

**A CRITERIA-BASED CLINICAL AUDIT ON THE CASE-
MANAGEMENT OF CHILDREN PRESENTING WITH
MALARIA AT THE PAEDIATRIC WARD OF MANGOCHI
DISTRICT HOSPITAL, MALAWI**

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Introduction

Malaria is a major threat to global health and is one of the leading causes of death worldwide. It is estimated that 2.3 billion people live in areas of malaria risk and each year 300-500 million cases of *Plasmodium falciparum* malaria occur worldwide. About two millions of those infected die [1, 2]. This parasitic infection is one of the major causes of morbidity and mortality in Africa and approximately 90 % of all cases of malaria are found here. Furthermore, about 90 % of cases which include life-threatening malaria are in African children, and the highest mortality rate is in children under the age of five, leaving malaria one of the most important causes of infant death [3].

Although childhood mortality in the world as a whole is decreasing, in some countries, especially in sub-Saharan Africa, the numbers of deaths among under-fives still remain unacceptably high. The five major contributors to infant mortality and morbidity in this area are acute respiratory infections (mainly pneumonia), diarrhoea, measles, malaria, malnutrition or a combination of these. These conditions will continue to maintain the high mortality rate in children under five years of age unless more efforts are made to prevent them or improve the treatment [4]. Improvement in case-management of malaria in children is one of the strategies in the prevention of infant mortality. In particular, the health system needs to concentrate on good quality care at the first referral level of the district hospital, as health care provided at this level is crucial for reducing child mortality and for a credible and effective support for the primary health care system [5]. Peripheral hospitals often face problems like shortage of staff, poor equipment, lack of technology and little or no ongoing staff

education. However, major financial or technological investments are not necessarily the solution to these problems. There is now some evidence for improvement in outcomes for hospitalised children through support for health workers, structured clinical care, and better use of existing resources [5].

It is therefore important to conduct systematic assessments of clinical care of malaria including the diagnostic process, medical treatment and nursing care in order to reveal shortcomings in case-management and make improvements where needed. The strengths and good qualities of the health care system also need to be identified and emphasised in order to be maintained.

Clinical audit is now routinely used and accepted as part of quality assurance in the health care services of many developed countries, but it has yet to be widely applied to the developing world [6].

Aim of the study:

The principal objective of this study was to assess the clinical care of children presenting with malaria at district hospital level in a low-income African country to highlight potential areas of improvement in the quality of care of malaria.

Specific objectives:

- Assess diagnostic process, medical treatment and nursing care
- Identify strengths and deficiencies in current practice

- Identify factors contributing to poor quality of care
- Find strategies to improve current practice

Materials and methods

Place of study and study period:

We conducted a one month-assessment of the current practice at the paediatric ward at Mangochi District Hospital from 1st to 31st of October 2004.

Mangochi district has a population of almost 650 000 and is located in the southern region of the Republic of Malawi at the southern end of Lake Malawi. Health services in the district are offered through a three level health care system consisting of community, health centre and district hospital level. The district hospital provides primary health care to the surrounding community and secondary health care to the population of the entire district. Patients from all health facilities are referred to the district hospital [7].

Study population:

The audit included every child from the age of two months to five years presenting with symptoms of malaria that were admitted to the paediatric ward of Mangochi

district hospital during the study period. We included only children under the age of five because morbidity and mortality of malaria are highest in this age group.

The children that are referred to the district hospital are first seen by a medical assistant (MA) at the under-five clinic, which is part of the integrated maternal and child health (MCH) department. The under-five clinic attends to 150 to 300 patients every day. There is usually only one medical assistant attending the clinic assisted by a hospital servant and a health centre assistant (HCA). The MA takes the patient's history, registers important signs and symptoms and decides whether or not the patient should be treated as an outpatient, be sent to a clinical officer for review or be admitted to the paediatric ward for further investigation and treatment. The MA's medical education consists of two years of training after secondary school. Among the several hundred patients that attend the clinic during a day, there are five to ten admissions.

