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The impact of supervision on stock management and adherence to treatment guidelines: a randomized controlled trial

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Ensuring the availability of essential drugs and using them appropriately are crucial if limited resources for health care are to be used optimally. While training of health workers throughout Zimbabwe in drug management (including stock management and rational drug use) resulted in significant improvements in a variety of drug use indicators, these achievements could not be sustained, and a new strategy was introduced based on the supervision of primary health care providers. This was launched in 1995 with a training course in supervisory skills for district pharmacy staff.

In order to evaluate the impact of the supervision and the effectiveness of the training programme, adherence to standard treatment guidelines (STG) and stock management protocols was evaluated in a randomized controlled trial. The study compared three different groups of health facilities: those that received supervision for either use of STG (n = 23) or stock management (n = 21) – each facility acting as control for the other area of supervision – and a comparison group of facilities which received no supervision (n = 18). On-the-spot supervision by a specially trained pharmacy staff, based around identified deficiencies, took place at the start of the study and 3 months later. The evaluation compared performance on a variety of drug management indicators at baseline and 6–8 months after the second supervisory visit.

The results of the study showed that, following supervision, overall stock management improved significantly when compared with the control and comparison groups. Similar improvements were demonstrated for adherence to STG, although the effect was confounded by other interventions. The study also showed that supervision has a positive effect on improving performance in areas other than those supervised, and demonstrated that pharmacy technicians with limited clinical skills can be trained to influence primary health care workers to positively improve prescribing practices.

Allocating resources to supervision is likely to result in improved performance of health workers with regard to the rational use of essential drugs, resulting in improved efficiency and effectiveness.

Introduction

Very limited funds are available for expenditure on drugs in the public health sector in most African countries. For example, in Zimbabwe during the 1994–95 fiscal year, about US$5 was spent in the public sector on drugs and supplies per person. Ensuring the optimal use of these limited funds is one of the major challenges facing health managers. The study described in this paper aimed to evaluate the impact of supervision undertaken by trained drug management supervisors on two crucial aspects of drug management at primary health care facilities: the implementation of stock management systems and adherence to standard treatment guidelines (STG).

Background

The healthcare delivery system in Zimbabwe has four levels: health centres or clinics at primary level, supported by district hospitals, provincial hospitals and finally central referral hospitals, which are located in the two major cities. Health services in the districts are coordinated by the district health executive. This is chaired by the district medical officer and includes the pharmacy manager, who is occasionally a pharmacist but in most cases a pharmacy technician. Each district has between five and 45 rural health centres or clinics (RHC) supported by the district hospital. One or two trained nurses and nurse aids undertake activities at the RHC, including prescribing and drug management. The role of the district pharmacy manager is related to implementation of the national stock management system, ensuring adherence to standard

treatment guidelines, and control of the budget for drugs and medical supplies at the hospital and RHCs.

The national stock management system relies on the use of stock cards and stock books to allow accurate recording of monthly consumption information in order to calculate a minimum stock figure, based on 3 months' consumption. This figure is the basis of the stock management system and is the re-order level as well as the re-order quantity. To implement this system, intensive training activities, aimed at more than 5000 health workers, were carried out, with district level workshops held countrywide during the period 1988–1992. All facilities were provided with guidelines and manuals on stock management, and copies of the Zimbabwe Essential Drug List (EDLIZ), which includes standard treatment guidelines for common conditions (Laing and Ruredzo 1994).

Zimbabwe Essential Drugs' Action Programme (ZEDAP)

ZEDAP was established in 1986 with the aim of ensuring that good quality drugs are available, accessible, affordable and put to appropriate use. A major part of the early ZEDAP programme was devoted to training related to stock management and improving drug use (Laing and Ruredzo 1994).

