

## **9.6 Veröffentlichte Originalarbeiten dieser Untersuchungen**

## Diagnostic quality in rural health centres in Burkina Faso

G. Krause<sup>1</sup>, D. Schielemacher<sup>1</sup>, M. Borchert<sup>1</sup>, J. Benzler<sup>1</sup>, R. Heinmüller<sup>2</sup>, K. Ouattara<sup>3</sup>, S. Coulibaly<sup>3</sup>, I. Diasso<sup>3</sup>, A. Ilboudo<sup>3</sup> and H.-J. Diesfeld<sup>1</sup>

<sup>1</sup> Institute for Tropical Hygiene and Public Health (ITH (ÖG), Heidelberg University, Germany

<sup>2</sup> German Development Service (DED), Nouna, Burkina Faso

<sup>3</sup> Projet Recherche Action pour L'Amélioration des Services de Santé (PRAPASS), Nouna, Burkina Faso

### Summary

**OBJECTIVE** To study the quality of diagnostic practice in rural Burkina Faso.

**METHOD** In 9 health centres of 3 districts, 313 outpatient consultations were observed, and 417 diagnoses by 15 nurses were analysed. Criteria for evaluation of patient history and clinical examination were based on the diagnostic guidelines distributed by the Ministry of Health.

**RESULTS** In only 20% of the diagnoses the nurses took a sufficient history and in only 40% they conducted a sufficient clinical examination. In 21% patients underwent no clinical examination at all. Only 12% of all diagnoses were based on sufficient history-taking and adequate clinical examinations. The individual elements of clinical examination were performed correctly in 82% of cases. The variation between nurses was immense, but no correlation could be found with regard to their basic training. However, nurses who had received the diagnostic guidelines examined patients more carefully than those who had not. Larger numbers of patients per day are not associated with shorter nurse-patient contact, and neither is sufficiency of patient history associated with duration of the consultation.

**CONCLUSION** The low diagnostic quality of the outpatient consultations in the studied area indicates that this issue has been neglected in national public health initiatives. But examination skills are good and diagnostic guidelines may have had a positive effect on the diagnostic quality.

**keywords** diagnosis, history taking, Burkina Faso

**correspondence** Dr Gérard Krause, Hauriweg 12, 79110 Freiburg, Germany. E-mail: gkrause@iuk1.ukl.uni-freiburg.de

### Introduction

In 1991 the Ministry of Health in Burkina Faso established a technical commission for creating national diagnostic and therapeutic guidelines whose 18 members 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 at the first level of care based on scientific knowledge and the regional resources available. The guidelines were to serve as treatment standards for nurses in the field and 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 the Burkina Faso Ministry of Health published the

guidelines 'Strategies of diagnosis and treatment for the first level of health care' (Anonymous 1993) with financial and technical support of the WHO and the German Development Organization (GTZ). In the same year an essential drug programme was introduced in Burkina Faso due to the national commitment to the Bamako Initiative: village pharmacies have been opened and essential drug supply systems built up. Nurses have been invited to training courses about the essential drug policy and the guidelines were presented to them. Heidelberg University was asked by the Ministry of Health to evaluate the quality of health services at the first level of care in rural Burkina Faso with special consideration of the recent introduction of essential drugs and the new treatment guidelines.

While much attention is being paid to the supply of drugs, the assessment of quality of the consultation itself is often limited to indicators such as consultation time or patient

**Table 1** Training of nurses and distribution by age and sex

Title	Training and occupation	Age distribution	Male	Female
State nurse	3-year training with state exam at the end, responsible for health centre	36	1	0
Short course nurse	2-year training course; training less demanding than for state nurse, responsible for health centre	24-34	6	1
Itinerant nurse	1-year training, intended mainly for health promotion activities but often replacing the nurse when absent	25-35	5	0
Nurse aid	No standardized training, intended mainly for assistance in health centres	36	1	0
Auxiliary midwife	2-year training as midwife, intended to deputize nurse when absent	28	0	1

satisfaction (Mc Pake *et al.* 1993; Litvack & Bodart 1991; Gilson *et al.* 1994). Professionally defined diagnostic quality remains an often-neglected issue in quality assurance. This especially affects rural areas in developing countries where (partly due to geographical remoteness) regular supervision is often insufficient and referral systems do not work (Snell & Dualeh 1988).

We analysed the diagnostic quality in health centres. Using methods of nonparticipating observation, this study is part of a survey aiming to investigate the quality and the effectivity of health care, including consultation in the health centre, dispensing of drugs in village pharmacies and drug-taking behaviour of the patients.

Burkina Faso has approximately 10.5 million inhabitants and comprises 30 provinces. The study took place in the Tougan, Nouna and Solenzo Districts of the Sourou and Kossi provinces in north-west Burkina Faso. Every district capital has one medical centre and there are 6-14 health centres in the surrounding villages. Each health centre covers a population of 10,000-15 000. The staff of a 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 is trained and paid by the state. Traditional and nonformal suppliers of health care play an important role in this area, but were not the object of this study. More than 10 ethnic groups live in the studied area, most of them with their own language.

## Materials and methods

### Study design and study population

The field study lasted from June 25 until July 26, 1995. All general consultations (313) in 9 health centres were observed for two weeks by guided observation. Surgical treatments and wound dressings were not the object of this study and

therefore not included in the evaluation. Of those 313 patients, 46.6% were female; 33.7% were under 5 years old; 8.9% were aged 5-14 years; 46.9% were 15-49 years old.

Since nurses could name more than one diagnosis per patient, 417 diagnoses were analysed. 15 nurses were involved in the treatment of patients. Most of them were men, which reflects the prevailing gender bias among health professional in the country. Although they had different levels of professional training (Table 1), for the sake of clarity they are all referred to as nurses. Additional semistructured interviews were held with the nurses to determine their training background and access to the treatment guidelines.

### Evaluation criteria

All evaluation criteria for sufficiency of the patient history and of the clinical examination were defined beforehand, and a variety of signs and symptoms likely to be presented during consultations were chosen. For each of those signs and symptoms, a separate observation form was designed with corresponding questions and examinations according to the guidelines. Observation forms consisted of a base form and a set of 10 subforms for the most frequent signs and symptoms. These were designed in a highly structured manner, basically following the INRUD recommendations (Arhinful *et al.* 1994). Each form had sufficient space to add additional observations. Participants recorded their observation using the subforms that would best fit the given complaints and symptoms and if necessary using several subforms. The observation forms were tested and revised in two pre-tests in a health centre which did not participate in the study.

In the evaluation stage, the cases were re-allocated according to the diagnosis given by the nurse and the observations transposed. This reallocation caused no major problem as the observers' documentation was very detailed

G. Krause *et al.* Diagnostic quality in rural health centres in Burkina Faso**Table 2** Criteria for assessment of sufficiency of the patient history and the clinical examination

Patient's signs	Essential questions*	Essential examination
Respiratory complaints	Duration of the disease or association with fever*	Taking the temperature and thoracic auscultation or taking temperature and counting respiratory frequency
Diarrhoea	Blood in the stool and duration of the disease	Estimating state of dehydration, e.g. by skin fold
Painful micturition	Turbid urine	Palpation of the pelvic region or taking temperature
Blood in the urine	Association with fever*	Taking the temperature
Blood in the stool	<i>in women:</i> pelvic pain	<i>in women:</i> pelvic palpation
Convulsions	Painful defecation	Inspection of the anal region
Painful ear	Association with fever* and occurrence of similar symptoms before	Taking the temperature or flexure of the neck
Eye complaints	Purulent excretion and association with fever*	Inspection of the ear with the naked eye
Abdominal pain	Sensation of sand in the eye	Inspection of the eye and revulsion of the upper eye lid
	Localization of pain and association with diarrhoea or constipation	Abdominal palpation
Fever (used for 'Malaria')	Duration of the disease	Taking the temperature
Skin complaints	Association with fever* or abortion	Inspection of the affected skin area
Painful joints	Pain or itching sensation and affection of other part of the body	Taking the temperature or in cases of localized pain inspection of the affected joint
	Localization and association with fever*	

\*When temperature was measured asking for fever was not mandatory

and complete. For each sign/symptom a set of mandatory questions and examinations was selected (Table 2). If all corresponding selected elements of clinical examination had been executed, the examination was rated 'sufficient'. Since the same method applied to the evaluation of patient histories, due to operational reasons the standards applied in this study are set much lower than the guidelines published by the Ministry of Health.

Sufficiency was analysed separately from the quality of examination. A list of evaluation criteria was defined for 26 different elements of clinical examination to assess the quality of clinical examinations. A selection of this checklist for the 5 most frequently used elements is presented in Table 3.

Possible accompanying factors such as the different languages of nurse and patient or general communication problems were assessed. A communication problem was defined as a situation in which independently of the use of a translator a misunderstanding or non-understanding occurred between nurse and patient.

#### Hidden and guided observation

Hidden nonparticipant observation was chosen as a method to minimize the influence of the observers on the nurses'

activities. Observation was combined with a study aiming to assess patients' drug-taking compliance. This justified the presence of the observer during general consultation. Nurses were invited several weeks before and informed about the intended study, but were not told that their diagnoses and their prescribing habits also were the object of investigation. During the two weeks' observation period, the observers lived in the village close to the health centre, thus allowing them to follow consultations even outside normal hours.

**Table 3** Excerpt from predefined criteria for quality assessment of clinical examination

Element of examination	Criteria
Undressing the patient	Pulmonary signs: undress thorax Gastrointestinal signs: undress abdomen
Measuring temperature	Disinfection of the thermometer Return mercury to its lowest position
Thoracic auscultation	Bilateral, anterior, posterior, basal and apical auscultation Positioning the stethoscope directly on the skin
Eye inspection	Sufficient illumination Comparison of both eyes

Table 4. Distribution of the nurses' diagnoses

Diagnosis	No. of cases	Percent
Malaria	157	32.3
Diarrhoea	58	11.9
Wounds	41	8.4
Respiratory tract affections	36	7.4
Gynaecological disorders	24	4.9
Abdominal pain	9	1.9
Conjunctivitis	15	3.1
Bone and joint pain	15	3.1
Ear disease	14	2.9
Undetermined (no specific diagnosis or symptom was named)	63	13.0
Other (diagnoses named only once or twice and not belonging to the groups above)	54	11.1
Total	496	

#### Study personnel

The observers (5 men, 1 woman) were national medical students and nurses with knowledge of at least two of the predominantly used languages in the area. They had all participated in a 30-day training course followed by a one-day refresher course and contributed to the design of the observation guides. After the two-week observation period, 3 of the 6 observers were moved to 3 other health centres to continue there. During the observation period, study supervisors for each district as well as the principal researcher reviewed the observation sheets, asking for missing information or clarifying additional comments of the observer in order to minimize interobserver variation.

#### Statistical analysis

Analysis was mostly based on the diagnoses. When a consultation with more than one diagnosis was analysed (e.g. in relation to consultation time) then the diagnosis first named by the nurse was taken, as we assumed that the nurse would regard this as the main diagnosis. For statistical analysis Epi Info 6.02 software was used and a significance level of  $P < 0.05$  was chosen.

#### Ethical considerations

The study was designed in co-operation with the regional district medical officers (DMO). It was then presented to representatives of the Ministry of Health for approval. The study was approved with the condition that the identity of nurses and vendors not be revealed to their DMOs nor to other persons. For this reason the specific villages are not named. The aim of the study is not to identify efficient or less

efficient nurses but to assess the overall quality of diagnosis and its accompanying factors. The observers also had strict instructions not to participate actively in the general consultations unless a patient's health was clearly at risk. (This happened in one case, where the nurse was absent and the observer was confronted with a patient badly hurt by a cow. The observer initiated treatment and organized evacuation of the patient to another medical centre.)

## Results

### General features

We counted an average of 3.2 nonsurgical consultations per day. The average ranged from less than one patient per day in one health centre to 6.3 per day in another one. The distribution of diagnoses is presented in Table 4. The median duration of a consultation was 12 min (standard deviation (s.d.) = 6.78; mean = 13 min). Consultation time was not significantly reduced in those health posts where the number of consultations per day was higher. Only 8 of 14 interviewed nurses stated that they had received the therapeutic guidelines during the course on rational drug use.

In 14% of the consultations the nurse and the adult patient (> 19 years) could not communicate in the same language. This happened more often to women (24%) than to men (10%) ( $n = 179$ ,  $P = 0.012$ ), but according to the ratings done by the observers, there was no difference in communication problems between the two sexes (7% for female, 6% for male adult patients).

### Sufficiency of history taking

For 20% of the nurses' diagnoses, taking of the history

G. Krause *et al.* Diagnostic quality in rural health centres in Burkina Faso**Table 5** Sufficiency of patient history and clinical examination according to predefined criteria (Table 1). Comparison of different diagnoses and other influencing factors

	Sufficiency of patient history			Sufficiency of clinical examination		
	Acceptable/total	%	Difference	Acceptable/total	%	Difference
Total	84/417	20		167/417	40	
By nurse (with > 20 observations; <i>df</i> = 3)						
Nurse with highest rate	17/41	41		31/41	76	
Nurse with lowest rate	3/48	6	<i>P</i> < 0.001	10/75	13	<i>P</i> < 0.001
By nurse's training						
State nurse	4/22	18		13/22	59	
Short course nurse	43/221	20	<i>P</i> = 0.984	81/221	37	<i>P</i> = 0.249
Itinerant nurse	23/122	19		53/122	43	
Nurse aid	6/26	23		11/26	42	
Auxiliary midwife	1/7	14		2/7	29	
By availability of diagnostic guidelines						
Guidelines received	47/189	25	<i>P</i> = 0.078	89/189	47	<i>P</i> = 0.002
Guidelines not received	27/158	17		49/158	31	
By nurse diagnosis						
Malaria	46/148	31		100/148	68	
Diarrhoea	7/33	13	<i>P</i> = 0.016	7/52	13	<i>P</i> < 0.001
Respiratory tract affection	2/31	39		21/34	62	

fulfilled predefined standards, i.e. the nurse either asked for necessary information or received it in another way, e.g. by spontaneous description by the patient. In the remaining 80%, at least one crucial item of information for the corresponding diagnosis was neither asked for nor obtained otherwise. The interindividual differences between nurses for sufficient histories ranged from 6% to 42% (Table 5). Those differences remain when controlling for the diagnosis as a possible confounding variable. The median consultation time for consultations with sufficient histories was 11 min (mean = 12.0; s.d. = 5.59; *n* = 69); for those with insufficient histories, 12 min (mean = 12.7; s.d. = 6.52; *n* = 230).