This study included only inpatient cases and all cases treated as outpatients were excluded. The enrolment criteria of the inpatient subjects were based on clinical signs and symptom of malaria. In areas where malaria is endemic, malaria should always be suspected whenever a child presents with fever. The audit therefore included every child presenting with fever during the last 24 hours. Other signs and symptoms that indicate malaria include vomiting, pallor, convulsions, and loss of consciousness. Children that were later diagnosed with other infections, e.g. pneumonia, measles, gastroenteritis and meningitis, or had concurrent infections besides malaria, were also included.

Study design:

This study was a criteria-based clinical audit based on comparison of actual management against standards and evidence based clinical guidelines. According to the guide “Principles for best practice in clinical audit” issued by the National Institute for Clinical Excellence a clinical audit is a quality improvement process that seeks to improve patient care and outcomes through systematic review of care against explicit criteria and the implementation of change. Aspects of structure, processes and outcomes of care are selected and systematically evaluated against explicit criteria. Where indicated, changes are implemented at an individual, team, or service level and further monitoring is used to confirm improvement in health care delivery [8].

A clinical audit cycle consists of the five following steps [6]:

- 1) Establish criteria for good quality care
- 2) Measure current practice
- 3) Feedback findings and set targets
- 4) Take action to change practice
- 5) Re-evaluate practice

In this clinical audit we focused on the assessment of the current practice at Mangochi district hospital as well as giving feedback of the findings to the district health management team (DHMT). The two last steps of the clinical audit cycle, i.e. efforts to change current practice and re-evaluation of practice, were not included in this audit and will be the responsibility of the DHMT.

The standards and guidelines were integrated in a set of audit criteria. The data collection was done retrospectively by reviewing the records of patients that fulfilled the inclusion criteria. In addition to the actual clinical audit, a qualitative analysis based on in depth interviews was conducted. Three health workers at Mangochi district hospital with different educational background and occupation were interviewed. The purpose of the qualitative analysis was to learn more about the health workers experiences, opinions, attitudes and expectations concerning the current practice at the district hospital, the quality of care and the case-management of malaria and to find explanations for the findings of the audit.

Data collection:***Establishing criteria:***

The criteria for this audit were developed based on international clinical practice guidelines for management of severe malaria as issued by the World Health Organisation [9] as well as national guidelines for Malawi from the “Guide for the Management of Malaria” [10].

During two meetings with the head of the paediatric department at the Queen Elisabeth Central Hospital in Blantyre, the criteria were reviewed and a final set of criteria for the optimal management of malaria in African children were selected. The criteria were also reviewed by the Mangochi District Health Officer (DHO) to ensure that the criteria were realistic taking into account the local resources available and familiarity of the hospital staff with the procedures described in the criteria. Twenty audit criteria were selected, which are presented in the appendix (see table 1).

Data sampling:***Assessment of patient records:***

The ward clerk at the paediatric ward who is responsible for record-keeping, filing of documents and summary reports in the ward, selected the relevant patient case-notes that were to be included in the audit. The selection was based on records of complaints and symptoms of malaria in the case-notes. Since every child with fever is suspected of malaria, the selection included every case with fever.

The selected records were thoroughly reviewed by the researcher and relevant data were extracted on standard data collection forms. The form specified precisely the information to be extracted from the record based on the audit criteria. Each patient's record was compared to the 20 final audit criteria and the objectives were marked as "yes", "no" or "not recorded" based on the findings.

In depth-interviews:

A qualitative analysis was done as a supplement to the quantitative data from the audit. Separate interviews were conducted with three health workers of different educational and clinical background, a clinical officer, a nurse and a medical assistant. With this qualitative research method we were able to gain more knowledge on the health workers' experiences, attitudes, opinions and values concerning the observed hospital practice and their working conditions. We wished to identify strengths and shortcomings in the current practice based on the health worker's knowledge and feelings. Areas for improvement, different reasons for the current problems and a

variety of solutions were suggested. We were particularly interested in the health workers' own reflections on the findings of the audit and their explanations for the findings.

Other areas for discussion included interaction and communication between health workers and patients, the meaning of good quality of care, the organisation of the health system, the current provision of health care services, financial issues and attitudes towards supervision of practice, introduction of new routines and the implementation of change. Discussions also focused on opinions about own performance and qualifications, the need for training and updating and morale and demoralisation among hospital staff. The relationship between health workers, in particular between different categories of health workers, and between health workers and the hospital administration was also a topic that was discussed.