ZEDAP surveys have examined the implementation of the stock management system and rational drug use by evaluating indicators related to correct use of the stock management tools and STG (Trap et al. 1997). The results of these surveys have indicated that while the training resulted in improvements in both stock management and adherence to STG, the achievements were not sustained. For example, the use of the stock management book increased from 28% in 1989 to 74% in 1991, thereafter reducing steadily until 1995, when only 45% of health facilities were using it (Trap et al. 1996). It therefore became evident that stock management changes related to behaviour (use of the stock management system) and knowledge (correct use of the system) achieved in 1989 were not sustained after 1991, and that stock management was no longer satisfactorily implemented at rural health facility level.

In the area of adherence to STG, impressive achievements were made in generic prescribing, decreased number of drugs per prescription, no increase in use of injections and increased adherence to STG (Trap et al. 1997). However, overall these results were also not sustained. The number of drugs per prescription increased from 1.3 in 1991 to 1.7 in 1995, and adherence to STG for diarrhoea without blood, acute respiratory infection (ARI) and urethral discharge in men all decreased over the same period (Ministry of Health and Child Welfare data).

Based on these findings, the need for a new strategy for achieving sustainable improvements in stock management and adherence to STG was identified. Without a well functioning stock management system, ensuring drug availability and the correct use of these drugs, the community's trust and the quality of care would be adversely affected, and the limited resources available for drugs and supplies would be wasted.

Supervision as an intervention

Face-to-face education has been found to be as effective as seminars and workshops in improving the level of knowledge of health workers (Ofori-Adjei and Arhinful 1996; Santoso et al. 1996), but has a greater impact on behavioural change (Kafuko 1994; Braybrook and Walker 1996; Ross-Degnan et al. 1997). When follow-up reinforcement visits were undertaken the impact was found to increase (Soumerai et al. 1989). These findings indicate the likely benefit of establishing a system that provides for regular, on-site supervisory visits. Several studies have confirmed that supervision with 'one-to-one' communication has provided the most appropriate and cost-effective way to increase knowledge and change behaviour in rational drug use (Soumerai et al. 1989; Loevinsohn et al. 1995; Kafle et al. 1997). Furthermore, supervision has been found to increase the supervised nurses' job satisfaction, whereby the nurses felt more confirmed in their work and more satisfied (Beget et al. 1997). Other studies, however, have pointed towards difficulties in achieving the desired changes if there are strong social and cultural influences (Ofori-Adjei and Arhinful 1996); the results may also be influenced by various factors such as the gender, age, seniority and educational background of the supervisor (Soumerai et al. 1989). The impact of supervision is also likely to depend on its different characteristics, such as the duration of training, quality of educational material, expertise of trainers, training context, level of trainees and degree of follow up (le Grand et al. 1999).

Various authors have concluded that the best effect occurs when combining strategies (Quick et al. 1991). In Zimbabwe such a combined strategy was applied with the use of checklists and guidelines, clinical guidelines and stock management modules combined with an educational strategy. The importance of familiarizing the pharmacist with the practices of supervision has been found to lead to better results, enhanced productivity and higher morale, and to create a better practical environment (Wick 1998).

Drug management supervisors' programme

In view of the importance of drugs and the experiences from other countries, ZEDAP decided to develop a special training programme for drug management supervisors. A national drug management supervisory programme was established under the auspices of the Department of Pharmacy Services of the Ministry of Health and Child Welfare. This focused on supervision in all drug-related matters, and provided regular feedback to programme managers, policy-makers and district health teams.

Pharmacists or pharmacy technicians from every province attended a 2-week national training course. The course emphasized the development of appropriate communication skills, and revisited the principles related to implementation of the stock management system, the use of STG, the essential drugs concept, national drug policy, organization of supervision, use of checklists, report writing and interpretation of indicator studies. The supervision training employed a practical approach with role-plays and field visits to health

facilities. The course was concluded with an examination and preparation of a plan of action. It was followed by a period of fieldwork, with a visit by one of the course facilitators. After the fieldwork, a 2-day final follow-up course was organized with a focus on identified weak areas of supervisory activities. The first group of supervisors completed this training in late 1995.

At the same time as this supervisory activity was being undertaken, a national training programme on sexually transmitted infections (STI) was being undertaken, funded by the World Bank. As will be seen, this had a confounding effect on the results of the supervisory intervention.

