparables à ceux obtenus avec des programmes canadiens semblables mais inférieurs aux estimations. Différentes stratégies, incluant la notification des personnes transfusées, particulièrement les patients pédiatriques, sont probablement nécessaires pour rejoindre les personnes transfusées infectées par le VIH et qui ne le savent pas.

Evaluation of the Quebec Public Information Campaign and Human Immunodeficiency Virus (HIV) Antibody Screening Program Directed to Persons Transfused Between 1978 and 1985

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Since November 1985, all donated blood in Canada has been screened for HIV antibodies, and so the risk of contracting HIV infection from a current blood transfusion is very low.¹ However, cases of HIV infection through unscreened blood transfusion between 1978 and 1985 have occurred, although their exact number is not known. Different measures have been used to reach recipients of blood potentially infected with HIV, such as various public and physician education activities, and Canadian Red Cross Society look-back and trace-back programs beginning with a known infected recipient or donor.^{2,3} Despite these efforts, there are still persons infected with HIV through blood transfusion who are unaware of their infection and may be spreading HIV to offspring and sexual partners.⁴

In the province of Quebec, it is estimated that 400,000 persons received a blood transfusion between 1978 and 1985, of

whom approximately 160,000 were still living by 1993.⁵ Using a mathematical model, Remis and Palmer estimated that between 150 and 200 Quebecers were infected by HIV through transfusion before 1985.⁶ From a comparison of the database from the Programme de surveillance du sida du Québec⁷ and that from the Red Cross Society, and according to the McDonald report,⁸ it is estimated that as of 1993 between 60 and 70 HIV-infected blood recipients had been informed of their serologic status. According to these estimates, 80 to 140 Quebec HIV-positive blood recipients were unaware of their infection at that time.

In this context and following the recommendation of an expert committee,⁵ the Ministère de la Santé et des Services sociaux du Québec initiated a public information campaign and an HIV antibody screening program in September 1993, directed to persons given transfusion between 1978 and 1985, called "Opération-Transfusion". The objectives of the present study were to estimate the number of Quebec patients who received transfusion between 1978 and 1985 who were tested for HIV infection as a result of the program directed to them, to estimate the number of HIV-seropositive subjects thus identified, and to describe these persons.

METHODS

Description of the program

All physicians in the province of Quebec were provided with a special pre-

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scription form for HIV testing of eligible patients. Information on age, sex and area of residence of patients, year, reason and hospital of transfusion was recorded on this form. For the other patients, physicians used the routine requisition form with no risk factor information. Blood samples were tested through the regular diagnostic network. An enzyme-linked immunosorbent assay (EIA) for HIV antibody testing was carried out. If the sample was repeatedly positive by EIA, the specimen was sent to the Laboratoire de Santé publique du Québec (LSPQ) for confirmatory testing using radioimmunoprecipitation assay (RIPA).

Study population and data collection

All subjects tested for HIV infection in the context of the Opération-Transfusion formed the study population. The subjects were eligible if an HIV antibody test was prescribed between September 22, 1993 (day of the public announcement of the program) and April 1, 1994 (date of the end of data collection).

The information on eligible persons for whom physicians used a special prescription form was centralized anonymously (without identification items of subjects) at the Centre québécois de coordination sur le sida. The prescribing physician of every patient whose test result was positive was contacted by one of us (R.M.) to verify the information provided on the prescription form. The study protocol was approved by the ethics committees of the Hôpital du Saint-Sacrement.

Statistical analysis

A descriptive analysis of the data was carried out. The HIV seroprevalence and 95% confidence intervals (CI) were computed for the study population overall and by sex. Fisher's exact test was used to compare proportions and Student's *t* test for the comparison of means. A comparative analysis of these data and those from the Programme québécois de diagnostic de l'infection au VIH, which compiles all data on HIV testing in Quebec,⁹ allowed an estimate of the increase in the number of HIV tests related to the program.

RESULTS

Characteristics of participants

A total of 6,348 special prescription forms for HIV testing were received in the context of the Opération-Transfusion. The sex, age and area of residence of participants are shown in Table I. Women were younger than men: 43.4 years (SD: 15.4) vs 47.6 years (SD: 20.6), $p < 0.001$. If subjects for whom there were missing data were excluded, women represented 66% of the participants; nearly 50% of patients tested were living in the region of Montreal.