#### Sufficiency of clinical examination

Forty percent of the diagnoses were based on sufficient clinical examination, in 39% the examination lacked an essential part, and in 21% no examination was conducted at all. The median consultation time was 12.5 min for cases with sufficient examinations (mean = 13.5; s.d. = 6.15; *n* = 126) and 10 min (mean = 11.8; s.d. = 6.34; *n* = 173) for those without. In one health centre the thermometer broke at the beginning of the observation period and was not replaced until the end of it, nor did the nurse make any effort to replace the thermometer. If the data from this particular health centre were deleted from the analysis, 46% of the clinical examinations would be rated sufficient (157/339). Adequate clinical examination is clearly associated with sufficient patient history (*P* < 0.001). Only 12% of all

diagnoses were based on sufficient histories and examinations.

#### Quality of clinical examinations

Individual elements of clinical examination were performed well, i.e. according to predefined standards in our checklist, in 82% of cases. The results differ depending on the kind of examination: abdominal palpation, for example, was performed correctly in 79% of cases (as opposed to only 36% of thoracic auscultations (Table 6).

#### Differences between nurses

Although the sufficiency of patient history and clinical examination varies immensely between the nurses, there was

**Table 6** Quality of single elements of clinical examination according to predefined criteria (Table 3)

Examination	Correct examinations/ executed examinations	%
Measuring temperature	157/169	93
Undressing the patient	84/110	76
Thoracic auscultation	17/47	36
Eye inspection	18/22	82
Abdominal palpation	15/19	79
Total	374/456	82

no correlation with the nurses' basic training. Differences were seen between nurses who had, and nurses who had not, received the diagnostic guidelines during the training course: While the difference for the taking of the patient history (25% sufficient histories with guidelines vs. 17% sufficient without guidelines) is not significant, the differences for the management of clinical examination are more important: Nurses who had received the diagnostic guidelines conducted sufficient clinical examinations in 47% of the cases as opposed to 31% where nurses had not received them (Table 5). The quality of diagnostic procedures for different diseases varies significantly: diagnostic procedures were insufficient in diarrhoea cases more often than for malaria and respiratory tract illnesses (Table 5).

#### Discussion

Assuming that good diagnostic quality requires sufficient and good clinical examination and clinical history-taking, our findings clearly show that diagnostic quality in the studied health centres is low.

#### Comparison with other studies

There is little evidence to think that the average of the health centres in the country should function differently than the health centres of our study. In an earlier participant observation study in the district of Solenzo, diagnostic procedures were rated congruent with the diagnosis in over 60% (Lougousse 1986).

In Angola a similar study of training nurses at primary level outpatient consultations found that history-taking was adequate in 54% of cases and examination in 29% (Björck *et al.* 1992). Those results differ from ours but comparison is almost impossible, because in both studies judgement was not based on predefined rating criteria, but on the individual observer's judgement. In Bangladesh a study in different health facilities found that only 37% of the patients had been adequately examined according to predefined (but unpublished) criteria (Guyon *et al.* 1994).

#### Effect of training and guidelines

The nurses are not to be blamed alone, and highly trained physicians in industrialised countries may not perform any better regarding some aspects (Harrison *et al.* 1993). This study shows that the nurses do have the skills for clinical examinations; only they do not apply them. Astonishingly, differences in training did not make any difference in the nurses' performance. And it is depressing that almost half had not received the guidelines although they should have been accessible to all. The reason for this is still not clear and

needs further investigation. But there is hope: if nurses have access to diagnostic guidelines, they tend to base their diagnoses on sufficient examinations.

Experience from other countries shows that guidelines often are not well accepted by users (Brook 1989; Haines 1992). In the case of Burkina Faso, it was mainly physicians who contributed to the guidelines, nurses were not involved. An analysis of the didactic structure of the guidelines shows that their use was often impractical; the design of the flow charts is not always clear (Dr M. Sanou, personal communication), which are two of the reasons why the guidelines are poorly understood or not used at all by the nurses.

#### Validity of consultation time as an indicator for diagnostic quality

The investigation of consultation time as a possible indicator for diagnostic quality revealed that in health centres with a higher workload (number of patients per day) consultation time is not reduced; sufficiency of patient history is not associated with duration of the consultation; and that consultations with sufficient clinical examinations may last longer than those with insufficient examinations. Our findings suggest that consultation time, although often used, is not always a valid indicator for measuring quality of health services. This is especially true in our setting, where a very low number of patients are seen each day. In fact, there is reason to believe that a low number of patients seen leads to a lack of clinical experience and therefore to lower clinical competence of the nurses.

#### Methodological considerations

While attempting to investigate diagnostic quality, we must clearly bear in mind the difference between correct diagnosis and good diagnosis. While one physician may come to the conclusion that his patient has a certain disease purely by inspiration and be right, another may, after a thorough history and examination, still come to the wrong conclusions and end up with a wrong diagnosis. Both cases happen to all health professionals no matter how well trained and experienced they may be. But we believe it to be a common understanding that physicians who follow complete diagnostic procedures are much more likely to come to the correct diagnosis.

Diagnostic quality is not only finding the right diagnosis for a given case, but reaching diagnosis by rational, reproducible procedures commonly subsumed under the term 'good medical practice'. Consequently our study can only examine adherence to good medical (diagnostic) practice, which in the context of this paper is called diagnostic quality.

Any attempt to analyse and compare the diagnostic quality of health care services is only as valid as the predefined criteria by which it is judged. One can always argue that in a given case a certain diagnostic tool may not be necessary and if standards follow impracticable textbook requirements, low performance results will be inevitable (Kassirer 1993). The poor results in the diagnosis of diarrhoea found in this study may be partly due to such a definition effect. We leave it to the reader to decide whether he or she can agree with our criteria. But we would like to point out that our requirements for sufficiency of diagnostic activity were much more humble than those proposed by the national diagnostic guidelines, and we believe that many colleagues would prefer to see higher standards applied.

The criteria for the quality of examination (as opposed to sufficiency of examination) were partly more demanding although they had been determined by national practitioners in the field, physicians as well as nurses. The low outcome of correct thoracic auscultation may be due to the requirement that eight auscultation points had to be used, and it is likely that many physicians in any other country would fail to do this, too. On the other hand, the results show that, even though the checklist contains rather demanding criteria, the nurses did accomplish high rates of correct procedure.

As expected, the inter-nurse variation was immense, which also proves the sensitivity of our methods. Attempts to break those differences down into further nurse-related determinants (other than professional training and accessibility to guidelines) are statistically not convincing with the given material.

We cannot rule out that the observers' presence influenced the nurses' behaviour. Comparison of prescribing behaviour before, during and after observation showed that no changes occurred during or after presence of the observers (Krause *et al.* 1996). It is likely that this is also true for diagnostic behaviour. In fact, we would rather expect a Hawthorne effect in the sense that nurses would follow more strictly the guidelines during the presence of the observers. So in reality diagnostic quality might even be worse without presence of observing persons. Another methodological problem is possible interobserver variation, which cannot be ruled out completely. Specific analysis showed that interprescriber variation remained extremely high comparing two prescribers observed by the same observer.

#### Implications for essential drug policy

Despite the methodological difficulties of such studies, we found enough evidence to conclude that diagnostic quality is low and may even present a health hazard for the patient. Important priorities such as the promotion and distribution of essential drugs may in the past have overshadowed this

crucial element of quality in health care. But how good can a drug be, if essential diagnostic procedures to determine its correct choice are not applied? In other words, how can we expect rational drug use if the diagnosis is irrational?

#### Recommendations

Despite all methodological constraints of such a study we cannot deny that diagnostic quality (at least in the given setting) needs improvement. More emphasis in national and regional health policy needs to be placed on this subject. We propose:

- to discuss the findings with nurses and supervisors and raise interest for this important aspect of health care, and to make clear that quality of health care does not only depend on a complete stock of medicines or the accessibility to more technical equipment;
- to create supervision schemes for the supervisors of the health centres which include assessment of diagnostic quality;
- to establish quality assurance measures and to enable the nurses to assess and improve the quality of their work;
- to revise the national training curricula for nurses (and physicians), emphasizing the importance of history-taking and physical examination;
- to revise the diagnostic guidelines and improve their didactic structure;
- to make the guidelines more accessible.

(Brook 1989; Haines 1992; Oeydiran 1993; Van Dyk *et al.* 1994)

Quality of health care cannot be measured by assessing indicators such as consultation time (as mentioned above) or patient satisfaction (Pickering 1993) alone. Health care is a complex and intellectually demanding profession; it needs to satisfy not only clients but also basic standards of good medical practice (Brook 1989; Pickering 1993; Haddad & Fournier 1995). More emphasis must be put on this goal both in research and in training.

#### Acknowledgements

This paper is dedicated to the nurses in the nine villages; they deserve our respect for working in often difficult conditions and our gratitude for their hospitality towards our field teams. We would also like to thank the observers, whose thorough and sensible work was crucial for the success of this study. The following persons and institutions encouraged and supported us and gave us valuable advice: A. Nougara



(Ministry of Health, Ouagadougou), E. Koob and I. Sanogo (GTZ Santé, Ouagadougou), M.J. Sanon (PRAPASS, Nouna), I. Zongo and F. Somé (DMO Nouna and Tougan), P. Ky and L. Winkler (CM Solenzo), R. Sauerborn (ITHÖG, Heidelberg). The study was part of the Projet Recherche Action Pour L'Amélioration des Services de Santé (PRAPASS) and has been funded in part by the Commission of the European Union, DG XII (TS3-CT92-0078) and the Bundesminister für Bildung, Wissenschaft, Forschung und Technologie (BMBF, 01 KA 9301/3). Special thanks to the whole PRAPASS team who made this work possible.

### References

- Anonymous (1993) *Stratégies de diagnostic et traitement pour le premier niveau de soins de santé*. Ministère de la Santé de l'Action Sociale et de la Famille, Ouagadougou, Burkina Faso.
- Arhinful DK, Das AM, Hadiyono JP, Iyoun FB, Ross-Degnan D, Heggenhougen K *et al.* (1994) *Qualitative methods for investigating drug use problems and designing interventions*. INRUD Social Scientist Working Group, Boston.
- Björck M, Johansson R & Kanji N (1992) Improving the quality of primary care services in Angola. *Health Policy and Planning* 7, 290-295.
- Brook RH (1989) Practice guidelines and practising medicine. *Journal of the American Medical Association* 262, 3027-3030.
- Gilson L, Allio M & Heggenhougen K (1994) Community satisfaction with primary health care services: an evaluation undertaken in the Morogoro region of Tanzania. *Social Science and Medicine* 39, 767-780.
- Guyon AB, Barman A, Ahmed JU, Ahmed AU & Alam MS (1994) A baseline survey on use of drugs at the primary health care level in Bangladesh. *Bulletin of the World Health Organization* 72, 265-271.
- Haddad S & Fournier P (1995) Quality, cost and utilisation of health services in developing countries: a longitudinal study in Zaire. *Social Science and Medicine* 40, 743-753.
- Haines A (1992) Guidance on guidelines. Writing them is easier than making them work. *British Medical Journal* 305, 785-786.
- Harrison LH, Khallaf N, El-Mougi M, Koura H, Shobair I & Terreri N (1993) An instrument to assess acute respiratory infection case management in Egypt. *Quality Assurance in Health Care* 5, 67-73.
- Kassirer JP (1993) The Quality of Care and the Quality of Measuring it. *New England Journal of Medicine* 329, 1263-1264.
- Krause G, Schleiermacher D, Borchert M, Benzler J, Heinmüller R, Coulibaly S *et al.* (1996) Quality of Care without Quality of Diagnosis? Non-participant Observation of Out-Patient Consultation in Rural Health Centres in Burkina Faso, West-Africa. (oral presentation) 13th International ISQua Conference on Quality in Health Care, Jerusalem, 26-30 May 1996.
- Litvack JI & Bodart C (1991) User fees plus quality equals improved access to health care: results of a field experiment in Cameroon. *Social Science and Medicine* 37, 369-383.
- Lougousse T (1986) *Les prestations curatives dans la zone médicale de Solenzo*. Thèse pour le diplôme d'état de docteur en médecine, Université Ouagadougou, Burkina Faso.
- Mc Pake B, Hanson K & Mills A (1993) Community financing of health care in Africa: an evaluation of the Bamako Initiative. *Social Science and Medicine* 36, 1383-1395.
- Oeydiran MA (1993) The importance of training and supervision in quality of care. *Advances in Contraception* 9, 175-178.
- Pickering WG (1993) Patient satisfaction: an imperfect measurement of quality of medicine. *Journal of Medical Ethics* 19, 121-122.
- Snell B & Dualeh MW (1988) Proper use of the right drugs: a complex task. *World Health Forum* 9, 207-213.
- Van Dyk A, Small LE, Haoses L & Ackerman MJ (1994) An evaluation of the quality of nursing care rendered to patients with intravenous infusions in the Windhoek Hospital Complex. *Curationis* 3, 3-7.

## Rationality of drug prescriptions in rural health centres in Burkina Faso

G KRAUSE,<sup>1</sup> M BORCHERT,<sup>1</sup> J BENZLER,<sup>1</sup> R HEINMÜLLER,<sup>2</sup> I KABA,<sup>3</sup> M SAVADOGO,<sup>3</sup> N SIHO<sup>3</sup> AND HJ DIESFELD<sup>1</sup>

<sup>1</sup>Institute for Tropical Hygiene and Public Health (ITHÖG), University of Heidelberg, Germany, <sup>2</sup>Deutscher Entwicklungsdienst (DED), Nouna, Burkina Faso and, <sup>3</sup>Projet Recherche Action pour L'Amélioration des Services de Santé (PRAPASS), Nouna, Burkina Faso

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 *Strategies 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 socio-cultural 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 were 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 sub-forms represented the ten most frequent symptoms. The sub-forms 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. Additionally 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-proprietary 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-butyl-hyoscine (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	
<b>By nurse's training*</b>						
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	
<b>By nurse's contact to diagnostic guidelines*</b>						
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
<b>By age of patient*</b>						
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.