Objective

The study aimed to test, with a controlled design, the impact (measured as actual behaviour change) of supervision undertaken by specially trained pharmacy staff on stock management and adherence to STG in district level peripheral health facilities. The study compared stock management and drug use performance between facilities that received either supervision in one or the other area. The facilities receiving supervision were compared on performance score with other facilities that did not receive any supervision.

Methods

The basic study design was a randomized controlled trial with randomization by health facilities using a balanced block design. Health facilities were randomized to receive interventions in either stock management or adherence to STG (rational drug use). In addition there was an independent comparison group.

Twenty-four facilities were selected to be included in each of the three groups. The facilities were selected from seven out of the eight provinces. The intervention facilities were selected from four provinces where trained supervisors were available and the facilities for comparison from the other three provinces. From the four intervention provinces, eight districts were randomly selected and from these districts 48 intervention facilities were randomly selected. From the other three provinces, 24 comparison facilities were randomly selected from the six districts, although for operational reasons it was only possible to collect data from 18 of these.

The 48 facilities were ranked on the basis of their total score on stock management in the baseline study. They were then paired according to their performance, but independently of province and district; i.e. the two facilities with the lowest position on the overall ranking were paired, and the next two, and so on. Each arm of the pair was then randomly allocated to receive supervision on either stock management or rational drug use. Each member of a pair thus acted as a control for the other health facility in the pairing.

The 18 comparison facilities included in the study had overall performance scores in the same range as the intervention facilities for both stock management and rational drug use. When the pre-intervention scores on both stock management and adherence to STG for the intervention, control and comparison facilities were compared there were no significant differences.

The baseline study was carried out in July 1996, followed 6 months later by supervision, consisting of two visits approximately 3 months apart. The final evaluation took place 6–8 months after the last supervision: the long interval was chosen to assess the sustainability of the intervention.

The overall study design is outlined in Figure 1.

Data collected

Evaluation of adherence to the stock management system was based on a sample of 12 drugs and three medical supplies selected from the essential drug list. Different items were chosen for the baseline and for the post-supervision data collection. The study assessed performance on nine different indicators relating to drug availability, use of stock cards and stock books, calculation of minimum stock and monthly ordering, for the 15 indicator items. Accountability was used as an indicator measuring the correctness of stock records when compared with actual physical stock count.

Data related to implementation of STG were collected from the outpatient register. Four common conditions were chosen: acute respiratory infection, diarrhoea without blood,

Group A (24 facilities) **Excluded three**	Intervention – Supervision on stock management	Control for STG intervention facilities
Group B (24 facilities) **Excluded one**	Intervention – Supervision on STG	Control for stock management intervention facilities
Group C (24 facilities) **Excluded six**	Comparison facilities – no intervention	Comparison facilities – no intervention

Figure 1. Overall study design

urethral discharge in men and genital ulcer disease. For each condition, 30 patients who had presented over the previous 3 months were identified retrospectively using systematic random sampling from the outpatient register, and the details of treatment noted. For each patient, data about diagnosis, drug/s, dose and duration were collected. The central project team assessed each patient's treatment as to whether or not it was according to the national STG. To be correct, drug, dose and duration for the recorded indication had to be fully in accordance with the national STG. An overall score for adherence to STG was calculated for each facility as the average of the individual scores for the four conditions. The field methods and sample size of 30 patients per facility were based on the standard WHO manual (Hogerzeil 1993; WHO 1993).

Ten supervisors were involved in the study itself: eight pharmacy technicians and two pharmacists. At any given health facility, different individuals carried out the baseline study, the supervision and the final evaluation. All supervisors had been trained in the survey methods and had gained experience from participating in the previous ZEDAP surveys. They were encouraged to be good communicators and to approach problem areas as a helping colleague rather than a 'controller'. In order to minimize bias in the impact evaluation, the supervisors were interchanged to ensure that facilities were evaluated by a different individual than the one providing supervision.

