Acceptability and utilisation of voluntary HIV testing and nevirapine to reduce mother-to-child transmission of HIV-1 integrated into routine clinical care

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Objectives. Use of nevirapine for prevention of mother-to-child transmission (PMTCT) of HIV-1 has been routine clinical care at Coronation Women and Children's Hospital since April 2000.We assessed the effect of regular audit and targeted interventions on the utilisation of the PMTCT programme.

Methods. Review of antenatal cards and hospital records of women discharged following delivery, in three time periods between October 2000 and February 2002. Following the initial audit an intervention was implemented to eliminate weaknesses in our PMTCT service. Following the second audit the hospital became a pilot site for the Gauteng PMTCT programme.

Results. In the initial audit 53.2% of women (159/299) were tested for HIV and received their results, while 56% (14/25) of identified HIV-infected women, and 16% (4/25) of their infants, received nevirapine. By the third audit 74.3% of women (266/358) received their results, and 86% (43/50) of HIV-positive women and 74% (37/50) of newborns were documented to have received nevirapine. In all three audits over 90% of women initiating antenatal care at the hospital were tested for HIV, while women who initiated care at district community clinics were less likely to receive testing.

Conclusions. Ongoing audit has been important for targeting obstacles to detection of HIV-infected women and documented nevirapine uptake by women and infants. Rates of HIV testing and nevirapine use have increased significantly. Voluntary counselling and testing for HIV and use of nevirapine are acceptable to pregnant women in our setting. Roll-out of the pilot programme to district community clinics is essential for further improvement.

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The finding that a single dose of nevirapine administered to women during labour and to their infants after delivery reduced mother-to-child transmission of human immunodeficiency virus type 1 (HIV) by 47%[1] was a critical event. It made feasible the use of antiretrovirals for prevention of mother-to-child transmission (PMTCT) of HIV in poorly resourced settings.[2] Nevirapine has been provided as part of routine care at Coronation Women and Children's Hospital (CWCH) since April 2000.

CWCH is affiliated to the University of the Witwatersrand. It provides primary, secondary and limited tertiary level obstetric and neonatal care facilities to a large urban and peri-urban population of western Johannesburg. Three district community clinics provide antenatal care in the area. None of these clinics provides intrapartum care, and only one had an established voluntary counselling and testing (VCT) system at the time of the first audit.

Although simple, the nevirapine regimen poses several challenges. It requires a functional VCT programme for HIV during antenatal care. The window of opportunity for intrapartum nevirapine is narrow — HIV-infected women should receive nevirapine at least 2 hours before delivery to ensure efficacy. Use of nevirapine before labour is problematic because of evidence that nevirapine-resistant mutations of HIV develop in approximately 20% of women[3] and there are concerns that the rate will be higher if multiple doses are used. HIV-exposed infants should receive nevirapine within 48 - 72 hours of delivery. The logistics of providing nevirapine are further complicated if, as occurs in our region, community clinics provide antenatal but not intrapartum care, and may or may not test for HIV.

The objectives of the study were to describe deficiencies in the antenatal VCT service and in provision of nevirapine, and to assess changes following targeted interventions.

Methods

Audits were conducted in October 2000, April 2001 and February 2002, and are referred to as audits 1, 2 and 3 respectively. Each audit was conducted over a 2-week period. It comprised a retrospective review of hospital records and antenatal clinic cards collected for consecutively discharged patients from the postnatal wards at CWCH. Labour ward and postnatal ward staff were not informed of the audit dates. Information was collected regarding: (*i*) attendance at and site of antenatal care; (*ii*) whether an HIV test was done; (*iii*)

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whether women received their HIV test result; (*iv*) whether a rapid plasma reagin (RPR) test for syphilis was done (for comparison purposes); and (*v*) whether nevirapine use was documented for mother and infant. Antenatal cards and hospital records of those not tested were assessed for missed opportunities for VCT at CWCH.

Women initiating antenatal care at CWCH receive VCT, and if they consent, are tested for HIV at the first visit. At the time audit 1 was conducted a laboratory enzyme-linked immunosorbent assay (ELISA) test was used. HIV-infected women were identified at the second visit and referred to the antenatal HIV clinic. One of the community clinics had a VCT system, but the other clinics tested only sporadically. In the interests of confidentiality results were documented cryptically on the patient-held antenatal card. Each clinic had its own method of documentation. HIV-infected women who presented to the hospital in labour were identified by the nursing staff and given nevirapine. In the postnatal wards, infants were detected and treated in a similar manner.