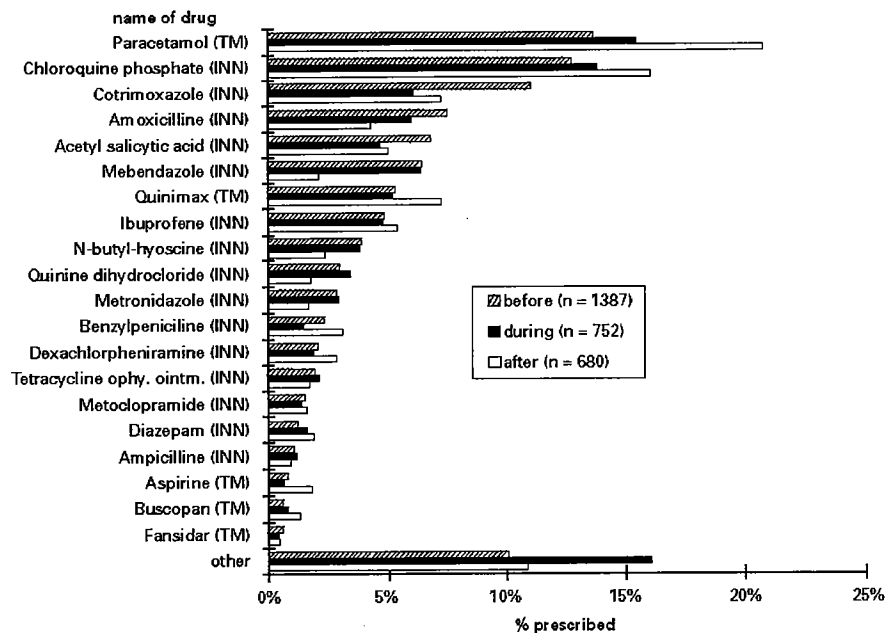


Figure 1. Proportion of top 20 drugs prescribed before, during and after observation by international non-proprietary name (INN) or trade mark (TM)

(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 countries (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-proprietary 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 & Osundu, 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.

## References

- Adikwu MU, Osondu BJ. 1991. Four years of essential drugs' list in Nigeria. *Social Science and Medicine* 13(9): 1005-10.
- Arhinful DK, Das AM, Hadiyono JP, Iyun FB, Ross-Degnan D, Heggenhougen K, Higginbottom N. 1994. *Qualitative methods for investigating drug use problems and designing interventions*. Boston: INRUD Social Scientist Working Group.
- Budson P. 1990. Global action towards rational drug use. In: Arundel A, Schaaber J, Mintzes B (eds.). *Primary Health Care and Drugs*. Health Action International: pp. 99-113.
- Christensen ROF, Anokbonggo WW. 1990. Prescribing in hospital outpatient departments and rural health facilities in Uganda: some clinical and educational implications. *Danish Medical Bulletin* 37: 357-77.
- Friebel H, Schäfer T, Balthasar R et al. 1988. Arzneimitteltransparenz und -beratung in Dortmund. 3. Mitteilung Teil 2. *Pharmazeutische Zeitung* 133(13): 932-40.
- Guyon AB, Barman A, Ahmed JU, Ahmed AU, Alam MS. 1994. A baseline survey on use of drugs at the primary health care level in Bangladesh. *WHO Bulletin* 72(2): 265-71.
- Guimier JM. 1995. Suivi de la politique du médicament essentiel au Burkina Faso. Rapport de mission. Ministère de la Santé, Ouagadougou, Burkina Faso.
- Lim Tan M. 1990. The issue of essential drugs and community based health programmes in the Philippines. In: Arundel A, Schaaber J, Mintzes B (eds.). *Primary Health Care and Drugs*. Health Action International: pp. 63-78.
- Litvack JL, Bodart C. 1991. User fees plus quality equals improved access to health care: results of a field experiment in Cameroon. *Social Science and Medicine* 17(1): 369-83.
- Krause G, Benzler J, Heinmüller R, Borchert M, Koob E, Ouattara K, Diesfeldt HJ. 1998a. Performance of village pharmacies and patient compliance after implementation of an essential drug programme in rural Burkina Faso. *Health Policy and Planning* 13(2): 159-66.
- Krause G, Schleiermacher D, Borchert M et al. 1998b. Diagnostic quality in rural health centers in Burkina Faso. *Tropical Medicine and International Health* 3(2): 100-7.
- McPake B, Hanson K, Mills A. 1990. Experience to date of implementing the Bamako initiative; a review and five country case studies. London School of Hygiene & Tropical Medicine, London.
- Ministry of Health. 1993. Strategies de diagnostic et traitement pour le premier niveau de soins de santé. Ministère de la Santé et de l'action sociale et de la famille, Ouagadougou, Burkina Faso.
- Ministry of Health. 1994. Note introductive sur l'initiative de Bamako au Burkina Faso. Bilan des années 1992 et 1993 et perspectives dans le contexte de la dévaluation du CFA. Ministère de la Santé, Ouagadougou, Burkina Faso.
- Molyneux ME. 1980. An ABC of prescribing sign. *British Medical Journal* 281: 1698-9.
- Ouedraogo A, Sawadogo A. 1989. Formulaire National des Médicaments Essentiels. Ministère de la Santé et de L'Action Sociale, Ouagadougou, Burkina Faso.
- Sauerborn R, Bodart C, Essomba RO. 1995. Recovery of recurrent health service costs through provincial health funds in Cameroon. *Social Science and Medicine* 40(12): 1731-9.
- Walker GJA, Hogerzeil HV, Sallami AO, Alwan AAS, Fernando G, Kassem FA. 1990. Evaluation of rational drug prescribing in Democratic Yemen. *Social Science and Medicine* 31(7): 823-8.
- WHO. 1993. *How to investigate drug use in health facilities*. World Health Organisation/Action Programme on Essential Drugs; WHO/DAP/93.1.

## Acknowledgements

The nurses deserve deep respect for their work often under difficult conditions, and all our gratitude for their hospitality towards our field teams. We would also like to thank the observers of the consultations; their thorough and sensible work was crucial for the success of this study. The following persons and institutions encouraged and supported us in the realization of the study and gave us worthy advice: A Nougara (Ministry of Health, Ouagadougou), D Schleiermacher and R Sauerborn (ITHÖG, Heidelberg), E Koob and I Sanogo (GTZ Santé, Ouagadougou), K Ouattara (PRAPASS, Nouna), I Zongo, F Somé (DPS, Nouna and Tougan), P Ky, L Winkler (CM, Solenzo). The study was part of the Projet Recherche Action Pour L'Amélioration des Services de Santé (PRAPASS) and has been funded in part by the Commission of the European Union, DG XII (TS3-CT92-0078) and the Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie (BMBF, 01 KA 9301/3). Special thanks to the whole PRAPASS team who made this work possible!

## Biographies

Gérard Krause, MD, Dr. med., DTMH, was research assistant and resident for tropical medicine and hospital epidemiology at the Institute for Tropical Hygiene and Public Health (ITHÖG) at the University of Heidelberg and at the Institute for Environmental Health and Hospital Epidemiology at the University of Freiburg. He is currently affiliated at the Epidemic Intelligence Service at the Centres for Disease Control and Prevention, Atlanta, USA.

Matthias Borchert, MD, MsPH, was research assistant at the (ITHÖG) at the University of Heidelberg. He was field coordinator



of the PRAPASS project in Burkina Faso 1992/93 and is currently affiliated at the Institute of Tropical Medicine in Antwerp, Belgium.

Justus Benzler, MD, specialized in medical informatics, is research assistant at the (ITHÖG) at the University of Heidelberg. He was field coordinator of the PRAPASS project in Burkina Faso 1993/94. His current affiliation is the African Center for Population Studies and Reproductive Health, University of Natal, Durban, Rep. of South Africa.

Rolf Heinmüller, MD, Dr. med., has been field coordinator of the PRAPASS project since 1994 for the German Development Service (DED) in Nouna, Burkina Faso. Previously he was project advisor of the (ITHÖG) at the University of Heidelberg.

Ismael Kaba, Savadogo Mahmoodo and Norbert Siho, all MD, belonged to the team of observers within the PTAPASS project, and are currently working as district medical officers in Burkina Faso.

Hans Jochen Diesfeld, MD, Dr. med., MPH, was professor and head of the Institute for Tropical Hygiene and Public Health (ITHÖG) at the University of Heidelberg until 1997.

*Correspondence:* Gérard Krause, MD, DTMH, Epidemic Intelligence Service Officer/ CDC, Florida Department of Health, Bureau of Epidemiology, 2020 Capital Circle SE, BIN # A-12, Rroom 337, Tallahassee, FL 32399-1734, USA. Email: gck8a@ibm.net

## Research reports

# Performance of village pharmacies and patient compliance after implementation of an essential drug programme in rural Burkina Faso

G KRAUSE,<sup>1</sup> J BENZLER,<sup>1</sup> R HEINMÜLLER,<sup>2</sup> M BORCHERT,<sup>1</sup> E KOOB,<sup>3</sup> K OUATTARA,<sup>4</sup> AND H J DIESFELD<sup>1</sup>

<sup>1</sup>*Institute for Tropical Hygiene and Public Health (ITHÖG), University of Heidelberg, Germany,* <sup>2</sup>*Deutscher Entwicklungs Dienst (DED), Nouna, Burkina Faso,* <sup>3</sup>*Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Ouagadougou, Burkina Faso,* and <sup>4</sup>*Projet Recherche Action pour L'Amélioration des Services de Santé (PRAPASS), Nouna, Burkina Faso*

After implementation of a nation-wide essential drug programme in Burkina Faso a prospective study was undertaken consisting of non-participant observation in the health centre and in the village pharmacy, and of household interviews with the patients. The study covered all general consultations in nine health centres in three districts over a two-week period as well as all client-vendor contacts in the corresponding village pharmacies; comprising 313 patients in consultations and 498 clients in eight village pharmacies with 12 vendors involved in dispensing 908 drugs. Additionally patients were interviewed in their households.

Performance and utilization of the village pharmacy: 82.0% of the drugs prescribed in the health centres were actually dispensed at the village pharmacy; 5.9% of the drugs were not available at the village pharmacy. Wrong drugs were dispensed in 2.1% of cases. 41.3% of the drugs dispensed in the village pharmacy were bought without a prescription. Differences are seen between the districts and are put in relation to different onset of the essential drug programme.

Patient compliance: Patients could recall the correct dosage for 68.3% of the drugs. Drug taking compliance was 63.1%, derived from the pills remaining in the households. 11.5% of the drugs had obviously been taken incorrectly to such an extent that the occurrence of undesired drug effects was likely.

The study demonstrates the success of the essential drug programme not only in performance but also in acceptability and utilization by the population.

## Introduction

Burkina Faso has approximately 10.5 million inhabitants and is divided into 30 provinces. This study took place in the districts (Tougan, Nouna, Solenzo) of the provinces Sourou and Kossi in north-west Burkina Faso. More than ten different ethnic groups live in the studied area, most of them having their own language.

There is one medical centre in every district capital and 6 to 14 health centres in the surrounding villages. Here each health centre covers a population of 10 to 15 thousand. The staff of a health centre is paid by the state, and generally consists of one nurse, a nurse aid and a midwife. Until 1993 the services in the health centres were free of charge, but patients had to buy the prescribed drug in private pharmacies

which were mostly located in the district capital, not in the village where the consultation took place. Often drugs were not available in the pharmacies or patients could not afford to buy them. Traditional and non-formal suppliers of health care play an important role in this area. In fact utilization of the rural health services was found to be low: within the population of a 10 km catchment area, approximately 30% of consultations in a year were curative.

Partly for these reasons the Government decided to start a reform of rural health services by implementing strategies of the Bamako Initiative in 1993. The core of this reform was the introduction of the essential drug programme. With financial and technical support from the World Health Organization and the GTZ (German Society for Technical Co-operation), village pharmacies have been inaugurated in all villages with health centres, an essential drug list and treatment guidelines have been published, nurses have received refresher courses on essential drugs, and drug vendors have been trained on four-week courses to sell the drugs in the new village pharmacies. A village committee is now in charge of its village pharmacy and decides how the income of the village pharmacy may be directed to local health services (e.g. by constructing new housing for health personnel).

The essential drugs are purchased on the world market by a national distributor. They are then distributed to district drug depots from where village pharmacies can buy the drugs at standardized prices much lower than on the private market.

By March 1994, drug depots and village pharmacies had been installed, and nurses and vendors had participated in additional workshops on rational use of essential drugs, in two of the studied districts. In the third district the programme was fully implemented by May 1995.

The question arose of how successful the implementation of the programme was and how patients use the essential drugs (Guimier 1995). Various studies have investigated performance of village pharmacies by assessing availability of drugs and other performance parameters (McPake et al. 1993; Litvack and Bodart 1991), but utilization of village pharmacies is not considered in relation to utilization of private drug sellers.

The objective of this study was therefore to assess (1) the performance of the village health pharmacies,

(2) the utilization of different drug selling places by the clients, and (3) their drug taking compliance in a prospective study starting at the general out-patient consultation. This work is part of a survey investigating the quality and the effectiveness of health care services from consultation in the health centre, through the dispensing of drugs in the village pharmacy to the drug taking behaviour of the patient. This survey took place within the PRAPASS project which has been gathering health related demographic data through household interviews in two of the studied districts since 1992. We believe this to be the first published study to investigate drug taking compliance in the rural setting of a West African country.

## Methods

### Study design and study population

Guided, non-participant observation was undertaken simultaneously in the health centre and in the village pharmacy, and was combined with household interviews with the corresponding patients. The field study lasted from June 25 to July 26, 1995 and took place in nine health centres and their corresponding catchment areas in three districts. The study covered all general consultations (except wound treatment) and all client-vendor contacts during a two-week observation period. This included 313 patients in consultations, 498 clients in eight village pharmacies, and 12 vendors involved in dispensing 908 drugs. In one village in the district of Tougan the pharmacy was not functioning; analysis on performance of village pharmacies therefore excludes this village. In two districts, 170 household interviews were carried out.

### Guided, non-participant observation

Observers in the health centre documented all the prescriptions made by the prescribers, while other observers in the village pharmacy observed all purchases during the two weeks, both those with and those without prescription. The observers did not intervene in the activities of the nurses or the vendors, neither by helping nor by giving any comments. Additionally the identity of the patient and the location of his household was documented by the nurse, in order to prevent the patient suspecting the prospect of a visit by the research team when asked about his address.