Intervention

The intervention was of supervision either on stock management or on adherence to STG. At each visit the supervisors initiated discussions with the health facility workers, focusing on deficient areas, as revealed by the baseline survey, and together they agreed on ways to improve the knowledge and performance of the staff. Supervisors were asked not to discuss issues concerning the converse area of interest. The first visit was meant mainly to break the ice and establish a good relationship focusing on a few important areas.

Measured outcomes

Approximately 6–8 months after the second supervisory visit, the effect of supervision was evaluated. Data were collected for each performance indicator in the same manner as during the baseline survey. Scores were derived for each individual indicator and a combined score for overall stock management and adherence to STG calculated. These scores were compared with the baseline findings for the same facility (differences before and after), and also compared with performance of the control and comparison groups.

Data entry and analysis

Raw data were recorded onto data collection sheets. Percentages were calculated for each performance indicator. Summary data were entered into an Excel version 6 spreadsheet (Microsoft Corp, Seattle, WA). Data analysis was carried out in SPSS (SPSS Inc. Chicago, IL). Since the data were not normally distributed, non-parametric tests were used. The differences between before and after score within each facility were compared using the Wilcoxson matched-pairs test. Differences between before and after scores in the intervention facilities were compared with those in the control and comparison facilities using the Mann–Whitney *U*-test.

Results

Twenty-one facilities completed supervision on stock management, 23 on STG and 18 served as comparison facilities. The other facilities were excluded due to staff changes or failure to conduct all the planned visits.

Table 1 shows the impact of supervision on the nine stock management indicators. Median scores before and after supervision in the intervention and control facilities are given alongside the data for the comparison facilities and the results of Wilcoxson matched-pairs analysis. This shows significant improvement in pre–post measurements of stock management indicators for the intervention group facilities. Table 2

Table 1. Impact of supervision on adherence to stock management protocols in the intervention, control and comparison facilities (median score before the intervention, median change and P value from Wilcoxson matched-pairs analysis)

SM indicator	Intervention (stock management) % (n = 21)			Control (STG intervention) % (n = 23)			Comparison (no intervention) % (n = 18)		
	Pre	Change	p value	Pre	Change	p value	Pre	Change	p value
Drug availability	73	+7	0.542	80	−6	0.23	73	−3	0.636
Use of stock cards	80	−2	0.371	80	−7	0.161	83.5	−30	<0.001
Correct use of stock cards	53	+7	0.654	67	−13	0.411	76.5	−22	0.001
Physical counts recorded	**47**	**+17**	**0.020**	47	−3	0.649	37	0	0.518
Accountability	60	−4	0.588	**64**	**−13**	**0.026**	48	−14	0.093
Correct minimum stock	**21**	**+14**	**0.022**	27	−6	0.468	29.5	−14.5	0.093
Use of stock book	**67**	**+20**	**0.014**	73	−1	0.876	60	0	0.576
Correct use of stock book	**13**	**+38**	**0.002**	7	+13	0.23	0	0	0.327
Correct min stock in book	53	−3	0.122	**56.5**	**−27**	**0.002**	16.5	0	0.248
Overall score	56	+7	0.001	60	−7	0.004	55	−7	<0.001

Table 2. Impact of supervision on adherence to stock management protocols: intervention group vs. control and vs. comparison groups – difference in median change in scores and P value from Mann–Whitney U-test

SM indicator	Stock management intervention compared with control (STG intervention) Difference (%)	p value	Stock management intervention compared with comparison (no intervention) Difference (%)	p value
Drug availability	+13	0.284	+10	0.443
Use of stock cards	+5	0.51	**+28**	**<0.001**
Correct use of stock cards	+20	0.312	**+29**	**0.001**
Physical counts recorded	+20	0.063	**+17**	**0.032**
Accountability	+9	0.196	+10	0.269
Correct minimum stock	**+20**	**0.023**	**+28.5**	**0.004**
Use of stock book	+19	0.06	**+20**	**0.020**
Correct use of stock book	+25	0.138	**+38**	**0.049**
Correct min stock in book	+24	0.173	−3	0.878
Overall score	+14	<0.001	+14	<0.001

