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Rationality of drug prescriptions in rural health centres in Burkina Faso

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The objective of this study is to investigate the quality of drug prescriptions in nine health centres of three districts in rural Burkina Faso. 313 outpatient consultations were studied by methods of guided observation. Additionally interviews were held with the health care workers involved in the study. A total of 793 drugs prescribed by 15 health care workers during the observation period and 2815 prescribed drugs copied from the patient register were analyzed. An average of 2.3 drugs were prescribed per visit. 88.0% of the prescribed drugs were on the essential drug list. 88.4% were indicated according to the national treatment guidelines. 79.4% had a correct dosage. The study revealed serious deficiencies in drug prescribing that could not be detected by assessing selected quantitative drug-use indicators as recommended by the WHO. In two-thirds of the cases the patients received no information on how long the drug had to be taken. Errors in dosage occurred significantly more often in children under 5 years. The combined analysis of choice and dosage of drugs showed that 59.3% of all the patients received a correct prescription. Seven out of 21 pregnant women received drugs contraindicated in pregnancy.

We conclude that assessment of quantitative drug-use indicators alone does not suffice in identifying specific needs for improvement in treatment quality. We recommend that prescribing for children under 5 and for pregnant women should be targeted in future interventions and that the lay-out, content and distribution of treatment guidelines must be improved.

Introduction

The rationality of drug prescriptions has been studied in various developing countries, however most of the studies have limited their evaluation on numeric analysis of certain indicators such as number of drugs per prescription, percentage of antibiotics prescribed etc. (McPake, 1993; Gilson et al., 1994, Litvack & Bodart, 1991). While such indicators are useful in detecting major deviations from rational drug use in a fast and simple fashion (WHO, 1993), it is not clear whether they are valid for detecting prescribing errors in relation to the diagnosis of the patient.

In francophone Africa, particularly Burkina Faso, very little is known about the quality of drug prescriptions in rural health centres. This lack of knowledge has become extremely evident in Burkina Faso as it has put considerable effort into improving drug supply in the country. In 1991 the Ministry of Health initiated a technical commission for creating national diagnostic and therapeutic guidelines for health care workers (HCWs). The 18 members of the commission were mostly physicians but also pharmacists and sociologists from different national and international organizations offering health care in the country. The intention was to create a consensus on rational diagnosis and treatment for the most frequent health problems in the first level of care and to base this consensus on scientific knowledge and on the regional resources available. The guidelines contain flow-charts indicating the questions and clinical examinations necessary for a given complaint. According to the results of these examinations, a treatment is recommended without specifying the name of the disease.

In 1993, under the financial and technical support of the World Health Organization and the GTZ (German Society for Technical Cooperation), the Ministry of Health published the guidelines S*trategies of diagnosis and treatment for the first level of health care* (Ministry of Health, 1993). In the same year an essential drug programme was introduced following the principles of the Bamako Initiative. Village pharmacies have been inaugurated and supply systems for essential drugs have been built up. Village committees are now in charge of their village pharmacy and decide how the profits of the village pharmacy may be inverted for local health services (e.g. by constructing new housing for health personnel). Drug vendors have been trained on four-week courses for selling drugs in the new village pharmacies. HCWs have also received refresher courses on essential drugs and the treatment guidelines for HCWs published by the Ministry of Health were supposed to be distributed to all HCWs in the area. By March 1994 the programme was fully implemented in the districts of Solenzo and Nouna, while in Tougan it was established by May 1995.

The University of Heidelberg was asked by the Ministry of Health to evaluate the quality of health services in the first

level of care in the three districts of northwest Burkina Faso, where the national essential drug programme was first implemented. The main objective of this study was to investigate the rationality of prescriptions in the general consultation according to the individual diagnoses of the patients. The second objective was to learn about the attitudes of the prescribers toward the essential drug programme. The study forms part of a survey aiming to investigate the diagnostic quality in the health centres, the dispensing of drugs in the village pharmacies and the drug-taking behaviour of the patients.

Burkina Faso has approximately 10.5 million inhabitants and is divided into 30 provinces. The study took place in the districts of Tougan, Nouna, and Solenzo, in provinces Sourou and Kossi, in north-west Burkina Faso. There is one medical centre in every district capital and 6 to 14 health centres in the surrounding villages. Each health centre covers a population of 10 000 to 15 000. The staff of one health centre generally consists of one nurse, a nurse aid and a midwife as well as one drug vendor for the nearby village pharmacy. The health personnel are trained and paid by the state.