Problems with the operational aspects identified in the initial audit (Table I) were addressed initially by means of an intervention to increase staff awareness. This included discussions with relevant staff, and a poster campaign in the hospital to target the problems identified. The audit was repeated in April 2001, 2 months after the intervention.

With the implementation of the national PMTCT pilot project (described by McCoy *et al.*[4]) in October 2001, CWCH became a provincial pilot site. Audit 3 was conducted in February 2002. While the pilot project provided additional resources to the hospital, the community clinics were not included.

Statistical analysis was conducted using Epi-Info 2000. Audit data were compared using a chi-square or Fisher's exact test as appropriate. Audit 1 was used as a control group for audit 2, and audit 2 for audit 3.

The study was approved by the University of the Witwatersrand Committee for Research on Human Subjects, protocol number M01-04-23.

Results

A total of 965 records were assessed across the three audits. Audit data for the whole group, and for those initiating antenatal care at CWCH, are presented in Tables II and III respectively.

The system for syphilis testing was efficient in all audits, whether antenatal care was initiated at CWCH or elsewhere. A total of 900/965 records (93.3%) had a rapid plasma reagin (RPR) result documented.

The rate of HIV testing differed markedly between women who initiated antenatal care at CWCH and those who did not. In total 424/965 women (43.9%) initiated antenatal care at CWCH, forming a similar proportion in each audit. The rates of testing for HIV among these subjects were above 90% for all the audits, with 401/424 (94.5%) receiving HIV testing.

Of the 965 women, 541 (56.0%) did not start antenatal care at CWCH. Most of these subjects initiated antenatal care at the community clinics, while 71 patients (7.4% of all subjects) received no antenatal care. The rate of HIV testing among these women was poor in audit 1, with only 37.2% (64/172) tested. This improved to 64.1% (109/170) and 74.9% (149/199) in

Table I. Process of audit and intervention

Problems at initial audit	Probable reason/s for problem	Interventions following audit 1	Changes introduced by PMTCT pilot project
Failure to offer VCT at community clinics	Lack of VCT knowledge, skills and resources	Clinic staff informed about availability of VCT training and encouraged to implement VCT	
Failure to test at hospital antenatal clinic visit	Lack of staff awareness	Staff education	Salaried lay counsellors
Failure to obtain HIV results	Lack of staff awareness	Staff education	'Rapid' on-site tests
No maternal dose of nevirapine recorded	Lack of staff awareness OR Women presenting in advanced labour OR Difficulty interpreting encoded results OR Poor documentation	Staff education	Women received nevirapine to take home for self-administration
No infant dose of nevirapine recorded	Lack of staff awareness OR Difficulty interpreting encoded results OR Poor documentation	Staff education	Lay counsellors monitor infant dosing

VCT = voluntary counselling and testing.

Table II. HIV testing and nevirapine use for all patients

	Audit 1 October 2000 (*N* = 299)	Audit 2 March 2001 (*N* = 308)	*p*-value* (audit 2 v. audit 1)	Audit 3 February 2002 (*N* = 358)	*p*-value* (audit 3 v. audit 2)
HIV tested (No. (%))	181 (60.5)	242 (78.6)	< 0.001	300 (83.8)	0.08
HIV results obtained antenatally (as % of the tested)	159 (87.8)	213 (88.0)	0.95	266 (88.7)	0.81
ELISA-positive (as % of tested)	27 (14.9)	58 (24.0)	–	54 (18.0)	–
Positive results obtained antenatally (% of positives)	25 (93)	51 (88)	0.79	50 (93)	0.41
Mother received nevirapine (as % of antenatal positives)	14 (56)	39 (76)	0.07	43 (86)	0.22
Nevirapine 2 - 48 hours before delivery (as % of those receiving nevirapine)	Not checked	26 (67)	–	30 (70)	0.76
Baby received nevirapine (as % of antenatal positives)	4 (16)	23 (45)	0.01	37 (74)	0.003

* Chi-square, or Fisher's exact test.