Nurses were invited several weeks before and informed about the intended study. The presence of

observers was explained by the fact that patient compliance was to be investigated, but the nurses and vendors were not told that the performance of the pharmacy would also be investigated. During the two-week observation period the observers lived in the village close to the village pharmacy, thus allowing them to observe drug selling activities even outside normal opening hours. Observation forms were designed in a highly structured manner following the INRUD recommendations (Arhinful et al. 1994). These observation forms included the documentation of communication problems between client and vendor, duration of purchase, content of possible negotiations, reasons for incomplete purchases and other accompanying aspects of the drug purchase. The observation forms were tested and revised in two pretests in a village not included in the study.

#### Household interviews

The prescribers in the health centre were asked to fill out a special identification form for each patient asking detailed information on location of household, ethnic group, names of family heads and household heads. The household interviews were realised only in the districts of Nouna and Tougan. Since Solenzo does not belong to the PRAPASS surveillance zone, locally experienced interviewers were not available in this district. 170 out of 190 patients (89%) were located and interviewed in their household. The visit at the household was not announced and took place at the middle of the expected treatment duration in order to assure that a defined number of drugs would still be left for counting. Drugs were identified by label of the package and through comparison with a sample board containing all different pills available from drug vendors in the district. The number of remaining pills were counted and for each drug the patient was asked how he/she was supposed to take it.

Other formulations played only a negligible role among the prescriptions. Injectable drugs were given directly by the nurse. Together with ointments, they were excluded from analysis of drug taking compliance as compliance could not objectively be measured for those applications.

Additionally, a semi-structured interview was held following recommendations by Maier and colleagues (Maier et al. 1994), thus allowing additional information to be gathered on drug buying behaviour outside the village pharmacy.

#### Study personnel

Observers in the health centre were national medical students and nurses; observers in the village pharmacy were graduates from secondary school and experienced in field work. Both groups knew at least two of the predominantly used languages in the area. The household interviewers were part of the constant field team of the PRAPASS Project. They had experience in household interviews and good knowledge of the villages and their populations, which made it possible to identify and locate the patients. Observers as well as interviewers participated in three-day training workshops and in an additional refresher session shortly before implementation of the study.

During the observation study, supervisors for each district and the principal researcher constantly revised the observation sheets that were filled out, cross-checked patient identity and determined the date for the household interview. The first two household interviews of each village were accompanied by the researcher and the supervisor. Additionally, in each village the supervisor repeated two randomly selected household interviews one or two days after the first one in order to ensure the validity of the interviews.

#### Statistical analysis

For statistical analysis Epi Info 6.02 software was used and a significance level of  $p < 0.05$  was chosen.

#### Ethical considerations

The district medical officers (DMO) responsible in the study area approved the study design and agreed to the hidden character of the observation. The aim of the study was not to identify efficient or less efficient vendors but to assess the overall quality of performance in the village pharmacies and their utilization by patients. The results of the household interviews were analyzed confidentially and no personal information was given to the nurses or vendors, nor to anyone else. The observers had strict instructions not to intervene in nurses' or vendors' action, since this might have undermined the authority of the health personnel towards their clients.

## Results

### General observations

The village pharmacies were generally installed in the same or in the neighbouring building of the health

**Table 1.** Indicators on performance of village pharmacies; comparison of three districts (in parenthesis = number of drugs)

	Nouna	Tougan	Solenzo	significance
drugs purchased at village pharmacy, among prescribed drugs	87.4% (237/271)	62.6% (67/107)	86.1% (348/404)	$\chi^2 = 136.99$ $p < 0.0001$
drugs not available when patient intended to buy a prescribed drug, among prescribed drugs	5.9% (16/271)	19.0% (20/105)	2.0% (8/403)	$\chi^2 = 45.56$ $p < 0.0001$
dispensing errors, among dispensed drugs	1.3% (3/227)	7.4% (5/67)	0.8% (3/351)	$\chi^2 = 15.05$ $p < 0.001$
dispensing without prescription, among dispensed drugs	35.7% (126/353)	54.7% (81/148)	9.3% (36/387)	$\chi^2 = 131.6$ $p < 0.0001$

centre. The usual procedure is that the patient takes the prescription to the vendor in the pharmacy and returns with the drugs he or she has bought in order to then receive the prescriber's (nurse) recommendation on how to take the drugs. For only 32.9% of the prescribed drugs did the prescriber specify to the patient how long the drug had to be taken. Drug dispensing without prescription is allowed for chloroquine, acetyl salicylic acid and paracetamol. In the three villages of Solenzo drug dispensing without prior consultation is not allowed following a decision by the village committee supervising the local pharmacy.

The village pharmacies buy the drugs at the district drug depot, generally in jars of 500 pills. The vendor then packs the pills with a hand-written paper label in small plastic bags according to defined units (e.g. 20 for chloroquine). Drugs are dispensed only in those units, regardless of the individual need of the patient.

#### Performance and utilization of the village pharmacy

Eighty-two per cent of the drugs prescribed in the health centres were dispensed at the village pharmacy. The remaining 18.0% were either bought elsewhere or were not bought at all. For 5.9% of the prescribed drugs the client went to the village pharmacy but the drug was not available. Most of the missing drugs did not belong to the essential drug list (32/44). Significant differences were seen between the different districts (see Table 1).

1.7% of the drugs prescribed and dispensed did not correspond to the prescription. This means the prescribed drug was replaced by another drug of a completely different therapeutic group (e.g. acetyl salicylic acid instead of chloroquine). Drug dispensing errors occurred significantly more often in the district of Tougan than in the other two districts.

41.3% of the drugs dispensed at village pharmacies were sold without prescription. Most of them were antimalarials and antipyretics (70%), oral antibiotics (7%), topical antibiotics (4%) and anti-helminthical drugs (3%).

#### Drug buying compliance

Of the prescribed drugs found in the houses, 5.2% were bought at a drug selling place other than the village pharmacy (see Table 2). The following alternative drug selling places were used: in Nouna, the medical centre pharmacy and one private pharmacy in the district capital; and in Tougan, two of the three private pharmacies in the district capital.

According to the observation in the pharmacy and to qualitative analysis of the household interviews, the reason for the client not buying the drug, although it was available at the pharmacy, was nearly always lack of money.

#### Patients' knowledge of correct dosage

During the household interviews patients - or their parents in the case of children - could recall correctly the prescribed dosage for only 68.3% of the drugs.

## Research reports

163

**Table 2.** Drug buying compliance among patients with complete household follow up

	No. drugs purchased	No. drugs prescribed	%
Total	310	378	82.0
Purchased at village pharmacies	294	378	77.8
		Total no. drugs purchased	
Purchased at village pharmacies	294	310	94.8

**Table 3.** Patient knowledge of dosage and duration of treatment when asked at patient's home in the middle of the expected treatment duration

Patient knowledge	No.	Category	Total No.	%
correct recalling of dosage	162	among all prescribed drugs of all patients	237	68.3
health threatening errors in recalling the correct dosage*	18	among cases where dosage was not recalled correctly	75	24.0
correct recalling of dosage	45	among drugs prescribed for adult male patients > 19 years	58	77.5*
correct recalling of dosage	35	among drugs prescribed for adult female patients > 19 years	52	67.3*
treatment duration given by the nurse	222	among observed drug prescriptions	674	32.9
correct recalling of recommended treatment duration	55	among cases for which detailed instructions on treatment duration were given	198	27.8
statement that drugs had to be taken until finished	288	among cases for which no instructions on treatment duration were given	415	69.4

\* Difference is not significant ( $\chi^2 = 1.46$ ,  $p = 0.226$ )

No significant differences could be found according to patient age, sex and ethnic group; nor could observed communication problems during consultation or language differences be related to knowledge of drug dosage. If instruction was given on duration of treatment, this could be recalled correctly for 27.8% of the drugs. See Table 3 for more details.

**Drug taking compliance**

Results on drug taking compliance are presented in Table 4. No significant differences in compliance

could be detected between health centres, sex or ethnic group of the patient, nor between different types of medicines. The need for translation between nurse and patient/accompanying person or observed difficulties of communication during the consultation did not decrease compliance. However, significant differences were observed due to patient age: children under 5 years received correct dosage in only 40.3% of the cases, while patients of 5 years or more were compliant for 64.7% of the drugs ( $\chi^2 = 11.91$ ,  $p < 0.001$ ).

**Table 4.** Drug taking compliance according to pill-count of drugs found in the household at the middle of the expected duration of treatment

Patient compliance	No.	Category	No.	%
probably correct intake of drugs	142	among drugs found in the households	225	63.1
health threatening compliance failure*	26	among drugs found in the households	225	11.5
health threatening compliance failure*	26	among cases with certainly incorrect intake	83	31.3
probably correct intake of drugs	29	among drugs prescribed for children under 5 years of age	72	40.3**
probably correct intake of drugs	99	among drugs prescribed for patients aged 5 years or more	153	64.7**

\* Cases with obviously such important errors in dosage or drug taking that the occurrence of important undesired drug effects by over-dosage or of completely inefficient anti-microbial therapy by under-dosage is likely.

\*\* Significant difference ( $\chi^2 = 11.91$ ,  $p < 0.001$ )

## Discussion

### Methodology discussion

Non-participant observation of health services may always bear the risk of bias, but in the observation of out-patient consultations we experienced very little influence on the behaviour of the health personnel, noted by comparing prescriptions before, during and after observation (Krause et al. 1996). There is unlikely to be much difference for the observation of the vendors. Within these constraints this study design made it possible to give detailed information on everyday reality in the pharmacy and to link this information to patients' drug taking compliance.

### Acceptance of essential drugs by the patients

The high rate of purchases in the village pharmacies as opposed to very few in the private market proves that patients accepted the programme extremely well. The reason is simple: village pharmacies are near and cheap, compared to private pharmacies in the district capital. The use of private pharmacies is limited mainly to drugs not included in the essential drug list and therefore not expected to be dispensed at the village pharmacy. The performance in the district of Tougan is not as good as in the other two districts. This may be because the essential drug programme has only just started in Tougan, and in the other districts the health personnel as well as the community had time to get used to the new system.

### Performance of village pharmacies

Errors of drug dispensing and non-availability are very rare and prove that the village pharmacies are functioning well. The habit of the nurses of explaining the drug dosage to the patient after he or she has received the drug in the village allows the nurse to check whether the right drug has been dispensed and to decide on alternatives if a certain drug is not available. This procedure may seem complicated and time consuming, but in the given rural setting, where nurses have only few consultations per day, the health personnel should certainly be encouraged to maintain this habit in order to guarantee correct drug delivery.

### Drug buying compliance

Another important but often neglected pillar of effective and efficient health care is patient compliance. As far as buying drugs is concerned compliance is good, but this may be due mostly to the fact that those patients who do not have the money to pay for the drugs do not even bother to go to the general consultation, well knowing that a more or less expensive prescription will be the consequence. The predominant reason for not buying a drug in the study population was lack of money.

### Drug taking compliance

Little is known about drug taking compliance in developing countries. In industrialized countries

non-compliance was found to have major economic consequences for the health system (Herrmann 1991; Friebel et al. 1988). Comparison with other studies proves that our results are not very different to industrialized countries (Sclar and Pharm 1991; Greenberg 1984; Kritzing 1980). Of concern is the increased non-compliance among children under 5 years old (De Wet and Hollingshead 1980; Baird-Lambert and Buchanan 1985; Rapoff and Christophersen 1982). Reasons for this are not clear and need further research, especially since various health initiatives in the area are focused on children under 5 years.

Compliance in general seems to be independent from common socio-cultural factors (Gul and Mackenzie 1993; Griffith 1990). Within the limits of observation, communication problems between nurse and patient could not be identified as a reason for increased non-compliance. One reason for non-compliance may be illiteracy of the patient on one hand and inappropriate drug labels on the other hand. Pills often look alike and the labels as they are used presently are of little help. They are small pieces of paper with the hand-written, often unreadable name of the drug. Often labels are missing completely. Larger labels of different colours, bearing commonly understood symbols may reduce the risk of confusing or forgetting treatment schedules (Pinto Pereira and Granger-Pierre 1995).

An additional problem is that patients are rarely informed about treatment duration. The few who are told cannot recall the recommendation. Those who do not receive any instructions on treatment duration tend to think that drugs have to be taken until finished. This may become dangerous as drugs are distributed in standardized quantities, e.g. 20 tablets of chloroquine in one bag, irrespective of whether they are for a child or an adult.

#### General interpretation

Comparison of the data with reports from other countries leads to the conclusion that the implementation of the essential drug programme was successful as far as performance of the pharmacies and drug buying compliance of users are concerned (Guyon et al. 1994; Adikwu and Osondu 1991; McPake et al. 1990). However, the programme has not managed to increase the low utilization of the health services, as expected. According to preliminary data the utilization remains at about 30%. One reason for this may be that the currency devaluation of 1993 has 'eaten

up' the effect of the lower prices of the generics offered by the new village pharmacies (Budson 1990; Litvack and Bodart 1991; Anonymous 1994, Raditapole 1990).

Much more investigation is needed on this neglected issue and on how to overcome this important determinant of health care effectiveness. As Káldor (1991) put it 'if the rather inflated slogan of the World Health Organisation 'Health for All by the Year of 2000' is realised, drug research will not be needed anymore, clinical pharmacology will disappear, only the problem of compliance and non-compliance will survive'.

#### References

- Adikwu MU, Osondu BJ. 1991. Four years of essential drugs' list in Nigeria. *Social Science and Medicine* 13(9): 1005-10.
- Anonymous. 1994. Note introductive sur l'initiative de Bamako au Burkina Faso. Bilan des années 1992 et 1993 et perspectives dans le contexte de la dévaluation du CFA. Ministère de la Santé, Ouagadougou, Burkina Faso.
- Arhinful DK, Das AM, Hadiyono JP, Iyun FB, Ross-Degnan D, Heggenhougen K, Higginbottom N. 1994. *Qualitative methods for investigating drug use problems and designing interventions*. INRUD Social Scientist Working Group, Boston.
- Baird-Lambert J, Buchanan N. 1985. Compliance with medication regimens in children. *The Medical Journal of Australia* 142: 201-3.
- Budson P. 1990. Global action towards rational drug use. In: Arundel A, Schaaber J, Mintzes B (eds). *Primary Health Care and Drugs*. Health Action International: pp. 99-113.
- De Wet B, Hollingshead J. 1980. Medicine compliance in pediatric outpatients. *South African Medical Journal* 58: 846-8.
- Friebel H, Schäfer T, Balthasar R et al. 1988. Arzneimitteltransparenz und -beratung in Dortmund. 3. Mitteilung. *Pharmazeutische Zeitung* 133(10): 680-90.
- Greenberg RN. 1984. Overview of patient compliance with medication dosing: a literature review. *Clinical Therapeutics* 6(5): 592-9.
- Griffith S. 1990. A review of factors associated with patient compliance and the taking of prescribed medicines. *British Journal of General Practice* 40: 114-6.
- Gul V, Mackenzie M. 1993. Medical counseling and patients compliance in Turkish and Greek speaking communities in Haringey and Enfield. *Journal of the Royal Society of Health* 113(6): 286-7.
- Guyon AB, Barman A, Ahmed JU, Ahmed AU, Alam MS. 1994. A baseline survey on use of drugs at the primary health care level in Bangladesh. *WHO Bulletin* 72(2): 265-71.
- Herrmann. 1991. Was wissen wir über da Einnahmeverhalten unserer Patienten: Ergebnisse von Umfragen. *Verh. Dtsch. Ges. Inn. Med.* 97: 342-6.
- Káldor A. 1991. How to comply with non-compliance. *International Journal of Clinical Pharmacology, Therapy and Toxicology* 29(5): 209.