The interviews were semi-structured with open-ended questions, and the duration of each interview was set to one hour. With the permission of the interviewee the interview was tape-recorded and short-notes were taken. Additional comments were written immediately after the interview.

Data analysis

Entry and analysis of the quantitative data from the patient records were performed using SPSS for Windows version 13.0 in order to produce frequencies and proportions of cases which did, or did not, meet the criteria of the optimal management of malaria. Results were presented in simple and clear tables and charts which were easy for the hospital personnel to interpret and understand.

Ethical considerations:

The clinical audit was approved by the DHO at Mangochi district hospital. The DHO is the overall in charge of the district health sector and reports to the Secretary for Health and Population [7].

The following issues were considered when conducting the audit:

1. Data protection and anonymity were ensured and access to personal data was restricted to qualified personnel only.
2. Written informed consent was obtained before admittance into the qualitative study. Participants had the right to withdraw from the interview at any time.
3. The aims of the study were explained to the interviewees in order for them to understand the purpose of their participation.

Results

A total of 132 case-notes were reviewed. Of the 162 case-notes that the ward clerk selected, we chose to exclude 30 cases. In 23 of these cases the patient was discharged on request and in seven cases the patient absconded before completing treatment. Of the patients that were investigated, 28 children (21 %) were admitted with severe malaria, 40 children with anaemia (30 %), of which eight cases (6 %) were classified as severe, 20 cases with gastro-enteritis (15 %), 20 cases with pneumonia (15 %) and 17 cases with sepsis (13 %). Other less frequent diagnoses (< 10%) were meningitis,

dehydration, febrile convulsions and malnutrition. Of the 132 cases in the study, 16 (12 %) had a fatale outcome.

Problems during the assessment of the records included illegible handwriting and missing files and laboratory results.

Diagnostic process:

With regard to history taking, the most poorly recorded symptoms (recorded in less than 50% of cases) were cough, which was recorded in 59 cases (45 %), convulsions in 19 cases (14 %) and drinking/feeding in 37 cases (28 %) (see table 2). In recording the general clinical state on admission, the level of consciousness was documented in 53 cases (40 %), with the use of the Blantyre Coma Scale in four cases. The most important signs that the health workers failed to document were recording of occurrence of seizures (recorded in eight cases, 6 %) and neck stiffness (25 cases, 19 %). The malaria blood slide was only checked in 41 (32 %) of the 129 patients admitted with the impression of malaria. Among the 28 patients with severe malaria a thick blood smear was checked in 46 %, in six cases the test was ordered or planned but not performed. In one of the only two cases where malaria was not the admission diagnosis, the malaria blood slide was actually checked. In 61 cases (46 %) the investigation of blood slide for malaria was not recorded, and in 21 cases (16 %) the test was either ordered or planned, but for some reason not performed. This pattern of missing laboratory results due to failing communication between health workers and lab technicians or poor hospital routines was also found for other laboratory tests.

The recording of other considered causes of fever was present in 68 cases (52 %) with the before mentioned differential diagnoses. However, assessment of respiratory rate

and chest auscultation to exclude other possible causes, were only performed in 27 (21 %) and 40 cases (30 %) respectively.

Medical treatment:

Antimalarial treatment was given in 131 cases. All the patients in the study received the recommended antimalarial drugs which corresponded with both WHO and national guidelines. The different regimes chosen were oral sulphadoxine pyrimethamine (SP) or oral, intramuscular or intravenous quinine. Furthermore, 104 patients received correct treatment, while 27 patients were prescribed inappropriate doses or regimes. Five patients were given more than the recommended dosage and 22 patients received less than recommended (too low dosage or too short regime). Since a parasitological confirmation of malaria was not performed in the majority of cases, antimalarial treatment was initiated on the basis of clinical presentation in a high proportion of children. While 120 patients were reported with a high body temperature, the health workers recorded the temperature on admission in 111 (84 %) of cases. The measuring was either done using a thermometer in the axilla or by touch. Paracetamol was given to all the patients. One or several concurrent infections were suspected and recorded in 46 % of the cases. Treatment of concurrent infections was actually started in 51 % of the cases, with chloramphenicol, metronidazole and x-penicillin as the most commonly used antibiotics. This means that in 6 % of cases antibiotic treatment was started without recording presence of other infections. The drugs were mostly dispensed within the facility, but at some occasions the drugs, most frequently antibiotics, were out of stock.

