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The effect of a CPD training (educational) intervention on the level of HIV knowledge of pharmacists

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Abstract

Introduction: Due to the huge impact of the HIV/AIDS epidemic in South Africa, it is critical that all health care professionals make the maximum possible contribution to prevention and care. Pharmacists in practice, who may have learnt little about the disease during their training, require to be taught and updated. We designed and implemented a continuing professional development (CPD) programme for this purpose. Learning materials were compact disc (CD) based and in print format.

Aim: The main objective of the study described in this paper was to determine the effect of the training course on the level of knowledge of community pharmacists in South Africa and to identify whether any differences occurred between study group sub-groups which received the manual only or the CD plus the instructional manual.

Method: We utilised a pre-intervention/post-intervention study design, with control and study groups, which also identified knowledge gaps at baseline. Questions in the research instrument were classified into five categories, transmission, testing and counselling, treatment, diagnosis and compliance/adherence. Differences between pre- and post-intervention results for the two groups were calculated, compared and analysed statistically and for effect size. Each respondent served as her/his own control.

Results: The differences between the sub-groups at post-test 1 were small and not statistically significant. We therefore combined them and compared the performance of the study group as a whole against that of the control group. In three of the five knowledge categories baseline scores were low (average scores around 50%). In the study group, these three categories showed highly significant increases at post-intervention (scores improved by between 20 and 30%), as did the overall response. The total effect size was high (0.85).

Conclusion: The CPD programme on the pharmacist in HIV/AIDS management tested in this study is highly effective in improving the knowledge base of participating pharmacists and hence preparing them for a wider role in reducing the effect of the pandemic.

Keywords: *CD and printed manual teaching material, CPD, HIV/AIDS, outcomes*

Introduction

HIV is a global disease which affects us all. Treatment alone is not enough. To fight the epidemic, all health care professionals and the community must be involved.

In South Africa, both public and private sector pharmacists contribute to the effort. In the public sector the main government initiative, *The Operational Plan for Comprehensive Treatment and Care for HIV and AIDS*, promised to deliver comprehensive care to the 5.3 million HIV positive people in the country, including providing antiretroviral treatment. Most of the operational plan is devoted to developing a network of accredited clinical facilities, called "service points" that will be dedicated to HIV care. Achieving this goal will require many trained healthcare providers. It is estimated that to provide treatment for each 10,000 patients, 28 doctors, 90 nurses, 44 pharmacists and 132 counsellors must be recruited and trained (Operational plan, 2003; www.aidsmap.com, 2003).

In the private sector, community pharmacists provide medication and advice. The South African Pharmacy Council promotes these and related activities through its formal recognition of approved pharmacies as HIV/AIDS Resource Centres. One of the criteria for approval is successful completion of an

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officially recognised HIV/AIDS continuing professional development (CPD) course. The course tested in this study is such a course.

HIV is a complex disease to treat. Long-term side effects may present and many drug interactions occur with other prescribed medications, as well as over-the-counter preparations and traditional and complementary remedies. Adherence to medication regimens is of the utmost importance. Additionally, many doctors rely on pharmacists to explain the use of the medication to patients to ensure adherence. There is also a great need to educate other HIV care providers on drug therapy to improve drug use and management. Specific training on highly active antiretroviral therapy (HAART) and adherence should therefore be offered to all health care providers, particularly pharmacists and must be updated regularly. Pharmacists should also be competent in testing and counselling as voluntary testing, counselling and information should be available to all (African Development Forum, 2000).

HIV/AIDS related research in pharmacy practice has not been extensive. A literature survey uncovered just five papers. The majority of these papers described studies which investigated the knowledge and/or attitudes of community pharmacists about HIV/AIDS, its prevention and treatment (Katz, Draugalis & Lai Katz, 1995, 2000; Sheridan, Strang, Taylor & Barber, 1997; Myers, 1998; Watson, Gould & Bond, 2003). No papers were located which described either the development and/or testing of an educational intervention for pharmacists, despite the finding that, although knowledge levels were low, pharmacists were prepared to play a greater role in HIV/AIDS prevention and treatment.