- Krause G, Schleiermacher D, Borchert M et al. 1996. Quality of Care without Quality of Diagnosis? Non-participant Observation of Out-Patient Consultation in Rural Health Centers in Burkina Faso, West-Africa. (oral presentation). 13th International ISQua Conference on Quality in Health Care, Jerusalem, 26-30 May 1996.
- Kritzinger NA. 1980. Adherence to drug therapy. an outpatient survey at the Johannesburg General Hospital. *South African Medical Journal* 58: 767-70.
- Guimier JM. 1995. Suivi de la politique du médicament essentiel au Burkina Faso. Rapport de mission. Ministère de la Santé, Ouagadougou, Burkina Faso.
- Litvack JJ, Bodart C. 1991. User fees plus quality equals improved access to health care: results of a field experiment in Cameroon. *Social Science and Medicine* 17(1): 369-383.
- Maier B, Gørgen R, Kielmann AA, Diesfeld HJ, Korte R. 1994. *Assessment of the district health system using qualitative methods*. London: MacMillan.
- McPake B, Hanson K, Mills A. 1990. *Experience to date of implementing the Bamako initiative; a review and five country case studies*. PHP Publication no. 8. London School of Hygiene & Tropical Medicine, London.
- McPake B, Hanson K, Mills A. 1993. Community financing of health care in Africa: an evaluation of the Bamako Initiative. *Social Science and Medicine* 36(11): 1383-95.
- Pinto Pereira LM, Granger-Pierre J. 1995. L'usage rationnel de médicaments à Tobago. *Forum mondial de la Santé* 16: 32-5.
- Raditapole D. 1990. Primary health care and drugs - challenges for the future. In: Arundel A, Schaaber J, Mintzes B (eds). *Primary Health Care and Drugs*. Health Action International: pp. 165-8.
- Rapoff MA, Christophersen ER. 1982. Improving compliance in pediatric practice. *Pediatric Clinics of North America* 29(2): 339-52.
- Sclar DA, Pharm B. 1991. Improving medication compliance: a review of selected issues. *Clinical Therapeutics* 13(4): 436-40.

### Acknowledgements

We would like to thank the health personnel for collaborating in the study. Special thanks also to the patients for their participation in the interviews. This study is dedicated to them, especially to seven month old Déme Marcel, who died of cerebral malaria during the study. In spite of the difficult field conditions, the interviewers were able to locate and interview the patients in their households. To them, the observers and the whole PRAPASS team, we owe the success of this study. The following persons and institutions encouraged and supported us in the realization of the study and gave us worthy advice: A Nougara (Ministry of Health, Ouagadougou), I Sanogo (GTZ Santé, Ouagadougou), M J Sanon

(PRAPASS, Tougan), I Zongo and F Somé (DMO Nouna and Tougan), P Ky and L Winkler (CM Solenzo), R Sauerborn (Tropical Institute, Heidelberg). The study was part of the Projet Recherche Action Pour L'Amélioration des Services de Santé (PRAPASS) and has been funded in parts by the Commission of the European Union, DG XII (TS3-CT92-0078) and the Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie (BMBF, 01 KA 9301/3).

### Biographies

Gérard Krause, MD, Dr. med., DTMH, is research assistant at the Institute for Tropical Hygiene and Public Health (ITHÖG) at the University of Heidelberg. He was resident for tropical medicine at the same institute and has conducted clinical studies on leishmaniasis and ciguatera intoxication. He currently works on health systems development within the Project for Action Research for the Improvement of Health Services (PRAPASS) in Burkina Faso.

Justus Benzler, MD, specialized in medical informatics, is research assistant at ITHÖG at the University of Heidelberg. He was field co-ordinator of the PRAPASS project in Burkina Faso 1993/94 and currently works in health systems development.

Rolf Heinmüller, MD, Dr. med., has been field co-ordinator of the PRAPASS project since 1994 for the German Development Service (DED) in Nouna Burkina Faso. Before this he was project adviser of ITHÖG at the University of Heidelberg.

Mathias Borchert, MD, is research assistant at ITHÖG at the University of Heidelberg. He was field co-ordinator of the PRAPASS project in Burkina Faso 1992/93 and currently works in health systems development.

Eberhardt Koob, MD, Dr. med., MPH, is Project co-ordinator of GTZ-Health (German Technical Co-operation Services) in Burkina Faso which has played an important role in the implementation of the essential drug programme.

Kassoum Ouattara, geographer and regional supervisor within the PRAPASS in Nouna since 1994, is a specialist in health and migration.

Hans Jochen Diesfeld, MD, Dr. med., MPH, is Professor and head of ITHÖG at the University of Heidelberg. He has very wide experience in health policy and health systems research.

*Correspondence:* Dr Gérard Krause, Am Natruper Holz 62b, D-49090 Osnabrück, Germany

# From diagnosis to drug taking: staff compliance with guidelines and patient compliance to prescriptions in Burkina Faso

G. KRAUSE, M. BORCHERT, J. BENZLER AND H. J. DIESFELD

Department of Tropical Hygiene and Public Health, University of Heidelberg, Germany

## Abstract

**Objective.** We studied compliance with guidelines and prescriptions for six steps of the health care process to identify the step with the greatest need for improvement.

**Design.** In a cross-sectional study we used hidden observation in health centres and counting of remaining drugs in home visits. We assessed provider compliance with guidelines for medical history, physical examination, drug choice, and explanation of drug dosing, and patient compliance for drug buying and drug taking.

**Setting.** The study took place in six rural health centres in Burkina Faso.

**Main outcome measures.** We measured unconditional (UPC), conditional (CPC) and accumulated proportions of compliant procedures (APC). UPC determined the proportion of compliant procedures independent from earlier steps. CPC was defined as the proportion of compliant procedures among those which were compliant in all previous steps. APC was the proportion of procedures compliant in all steps including the step concerned.

**Results.** Twenty-three per cent UPC medical history, 27% UPC (CPC = 39%) clinical examination, 59% (83%) drug choice, 22% (40%) explanation of dosing, 71% (75%) drug buying, and 63% (67%) drug taking compliance. Two per cent of the patients had compliant procedures for all steps of the process (APC).

**Conclusion.** The majority of patients did not get treatment compliant with guidelines. Diagnosis had the largest need for improvement. UPC, CPC and APC were useful to identify steps with the greatest need for improvement and to assess quantitatively aspects of quality of care.

**Keywords:** diagnostic quality, drug-buying compliance, drug taking compliance, health care process, treatment guidelines, treatment quality

Burkina Faso, West Africa is a poor, predominantly rural country with approximately 10.5 million inhabitants. There are approximately 50 health districts with one medical centre each and 6–14 health centres in the surrounding villages. Each health centre covers a population of 10–15 000. The staff of medical and health centres are paid by the state. Until 1993 services in these health centres were free of charge and patients were required only to buy their prescriptions, for which they had to use private pharmacies that were located mainly in the district capital and not in the village where their consultation had taken place. In 1993 the Government of Burkina Faso decided to reform rural health services

by implementing strategies of the Bamako Initiative and introducing an essential drug program: under financial and technical support of the World Health Organization, World Bank, GTZ (German Society for Technical Co-operation) and others, village pharmacies have been inaugurated in all villages with health centres. Nurses have received refresher courses on essential drugs and drug vendors have been trained in 4-week courses to sell the drugs in the new village pharmacies. A village committee is now in charge of its village pharmacy and decides how the income of the village pharmacy is invested for local health services (e.g. by constructing new housing for health personnel). Also in 1993 the Ministry of

Address reprint requests to Gérard Krause, EIS Officer, Florida Department of Health, Bureau of Epidemiology, 2020 Capital Circle SE, Bin # A-12, Room 337 (HSDE), Tallahassee, FL 32399-1734, USA. E-mail: gerard\_krause@ibm.net

G. Krause *et al.*

Health published the guidelines 'Strategies of diagnosis and treatment for the first level of health care'. The guidelines were supposed to serve as treatment standard for nurses in rural health care facilities.

Numerous studies have assessed the quality of single aspects of the health care process in developing countries such as diagnosis [1,2], treatment [3-6], or patient compliance [7-11]. To our knowledge only a few studies have included diagnosis, treatment and patient compliance simultaneously in their quality assessment [12].

A comprehensive simultaneous assessment of the different elements of health care is important to identify more thoroughly the elements with a particular need for improvement. Moreover, knowing how those elements relate to each other does not only provide an estimate of the overall compliance, but may also generate hypotheses about how changes in one step might affect the compliance in other steps.

The Heidelberg University was asked by the Ministry of Health to evaluate the quality of first level health services in rural Burkina Faso under special consideration of the recent introduction of essential drugs and the new treatment guidelines. The study was conducted in 1995 in six rural health centres in North West Burkina Faso, situated in the longitudinal demographic surveillance zone PRAPASS. This region is considered by the Ministry of Health to represent an average rural setting in Burkina Faso.

The aim of this study was to assess how diagnosis and treatment in rural health services comply with the guidelines and how patients comply with the prescriptions provided by those services. We used a system of three quantitative measures in order to demonstrate how compliance in the individual step relates to compliance in all other steps of the health care process.

## Methods

The field study lasted from June 25 until July 26, 1995. All non-surgical general consultations in six health centres in rural Burkina Faso were observed over a 2-week period. The activities in the health centres and in the village pharmacies were documented by hidden, non-participant observation. We chose this method in order to minimize the influence of the observers on the nurses' activities. The presence of the observer in the general consultation was explained to the nurse by stating that drug taking compliance of patients was one of the study objectives. The observers in the health centres were national medical students and nurses. Observers in the village pharmacies were graduates from secondary school and experienced in fieldwork. Both groups had participated in a 3-day training course followed by a 1-day refresher course and contributed to the design of the observation guides.

All evaluation criteria for patient history and clinical examination were based on compliance with diagnostic guidelines published by the Ministry of Health [13]. Together with local clinicians and public health physicians we selected only

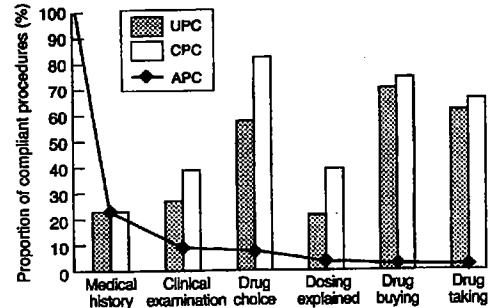


Figure 1 UPC, CPC and APC at six different steps of the health care process.

the most essential elements of these basic guidelines. In order to fulfill our criteria for compliance, the nurse had to ask key questions and perform essential examinations for each symptom. For example, in a case of diarrhoea, the nurse was expected to ask how long the episode of diarrhoea had lasted and if there was blood in the stool. For the physical examination, at least one way of assessing the extent of dehydration (e.g. by skin fold) was required. The complete set of observation criteria for diagnostic procedures has been published in detail elsewhere [2]. For each of those symptoms likely to be presented during consultation, a separate observation form was designed.

Drug choice was rated compliant if all prescribed drugs were indicated for at least one of the diagnoses suggested by the nurse. The standard for evaluating the indication and the dosage of the prescribed drugs were the above mentioned treatment guidelines and the national drug list distributed by the Ministry of Health [13,14]. An adverse interference with other drugs and individual contraindications (such as pregnancy) had to be absent. The explanation of drug dosing was rated compliant if correct explanations on dosing had been given to the patient for all drugs according to the guidelines. The observers in the health centres and in the pharmacies documented on observation forms if and what explanations were given for the drug dosing. Detailed methodology on the assessment of drug choice and explanation of dosing has been published elsewhere [6].

Drug buying behaviour was observed in the village pharmacies. Observers in the village pharmacies documented all purchases during a 2-week period. It was then assessed whether each patient had purchased the prescribed drugs. Drugs found during the home visit that were not purchased at the village pharmacies but elsewhere were also taken into account. Drug-taking compliance was assessed by visiting patient homes half-way through the treatment course by asking the patient to present the drugs that had been purchased for this illness episode and by counting the pills that had not been taken yet by the patient [11]. If one of multiple prescribed drugs was not taken as instructed, then drug

**Table 1** Age and sex distribution of patients participating in the study

Age group (years)	Male	Female	Total
0-4	25	20	45 (27%)
5-14	12	3	15 (9%)
15-49	45	42	87 (52%)
>50	9	9	18 (11%)
Unknown	0	3	3 (2%)
Total	91 (54%)	77 (46%)	168 (100%)

taking was considered to be non-compliant. Drugs were not evaluated for compliance if they were not accompanied with dosing instructions or if their dosing was left to the need of the patient.

The observation forms were tested and revised in two pretests in a health centre that did not participate in the study. More information of the observations technique and the evaluation criteria has been published elsewhere [2,6,11].

Three measures were calculated for each of the six steps of the health care process. The first measure is the unconditional proportion of compliant procedures (UPC) at a defined step and represents the proportion of cases managed in compliance with the guidelines at this step, without taking previous steps into account. For example, the percentage of compliant drug choices was measured without taking into account how many of those drug choices were based on compliant diagnostic examinations.

The second measure, called conditional proportion of compliant procedures (CPC), expresses the proportion of cases with compliant management at that step among only those cases that were also managed in compliance with guidelines in all previous steps. An example of CPC would be the compliance in drug choice measured only among those cases whose medical history and clinical examination were also compliant with the guidelines.