The main reasons reported as indications for transfusions were cardiovascular surgery (14.7%) and obstetrical indications, including ectopic pregnancy (15.2%) (Table I). When subjects with unknown year of transfusion were excluded, the majority (53.1%) of HIV tests were prescribed for persons given transfusion during years 1983, 1984 and 1985 when the risk of exposure to HIV through infected blood was highest (Table I).

Prevalence of HIV infection

Of the 6,348 blood samples corresponding to the forms that were received, 33 (0.5%) were sent to the LSPQ for confirmatory testing because of two positive EIA results. Seven of these 33 samples yielded a positive result and one an undetermined result by RIPA. Excluding the latter, the prevalence of HIV infection was 0.1% (95% CI: 0.04% - 0.2%). The prevalence was higher among men than women, but the difference was not statistically significant: 0.3% (5/1,934) vs 0.06% (2/3,533), $p = 0.1$. The median age of seropositive subjects was 43 years (range: 26 to 65), and five of them were living in the Montreal region. Six of the 7 seropositive subjects received blood between 1979 and 1985. The year of transfusion and the name of physician were unknown for the other. The personal physicians of six seropositive subjects were contacted, and, according to the medical history, transfusion was the sole risk factor for three seropositive subjects whereas other risk factors, such as multiple sexual partners, male homosexual behaviour or intravenous drug use, were reported by three others.

TABLE I
Characteristics of Persons Tested for HIV Infection in the Context of the Quebec Opération-Transfusion

	Number	%
Sex		
Male	1,936	30.5
Female	3,532	55.6
Unknown	880	13.9
Age (years)		
0-19	537	8.5
20-39	1,385	21.8
40-59	1,894	29.8
≥ 60	1,171	18.5
Unknown	1,361	21.4
Area of residence		
Montreal	2,546	40.1
Elsewhere in the province	2,891	45.5
Out of the province	1	0.02
Unknown	910	14.3
Year of transfusions*		
< 1978	49	0.8
1978-1979	584	9.2
1980 to 1982	1,741	27.4
1983 to 1985	2,859	45.0
> 1985	152	2.4
Unknown	963	15.2
Reason for transfusions		
Cardiac surgery	936	14.7
Other surgeries	1,459	23.0
Obstetric (including ectopic pregnancy)	968	15.2
Trauma	427	6.7
Other indications	811	12.8
Unknown	1,747	27.5

* If there were two or more years of transfusions, only the most recent year was kept, unless subjects were transfused both between 1978 and 1985 and after 1985. In this case, the year between 1978 and 1985 was kept.

According to the available information, no additional case has been identified among contacts of positive subjects.

Estimated increase in the number of HIV tests

A total of 94,073 HIV tests were reported to the Programme québécois de diagnostic de l'infection au VIH during the study period. This number represented an increase of 24% (18,222/75,851) over the number of tests reported during the corresponding period one year before (Figure 1). However, an increase in the number of tests of 7.5% (2,866/38,043) occurred during the first 15 weeks of 1993 (from January 1 to April 15) as compared with the corresponding period during 1992. After adjustment for this rise, the increase has been estimated at 12,061 tests, 16.5% of 73,211. More than 80% of these addi-

project initiated by the Hospital for Sick Children in Toronto to notify the parents of blood recipients received considerable media attention throughout Canada.¹¹ During the four weeks after the announcement of this project, Ontario noted a daily increase of 60% (400/650) in HIV tests. In Quebec, the LSPQ recorded an increase of 30% in the number of HIV tests (2,906/10,586) over a five-week period as compared with the corresponding period in 1992. As a rise of 10% was already noted five weeks before and after this period, it is possible that some Quebec patients given transfusion had already been tested when the program was launched.

On the other hand, it seems that neither the Ontario screening program announced in July 1993 directed to persons who had received blood, nor the media attention surrounding the Montreal session of the federal Commission of Inquiry on the Blood System in Canada in January 1994, had any perceptible effect on the number of HIV tests performed in Quebec. In contrast, the Montreal Children's Hospital program¹² to notify young patients may explain the increase in the number of these patients tested after January 1994. Indeed, 31% of persons tested after January 31, 1994, were aged less than 20 years vs 9% of those tested before this date, $p < 0.001$. According to the results of the Montreal Children program, it seems that up to 36% of the persons did not know that transfusion had been given.¹² This may explain in part why the number of tests performed during the study period was lower than expected.

DISCUSSION

The results related to the number of HIV tests performed in the context of the Quebec Opération-Transfusion and the number of HIV-seropositive subjects thus identified were consistent with those observed in similar programs elsewhere in Canada, but less than expected.