As the School of Pharmacy had previously designed and developed an HIV/AIDS self-study, distance learning training programme, the study described in this paper was designed to determine its effect on the level of knowledge of practising community pharmacists. Initially, we planned to investigate which of two methods of delivery, namely compact disc (CD) only or CD plus instructional manual, was more effective.

Methods

Study population and sampling

Lists of all community pharmacies in the Gauteng (study group) and Western Cape (control group) provinces were obtained from the South African Pharmacy Council. Pharmacies were selected at random from these lists, as described below. The investigator contacted each pharmacy by telephone and requested the pharmacist on duty to participate in the study. In cases where pharmacists in specific pharmacies declined to participate, the next pharmacy on the list was selected. Each participating pharmacist was allocated an identity number, which allowed for tracking and follow-up throughout the study.

Study group

A total of 150 usable responses was necessary for the study group. Hence, 300 pharmacies were selected. Because, there were approximately 900 community pharmacies in Gauteng, one in every three pharmacies was selected at random to ensure a representative sample. A total of 293 pharmacies was selected in this way.

Control group

A total of 100 usable responses was necessary for the control group. Hence, 200 pharmacies were selected. Because, there were approximately 400 community pharmacies in the Western Cape, one in every two pharmacies was selected at random to ensure a representative sample.

Measurements

This study was designed as a pre-test/post-test experiment, utilising a questionnaire to collect data for measurement. A pre-test was applied to all participants before the intervention took place to determine whether the groups were comparable at the beginning of the study (at baseline). The questionnaire was designed to ascertain if course objectives were achieved. The control group was selected from a distant geographic area to ensure that this group was not inadvertently exposed to the intervention used in the experimental condition (Trochim, 2002).

The questionnaire was adapted from Katz et al. (1995). Pharmacists in both the study group and the control group received the same questionnaire during all stages of the research project. The questionnaire contained 25 questions to test HIV knowledge. The respondents were required to mark the statements as "true", "false" or "don't know". The questionnaire contained questions relating to transmission, testing and counselling, treatment, diagnosis and compliance/adherence.

The questionnaire accompanied by a covering letter was mailed, faxed or e-mailed to participants. Respondents were asked to return the completed questionnaires by fax. In the study group, the pre-test was administered during August/September 2002. After collection of baseline data, the training programme was implemented in the study group. This group received training material for self-study during March 2003. The training material was posted to all respondents by registered mail. Study group participants were divided into two groups. About 50% of the study group respondents received a printed training manual. The other 50% received the manual and an

interactive CD. Pharmacists were asked to study the material in their own time. Appropriate time was allowed before respondents were tested at post-test (approximately 6–8 weeks). The post-test was administered during May 2003. In the control group, the pre-test was administered during September/October 2002. This group received no intervention. The post-test was administered during April/May 2003.

All pharmacists who did not respond after the first request were contacted by telephone after 3 weeks and again asked to complete the questionnaire.

The training programme

Since 1998, the International Pharmaceutical Federation (FIP) Working Group on AIDS and drug addiction has worked with the World Health Organisation (WHO) on a project entitled "Pharmacists as key for prevention and pharmaceutical care providers for people living with AIDS". The training programme used in this study used the layout of the FIP project and adapted the modules to comprise a CPD course. The training programme is aimed at all pharmacists who practise in a patient care environment. The programme consists of 10 modules, which cover the following aspects:

- the human immunodeficiency virus;
- testing and counselling;
- the continuum of care;
- antiretroviral therapy;
- adherence to antiretroviral therapy;
- HIV and pregnancy;
- post-exposure prophylaxis;
- HIV-related opportunistic infections;
- ensuring the quality and effective supply of drugs; and
- training and self-development.

The main objective of the training programme was to stimulate and encourage pharmacists to contribute their knowledge and skills to improve outcomes in HIV/AIDS patients (www.fip.org, 2001). This HIV training module should equip pharmacists with the necessary knowledge to perform their proposed role as part of the HIV/AIDS healthcare team. The training material aims to:

- provide the appropriate level of information to pharmacists to ensure correct drug use;
- ensure that pharmacists understand the goals of therapy with realistic outcomes;
- ensure that pharmacists understand the dangers of inappropriate therapy and the importance of proper monitoring; and
- ensure that pharmacists understand the importance of adherence to therapy, management of common side effects, dosage regimens, prevention of drug interactions and the long-term complications of therapy.