The third measure, the accumulated proportion of compliant procedures (APC) at a certain step, represents the

proportion of all cases seeking help at the health centre who were compliant on all steps up to and including the step concerned. For example, patients with compliant drug choices were counted only if the medical history and the examination for that patient were also compliant with the guidelines. The denominator was the total of patients presenting at the health care centre including those with non-compliant procedures in the diagnosis. The APC is the product of all CPC, including the step in question. Each of those three measures, UPC, CPC and APC, were calculated for every step. CPC was compared with the proportion of procedures that were compliant at the step concerned but *not* compliant in former steps (UPC not CPC); it would have been incorrect to compare CPC with UPC directly, as the CPC-positive procedures are included in the UPC-positive ones. For statistical analysis, Epi Info 6.02 software was used to perform two-sided chi-square and Fisher exact tests. Results were considered as statistically significant if  $P < 0.05$ .

## Results

A total of 168 patients were enrolled in our study (Table 1); 131 of them were followed-up from diagnosis until drug taking. Ten nurses and nine village pharmacists were involved in the treatment of those patients (Table 2). Fifteen of the 19 nurses and pharmacists were men, which reflected the common sex distribution among health care professionals in Burkina Faso. The distribution of diagnoses of the patients who participated in the study is presented in Table 3. Completeness of information for each of the six steps studied ranged from 78 to 98% (Table 4).

Detailed results of the outcome measures are shown in Table 4. Some examples may illustrate the interpretation of the study measures: 23% of the patients had a medical history taken that was compliant with the guidelines (=UPC), 27% had a compliant physical examination (=CPC); 9% of the patients had both a compliant medical history and a compliant physical examination (=APC). For 59% of the patients, the choice of drugs prescribed was compliant with the guidelines (UPC). Among those patients whose diagnostic procedures

**Table 2** Training level of nurses and distribution by age and sex

Title	Training and occupation	Age	Male	Female
Short course nurse	Two year training - training less demanding than for state nurse, responsible for health centre	24-34	5	0
Community nurse	One year training, foreseen mainly for health promotion activities but often replacing the nurse when absent	25-26	2	1
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
Total		24-36	8	2

G. Krause et al.

Table 3 Primary non-injury related diagnoses in study patients

Diagnosis	Number of patients (%)
Malaria	569 (33.3)
Conjunctivitis	16 (9.5)
Diarrhea	12 (7.1)
Painful joint	9 (5.4)
Ophthalmological problems	8 (4.8)
Respiratory diseases	5 (3.0)
Pelvic pain	4 (2.4)
Abdominal pain	4 (2.4)
Bilharziosis	2 (1.2)
Other	52 (30.9)
Total	168 (100)

were compliant, the drug choice of their prescriptions was compliant for 83% of the patients (CPC). In all steps, CPC was larger than UPC, but these differences were not statistically significant. For the clinical examination and the explanation of drug dosing the differences were close to the significance level of 0.05; in the later steps of the process the differences were far from being statistically significant (Table 4). APC was 2%; this means that for 2% of the patients the medical history, the physical examination, the prescribed drugs chosen as well as the explanation of drug dosing were compliant with the guidelines, and the patients bought and took the drugs according to the prescriptions.

The number of patients assessed differs between the three observation steps. For medical history, clinical examination and drug choice 16–18% of the 168 patients were excluded from analysis. For explanation of dosing and for drug buying less than 1%, and for drug taking 22% were excluded from analysis. The exclusion was due to the lack of sufficient information to classify the case as compliant or non-compliant. The 131 patients assessed for drug taking had essentially the same results in the first four UPC measures as the remaining 37 patients ( $P > 0.4$ ). However for UPC of drug buying a significant difference can be seen: patients whose drug taking could be assessed had 77% correct drug buying while patients whose drug taking was not assessed had only 47% correct drug buying ( $P < 0.001$ ).

## Discussion

We assessed prospectively compliance of diagnosis and treatment with established guidelines and patient compliance with prescribed treatments simultaneously within the same study population.

The study design allows the measurement of unconditional, conditional and accumulated proportion of compliant procedures for each step within the health care process. Each of these measures gives complementary information on the quality of health care and demonstrates how compliance in one step relates to compliance in another step. The lowest UPC in the process may indicate the step with the greatest

need and potential for improvement. Where CPC is considerably higher than UPC, improvements in earlier steps may have a particularly strong impact on the overall compliance. Therefore, measuring CPC may have an additional value. APC can be used to determine the effect of such selective improvements on the overall health care process.

In our study, differences between UPC and CPC were visible and consistent but not statistically significant. Assuming that the proportions remain the same, we would have needed twice as many observations (287) to find a significant difference between UPC and CPC in the drug choice step, and almost six times as many observations (918) to detect a significant difference in the explanation of dosing step. Nevertheless, the concept of distinguishing between unconditional, conditional and accumulated proportion of compliant procedures appears to be useful since the difference between UPC and CPC may be significant if applied to other health care settings.

Compliance with guidelines is not the only element, but is an important element of health care quality, as it assures rational case management if the guidelines themselves are rational. We were unable to evaluate how the introduction of the guidelines and the other recent changes in the health care system have affected the quality of health services, because baseline data are not available. Nevertheless, our cross-sectional study was able to detect some serious problems.

We found very low compliance in the diagnostic steps, although our criteria for assessing compliance only requested a few very basic items to be completed and were clearly less demanding than the official national treatment guidelines [2, 6,11,13]. In Angola, too, nurses at primary level outpatient consultations were found to perform adequate history taking in 54% and adequate physical examination in only 29% of their patients [1]. This suggests that diagnostic quality may be a major problem in other settings of health care as well. Furthermore, deficiencies in explaining the dosing to the patients were detected [6].

The client-related steps such as drug buying and drug taking compliance yielded more satisfactory results than the provider-related steps. Even though patients have to pay for their drugs, the drug buying compliance is remarkably high. In comparison with other studies, the performance of the pharmacies and the drug buying compliance in our study population are good [3,7,8]. The drug taking compliance appears to be independent of previous steps as UPC and CPC are very similar. In a review of 37 studies on compliance in developing countries Homedes and Ugalde present results from 30 to more than 90% compliance [15]. However, the individual settings are so different that comparisons between the studies are very difficult [9,10].

The first four steps of the process are likely to depend on the individual capacity of each nurse as well as the diagnosis of the patient. The sample size of this study however does not allow us to differentiate the performance results by those variables. In a study that focused on diagnostic quality among a very similar but larger patient population we were able to detect that compliance with diagnostic guidelines was less in

Table 4 UPC, CPC and APC at six different steps of the health care process

Steps in the health care process	UPC		CPC		APC <sub>i</sub> = APC <sub>i-1</sub> × CPC <sub>i</sub> (%)	P
	n	%	n	%		
1. Medical history	142 <sup>1</sup>	23	142	= UPC <sup>2</sup>	= UPC <sup>2</sup>	—
2. Clinical examination	142 <sup>1</sup>	27	33	39	9	0.061 <sup>4</sup>
3. Drug choice	138 <sup>1</sup>	59	12	83	8	0.069 <sup>4</sup>
4. Explanation of drug dosing	164 <sup>1</sup>	22	10	40	3	0.229 <sup>5</sup>
5. Drug buying	165 <sup>1</sup>	71	4	75	2	1.00 <sup>5</sup>
6. Drug taking	131 <sup>1</sup>	63	3	67	2	1.00 <sup>5</sup>

<sup>1</sup> n=168 patients, difference to total determined is due to missing information. <sup>2</sup> For step 1, UPC, CPC and APC are equal by definition. <sup>3</sup> UPC in cases that were non-compliant in one or more preceding steps is compared with CPC. <sup>4</sup> Two-sided chi-square test. <sup>5</sup> Two-sided Fisher exact test. i, Index step.

diarrhoea cases as compared with cases of malaria or respiratory tract infections [2]. In that same study we were also able to find significant differences between individual nurses but not between different training levels of nurses [2].

The different population sizes at the different observation steps is explained by the varying complexity of information that had to be retrieved in order to classify each case as compliant or non-compliant. The comparison of patients whose drug taking was assessed with those whose drug taking could not be assessed show that a difference can only be seen for the drug buying step. This difference may be caused by the fact that patients whose drugs could not be found or identified during the home visit were less likely to follow the drug buying instructions because they gave less attention to the drug treatment as a whole.

## Conclusion

We conclude that in the rural Burkinian setting, the strongest need for improvement of the health care process is in compliance with diagnostic guidelines. Improvements here may have a significant impact on the overall quality of the health care process. Furthermore, patients need to receive better instructions on how to take the drugs.

Recommendations include: (i) emphasize rational diagnostic procedures in the professional training of health care workers and in refresher courses; (ii) motivate the health care workers to provide patients with clear drug taking instructions together with the prescription; (iii) increase and improve supervision of rural health care workers to enhance compliance with existing guidelines; (iv) evaluate existing guidelines for diagnosis and treatment with respect to their completeness and user-friendliness and, if necessary, improve them.

We believe that this study provides useful tools with which to assess simultaneously provider compliance to guidelines and patient compliance to prescriptions as an important aspect of quality of health care.

## Acknowledgements

The authors thank the whole PRAPASS team (Projet Recherche Action Pour L'Amélioration des Soins de Santé) who made this work possible. We thank L. Gilson, P. Van der Stuyft, R. Brugha and N. Tackett for their comments on the manuscript. The study was funded in part by the Commission of the European Union, DG XII (TS3-CT92-0078) and the Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie (BMBF, 01 KA 9301/3).

## References

- Björck M, Johansson R, Kanji N. Improving the quality of primary care services in Angola. *Health Pol Plan* 1992; 7(3): 290-295.
- Krause G, Schlemacher D, Borchert M, et al. Diagnostic Quality in rural health centers in Burkina Faso. *Trop Med Int Health* 1998; 3(2): 100-107.
- McPake B, Hanson K, Mills A. Community financing of health care in Africa: an evaluation of the Bamako Initiative. *Soc Sci Med* 1993; 36(11): 1383-1395.
- Gilson L, Allio M, Heggenhougen K. Community satisfaction with primary health care services: an evaluation undertaken in the Morogoro region of Tanzania. *Soc Sci Med* 1993; 39(6): 767-780.
- Litvack JJ, Bodart C. User fees plus quality equals improved access to health care: results of a field experiment in Cameroon. *Soc Sci Med* 1991; 37(3): 369-383.
- Krause G, Borchert M, Benzler J et al. Rationality of drug prescriptions in rural health centers in Burkina Faso, West Africa. *Health Pol Plan* 1999; 14(3): 291-298.
- Guyon A. B, Barman A, Ahmed J.U. A baseline survey on use of drugs at the primary health care level in Bangladesh. *WHO Bulletin* 1994; 72(2): 265-271.
- Adikwu M.U, Osondu B.J. Four years of essential drug list in Nigeria. *Soc Sci Med* 1991; 13(9): 1005-1010.

G. Krause et al.

9. Greenberg RN. Overview of patient compliance with medication dosage: a literature review. *Clin Therapeut* 1984; 6(5): 592-599.
10. van der Geest S. Pharmaceuticals in the third world: the local perspective. *Soc Sci Med* 1987; 25(3): 273-276.
11. Krause G, Benzler J, Heinmüller R et al. Performance of village pharmacies and patient compliance after implementation of an essential drug program in rural Burkina Faso. *Health Pol Plan* 1998; 13(2): 159-166.
12. Tanner M, Lengeler C, Lorenz N. From the efficacy of disease control tools to community effectiveness. *Trans R Soc Trop Med Hyg* 1993; 87: 518-523.
13. Anonymous. *Strategies of Diagnosis and Treatment for the First Level of Care* (in French). Ouagadougou, Burkina Faso: Ministère de la Santé, 1993.10
14. Oedreago A, Sawadogo A. *Formulaire National des Médicaments Essentiels* (in French). Ouagadougou, Burkina Faso: Ministère de la Santé, 1989.
15. Homedes N, Ugalde A. Patients' compliance with medical treatments in the third world. What do we know? *Health Pol Plan* 1993; 4: 291-314.

Accepted for publication 2 November 1999

## **Comprehensive community effectiveness of health care. A study of malaria treatment in children and adults in rural Burkina Faso**

GERARD KRAUSE\* & RAINER SAUERBORN

*Department of Tropical Hygiene and Public Health, Heidelberg University, Germany*

(Accepted June 2000)

**Summary** Malaria is one of the most important causes of morbidity and mortality in children in sub-Saharan Africa, yet community effectiveness of treatment is not well understood. This study presents a quantitative estimate of community effectiveness of malaria treatment in Burkina Faso, based on population surveys, observational studies of health services and user surveys. Analysis of seven steps in the process of treating malaria reveal the following: (1) 21% of people with malaria attend health centres; (2) 31% of them have a sufficient history taken; (3) 69% receive a complete clinical examination; (4) 81% receive the correct dosage of drugs prescribed; (5) 91% purchase the drugs; (6) 68% take the drugs as prescribed; (7) the drugs are estimated to be 85% effective. Taking all the steps into account, overall community effectiveness is estimated to be 3%. Statistically significant differences in age and gender are seen in some steps. Quinine is prescribed too frequently. Critical issues in educating health care workers include complete history-taking and clinical examination, rational indication for quinine and adjusted drug dosages for children. We identify utilization and diagnostic quality as offering the greatest potential for improvement in overall community effectiveness.

### **Introduction**

In sub-Saharan Africa, malaria is one of the most important causes of death in children under 5 years of age<sup>1</sup> and contributes 9% to the total burden of disease.<sup>2</sup> Little is known about community effectiveness in managing malaria in endemic areas. Tugwell described the following main elements of community effectiveness: use of services, provider compliance with quality standards, user compliance with prescriptions and efficacy of treatment.<sup>3</sup> When treating malaria, management success depends largely on the synergism of the above-mentioned elements. Incorrect drug

choices and low patient compliance can, in turn, reduce drug susceptibility, which would then negatively affect efficacy of treatment.