Methods

Study design and population

All general consultations in nine health centres of the three districts (Nouna, Tougan, Solenzo) were observed for two weeks. These districts were chosen because the implementation of the essential drug policy in Burkina Faso started here. The health centres were chosen to be representative of the other health centres in the district, as far as size and sociocultural characteristics of the catchment area population are concerned.

During the observation period, 366 prescriptions with a total of 793 drugs were given out by the prescribers. Drugs were dispensed by village pharmacists. Eighty-two percent (653) of these drugs, from 313 consultations, could be analyzed with regard to indication and dosage; for the remaining 18%, information on diagnosis or on the drug was lacking. Of the 313 patients, 46.6% were female, 33.7% were under 5 years, 8.9% were between 5–14 years, and 46.9% between 15–49 years old.

Fifteen prescribers were involved in the treatment of these patients. Most of them where men, which reflects the common distribution among health professionals in the country. The prescribers had different levels of professional training, but the level of training did not differ between districts (see Table 1).

Study personnel

The observers were national medical students and nurses, with fluency in at least two regional languages. All were trained in a three-day workshop in which they contributed to the design of the observation forms and guidelines.

Hidden non-participant observation

Since this study formed part of a survey in which patient compliance was to be assessed, it could be easily explained to the HCWs that observers had to be present at the consultation. During the consultation, both the history taking and all clinical examinations performed by the HCWs were observed. The observations were documented on observation forms designed in a highly structured manner following the INRUD recommendations (Arhinful et al., 1994). The observers used one base form to document patient demographics and initial complaints as well as the drugs prescribed. A set of ten subforms represented the ten most frequent symptoms. The subforms contained a set of questions for history taking as well as a set of physical examinations according to the national guidelines for treatment and diagnosis. The observers documented whether and how the questions and examinations were performed. Additionaly the answers of the patients to the questions, or in case of examinations, the result of the examination, were documented. Unforeseen questions and examinations were documented in the same way. The correlation between the prescribers' diagnoses and the observed signs and symptoms, as well as the methods of observation, have been published elsewhere (Krause et al., 1998a). The observation forms were tested and revised in two pre-tests in a health centre that did not participate in the study.

Analysis of patient register

Several weeks after the observation, the data in patient registers of the preceding two months, including all the corresponding drug prescriptions (n = 2815), were entered into a database, thus containing information on a period before, during and after the observation. This allowed for comparison of the three periods in order to see whether prescribing

Table 1. Training of health care workers and distribution by age and sex

Title	Training and occupation	Age	Male	Female
State nurse	three year training with state exam at the end of the training, responsible for health centre	36	1	0
Short course nurse	two year training – training less demanding than for state nurse, responsible for health centre	24–34	6	1
Itinerary nurse	one year training, foreseen mainly for health promotion activities but often replacing the nurse when absent	25–35	5	0
Nurse aid	no standardized training, foreseen mainly for assisting activities in the health centre	36	1	0
Auxiliary midwife	two year training as midwife, foreseen to replace nurse when absent	28	0	1

behaviour changed during observation, and therefore the detection of a possible bias caused by the observers' presence.

Interviews with prescribers

Two interviews were done with each HCW: the first was performed by the observer in a semi-structured way; the second was an in-depth interview held by the principal researcher (GK) and based on the information gathered by the first interview and by observation. The latter took place after the observation period and contained, among others, questions on the acceptability of the essential drug programme and the treatment guidelines. Both interviews were then analyzed according to INRUD recommendations (Arhinful et al., 1994).

Evaluation criteria

During consultations the prescribers were always asked about the diagnosis of the patient. Additionally the observers registered their own observations of signs and symptoms. Each drug prescribed by the HCW was then evaluated on whether it would fit either to the diagnosis named by the HCW or to the signs and symptoms registered by the observers. This procedure was felt to be necessary in order to take into account diagnoses that the HCW may have thought of while prescribing but may not have expressed verbally. Standards for evaluating the indication and the dosage of the prescribed drugs were the above-mentioned treatment guidelines and the national drug formula distributed by the Ministry of Health (Ministry of Health, 1993; Ouedraogo & Sawadogo, 1989). The choice of treatment was rated based on the medical substance, regardless of whether the HCW chose an essential drug or not.