Results

Statistical analysis

A computerised spreadsheet was designed and used to enter all data. The data were then imported into a statistical analysis program (Statistical Analysis Systems, ©SAS Institute Inc., Cary, NC, USA) and analysed for statistical significance.

Data from the knowledge questionnaires were analysed for the two sub-groups in the study group and for the control group. Differences between pre-test and post-test were analysed for each category. The non-responders were accounted for in the analysis as only paired results were used at post-test level. Each respondent served as his/her own control to reduce bias, but this approach may itself have a potential to bias. The differences between the two study sub-groups at post-test 1 were small and not statistically significant. We therefore pooled the results of the sub-groups in subsequent analysis.

The difference in outcomes between two groups can be illustrated by the use of "effect size". Effect size is a way of quantifying the difference between two groups where one group received an intervention and the other served as the control group. The effect size is a measure of the effectiveness of the intervention (Coe, 2000). The concept of effect size is useful as it allows the researcher to express expectations for group differences that are independent of the sample size or the units of the measure being used in the study (Albanese, 2000).

The effect size of the intervention, demonstrated in the study group relative to the control group, was calculated as follows (Lipsey, 1990b):

$$\text{Effective size} = \frac{\text{Mean of experimental group} - \text{Mean of control group}}{\text{Common standard deviation}}.$$

According to Lipsey (1990b), a positive effect size can be interpreted as small, medium and large, as shown in the following table.

Range	Effect size value
Small	0.00–0.32
Medium	0.33–0.55
Large	0.56 and higher

(Lipsey 1990a,b).

Table I lists the response rates for pharmacists.

Table I. Pharmacist respondents.

	Study group		Control group		Total	
	No. of respondents	Response rate (%)	No. of respondents	Response rate (%)	No. of respondents	Response rate (%)
Pre-test sent	293		200		493	
Pre-test received	114	38.9	74	37	188	38.1
Intervention	107				107	
Post-test sent	107		68		175	
Post-test received	66	61.6	46	67.6	112	64

A two-tailed paired *t*-test was performed on the control group and on the study group to compare differences in means between the pre-test and post-test results. The improvements and deteriorations (mean differences) in knowledge from the pre-test to post-test were calculated. All changes from pre-test to post-test were converted to a scale where positive changes (improvements) were indicated by positive numbers and negative changes (deteriorations) were indicated by negative numbers. A zero value indicated no change.

At baseline, there was a large difference in knowledge scores between the two groups. This may be a potential for bias. However, the results for both groups at baseline indicated that the knowledge of respondents was inadequate to offer effective HIV services.

Table II. Mean scores for paired responses in study group and control group at pre-test and post-test.

		Total % pre-test	Total % post-test	Difference pre-test to post-test
Study group	*n*	66	66	
	Mean %	56.06	79.88	23.82
	Std deviation	25.42	18.89	25.90
	p-value			0.0001*
Control group	*n*	46	46	
	Mean %	38.96	41.91	2.96
	Std deviation	20.73	23.30	16.43
	p-value			0.2285

* $p < 0.01$.

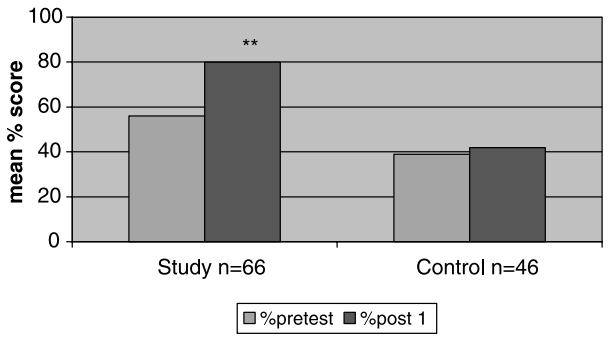

Figure 1. Mean scores for the study group ($n = 66$) and control group ($n = 46$) at pre-test and post-test. ** $p < 0.01$.