The presence or absence of convulsions, the pulse rate and state of hydration were not recorded in over 78 % of the cases. Additionally, of the 52 cases where anaemia was

present on clinical examination (assessed by palmar pallor or pale conjunctiva), the haemoglobin concentration was not checked in three cases, and in four cases it was ordered or planned but not done. We also found that the investigation of blood group and cross-matching was not performed in 18 of the cases with anaemia. 27 of the patients with anaemia received blood transfusion while 25 did not. In three of the cases blood transfusion was planned but never carried out.

Seven patients were admitted with suspected meningitis but six of these patients were not examined by lumbar puncture. However, six of the seven patients with suspected meningitis were treated as such.

One patient was diagnosed with hypoglycaemia and received glucose intravenously but the patient's blood glucose was never checked.

Nursing care:

We found that regular recording of vital signs (minimum four times a day) including pulse rate and respiration, was not done in any of the cases, nor did the nurses assess the level of consciousness regularly. In the majority of cases this responsibility was left to the family members who stayed at the hospital with the child. Instruction on tepid sponging or fanning was given to the guardians in only 15 cases (11 %) with fever.

Health workers' perceptions on quality of care and case-management of malaria at MDH

Clinical officers (CO) have three years of tertiary level clinical training at the College of Health Science in addition to one year of internship. The CO who was interviewed

reported that the main weaknesses in the current hospital practice are shortage of staff, lack of expertise, overcrowded wards, and lack of equipment, especially operating, dressing and resuscitation equipment. Moreover, he narrated absence of appropriate examination rooms, availability of drugs and lack of time. One clinical officer see on average 50-60 patients at ward rounds and attends to another 60-70 patients at the outpatient clinic during a day shift. These factors may result in misdiagnosis and mistreatment, inadequate history taking and clinical examination, and inability to perform necessary investigations. Shortcomings in the health system will also affect patient information and communication with patients leaving the patients unsatisfied and in distrust. He also emphasised the need for specialization amongst clinicians and enable the district hospital to perform more procedures without needing to refer the patients to a larger hospital. Suggested solutions to improve quality of care were employing more health workers to reduce the work load, setting up separate examination rooms or using screens to ensure privacy. Other suggestions were to improve hospital routines like transportation of laboratory specimens and results between wards and laboratories to avoid unnecessary delay in investigations or loss of test results. In-service training and organisation of regular meetings and seminars where progress of health programs, projects and clinical cases could be discussed, were also thought to be potential means to improve and optimise health services.

The nurse in charge of the paediatric ward placed great emphasis on low morale among nurses, especially frustration and demoralisation due to overcrowded wards and shortage of staff. There were nurses who tried to provide optimal treatment and care despite scarce resources, but bad attitudes towards patients and unsatisfactory fulfilment of the nurses duties were pointed out as a general problem in the district hospital. The most important consequences are inadequate nursing care, poor record-

keeping (e.g. records of vital signs, fluid balance, level of consciousness) and use of incorrect dosages. Suggested interventions to improve quality of nursing care were supervision and feedback on the nurses' personal performance, use of standardized protocols to ease the recording of nursing care, and in-service training.

The medical assistant at the MCH expressed the need for more MAs at the clinic. At present there is only one MA who is responsible for history taking and clinical examination of all the patients. Lack of equipment also reduced the possibility for an adequate examination. Simple means like a bed to perform examinations and sphygmomanometers to measure blood pressure could improve the quality of care significantly. Because of lack of resources and lab technicians, laboratory tests such as haemoglobin concentration and malarial blood smear could not be performed on every patient presenting with fever. The MA suggested that the clinic could have one lab technician whose only responsibility was to screen every paediatric patient for malaria.

Important strengths that were identified were the general agreement on the good relationship and co-operation between health workers and between health workers and the hospital administration. The interviewees also expressed positive attitudes towards interventions to measure current practice and changes to improve quality of care.