Tanner and colleagues gave examples from different research projects for each of the elements of community effectiveness.<sup>4</sup> Lengeler & Snow used the example of insecticide-treated bed-nets to disentangle the relationship between theoretical efficacy and community effectiveness.<sup>5</sup> Previous publications by Sauerborn and colleagues, based on a population-based study in rural north-west Burkina Faso, described how households allocate their resources to health care.<sup>6–8</sup> An observational study conducted by Krause and colleagues assessed findings on provider compliance with quality standards and user compliance with prescriptions.<sup>9–12</sup> In this paper,

Reprint requests to: Dr Gérard Krause, Robert Koch-Institut, Infektionsepidemiologie, Postfach 650280, D-13302 Berlin, Germany; Phone: + 49 30 4547-3485, Fax: + 49 30 4547-3533; e-mail: krauseg@rki.de

ISSN 0272-4936 print/ISSN 1465-3281/online/00/040273-10 © 2000 The Liverpool School of Tropical Medicine  
Carfax Publishing  
DOI: 10.1080/1465328002003861



the primary authors of both studies jointly analyse their findings in order to achieve the following objectives: (1) focus on malaria treatment; (2) identify areas of specific relevance to children; (3) analyse all elements of community effectiveness from access to health care to patient compliance; and (4) offer a more detailed view of the process by breaking down Tugwell's three elements<sup>3</sup> into six separate elements: use of health care, diagnostic history-taking, diagnostic clinical examination, drug choice, drug treatment, drug-buying and drug-taking compliance.

This study comprehensively addresses community effectiveness including all elements from use of health care services to drug-taking compliance, based on data from a single population and their health facilities.

## Methods

### *Background*

Burkina Faso has approximately 10.5 million inhabitants and is divided into 50 districts. The study was done in north-west Burkina Faso in Tougan, Nouna and Solenzo districts. There is one medical centre in every district capital and between six and 14 health centres in the surrounding villages. Each health centre serves a population of 10,000–15,000. Malaria transmission in Burkina Faso is holo-endemic. Less than 15% of malaria cases are caused by chloroquine-resistant *Plasmodium falciparum*.<sup>13,14</sup>

In 1993, the Ministry of Health in Burkina Faso published Strategies of Diagnosis and Treatment for the First Level of Health Care, guidelines aimed at improving and standardizing health care in rural health facilities.<sup>15</sup> In the same year in Burkina Faso, because of the national commitment to the Bamako Initiative, an essential drug programme was introduced: village pharmacies and essential drug supply systems were established. In 1995, the average cost of a visit to a health centre was c.US\$2 (1432 FCFA). Essential drugs were purchased by the national pharmacy from international manufacturers and distributed to

regional pharmacies. Nurses were invited to training courses and informed about the essential drug policy, and the above guidelines were presented to them.

This paper is based on a joint analysis of a household panel survey conducted by Sauerborn in the rainy season of 1994 and an observational study conducted by Krause in the rainy season of 1995. Both were separate studies, conducted in a co-ordinated manner (in the same area of north-west Burkina Faso), which to a large extent used the same study personnel. The following sections describe the basic methodologies applied and refer to previous publications for more detailed description of methods.

### *Household panel survey*

From the population of 26,504 people under demographic surveillance in the health districts of Nouna and Tougan, a two-stage cluster sample of 600 households was drawn and remained the study population for 15 household panel surveys conducted between 1992 and 1998. For this study, which took place from 14 October to 1 November 1994, data from the 12th survey were used. Given a recall period of 4 weeks, it covered illness episodes between 14 September and 1 November 1994 (rainy season).

The interviewers used complete household lists that had been established through the demographic surveillance system. All women of reproductive age were asked about their own illnesses and those of their children. The head of the household was asked about any illnesses in other household members.

The case definition for malaria in the survey was any reported illness where respondents used the local term for malaria (e.g. 'sumaya' in Dioula) and/or fever. After spontaneous recall, ten tracer conditions<sup>16</sup> were read to the interviewees. Each mother was asked to report her own illnesses and those of her children (including adopted children). Any other adult members of the household were asked directly about any illnesses. If this was not feasible, the household head reported.

Choice of health service was recorded as well as perceived illness.<sup>17</sup> For the purposes of this study we recorded the first-named choice of health service only.

#### *Observational study*

The observational study took place during the first half of the rainy season from 25 June to 26 July 1995 in the health districts of Nouna, Tougan and Solenzo. Altogether, 313 consultations were observed in nine health centres during a 2-week observation period,<sup>9,10</sup> and 159 (50%) of them were cases of malaria. Of those, 47% were female, 40% were under 5 years of age, 8% were between 4 and 14, 45% were aged 15–49 and 7% were over 49 years of age.

A case of malaria was defined as a patient in whom the health care worker (HCW) specifically diagnosed malaria or for whom the HCW prescribed antimalarial drugs.

#### *Observation of the consultation*

Final-year medical students were trained to observe the consultations using a set of 11 observation forms which had been developed and pre-tested twice for the study.<sup>9,11</sup> A variety of questions and examination procedures were documented and analysed to assess diagnostic quality. For diagnosing malaria, history-taking was deemed acceptable if the HCW asked how long the patient had had symptoms or if the patient spontaneously offered the information. Clinical examination was deemed acceptable if the patient's temperature was taken. Therefore, we rated history-taking and clinical examination incomplete only when those minimal procedures were not performed.<sup>9</sup>

#### *Observation of drug purchase*

We assessed drug purchase by posting observers in the village pharmacies of the corresponding health centres. They documented the name and quantity of drugs dispensed to each patient during the 2-week observation period.<sup>10</sup>

#### *User survey and determination of drug consumption*

Patients' compliance with the prescribed treatment schedule was assessed during a household visit when patients were asked to show the drugs they had purchased for the recent illness. The visit took place after half of the foreseen treatment time had elapsed. This enabled the amount of drugs consumed to be determined in order to assess drug-taking compliance.

The household interviewers were able to locate and visit 76% of the patients treated for malaria in two of the study districts. In the third district (Solenzo), in which 93 patients were considered to be malaria cases, household follow-up could not be done because experienced interviewers were not available.<sup>10</sup> Data on drug-taking compliance is therefore available for only 47 patients.

#### *Estimation of drug efficacy*

Drug efficacy was not assessed in this study. Results of recent *in vitro* and *in vivo* sensitivity studies of *Plasmodium falciparum* in Burkina Faso were used to determine a conservative estimate of 85% clinical efficacy.<sup>13,14</sup>

## **Results**

#### *Utilization of health care*

There were 538 households comprising 5746 individuals in the panel, which represents a loss to follow-up of 10% of households over 2 years and 12 survey rounds. Illness in the preceding 4 weeks was reported by 797 individuals (12%), 219 of whom reported malaria or fever (161 malaria and 58 fever). Complete information on healer choice was available in 204 cases (Table I).

A large proportion of any age and sex group was treated at home. The treatment choice of men and women showed no significant differences. Children under 5, however, were more likely than older children and adults to be taken to the health services (to see either a nurse or physician) (27% vs 15%).

TABLE I. Choice of health care for malaria by age and gender

Choice of health care	<5 years No. (%)	≥5 years No. (%)	Male No. (%)	Female No. (%)	Total No. (%)
Nurse/doctor	28 (27)	15 (15)	22 (21)	21 (22)	43 (21)
Home + self-treatment	45 (44)	60 (59)	53 (50)	52 (54)	105 (52)
Other*	30 (29)	26 (26)	32 (30)	24 (25)	56 (27)
Total	103 (100)	101 (100)	107 (101**)	97 (101)	204 (100)
<i>p</i> -value ( $\chi^2$ )		0.042		0.709	

\* Includes traditional birth attendants, community agents and traditional healers; \*\* rounding error.

TABLE II. Quality of diagnosis, drug dosage and compliance by age and gender

Steps in treatment	<5 yrs No. (%)	≥5 yrs No. (%)	<i>p</i> -value ( $\chi^2$ )	Male No. (%)	Female No. (%)	<i>p</i> -value ( $\chi^2$ )	Total No. (%)
History-taking	21/57 (43)	24/90 (27)	0.192	36/78 (46)	9/69 (13)	<0.001	45/147 (31)
Clinical examination	45/57 (79)	56/90 (62)	0.033	54/78 (69)	47/69 (68)	0.884	101/147 (69)
Drug dosage*	37/57 (65)	74/79 (94)	<0.001	62/71 (87)	49/65 (75)	0.073	111/136 (82)
Drug buying	56/62 (90)	82/90 (91)	0.869	72/80 (90)	66/72 (92)	0.723	138/152 (91)
Drug intake	11/15 (73)	21/32 (66)	0.597	18/27 (67)	14/20 (70)	0.808	32/47 (68)

\* Correct dosage supplied with prescription.

TABLE III. Drugs prescribed for malaria by age and gender

Prescribed treatment	<5 yrs No. (%)	≥5 yrs No. (%)	Male No. (%)	Female No. (%)	Total No. (%)
Chloroquine	34 (55)	56 (60)	48 (59)	42 (58)	90 (58)
Quinine	26 (42)	29 (31)	30 (37)	25 (34)	55 (35)
Sulfadoxine/pyrimethamine	0 (0)	6 (7)	3 (4)	3 (4)	6 (4)
Two antimalarial agents	1 (2)	0 (0)	0 (0)	1 (1)	1 (1)
No antimalarial agent	1 (2)	2 (2)	1 (1)	2 (3)	3 (2)
Total	62 (101*)	93 (100)	82 (101*)	73 (100)	155 (100)

\* Rounding error.

#### Quality of diagnosis

The data for quality of diagnosis are shown in Table II. A significant difference was found between males and females for adequacy of history-taking. Only 13% of females (compared with 46% of males) were asked about the duration of their complaints or communicated the information spontaneously to the nurse. Children under 5 years of age were significantly more likely than older children and adults to have their temperature taken (79% vs 62%).

#### Rationality of treatment

In three cases (two adults and one child) the nurse did not prescribe any antimalarial agent even though he/she had diagnosed malaria. The antimalarial drug prescribed was chloroquine in 58% of cases. The second most frequently prescribed drugs were quinine products (36%). Pyrimethamine/sulfadoxine was prescribed exclusively to adults. In one case, two different antimalarial drugs were prescribed to the same patient (Table III).

TABLE IV. Proportions of effective procedures and estimated effectiveness of seven steps in treatment of malaria

Steps in the process	Effectiveness of the procedures (%)	Combined estimated effectiveness (%)*
Utilization (Table I)		21
History-taking (Table II)	× 21	7
Clinical examination (Table II)	× 7	5
Drug dosage (Table II)	× 5	4
Drug-buying (Table II)	× 4	4
Drug-taking (Table II)	× 4	3
Efficacy of drug†	× 3	3

\* /100; † based on estimates.<sup>13,14</sup>

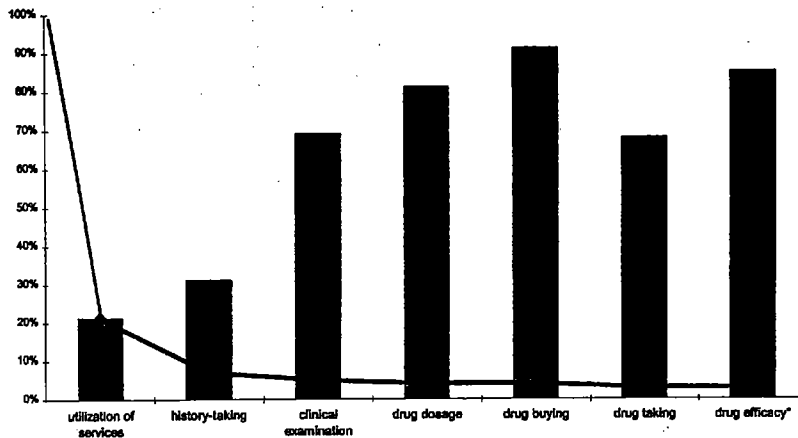


FIG. 1. Proportion of effective procedures (in % columns) and estimated effectiveness (in % lines) of seven steps in the process of treating malaria. The asterisk indicates that data on drug efficacy are based on estimates from the literature.<sup>13,14</sup>

Drug dosages prescribed for children under 5 years were significantly more inadequate than for older children and adults (35% vs 6%) and this difference remained significant when analysing the dosage of chloroquine only.

#### Patient compliance

Ninety-one per cent of patients purchased the prescribed drug. The wrong drug was purchased in only one case. According to counts

of the remaining pills in the middle of the treatment period, 68% of the drugs had been taken correctly. In two cases, the number of pills remaining suggests that more than twice the prescribed dosage had been taken.

#### Discussion

##### Community effectiveness

Table IV and Fig. 1 summarize the results of our study. The following can be seen as steps

towards community effectiveness of malaria treatment in their natural chronological order: (1) utilization of health services, (2) completeness of history-taking, (3) completeness of clinical examination, and (4) correct drug dosage; these steps depend mainly on the quality of the health service. Compliance in drug-buying (5) and compliance in drug-taking (6) depend mostly on patients' willingness and financial capacity to comply with the prescribed treatment. Drug efficacy against *Plasmodium falciparum* (7) is the final factor in community effectiveness. A quantitative figure for overall community effectiveness can be estimated by successively relating the results of the above-listed steps to each other. In a similar approach, Krause and co-workers used the 'accumulated proportion of compliant procedures' to quantitatively assess overall effectiveness of a health care process.<sup>12</sup> Based on our study, only 31% of those who attend the health centre have a complete history taken and only 21% of those who are ill come to the health centre in the first place. Consequently, only 7% of all people with a malaria-like illness attend the health centre and have a complete history taken (Table IV). The overall estimated community effectiveness of malaria treatment is only 3%. This does not imply that only 3% have received correct or even effective treatment, since some patients may have received the necessary treatment even without proper diagnosis or explanation of drug dosing. The findings show that only 3% of all people with a malaria-like illness have progressed successfully through all seven steps of the process. As demonstrated in Fig. 1, the main loss of opportunity occurs at the very beginning. Loss of opportunity in the subsequent steps diminishes even further the number of successfully treated patients, but cannot much influence overall effectiveness. For example, if the earlier steps have not been adhered to, then introducing a new antimalarial drug that increases efficacy from 85% to 100% will not increase overall community effectiveness by even 1%.

#### *Use of health care*

In our study, use of health services for febrile illnesses seems rather low compared with use in other countries. For example, in a malaria-endemic area of Mexico, 55% of people with febrile illnesses were found to be treated at home while 17% attended health centres.<sup>18</sup> In Togo, 20% of children under 5 years with fever were seen during their illness at health centres.<sup>19</sup> In Zaire, however, 45% of children under 5 were seen in a health facility.<sup>20</sup> We found that febrile children under 5 were more likely to attend the health centre than older children and adults, whilst in a previous study in Burkina Faso we reported that children were less likely to be taken to formal health services.<sup>7</sup> This difference might be explained by the fact that the earlier study included all diseases, while this study focused on malaria. Perhaps parents regard malaria as being particularly serious in childhood and are therefore more inclined to seek modern health care for their children when affected.