Overall knowledge

Note: The mean scores refer to the average of the marks obtained. Another indicator of performance is the percentage of the groups that achieved the pass mark of 60%. This achievement level (60%) was used as a stricter criterion than the normal pass mark of 50% because of the critical nature of HIV/AIDS. About 88% of the study group achieved the pass mark at post-test compared to 42% at pre-test(Table II, Figure 1) .

Knowledge categories

Questions in the knowledge section were grouped together in categories (Tables III and IV, Figures 2 and 3, Table V, Figure 4).

Effect size of the intervention

Table VI, Figure 5.

Discussion

As the groups decreased in size over the time period, it can be surmised that only motivated respondents continued with the study. This interpretation applied to both the study group and the control group. The results must therefore be interpreted with this concern in mind. During personal telephone contact with participants, reasons for not participating were identified as lack of time, lack of interest in the disease entity and lack of HIV patients in their practices.

The difference in baseline knowledge between the study and control groups may be a limitation of the research. However, the study respondents' knowledge increased significantly as a result of the educational intervention.

At baseline, respondents who were to receive the CD-ROM and printed material achieved a higher total score than those who only received the printed material. This difference was not statistically significant. At post-test, the difference between the two groups was small (1.21%) and not statistically significant. Both groups achieved similar high scores at post-test, irrespective of the method of training

Table III. Questions grouped per category.

Category	Questions	True	False
Transmission	1. HIV can be transmitted through unprotected intercourse		
	2. HIV cannot be transmitted through body fluids—breast milk, semen and vaginal fluids		
Testing and counselling	3. Elisa and Western blot antibody tests are used for diagnosis of HIV		
	4. Viral load and CD4 tests are used to monitor therapy		
	5. Viral load is an indication of number of CD4 cells in the blood		
	17. When the patient's viral load is undetectable, the antibody test will be negative		
Treatment	6. Didanosine (Videx) can cause pancreatitis and peripheral neuropathy		
	7. AZT (Retrovir) is recommended for pregnant HIV positive women to reduce vertical transmission of the virus		
	8. Ritonavir (Norvir) must be taken on an empty stomach		
	9. AZT has no suppressive effect on the bone marrow		
	10. Patients with CD4 counts of 3500 cells/ml should be offered HIV treatment		
	13. AZT cannot be combined with Didanosine as part of a treatment regimen		
	14. AZT + 3TC (Lamivudine)+Nevirapine (Viramune) is an effective triple regimen for HIV positive patients		
	19. The Thymidine analogue NRTI's (Nucleoside Reverse Transcriptase Inhibitors) work on the resting cells		
	20. The Thymidine analogue NRTI's are Stavudine (Zerit) and AZT		
	22. Resistance to Protease Inhibitors does not cause cross-resistance within this class of drugs		
	23. When drug resistance is suspected/confirmed it is essential to change only one of the drugs in the patient's regimen		
	24. Didanosine and Zalcitabine (Hivid) should not be combined in the same regimen due to the high risk of peripheral neuropathy		
	25. When using triple-drug combinations, a viral load of <50 RNA copies/ml is associated with the most durable antiviral response		
Diagnosis	11. Acute HIV infection (seroconversion) is often not recognized because of its similarity of the symptom complex with those of flu or other common illnesses		
	12. Symptoms of acute HIV infection include fever, lymphadenopathy, pharyngitis and rash		
Compliance	15. The HIV patients needs to comply 50% to the treatment regimen to obtain maximal viral suppression		
	16. Non-compliance causes the HIV virus to become resistant to available drugs		
	18. Repeated detection of virus in plasma after initial suppression to undetectable levels, suggest the development of resistance and changing therapy should be considered		
	21. Protease inhibitor containing regimens often fail due to poor adherence		

Table IV. Mean scores per category for study group and control group.