Discussion

Our study focused on identifying resources and deficiencies in the current management of malaria at the paediatric ward of a district hospital in an African developing country. It also describes the health providers' perspectives on the hospital practice and quality of care. Several crucial components that characterize good quality of care were found to be inadequate. This applied particularly to patient's records where recordings of patient's history and nursing care were inaccurate and insufficient. The clinical examination was in several cases found to be incomplete with no records of chest auscultation, inspection of ears, pulse and respiratory rate, state of hydration and level of consciousness. Another important aspect concerning nursing care was the omission of regular checking of vital signs. The laboratory results were missing in a great number of case-files and in some cases the laboratory results were planned, but for some unknown reason never carried out. Other clinical audits, like the one conducted on obstetric practice by Wagaraachchi et al, have also shown sub-standard performances in record keeping and clinical monitoring [11]. A study by Boonstra et al. in Botswana on adherence to management guidelines in infectious diseases in children under five years concluded that that health care provider's adherence to guidelines on history taking and examination was sub-optimal or poor and that there was a high level of inappropriate prescription of unnecessary drugs [12].

An important strength was the use of recommended antimalarial medication in all cases where antimalarial treatments were initiated. However, in some cases the dosages and regimes were incorrect with too short regimes or dosages which were too high or too low according to the child's age. Malaria blood slides were only checked in less than one third of the cases admitted with suspected malaria. Antimalarial treatment was, however, given to 131 of the 132 patients in the study, indicating that

antimalarial medication in most cases is initiated on the basis of clinical findings rather than laboratory results. Antimalarials were also given despite of a negative thick blood smear. The possible overuse of antimalarial medication in treatment of fever is an area of concern. Affordable rapid diagnostic tests for malaria may solve this problem. Another strength in the current practice was the reported good communication and co-operation between health workers, as well as between health workers and the administration, although the laboratory tests which were not carried out indicate a problem. Communication with patients was by the health workers pointed out as one of the weaknesses of today's practice.

The problems that were identified in the in-depth interviews were in accordance with the quantitative results from the clinical audit. These included inadequate history-taking, clinical examination and insufficiency in laboratory testing. In addition, shortage of staff was expressed in the interviews as a contributing factor to shortcomings in care. Future challenges will be to stimulate the health workers to analyze their own situation, find local appropriate solutions and produce cost-effective and sustainable changes in the standard of health care. A study performed in Uganda indicated that clinical audit was highly effective in stimulating health workers to provide creative solutions to problems and to tackle the problems from below [13].

There is currently no universally accepted method for measuring quality of care [14]. The Cochrane systematic review "Audit and feedback: effects on professional practice and health care outcomes" suggests that audit and feedback can be effective in improving professional practice, but that the effects are generally small to moderate and that they are more likely to be larger when baseline adherence to recommended practice is low [15]. Abuya et al described the quality of care provided to febrile

children presenting in a rural private clinic in Kenya, using structured observations of consultations, interviews with users and in depth interviews with health workers as assessment methods [14]. They state that these methodologies were shown to be more accurate than record reviewing. However, another study conducted by Wagaarachchi et al. [11] concluded that clinical audit had a significant impact in developing country settings where its dual function as a means for monitoring practice and as a non-punitive, educational tool had particular value given the pressures on staff and resources. They used multiple approaches, such as hospital dissemination meetings, workshops to reinforce best practice and feedback meetings, to implement change.

Limitations of our study include the fact that we did not perform an independent re-assessment of the clerk's selection of cases. Consequently, the ward clerk may have excluded relevant case-notes from the clinical audit that should have been included. However, we considered this to be a minor bias as the number of case-notes that were finally selected still represented enough material to make a satisfactory assessment of the current practice.

Instead of having local health workers to assess the case-notes, the principal researcher conducted the assessments herself, ensuring that only practices documented in the patient's notes were recorded. In this way we could reduce the potential bias due to clinical interpretation that may occur when using different local health workers.

Other limiting factors included illegible handwriting and unstructured case-notes which prevented us from extracting all the relevant data from some case-files. We used the principle of "not recorded means not done". We found that local health

workers also had problems with understanding some of the handwriting, which means that written messages may be misinterpreted. To have a health worker from a western country to perform the in-depth interviews may have influenced the interviewees' responses and perhaps caused them to give the answers they thought were expected of them rather than their own truthful opinions.