It has been claimed repeatedly that bias against girls is an important factor in access to modern health care in developing countries.<sup>21-23</sup> Our findings do not support this view, and neither did the findings in an earlier study.<sup>8</sup>

Overall, use of the health centre in our study was low. The three major determinants for using the services are access, quality and cost.<sup>24-27</sup> Perceived poor quality of care is as powerful a deterrent to use as expense.<sup>28</sup> Access to drugs has improved since the implementation of the essential drug programme in 1994, and the overall cost of services has remained stable.<sup>10</sup> The efforts of the ministry of health to improve quality of care have been described in the introduction; however, their effect cannot be assessed retrospectively.<sup>9,11</sup>

#### *Diagnostic quality*

Nearly 80% ( $31\% \times 69\% / 100\% = 21\%$ ) of patients were diagnosed with malaria without meeting our criteria for an adequate clinical

examination and having an adequate medical history taken. Comparison with other countries is difficult because the few relevant studies published do not present pre-defined criteria.<sup>29,30</sup> In Bangladesh, however, Guyon and co-workers found that 37% of patients had been adequately examined using pre-defined criteria.<sup>31</sup>

We were able to identify age- and gender-related differences in diagnostic management. History-taking was significantly less adequate in females. In an earlier publication, we found that 24% of adult women (> 19 years) were unable to communicate with the HCW in the same language compared with only 10% of men ( $p = 0.012$ ).<sup>9</sup> HCWs in the study area see patients from more than ten different ethnic groups, most of whom speak their own languages. Most HCWs can communicate in two or three of the commonest languages, but not in all. We also found that males often speak more languages than females. Therefore, in the absence of a translator, nurses have more difficulty communicating with female than with male patients. The frequency of complete clinical examination was almost identical between the sexes.

Children under 5 were more likely to be diagnosed according to the minimum criteria, especially following physical examination. This might be because HCWs feel that clinical examination of a child is more readily accepted by both parents and child and is also more necessary since children cannot articulate their symptoms as well as adults.

#### *Choice of drug*

Given the low levels of chloroquine resistance in the area, the high proportion of quinine prescription is unjustified on medical grounds.<sup>15</sup> It is also very surprising because the national treatment guidelines recommend quinine only in complicated cases such as cerebral malaria.<sup>15</sup> Our data do not allow differentiation between malaria patients with and without an indication for quinine. Approximately two-thirds of quinine prescribed was for oral use, which indicates that the clinical

condition of the patients was probably not very serious. Over-prescription of quinine has two negative effects: there is a greater risk of undesirable side-effects and it costs five-to-ten times more than chloroquine. Based on estimates of great fluctuation in the price of out-patient health care for children,<sup>32</sup> a reduction in price would considerably increase demand. Avoiding irrational use of drugs would reduce side-effects of malaria treatment which, in turn, would probably improve parents' compliance with prescriptions.<sup>27,33</sup>

It is possible that the over-prescription of quinine is related to the fact that the health centre's revenue is partly dependent on sales in the village pharmacy. Nurses might be motivated not only to over-prescribe but also to prescribe more expensive drugs.<sup>10,26,34</sup> Over-prescription of quinine might also reflect colonial practice before implementation of the essential drug policy.

#### *Prescribed dosage*

We found a clear difference between dosage errors in adults and children over 4 years of age vs children under 5 years of age. Our findings were similar in an earlier study which included treatment of other diseases also.<sup>9</sup> Apparently, HCWs do not take account of the fact that dosages in children need to be adjusted according to age and/or size.

#### *Drug-buying compliance*

As described in our previous study, the village pharmacies are functioning very well and have been accepted by the community since being introduced in the summer of 1995.<sup>10</sup> Ninety per cent of antimalarials prescribed are bought in the village pharmacy.

#### *Drug-taking compliance*

As far as we know, this is the first study in Africa to report data on observed compliance with antimalarial treatment, and compliance

appears to be similar to that in industrialized countries.<sup>35-37</sup> Evaluation of drug-taking compliance shows no age- or gender-specific differences. This surprised us since we found in an earlier study looking at all drugs prescribed for all diseases that compliance in children under 5 years of age was significantly reduced.<sup>9</sup> One reason might be that parents have more of a routine for administering anti-malarials than drugs for other diseases. It is also possible that adults caring for a child might regard the fever as more life-threatening and therefore have a stronger interest in ensuring completion of a course of treatment.

#### *Limitations of the study*

The main limitation of this work is that the populations studied are not identical. However, social demographic aspects, geographic location and the seasonal timing are believed to be sufficiently similar to permit combined analysis.

This study was not designed to investigate medication used at home and therefore we do not know how half of the patients with febrile illness were treated.

We acknowledge that the health centres were not chosen at random and that our findings do not allow extrapolation to the whole country. Our case definition for the household surveys was based on perceived morbidity alone. In a holoendemic malarious area, however, fever and the local term for malaria are considered valid proxies for malaria.<sup>38</sup>

The requirement for an adequate diagnosis was limited to a few main criteria, which might not always reflect the need for individual diagnosis. We felt that adding more or different criteria would have made it difficult for the observers to document, given that diagnoses of other illnesses were also studied. The criteria we used have proved to be useful in the field and to make observations comparable.<sup>9</sup> More precise requirements would have resulted in an even smaller proportion of complete diagnoses. It is possible that the observers in the health facilities influenced the behaviour of the

HCWs, but a comparison with data from patient registers suggests that the presence of the observers did not influence the HCWs' prescribing behaviour.<sup>9</sup>

Since this study focuses on malaria management, the numbers of observed consultations, subsequent drug purchases and patients complying with drug-taking might be too small to determine significant differences between age groups and gender. Nevertheless, the study was able to identify some differences which have direct implications for future interventions.

#### *Conclusions and recommendations*

The study assessed community effectiveness of malaria management and analysed its components, including use, diagnosis, treatment and compliance simultaneously. We found low overall community effectiveness, largely owing to low use and poor diagnosis.

We believe that improvement in diagnosis and treatment must be a priority in future interventions and that better uptake would then eventually follow. We recommend that health care workers be better motivated and trained in the following important points: (i) thorough diagnostic management; (ii) appropriate choice of chloroquine vs quinine; and (iii) weight- or age-adjusted drug dosages for children. Based on the findings of this study, changes are currently being made in the national training curriculum for nurses. In the study area, additional workshops for nurses have been held to address these recommendations.

While research on new antimalarial drugs is necessary and welcome in order to overcome chloroquine resistance, this study demonstrates how limited its effect will be on overall community effectiveness if other aspects of the process are not improved first. Therefore, research on how to improve the quality and use of rural health services must be intensified. Modern antimalarial drugs will contribute to effective malaria control only if uptake and quality of health care are high.

### Acknowledgments

We should like to thank the members of the field teams whose thorough, capable work was crucial to the success of this trial. The following colleagues have given advice and active support: J. Benzler, M. Borchert, H. J. Diesfeld, R. Heinmuller, K. Ouattara, F. Somé and I. Zongo. We thank Larissa Itina for help with data management and Natalie Tackett for editorial assistance. The study was part of the *Projet Recherche-Action Pour l'Amélioration des Services de Santé (PRAPASS)* and has been funded in part by the Commission of the European Union, DG XII (TS3-CT92-0078) and the Federal Ministry of Research and Education, Germany (BMBF, 01 KA 9301/3).

### References

- 1 Binka FN, Kubaje A, Adjuk M, *et al.* Impact of permethrin impregnated bednets on child mortality in Kassena-Nankana district, Ghana: a randomised controlled trial. *Trop Med Int Health* 1996; 1:147-54.
- 2 World Health Organization. Ad Hoc Committee on Health Research Relating to Future Intervention Options. Investing in Health Research and Development. WHO: Geneva, 1996.
- 3 Tugwell P, Bennett KJ, Sackett DL, Haynes RB. The measurement iterative loop: a framework for the critical appraisal of need, benefits and costs of health interventions. *J Chron Dis* 1985; 38:339-51.
- 4 Tanner M, Lengeler C, Lorenz N. From the efficacy of disease control tools to community effectiveness. *Trans R Soc Trop Med Hyg* 1993; 87:518-23.
- 5 Lengeler C, Snow RW. From efficacy to effectiveness: insecticide-treated bednets in Africa. *Bull WHO* 1996; 17:325-32.
- 6 Sauerborn R, Adams E, Hien M. Household strategies to cope with the economic costs of illness. *Soc Sci Med* 1996; 43:291-301.
- 7 Sauerborn R, Nougara A, Hien M, Diesfeld HL. Seasonal variations of household costs of illness in Burkina Faso. *Soc Sci Med* 1996; 43:281-90.
- 8 Sauerborn R, Berman P, Nougara A. Age bias, but not gender bias, in the intra-household resource allocation for health care in rural Burkina Faso. *Health Trans Rev* 1996; 6:131-45.
- 9 Krause G, Schleiermacher D, Borchert M, *et al.* Diagnostic quality in rural health centres in Burkina Faso. *Trop Med Int Health* 1998; 3:100-7.
- 10 Krause G, Benzler J, Heinmuller R, *et al.* Performance of village pharmacies and patient compliance after implementation of an essential drug program in rural Burkina Faso. *Health Pol Plan* 1998; 13:159-66.
- 11 Krause G, Borchert M, Benzler J, *et al.* Rationality of drug prescriptions in rural health centres in Burkina Faso, West Africa. *Health Pol Plan* 1999; 14:291-8.
- 12 Krause G, Borchert M, Benzler J, Diesfeld HJ. From diagnosis to drug taking: a study on the quality of the health care process in rural Burkina Faso. *Int J Qual Health Care* 2000; 12:25-30.
- 13 Guiguemde TR, Aouba A, Ouedraogo JB, Lamizana L. Ten-year surveillance of drug-resistant malaria in Burkina Faso (1982-1991). *Am J Trop Med Hyg* 1994; 50:699-704.
- 14 Ouedraogo JB, Duthell Y, Tinto H, *et al.* In vitro sensitivity of *Plasmodium falciparum* to halofantrine compared with chloroquine, quinine and mefloquine in the region of Bobo-Dioulasso, Burkina Faso (West Africa). *Trop Med Int Health* 1998; 3:381-4.
- 15 Anonymous. *Stratégies de diagnostic et traitement pour le premier niveau de soins de santé*. Ouagadougou, Burkina Faso: Ministère de la Santé Publique, 1993.
- 16 Kroeger A. Response errors and other problems of health interview surveys in developing countries. *World Health Stat Q* 1995; 38:15-37.
- 17 Anonymous. *Rapport de Projet. Projet de Recherche-Action pour l'Amélioration des Soins de Santé (PRAPASS)*, Ouagadougou. University of Heidelberg, 1996.
- 18 Leyva-Flores R, Erviti-Erice J, Kageyama-Escobar, *et al.* Utilización de servicios de salud por febriles en un área de transmisión de paludismo en México. *Salud Publica Mexico* 1995; 37:400-7.
- 19 Deming MS, Gayibor A, Murphy K, *et al.* Home treatment of febrile children with antimalarial drugs in Togo. *Bull WHO* 1989; 67:695-700.
- 20 Vernon AA, Taylor WR, Biey A, *et al.* Changes in use of health services in a rural health zone in Zaire. *Int J Epidemiol* 1993; 22(Suppl. 1):20-31.
- 21 Vlassoff C. Gender inequalities in health in the third world: uncharted ground. *Soc Sci Med* 1994; 39:1249-59.
- 22 Okojie CE. Gender inequalities of health in the third world. *Soc Sci Med* 1994; 39:1237-47.
- 23 Santow G. Social roles and physical health: the case of female disadvantage in poor countries. *Soc Sci Med* 1995; 40:147-61.
- 24 Haddad S, Fournier P. Quality, cost and utilisation of health services in developing countries. A longitudinal study in Zaire. *Soc Sci Med* 1995; 40:743-53.
- 25 McPake B. User charges for health services in developing countries: a review of the economic literature. *Soc Sci Med* 1993; 36:1397-1405.



- 26 McPake B, Hanson K, Mills A. Community financing of health care in Africa: an evaluation of the Bamako Initiative. *Soc Sci Med* 1993; 36:1383-95.
- 27 Litvack JI, Bodart C. User fees plus quality equals improved access to health care: results of a field experiment in Cameroon. *Soc Sci Med* 1994; 37:369-83.
- 28 Akin JS, Guilkey DK, Denton EH. Quality of services and demand for health care in Nigeria: a multinomial probit estimation. *Soc Sci Med* 1995; 40:1527-37.
- 29 Lougoussé T. Les prestations curatives dans la zone médicale de Solenzo. Thèse pour le diplôme d'état de docteur en médecine. Université Ouagadougou, Burkina Faso, 1986.
- 30 Bjorck M, Johansson R, Kanji N. Improving the quality of primary care services in Angola. *Health Pol Plan* 1992; 7:290-5.
- 31 Guyon AB, Barman A, Ahmed JU, Ahmed AU, Alam MS. A baseline survey on use of drugs at the primary health care level in Bangladesh. *Bull WHO* 1994; 72:265-71.
- 32 Sauerborn R, Nougata A, Latimer E. The elasticity of demand for health care in Burkina Faso. *Health Pol Plan* 1994; 9:185-92.
- 33 Brudon P. Global action towards rational drug use. In: Arundel A, Schaaber J, Mintzes B, eds. *Primary Health Care and Drugs*. Bielefeld, Germany: Health Action International, 1990; 99-113.
- 34 Fabricant SJ, Hirschhorn N. Deranged distribution, perverse prescription, unprotected use: the irrationality of pharmaceuticals in the developing world. *Health Pol Plan* 1987; 2:204-13.
- 35 Greenberg RN. Overview of patient compliance with medication dosing: a literature review. *Clin Ther* 1984; 6:592-9.
- 36 Kritzinger NA. Adherence to drug therapy. An outpatient survey at the Johannesburg General Hospital. *S Afr Med J* 1980; 58:767-70.
- 37 Rapoff MA, Christophersen ER. Improving compliance in pediatric practice. *Pediatr Clin North Am* 1982; 29:339-52.
- 38 Pagnoni F, Convelbo N, Tiendrebeogo J, Cousens S, Esposito F. A community-based programme to provide prompt and adequate treatment of presumptive malaria in children. *Trans R Soc Trop Med Hyg* 1997; 91:512-17.