		Study group			Control group		
Category	Variable	Pre-test	Post-test	Difference	Pre-test	Post-test	Difference
Transmission	*n*	66	66		46	46	
(questions 1, 2)	Mean %	90.91	98.48	7.58	92.39	95.65	3.26
	Std deviation	19.43	8.64	21.91	18.16	14.24	24.50
	p-value			0.0066†			0.3715
Testing and counselling	*n*	66	66		46	46	
(questions 3–5,17)	Mean %	52.27	73.86	21.59	29.35	32.61	3.26
	Std deviation	34.45	22.12	34.22	27.03	31.12	27.69
	p-value			0.0001†			0.4287
Treatment	*n*	66	66		46	46	
(questions 6–10, 13,	Mean %	47.90	75.52	27.62	29.77	30.43	0.67
14, 19, 20, 22–25)	Std deviation	30.17	23.60	32.69	25.26	27.52	20.18
	p-value			0.0001†			0.8231
Diagnosis	*n*	66	66		46	46	
(questions 11,12)	Mean %	80.30	89.39	9.09	58.70	65.22	6.52
	Std deviation	33.82	25.59	36.07	43.85	43.29	51.22
	p-value			0.0446⋆			0.3924
Compliance	*n*	66	66		46	46	
(questions 15,16,18,21)	Mean %	56.82	85.98	29.17	41.85	50.00	8.15
	Std deviation	34.96	25.24	36.32	31.20	34.96	26.38
	p-value			0.0001†			0.0418⋆

⋆$p < 0.05$; †$p < 0.01$.

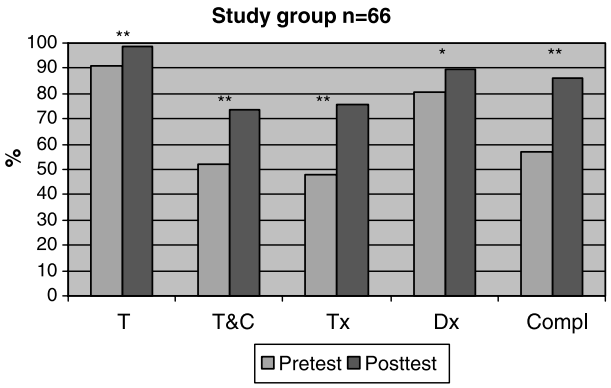

Figure 2. Mean scores per category for study group ($n = 66$) at pre-test and post-test. ⋆ $p < 0.05$; ⋆⋆ $p < 0.01$; T, transmission; T and C, testing and counselling; Tx, treatment; Dx, diagnosis; and Compl, compliance.

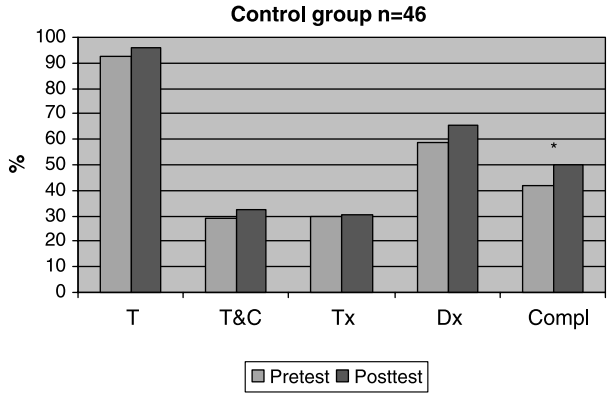

Figure 3. Mean scores per category for control group ($n = 46$) at pre-test and post-test. ⋆ $p < 0.05$; T, transmission; T and C, testing and counselling; Tx, treatment; Dx, diagnosis; and Compl, compliance.

received. Analysis per category at post-test produced no statistically significant differences between the two learning methods. Both methods of learning can be regarded as successful to increase the level of HIV knowledge of pharmacists. Views expressed by respondents during telephone contact indicated that the printed material was used as a reference manual while the CD provided a more visual and interactive learning experience. For the comparisons described in this paper, the two learning methods were combined into one group and referred to as the study group.

In 1999, Zappa conceptualised a new model for healthcare delivery to people with HIV/AIDS using the pharmacy as the focal point for care (a community-based care centre). The model is unproven as yet. The aim was to identify patients at risk before they become severely ill. The pharmacist must then provide services that complement those offered by the primary HIV/AIDS doctor. The pharmacist will be an expert in the management of patients with HIV/AIDS and take responsibility for all drug-related issues (Zappa, 1999). Clearly, pharmacists must be properly trained for these roles.