Ethical considerations

The study design was refined in cooperation with the regional district medical officers (DMO). It was then presented to representatives of the Ministry of Health for approval. The study was approved under the restriction that the identity of HCWs and vendors is not revealed. For this reason the specific villages are not named as this would allow the detection of individual HCWs. Additionally the observers had strict instructions not to participate actively in the general consultations except in cases where patients' health would be clearly at risk.

Results

Number of drugs prescribed

The average number of drugs prescribed per visit was 2.3. The rate of prescriptions remained stable when comparing HCWs, different districts, and male and female patients (see Table 2). Various drug-use indicators, as recommended by the WHO (1993), are presented in Table 3.

Table 2. Number of drugs prescribed per consultation

Drugs prescribed per consultation	Average	Range	Standard deviation
Total	2.3	1–5	0.99
Per nurse (mean of 8 nurses with > 20 consultations observed)	2.3	2.1–2.6	0.17
Per district (mean)	2.2	2.1–2.3	0.12
Female patients	2.3	1–5	1.07
Male patients	2.2	1–4	0.92

Table 3. Selected drug use indicators recommended by the WHO (WHO/DAP/93.1) for investigation of drug prescribing habits, total and comparing the three different districts

Proportion of essential drugs prescribed, total and by district							
Total		Solenzo		Nouna		Tougan	
698/793	88.0%	377/403	93.5%	236/271	87.1%	85/119	71.6%
difference	$p < 0.001$						
Proportion of drugs prescribed by international non-proprietory name (INN), total and by district							
Total		Solenzo		Nouna		Tougan	
636/740	85.9%	361/399	90.5%	229/270	84.8%	60/118	50.8%
difference	$p = 0.036$						
Prescriptions with antibiotics, total and by district							
Total		Solenzo		Nouna		Tougan	
121/366	33.1%	60/176	34.1%	42/126	33.3%	19/64	29.7%
difference	$p = 0.811$						
Prescriptions with injectable drugs, total and by district							
Total		Solenzo		Nouna		Tougan	
90/366	24.6%	49/225	27.8%	32/258	25.4%	9/64	14.1%
difference	$p = 0.087$						

Adherence of prescription to treatment guidelines

Prescriptions were correct for 59.3% of patients who received indications on drug dosage. In all other prescriptions at least one drug was not indicated or the dosage was wrong. Looking at the drugs separately and not at the prescriptions as a whole, 88.4% of the prescribed drugs were indicated (see Table 4). This includes eight prescriptions (2.5% of 313 prescriptions) in which two drugs of the same therapeutic effect had been unnecessarily prescribed (e.g. paracetamol and acetyl salicylic acid). About 1% of the prescribed drugs were contra-indicated because of pregnancy; this affected eight out of 21 pregnant women attending the general consultation. The non-indicated drugs were metoclopramide (13 times), ibuprofene (10), mebendazole (9), dexchlorpheniramine (4), various antibiotics (10) and others (23).

The prescribed dosage and treatment schedule was analyzed independently from the drug indication. 79.4% of the drug dosages were prescribed according to the above-mentioned treatment guidelines (see Table 4). In 12% the drug was heavily over- or under-dosed (defined as less than 50% of the minimal dosage for anti-malarials or antibiotics and more than 200% of the maximal dosage of any other drug with serious undesired effects). Incorrect dosing occurs significantly more often in children under 5 than in patients over 5 years (Table 4). This is mainly due to dangerous over-dosing. Among the ten most frequently prescribed drugs n-butylhyoscine (14 wrong dosages in 22 prescriptions) and mebendazole (12/23) were overdosed in more than half of the cases. Wrong dosage among the remaining top ten drugs ranges from 9% to 33%. For only 34 % of the drugs did the prescriber specify to the patient how long the drug had to be taken. No significant association could be detected between the quality of the prescription and the training of the HCW, nor with whether or not they had received the treatment guidelines (see Table 4). The level of training of prescribers did not differ between districts.

Change in prescribing behaviour during observation

Comparison of the number and distribution of the different pharmaceutical products prescribed before, during and after observation is visualized in Figure 1. A slight increase in anti-malarials and antipyretics is observed over time. Besides this observation, no major changes can be seen.