Quality of data

One of the important limits of this study was the reliability of the source of data. It is difficult to know with certainty whether physicians used the special form for all eligible patients and only for them. Only 6,348 special prescription forms were used during the study period, whereas an increase of 12,061 HIV tests has been estimated. This difference may indicate that some physicians prescribed HIV tests for eligible patients and did not use the special form. It is also possible that the increase may be related, at least in part, to the increase in testing among others than the targeted group. Likewise some special prescription forms may have been used for

ineligible subjects. In addition, duplicate testing may be possible for some patients. Unfortunately, it is impossible to estimate this duplication rate. Finally, the amount of missing data constitutes another important limit of this study. Nevertheless, the characteristics of participants seem compatible with those of survivors of transfusion:¹⁰ the majority were women, and 52% received their transfusion for a surgical or an obstetric indication.

Estimated increase in the number of tests

The results showed an estimated increase of 6,000 HIV tests during the first six weeks and 12,000 after 30 weeks. Even though these results are less than expected, they seem consistent with those observed in Ontario. With a larger population and a different method of adjustment, Ontario reported an estimated increase of 12,500 HIV tests during the first four months after the beginning of the provincial screening program (C. Major, HIV Laboratory, Central Public Health Laboratory, Ontario Ministry of Health: personal communication). Unfortunately, no information from other Canadian provinces with similar programs—New Brunswick, British Columbia and Alberta—has been reported.

Some events may have had an effect on the number of HIV tests performed during the study period. First, in April 1993 a

Number of seropositive patients identified

The Quebec Opération-Transfusion allowed identification of seven seropositive subjects who were unaware of their infection. This result is similar to that obtained in Ontario, where six HIV-seropositive persons were identified out of an estimated 12,500 persons tested as a result of the provincial program (C. Major, personal communication). This is far lower than the figure of 80 to 140 HIV-seropositive persons unaware of their infection that was estimated using a back calculation method,⁶ but is within the limits of the

more recent projection estimated at between 0 and 50.¹³

Indeed, it seems that the former figure could have been an overestimate. First, the HIV seroprevalence rate (6 per 10,000 blood donors) used in the mathematical model was that observed among Quebec blood donors during the first three months after the introduction of screening of all donated blood. During the same period, this rate was 2 per 10,000 among Canadian blood donors.¹⁴ It appears that the difference was related in part to the fact that testing was not available in clinical settings in the province of Quebec at that time, and in spite of efforts of blood centres to exclude them, many persons with risk factors for HIV infection donated blood so that they would learn their serostatus. The more recent estimation took this factor into account.¹³ Second, the survival rate of 40% after one year among all persons who had been given blood could also overestimate the number of transfusion-associated HIV-positive subjects who were still living and unaware of their infection. Indeed, the risk of HIV infection is higher among persons who received many blood units than among those who received few blood units. As the mortality rate is probably also higher among this group,¹⁰ it is likely that some HIV-positive transfusion recipients were dead without having known their serostatus. Thus, these persons have to be withdrawn from the pool of infected persons still living and unaware of their infection.

The design of this study did not allow an assessment of the cost-effectiveness of the program. If we assume that the main costs of the program are attributable to the public campaign (estimated at between \$75,000 and \$150,000) and to the increase in the number of HIV tests (estimated at between \$60,000 and \$96,000), the cost by HIV-seropositive subject identified as a result of the program would be between approximately \$20,000 and \$35,000. Unfortunately, no data on the

costs of other programs are available for comparison; neither do we know whether secondary cases were prevented because these seropositive subjects were henceforth aware of their status. Other important objectives, such as determining the proportion of persons given a transfusion who received information on the risk of transmission of HIV infection by contaminated blood, were not assessed. However, according to the results of a telephone survey among a representative sample of the Quebec population conducted during the sixth week after the beginning of the program, 80% (805 of 1000 participants) of interviewed persons reported having heard about the Quebec HIV screening program, and 56% of those who had received blood between 1978 and 1985 (18/32) had seen their family physician.¹⁵ Finally the present analysis did not include the blood recipients who visited their physician after the end of the study period and who received relevant information and testing.

In conclusion, because lack of awareness of transfusion seems an important limitation to seeking testing, multiple strategies, including direct notification of transfusion recipients and particularly pediatric patients, are probably necessary to identify HIV-infected persons who received blood between 1978 and 1985 and are still unaware of their infection.

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