shows the pre–post differences of the intervention facilities compared with the control and comparison facilities. This shows that when comparing intervention with control facilities, improvements occurred for *all* indicators, although only one component indicator and the overall score reached the level of statistical significance. When compared with comparison facilities that did not receive any supervision, the differences reached the level of statistical significance for most indicators. Table 3 compares adherence to STG for the four selected indicator conditions between intervention, control and comparison groups of facilities. This shows significant improvements in pre–post measures for all four indicators in the intervention group. Table 4 shows the impact of supervision on intervention group facilities compared with control and comparison facilities. This shows significant improvements in the treatment of diarrhoea and acute respiratory infections (ARI). The results for the treatment of urethral discharge and genital ulcer disease did not show significant differences in improvement compared with the control facilities. This was probably due to the confounding effect of the national STI training programme mentioned earlier.

Discussion

In this study, we attempt to evaluate the impact of two supervisory visits on the performance of primary health care workers with regard to drug management. Modest but significant improvements were found in both stock management and adherence to STG, when compared with a control group

Table 3. Impact of supervision on adherence to standard treatment guidelines in the intervention, control and comparison facilities (median score before the intervention, median change and P value from Wilcoxson matched-pairs analysis)

Indicator condition	Intervention (STG) % (n = 23) Pre	Change	p value	Control (stock mangement intervention) % (n = 21) Pre	Change	p value	Comparison (no intervention) % (n = 18) Pre	Change	p value
Diarrhoea without blood	**46**	**+31**	**<0.001**	73	0	0.57	**59.5**	**−16**	**0.017**
Acute respiratory infection	**85**	**+7**	**0.024**	90	0	0.6	93	−10	0.024
Urethal discharge	**47**	**+26**	**0.031**	30	+27	0.144	56.5	−6.5	0.77
Genital ulcer disease	**40**	**+19.5**	**0.004**	**36.5**	**+25.5**	**0.022**	57	+4	0.3
Overall score	**54**	**+19**	**<0.001**	63.5	+5.5	0.055	73	−10	0.07

Table 4. Impact of supervision on adherence to standard treatment guidelines: intervention group vs. control and vs. comparison groups – difference in median change in scores and P value from Mann–Whitney U-test

Indicator condition	STG intervention compared to control (stock management intervention) Difference (%)	p value	STG intervention compared to comparison (no intervention) Difference (%)	p value
Diarrhoea without blood	**+31**	**0.017**	**+47**	**<0.001**
Acute respiratory infection	**+7**	**0.030**	**+17**	**0.001**
Urethal discharge	−1	0.6	**+32.5**	**0.042**
Genital ulcer disease	−3.5	0.9	+15.5	0.2
Overall score	+13.5	0.96	+29	0.34

that had the same supervisory intervention but on the opposite area of activity. When compared with the group that had no supervision at all, larger differences were found. Drug availability was seen to improve in the stock management intervention group and decrease in the other groups, but the improvement was not statistically significant. This might be related to the multifaceted nature of drug availability. Improvement will depend on many factors other than good stock management, such as national availability of the drug, funding capability, distribution, etc.

The study utilized existing pharmacy staff based in the districts, and two supervisory visits took place over a period of 6 months, as advocated by the national supervisory programme. In other words, the study reproduced as closely as possible the conditions in a district in Zimbabwe, except that the final evaluation took place after a further 6 months without further visits. The supervisors' understanding of the stock management and rational drug use indicators allowed them to focus their supervisory visit on the areas of real deficiency in either stock management or adherence to STG. Focusing the supervision allowed supervisors to use their training in communication skills to improve the knowledge and performance of primary level workers. We did not attempt to assess the cost of the supervision in relation to the benefits in this study, and we recommend that a cost-benefit element be included in future studies of this type.

There are a number of important limitations to the study. Pharmacy staff performed the baseline study, supervision and final assessment, although different individuals were involved at each step. They were not blinded and hence knew which group they were assessing. (However, operationally there were benefits in using the supervisors to make the assessments as it helped to develop their skills in assessing the impact of their work.) The single, pre/post design was rather artificial, but was chosen to simplify the methods and minimize costs. The long-term sustainability of supervision was not assessed beyond 6–8 months.