The results presented in this paper illustrate the effect of the educational intervention on the HIV knowledge of pharmacists in the study group. The level of knowledge increased significantly over baseline values after completion of the training programme. These pharmacists are now better equipped to fulfil their role in the management of HIV as described by the SA Pharmacy Council Position Paper on the role of the pharmacist in HIV and the model conceptualised by Zappa (1999) and South African Pharmacy Council (2003) (see Table VII).

Table V. Comparison of mean percentage difference per category for study and control groups: *p*-values at post-test.

Variable	Group	*n*	Mean % difference	Standard deviation	*p*-value
Transmission	Control	46	3.26	24.50	
	Study	66	7.58	21.91	
					0.3310
Testing and counselling	Control	46	3.26	27.69	
	Study	66	21.59	34.22	
					0.0032⋆⋆
Treatment	Control	46	0.67	20.18	
	Study	66	27.62	32.69	
					0.0001⋆⋆
Diagnosis	Control	46	6.52	51.22	
	Study	66	9.09	36.07	
					0.7701
Compliance	Control	46	8.15	26.38	
	Study	66	29.17	36.31	
					0.0006⋆⋆
Total	Control	46	2.96	16.43	
	Study	66	23.82	25.90	
					0.0001⋆⋆

⋆⋆ Statistical significance.

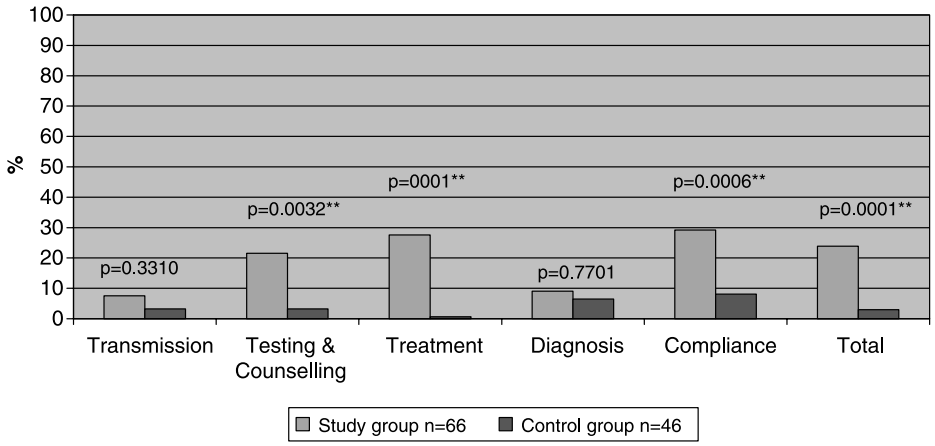

Figure 4. Comparison of mean percentage difference per category for study and control groups at post-test. ** $p < 0.01$.

Table VI. Effect size of the intervention.

Variable	Mean% difference study group $n = 66$	Mean% difference control group $n = 46$	Common Std deviation $n = 112$	Effect size
Transmission	7.58	3.26	23.0017	0.1878
Testing and counselling	21.59	3.26	32.8423	0.5581
Treatment	27.62	0.67	31.1174	0.8661
Diagnosis	9.09	6.52	42.7403	0.0601
Compliance	29.17	8.15	34.0929	0.6165
Total%	23.82	2.96	24.6666	0.8457

From Table VII, it can be seen that the postulated SA Pharmacy Council model is similar in all core areas to the model conceptualized by Zappa. Both models concentrate on drug-related activities, information provision and patient confidentiality. It is essential for pharmacists to be equipped with the necessary HIV knowledge to fulfil this postulated role in HIV management. With the knowledge gained as a result of the training programme, pharmacists can actively pursue their role in HIV to counsel patients on correct use of medication, provide pre-test counselling and post-exposure prophylaxis and be aware of drug-related side effects and interactions.