Prescribers' attitude towards the essential drug programme

Eighty-eight percent of the prescribed drugs were on the essential drug list. In the semi-structured interviews, when asked about the differences, advantages and disadvantages of generic drugs versus trade-mark drugs, the predominant answer given by all HCWs (15 out of 15 HCWs) was the low price and secondly the improved accessibility (6/15) of the generic drugs. Almost all prescribers perceived the essential drug programme to be a major improvement (14). Only one HCW stated that generic drugs may be less effective than original trade-mark drugs. The packaging was seen as the major disadvantage of the generic drugs (5). It was stated that the tablets in the plastic bag break more easily (4), don't look as nice (3), are more easily confounded by the patient (1) and that drug administration is more complicated (2). Other rare complaints concerned the bandages (1) and the cotton (1) being unhygienic, and the syringes (1) not being tight and proof. When asked what could be improved in the essential drug programme the following answers were given: centralize packaging of drugs (3), avoid supply gaps in the district depot

Table 4. Correct indications and correct dosages among prescribed drugs

	Indication of prescribed drugs			Correct dosage of prescribed drugs		
	indicated/ total	%	difference	indicated/ total	%	difference
Total	577/653	88.4		458/577	79.4	
By nurse's training*						
state nurse	39/43	90.7		36/41	87.8	
short course nurse	307/352	87.2		241/314	76.8	
itinerary nurse	153/171	89.5	p = 0.434	125/155	80.6	p = 0.983
nurse aid	38/40	95.0		32/39	82.1	
auxiliary midwife	9/9	100.0		7/9	77.8	
By nurse's contact to diagnostic guidelines*						
received guidelines	265/297	89.2		222/278	79.9	
not received guidelines	223/254	87.8	p = 0.599	165/215	76.7	p = 0.239
By age of patient*						
under 5 years	26/228	89.8	p = 0.332	56/144	72.0	p = 0.002
5 years and above	50/342	87.2		62/308	83.2	

* Total number of subgroups do not add up to the total number of cases because information on the prescriber or the age of the patient was missing in some of the cases.