Table III. HIV testing and nevirapine use for subjects initiating antenatal care at CWCH

	Audit 1 October 2000 (*N* = 127)	Audit 2 March 2001 (*N* = 138)	*p*-value* (audit 2 v. audit 1)	Audit 3 February 2002 (*N* = 159)	*p*-value* (audit 3 v. audit 2)
HIV tested (No. (%))	117 (92.1)	133 (96.4)	0.13	151 (95.0)	0.55
HIV results obtained antenatally (as % of the tested)	101 (86.3)	130 (97.7)	<0.001	150 (99.3)	0.34
ELISA-positive (as % of the tested)	10 (8.5)	23 (17.3)	-	24 (15.9)	-
Positive results obtained antenatally (% of positives)	8 (80)	22 (96)	0.21	24 (100)	0.31
Mother received nevirapine (as % of antenatal positives)	6 (75)	21 (95)	0.17	22 (92)	1.0
Nevirapine 2 - 48 hours before delivery (as % of those receiving nevirapine)	Not checked	14 (67)	-	17 (77)	0.44
Baby received nevirapine (as % of antenatal positives)	1 (12.5)	7 (30)	0.39	19 (79)	< 0.001

*Chi-square, or Fisher's exact test .

audits 2 and 3 respectively. As there may have been missed opportunities for testing at CWCH before the onset of labour, the frequency of missed opportunities in untested women was assessed in audits 1 and 2. There were 51 missed opportunities in audit 1 compared with 24 in audit 2.

The rate at which women received nevirapine increased significantly between audits 1 and 3 ($p = 0.004$, chi-square). The only women who received nevirapine to take home for self-administration were those initiating antenatal care at CWCH in audit 3. None of these women took their nevirapine more than 48 hours before delivery.

Discussion

The study demonstrates significant improvements over time in the rates of testing for HIV. Audit 1 showed that the CWCH antenatal clinic provided an effective VCT and HIV testing programme for those initiating antenatal care at the hospital, and demonstrates that HIV testing is well accepted by women attending antenatal care. Among women not initiating antenatal care at CWCH the rate of HIV testing was low because several community clinics did not have a well-established VCT system. Testing rates improved over time, but remained suboptimal. The fact that RPR testing was provided efficiently suggests that these clinics give competent antenatal care, and that with appropriate support they should be able to implement VCT for HIV. Although there was a reduction in missed opportunities for HIV testing at CWCH, in many cases there were no opportunities for HIV testing at the hospital. We concur with the recommendation of McCoy *et al*.[4] that the PMTCT programme should be developed and integrated into other related programmes at subdistrict level.

The proportion of HIV tests for which results were obtained did not improve between the audits, except among women who initiated antenatal care at CWCH between audits 1 and 2. For these patients virtually all results were obtained once staff awareness improved, because undocumented results are readily accessible by computer. Thus the introduction of a rapid HIV test yielded no further improvement, contrary to the findings of a previous study[5] demonstrating increased uptake of testing with a rapid test compared with a laboratory ELISA test. The use of a rapid test would more likely have been useful in the community clinics, where there were persistent problems with obtaining HIV results.

The maternal dose of nevirapine should be taken between 2 and 48 hours before delivery. Nearly one-third of women who received nevirapine did not take it in this time period (i.e. timeously). One might expect that women would tend to take nevirapine too late if it is only dispensed by labour ward staff, and too early if they self-administer it. However, in only one case was the nevirapine taken too early and this was administered by hospital staff. In the small group of subjects who received nevirapine for self-administration there was no significant improvement in the rate at which these women took their nevirapine, or in the rate that they took it timeously. It is likely that self-administration of nevirapine would be more important for women who live further away from the hospital, particularly those attending community clinics. Reasons for failure to self-administer nevirapine at the correct time require further elucidation. Our impression is that some women find it difficult to decide when to take their nevirapine, or may misplace the tablet. It is therefore important that women be counselled on the correct use of nevirapine and that the labour ward staff confirm that nevirapine has been taken.

The emphasis on maternal diagnosis and prophylaxis may result in an underemphasis on giving nevirapine to the infant. However, this is an integral part of the regimen. In addition, post-exposure prophylaxis with neonatal nevirapine may be important if women do not receive nevirapine or do not receive it timeously (G Gray *et al*. — paper presented at the 14th International AIDS Conference, Barcelona, 2002 (abstract No. LbOR13)). The neonatal dose of nevirapine was infrequently documented at the initial audit. This improved, but by the third audit neonatal nevirapine was still not documented in one-quarter of cases. The neonatal dose is given in the postnatal wards, and requires that the antenatal card and delivery notes be rechecked and nevirapine given accordingly.

The confidential nature of information regarding HIV status unintentionally increases the risk of missed opportunities for nevirapine use. Some women are reluctant to notify staff of their status. This is unlikely to change until stigma related to HIV-positive status reduces. In addition, it has proved difficult to develop a uniform but confidential system of documentation for HIV results.