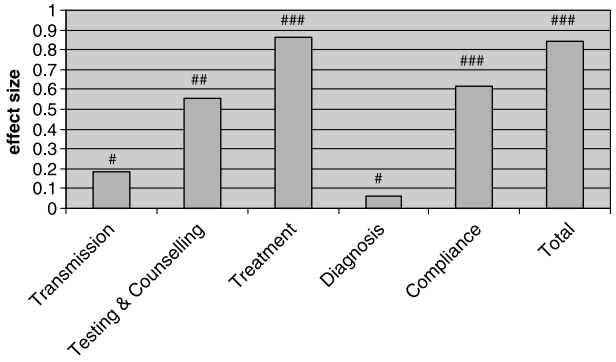

Figure 5. Effect size of the intervention. #, small effect size; ##, medium effect size; and ###, large effect size.

An adequate level of HIV knowledge is fundamental in order for pharmacists to perform their role in HIV management. The results at baseline indicated that the knowledge of respondents was inadequate to offer effective HIV services. The low scores in knowledge for the categories testing and counselling, treatment and compliance identified the main learning needs of respondents.

Knowledge scores in all categories improved significantly from baseline scores in the study group after receiving training materials. The control group showed minimal changes in all categories. It can therefore be surmised that the training material was effective in achieving the following objectives:

- to provide the appropriate level of information to pharmacists (to ensure correct drug use);
- to ensure that pharmacists understand the dangers of inappropriate therapy;
- to ensure that pharmacists understand the goals of therapy with realistic outcomes; and
- to ensure that pharmacists understand the importance of adherence to therapy, management of common side effects, dosage regimens, prevention of drug interactions and the long-term complications of therapy.

Comparison of the intervention effect between the study group and control group showed a statistically

Table VII. Comparison of models for pharmacists in HIV/AIDS.

Zappa (1999)	SA Pharmacy Council criteria (2003)
Responsible for all drug-related activities	Supply antiretrovirals, manage tuberculosis and treatment of opportunistic infections
Supply products, services and information in one place	Provide prevention, treatment, care and support services
Focus on education, prevention and screening programmes	Provide voluntary testing and counselling
Include services of a nutritionist and a nurse, and complement services provided by the medical doctor	Monitor complications and referrals for medical intervention
Ensure patient confidentiality	Ensure patient confidentiality and privacy

highly significant difference in favour of the study group in the testing and counselling, treatment and adherence/compliance categories. The total difference was also statistically highly significant in favour of the study group. The above categories are most relevant to the role of the pharmacist in HIV management. Respondents also achieved the lowest scores at baseline for these categories. The training material was therefore successful in increasing the HIV knowledge of pharmacists.

None of the studies referred to earlier in this paper implemented or tested an educational intervention (Katz et al., 1995, 2000; Sheridan et al.,1997; Myers, 1998; Watson et al., 2003). From the above summary, it is clear that there is room for expansion of the role of the pharmacist in HIV, but the evaluation of educational interventions to define and implement such a role has not occurred.

Respondents from the study group showed substantial improvements in all aspects after they completed the training course "The pharmacist in HIV/AIDS" from the School of Pharmacy, MEDUNSA. Once something has been learnt and remembered, it can be used. Now that the study group pharmacists are equipped with the necessary knowledge, their new skills can be used to manage HIV patients effectively.

A limitation of the selection process may be the geographic areas used in this study. The sample for the study and control groups was selected from only two geographic areas in South Africa. This selection process may be a potential source of bias as the groups may be different. Enlarging the sample size and including respondents from all provinces may minimize potential bias. The inclusion of only consenting participants may be a source of bias, but it is a bias which is unavoidable in the majority of studies of this type.

Conclusion

Southern Africa is the area worst affected by the AIDS epidemic. This epidemic has a profound effect on economic growth, income and poverty. AIDS threatens human welfare, development progress and social stability (UNAIDS/WHO, 2001).

The educational intervention on HIV/AIDS was aimed to achieve a better standard of pharmaceutical care, as defined by Hepler and Strand (1990). With improved HIV knowledge, pharmacists who completed the training are now in a position to provide effective drug therapy and achieve outcomes to improve the patient's quality of life.

Based on the findings of this study, in the light of improvements and effect sizes demonstrated in the study group relative to the control group, the training has been successful in improving the knowledge of pharmacists to manage HIV/AIDS patients.

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