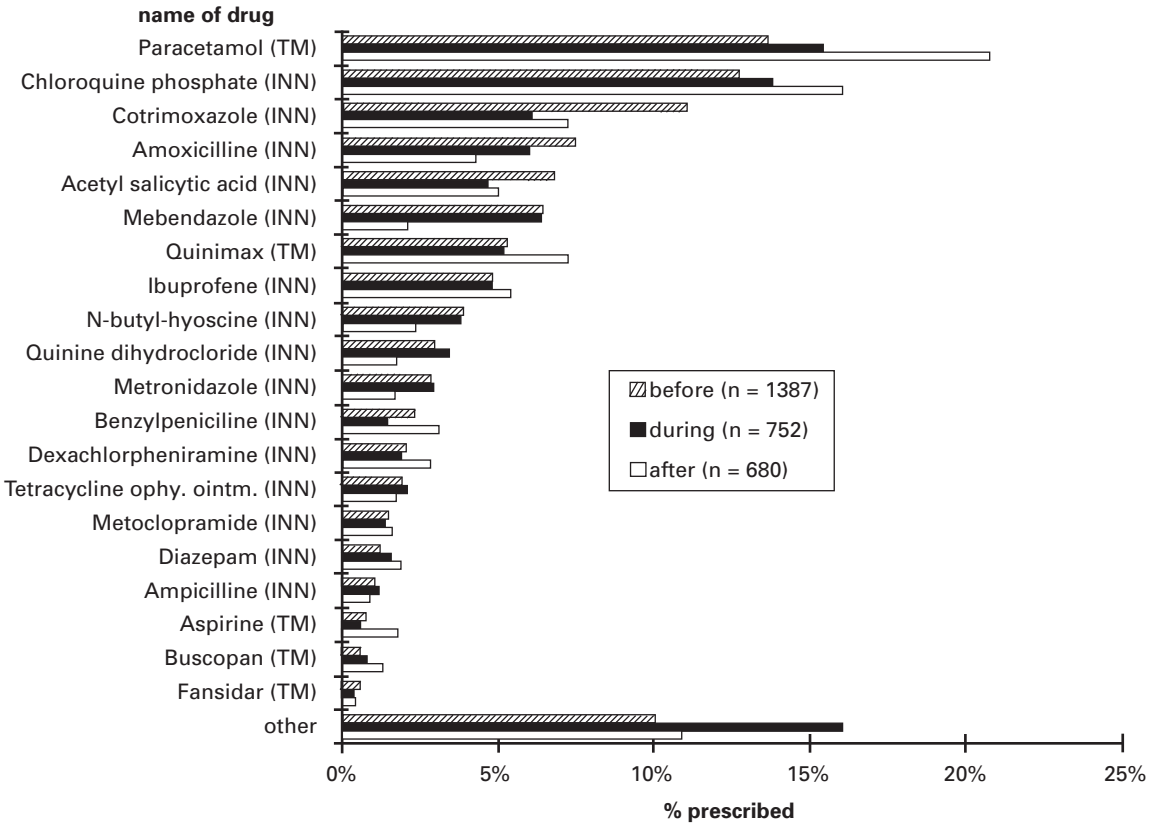

Figure 1. Proportion of top 20 drugs prescribed before, during and after observation by international non-proprietory name (INN) or trade mark (TM)

(3) and improve training of vendors (1). Additionally, HCWs felt that the following drugs should be added to the essential drug list: amoxicilline syrup (3), cardiac medicine (2), anti-haemorrhagic drugs (2), anti-tussive syrups (2) anti-vomiting drugs (1) and gynaecological drugs (1).

Eight out of 14 prescribers received the treatment guide. When asked what could be improved in it, they stated that it is sometimes difficult to find the right page, that too often referral to the next level is recommended, that signs are not put in relation to the disease and that some frequent diseases are missing (such as hepatitis and skin fungus). Additionally more illustrations were requested.

Discussion

Quantitative indicators

The number of drugs per prescription is similar to studies from other counties (Christensen & Anokbonggo, 1990; Walker et al., 1990; Guyon et al., 1994). The figures do not seem to vary much between the districts, the individual HCW or the gender of the patient. However, the power of the study may not have been sufficient to detect such differences.

The attitude of prescribing one drug for every symptom is common, not only in developing countries (Molyneux, 1980; Friebel et al., 1988). A lower number of drugs per prescription would not only avoid undesired drug effects, but also lower the cost for the patient (Brudon, 1990) and thus possibly improve utilization of the services (Litvack & Bodart, 1991). However, since implementation of the Bamako Initiative, the profit of the health centre depends partly on income through drug selling. This may stimulate nurses to prescribe more drugs than necessary (McPake, 1993). Supply gaps in the local depot may also affect prescribing behaviour. During our study, all participating village pharmacies had a complete stock of the drugs listed in the essential drug list for rural pharmacies.

As far as the proportion of antibiotics and injections among prescriptions is concerned, the prescribing behaviour is quite good (Adikwu & Osondu, 1991). The high proportion of essential drugs, and also the high proportion of drugs prescribed by international non-proprietory name (INN), could lead to the conclusion that the essential drug system has been well integrated in the daily routine of the prescribers. Of course one must consider that the village pharmacies had a regional monopoly over drug supply. As almost all of the drugs sold in the pharmacies belong to the essential drug list and are listed by their generic INN, prescribers are more or less forced to follow this system. Nevertheless, there are differences between the three districts as far as the proportion of essential drugs and the use of INN prescription are concerned, with the highest proportions found in Solenzo, followed by Nouna and lastly Tougan. Possibly this reflects the fact that the programme was implemented first in Solenzo and last in Tougan, so that HCWs in Tougan might

need a little more time to get used to the essential drug list and to their INN. Astonishingly the professional training of the HCWs was not found to play a significant role in prescribing habits. However, the study was not designed to investigate this particular aspect and therefore may not have been sufficiently strong, in this regard, to detect such a difference.

Quality of drug prescription

Although a fairly high percentage of drugs were indicated, drug prescription is far from optimal. Only 60% of patients received a prescription where all drugs, their combination and their dosage was indicated. Unfortunately we could not find comparable data in the literature because most studies do not correlate the prescriptions to the individual diagnosis.

Another concern is that in only one-third of the cases did HCWs give information to patients on how long the drug had to be taken. Interviews with patients of the same population revealed that patients tend to take drugs until the package is finished if not indicated otherwise by the HCW (Krause et al., 1998a). This is particularly worrisome since drugs are dispensed in standardized quantities regardless of how many pills are needed for the treatment.

Prescribing errors were found to occur significantly more often in children and pregnant women. Special awareness must be raised among prescribers that dosages for children must be adapted to their age and/or weight.