Criteria-based clinical audits have yet to be incorporated as a routine in hospital practice in developing countries. Few studies have explored whether or not the hospitals follow the new guidelines or the antimalarial treatment that are being introduced. Audits like the one conducted here are important to highlight the need for improvements in hospital practice to make better use of knowledge obtained from research. It will be difficult to attain a reduction in childhood mortality or morbidity unless an improvement in the case-management of diseases like malaria is made. This can be monitored through clinical audits which can easily be conducted by local hospital administrations and may be used in a dual role: to assess the effectiveness of the current practice and to make improvements of the health care.

Conclusion

We found that the quality of care of children with malaria was sub-optimal compared to national standards and the WHO's guidelines. This applied particularly to inaccurate recordings of patient's history and nursing care, as well as inadequate clinical examination and insufficiency in laboratory testing.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

PP Diep conducted the data collection and analysis and wrote the paper, J Hofman participated in the study design and supervised the data collection and L Lien supervised the data analysis. Both L Lien and J Hofman commented on the draft. All authors read and approved the final manuscript.

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Table 1. Final set of audit criteria

<i>Condition</i>	<i>Criteria</i>								
Fever	<p>Diagnostic process:</p> <ol style="list-style-type: none"> 1. Patient's history should be documented in case notes on admission (including age, weight, vomiting/diarrhoea, cough, convulsions and drinking/ feeding). 2. General clinical state on admission should be recorded (with special attention to level of consciousness using the Blantyre Coma Scale, seizures, neck stiffness, dehydration, respiratory distress and pallor). 3. Check malaria blood slide. 4. Consider other causes of fever: <ol style="list-style-type: none"> a. Assess respiratory rate and do chest auscultation for pneumonia b. Inspect ears for discharge <p>Medical treatment:</p> <ol style="list-style-type: none"> 5. Start treatment on the basis of clinical presentation if parasitological confirmation of malaria is not readily available (within 1 hour). Give antimalarial treatment. For uncomplicated malaria, give sulphadoxine pyrimethamine (SP) orally (providing that the patient is not vomiting): <table data-bbox="893 1153 1252 1276" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;"><u>Age group</u></th> <th style="text-align: left;"><u>Tablets of SP</u></th> </tr> </thead> <tbody> <tr> <td>< 6 months</td> <td>¼</td> </tr> <tr> <td>6 months-3 yrs</td> <td>½</td> </tr> <tr> <td>4-8 yrs</td> <td>1</td> </tr> </tbody> </table> <p>For complicated malaria, start treatment with quinine:</p> <p><i>IV quinine:</i> Give a loading dose of quinine (20 mg/kg of quinine dihydrochloride salt) in 10 ml/kg of IV fluid (5 % dextrose) over a period of 4 hours. 12 hours after the start of the loading dose, give 10 mg/kg quinine salt in IV fluid over 2 hours and repeat every 12 hours until the child is able to take oral treatment. Then, give oral quinine doses to complete 7 days of treatment or give one dose of SP.</p> <p><i>IM quinine:</i> If IV infusion is not possible, quinine dihydrochloride can be given in the same dosages by IM injection. Give 10 mg of quinine salt per kg IM and repeat after 4 hours. Then, give every 12 hours in similar manner until the malaria is no longer severe and the child can take oral treatment.</p> <p>(Dosages are calculated as mg/kg. Therefore</p>	<u>Age group</u>	<u>Tablets of SP</u>	< 6 months	¼	6 months-3 yrs	½	4-8 yrs	1
<u>Age group</u>	<u>Tablets of SP</u>								
< 6 months	¼								
6 months-3 yrs	½								
4-8 yrs	1								