In addition, the effect of extraneous factors could not be taken into account. The stock management system was originally implemented with the primary aim of improving drug availability, but drug availability is strongly influenced by the supply performance of the central procurement office, which is the only supplier of drugs to the primary health care level. The possibility of private sector procurement did not exist. Overall drug availability from the central procurement office remained almost constant during the intervention[1] and significant changes in this indicator did not occur (Ministry of Health and Child Welfare data).

The score for calculation of minimum stocks in all groups is very low – in the stock management intervention group it was 36.2%. The calculation of minimum stock levels is fundamental to the stock management system, but it is very difficult to teach. For health workers to make the calculation requires mathematical ability (calculators are not universally available in health facilities) as well as the motivation through understanding how the calculation will be used. This is particularly a problem because the entire ordering system is based on this calculation.

Our study has found that even when supervision is focused on another area of work, it may have a positive effect on overall performance of the health worker. Some indicators showed impressive improvements of 16–30% following supervision. The overall stock management score showed moderate improvement after the intervention of only 7%. However, in the comparison group there was an overall deterioration of 9.5%.

The pre–post effect of supervision on adherence to STG was found to be significant for all indicators, with an overall improvement of 22%. When compared with the control group, the improvement was significant only for diarrhoea and ARI. Improved adherence to STG for genital ulcer disease was seen in all three groups. This may have been achieved by other activities undertaken nationwide by the World Bank supported STI project and related to the new ZEDAP STD-modules.

The greatest improvement in use of the STG occurred in the case of non-bloody diarrhoea. Surveys conducted by ZEDAP in 1993 and 1995 showed that although extensive training on the appropriate management of cases of non-bloody diarrhoea has been provided (both through the development and training of ZEDAP modules and from the Maternal and Child Health department), the adherence to STG had not improved substantially on a national level. Chronic repeated episodes of diarrhoea place pressure on the prescriber to prescribe a 'strong medicine', in the form of an antibiotic. The results of this study show that drug management supervisors can convince prescribers to reduce the use of antibiotics and promote the use of oral rehydration therapy (ORT).

The substantial improvement noticed in adherence to STG suggests that changes in clinical practice can occur as a result of supervision. This is consistent with similar findings from Uganda and Indonesia (Quick et al. 1991; Kafuko et al. 1994; Santoso et al. 1996). Communication skills and focused messages on common conditions could be incorporated into the basic pharmacy technician training programme.

In the past, pharmacy technicians have not been expected to provide clinical supervision, as their basic training does not provide them with the requisite skills. However, in this study pharmacy technicians were provided the key information needed to convince prescribers to change their prescribing practices. This is similar to the way that drug representatives in the pharmaceutical industry are trained to provide key messages to change prescribing behaviour. Knowing the key messages, acquiring in-depth knowledge on a few diseases and treatment regimens, and fine-tuning communication skills places the pharmacy technicians in a confident position to impart knowledge and promote a change in prescribing behaviour.

Conclusions

Regular supervision (as few as two visits in 6 months) has a positive impact on the performance of primary care staff that is detectable 6 months later. However, training of supervisors must be focused on areas where improvements are needed.

Pharmacy technicians with limited clinical knowledge can be trained to influence prescribers to positively change prescribing practices and to improve stock-keeping practices. Techniques similar to those used to train commercial drug representatives can be utilized in the training of supervisors who may lack formal clinical training. In this study, training was provided at a post-basic level.

Evaluating the effect of supervision on primary health care facility staff is possible through the use of outcome indicators such as stock management or drug prescribing measures. Investing in regular supervision is likely to prove more effective in terms of improving performance in both stock management and rational drug use by primary level health workers than the past practices of large group workshops or the provision of printed educational or reference materials. While these activities may be necessary at the beginning of a programme, regular on-going supervision would appear to be necessary for the sustainability of desired outcomes.

Endnotes

[1] Overall drug availability was 75% in both the 1995 and 1996 ZEDAP surveys.

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Biographies

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