Our results also show that the analysis of quantitative drug-use indicators alone, as recommended by the WHO (1993), would not have been able to detect the particular deficiencies in drug use in the given population. A significant proportion of patients have probably received ineffective or even harmful prescriptions, although the interpretation of quantitative drug-use indicators alone would have led to a very positive evaluation of the prescribing practices. Only by correlating prescriptions to the diagnoses of the patients was it possible to detect problems of false dosage and contraindications, and to identify certain risk groups.

Quantitative drug-use indicators have proven to be very useful for a rapid and economic assessment of general drug-use habits. But in-depth studies may be necessary from time to time in order to detect problems that cannot be detected through quantitative indicators. Additionally our methodology allowed the identification of special risk-issues and risk-groups that can help determine the focus of further interventions in this field.

Prescribers' attitudes

The results of the interviews as well as the quantitative parameters have shown that the essential drug programme is very well accepted by HCWs in Burkina Faso as compared with other West African countries (Adikwu & Osondu, 1991). However, the prescribers' concerns must be considered, especially the question of packaging of drugs; whether this decentralized procedure is rational and safe should be discussed. Complaints about the quality of certain items on the essential drug list must be taken seriously, because once the impression is given that the essential drug list contains poor quality products, the acceptability of the program may fall. This may especially be true if international pharmaceutical industries interested in expanding the non-generic private market decide to include such arguments in their PR-campaigns (Lim Tan, 1990). HCWs apparently prefer to prescribe syrups for children and wish to add those and certain other drugs to the essential drug list. Therefore supervisors and trainers in the essential drug training workshops should actively clarify these concerns and explain why certain drugs have not been included in the list.

Methodological concerns

Whenever observation methods are applied the question arises of whether the presence of the observer did not cause a Hawthorne effect, in the sense that the HCW may have followed the treatment guidelines and the essential drug policy more rigorously than usual. Analysis of the patient register did not give any evidence for this assumption. Important drug prescribing indicators, such as the proportion of essential drugs and of drugs prescribed by generic name, remained nearly the same before, during and after observation. The increase of anti-malarials and antipyretics is most likely linked to an increased incidence of malaria cases with the start of the rainy season. We cannot rule out that other drug prescribing indicators, not covered by the patient registry, may have changed during observation; however, within our possibilities of triangulating the observation, we could not find an indication that observation did change prescribing behaviour.

Due to practical reasons the prescribers were not selected randomly and their number is not large enough to draw conclusions for all of Burkina Faso. However, due to its more detailed and more qualitative approach, this study does raise important issues that would not have been detected by WHO quantitative prescribing indicators alone.

The main methodological advantage of this study is the correlation of the prescription to the diagnosis of the patient; we could not execute reference diagnosis on place as this would have influenced the HCW dramatically. We believe this approach to be important to gain a realistic view on the quality of treatment. Recently published works on diagnostic quality and on patient compliance within the same population have shown the complexity of the factors that act on the quality of health care (Krause et al., 1998a, 1998b). Prescribing quality is another factor that cannot easily be evaluated by assessing quantitative indicators alone.

Recommendations

Improved rationality of prescribing is crucial for professionally determined quality of care and should therefore be linked with the implementation of the essential drug programme (Sauerborn et al., 1995; McPake et al., 1990). The following concrete recommendations can be deduced:

- Some diseases missed in the current edition of the treatment guidelines may have to be added (especially dermatological conditions).
- The lay-out and didactic structure of the treatment guidelines should be more user friendly (clear flow-charts, accompanied by full text instructions; correct and complete table of contents and index; illustrations of skin diseases).
- The logistics for the distribution of the guidelines among health personnel must be improved. The treatment guidelines must be available to every HCW.
- The workshops currently programmed within the essential drug programme, as well as basic training curricula for nurses and regular supervision, should put more attention on rational drug indication and drug dosage, particularly for pregnant women and for children.
- The prescribers' concerns about the essential drug list and the quality of the products should be considered and discussed.

Some of these points are currently being realised. A study on the quality of the guidelines is close to termination and should help to improve the second edition (Dr M Sanon, personal communication). Drug choice for pregnant women and dosages for children have been adopted as special issues for the essential drug training courses.

While the recommendations named above account primarily for the special situation of our study population, some of them may be valid for other countries that, like Burkina Faso, have adopted a national essential drug policy. One general conclusion that is probably valid beyond Burkina Faso is that quantitative drug-use indicators may not be sufficient to detect serious problems in prescribing habits. In-depth studies assessing drug use in relation to diagnosis may be necessary in order to receive a more complete picture of the quality of health services.

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