The fact that almost half of the identified HIV-infected women in audit 1 were not documented to have received nevirapine may reflect poor documentation. The study was limited by the fact that it relied on written documentation in the antenatal cards and hospital records, and it was not possible to differentiate with certainty between medication not given and medication not documented. While we attempted to improve documentation, we feel that for audit purposes it is appropriate to assume that 'not documented means not done'.

Another limitation was the retrospective collection of data, resulting in an inability to collect information on women who received antenatal care in our service but delivered elsewhere.

It has been noted that public health interventions in developing countries, such as the Expanded Programme for Immunisation, have taken some time to achieve adequate coverage.[6] In view of our use of historical control groups, it is not possible to be certain that the improvements documented were due to the interventions applied rather than related to the passage of time. However, it seems very likely that ongoing quality control through audit and intervention has been important in the improvement our PMTCT programme. It is apparent from our results that the incremental effect of drop-offs at several stages in the process of HIV testing, obtaining results and providing nevirapine on the overall efficiency of the PMTCT programme can be very large. Attention to each detail is therefore essential.

Conclusion

The overall efficiency of our PMTCT service improved from audit to audit. Testing for HIV and use of nevirapine were well

accepted. The main shortcomings with HIV testing were among women who initiated antenatal care outside the hospital. Roll-out of the PMTCT pilot project to the community clinics is essential. In addition, significant challenges remain in the provision of nevirapine to newborns, and in the timing of the maternal dose. Similar to many other public health interventions, the PMTCT programme requires ongoing quality control to ensure effectiveness.

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References

1. Guay LA, Musoke P, Fleming T, *et al*. Intra-partum and neonatal single-dose nevirapine compared with zidovudine for prevention of mother-to-child transmission of HIV-1 in Kampala, Uganda: HIVNET012 randomised trial. *Lancet* 1999; **354:** 795-802.
2. Abdool-Karim S, Abdool-Karim Q, Adhikari M, *et al*. Vertical HIV transmission in South Africa: translating research into policy and practice. *Lancet* 2002; **359:** 992.
3. Eshlemann SH, Mracna M, Guay L, *et al*. Selection and fading of resistance mutations in women and infants receiving nevirapine to prevent HIV-1 vertical transmission (HIVNET 012). *AIDS* 2001; **15:** 1951-1957.
4. McCoy D, Besser M, Visser R, Doherty T. *Interim Findings on the National PMTCT Pilot Sites: Lessons and Recommendations*. Durban: Health Systems Trust, 2002. **www.hst.org.za/pubs/pmtct/pmtctinterim.htm** (accessed 15 April 2003).
5. Malonza IM, Richardson BA, Kreiss JK, Bwayo JJ, John-Stewart GC. The effect of rapid HIV-1 testing on the uptake of perinatal HIV-1 interventions: a randomized clinical trial. *AIDS* 2003; **17:** 113-118.
6. Abdullah MF, Young T, Bitalo L, Coetzee N, Myers JE. Public health lessons from a pilot programme to reduce mother-to-child transmission of HIV-1 in Khayelitsha. *S Afr Med J* 2001; **91:** 579-583.

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IN BRIEF

Domestic cleaning and asthma

Asthma is the most common occupational lung disease in industrialised countries, occupational exposures being responsible for 5 - 20% of all adult asthma cases. Several community-based studies have recently shown an increased risk for asthma in cleaners, an occupation not traditionally associated with this disease.

To assess the risk of asthma in women employed in domestic cleaning, a group of researchers in Spain conducted a cross-sectional study in 4 521 women aged 30 - 65 years. Information on respiratory symptoms and cleaning work history was obtained using a posted questionnaire, with telephonic follow-up. Asthma was defined as reported symptoms within the last year, or current use of drugs to treat asthma. The questionnaire requested answers to questions about wheezing, breathlessness, previous asthma, nocturnal dyspnoea, drug use for asthma, cough, phlegm, runny nose or sneezing without a cold, and job-related respiratory problems. Work-related questions enquired about the location of the work (domestic or non-domestic), timing and type of work.

Of the total enrolment, 593 of 4 521 women were employed as domestic cleaners. Asthma was more prevalent in this group than in women who had never worked in cleaning. Former domestic work was reported by 1 170 women, and was strongly associated with asthma. Current and former non-domestic cleaning was not significantly associated with asthma. Twenty-five per cent of the asthma cases in the study population were attributable to domestic cleaning work.

This study suggests that not only professional domestic cleaners but people undertaking cleaning tasks at home are at risk of asthma.

Medina-Ramon M *et al. Thorax* 2003; **58:** 950-954.