	<p>the patient must be weighed.)</p> <p>6. Treat concurrent infections with appropriate antibiotics.</p> <p>Nursing care:</p> <p>7. Reduce high body temperature (>39 C) by tepid sponging or fanning. Give an antipyretic (paracetamol) if necessary.</p> <p>8. Carry out regular checks (4 times a day) on Hct or Hb and blood glucose concentration if clinical signs of anaemia, convulsions or coma are present.</p>
Complicated malaria	<p>Diagnostic process:</p> <p>9. Initial assessment should involve level of consciousness (using BCS), presence of respiratory distress, pulse rate, presence of anaemia, state of hydration and temperature.</p> <p>10. Immediate tests must include:</p> <ol style="list-style-type: none"> i. thick blood smear ii. Hct or Hb iii. finger-prick blood glucose iv. lumbar puncture <p>11. If Hb < 4 g/dl, do blood group and cross-match for transfusion.</p>
Cerebral malaria	<p>Medical treatment:</p> <p>12. Exclude other treatable causes of coma. If you cannot do a lumbar puncture and cannot exclude meningitis, give antibiotics as for bacterial meningitis.</p> <p>13. When convulsions are present, give anticonvulsant treatment with rectal diazepam or paraldehyde or IM paraldehyde, and check blood glucose.</p> <p>Nursing care:</p> <p>14. Assess the level of consciousness using the Blantyre Coma Scale.</p> <p>15. Regular recordings of vital signs (minimum four times a day)</p> <p>16. Give meticulous nursing of unconscious children including frequent turning (every 2 hours) and careful attention to airways, eyes, mucosae, skin and fluid requirements. The child should be nursed in the lateral or semi-prone position.</p>
Severe anaemia	<p>Medical treatment:</p> <p>17. Give a blood transfusion as soon as possible to:</p> <ol style="list-style-type: none"> a. all children with Hct < 12 % or Hb < 4 g/dl b. less anaemic children (Hct 13-18 % or Hb 4-6 g/dl) with any of the following: shock, impaired consciousness, deep and laboured breathing, heart failure, very high parasitemia (>

	10 % of RBC parasitized) or children with borderline Hct. (Give packed blood cells, if available, in preference to whole blood.)
Hypoglycemia (blood glucose < 2.5 mmol/L or < 45 mg/dl)	Medical treatment: 18. Give 5 ml/kg of 10 % glucose (dextrose) solution IV rapidly. 19. Recheck the blood glucose and repeat the glucose (5 ml/kg) if the level is still low (<2.5 mmol/L or < 45 mg/dl).
Acidosis	Medical treatment: 20. Correct reversible causes of acidosis, especially severe anaemia and dehydration (the latter by IV fluid infusion or, if possible, an oral rehydration solution).

Table 2

Assessment of case-management of malaria
 Percentages and numbers of cases which fulfilled the criteria

Criteria	Percentage	Number
Diagnosis		
1 Patient's history		
Record of age	100	132
Record of weight	83	109
Record of vomiting/diarrhoea	65	86
Record of cough	45	59
Record of convulsions	14	19
Record of drinking/feeding	28	37
2 General clinical state		
Record of consciousness	40	53
BCS used	3	4
Record of seizures	6	8
Record of neck stiffness	19	25
Record of dehydration	27	35
Record of respiratory distress	27	36
Record of pallor	80	105
3 Investigation		
Malaria blood smear checked	32	42
Result recorded	28	37
Positive blood smear	5	7
Negative blood smear	23	30
4 Differential diagnoses		
Other causes considered	52	68
Assessment of respiratory rate	21	27
Chest auscultation	30	40
Inspection of ears	2	3

Criteria	Percentage	Number
<i>Treatment</i>		
5 Medical treatment		
Antimalarial treatment started	99	131
Sulphadoxine pyrimethamine	53	70
Quinine orally	6	8
Quinine i.m.	64	84
Quinine i.v.	5	6
Both SP and quinine	30	39
According to standards	79	104
Too large dosage	4	5
Too small dosage	17	22
6 Presence of concurrent infection (recorded)	46	61
Treatment of concurrent infection	51	67
7 Reduction of high body temperature		
High body temperature	91	120
Instruction on tepid sponging/fanning	11	15
Paratamol given	100	132
8 If anaemia present, Hb checked regularly?	0	0

Criteria	Percentage	Number
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Complicated malaria

9 Initial assessment

Record of consciousness	50	14
Coma score used	7	2
Record of respiratory distress	14	4
Record of pulse rate	4	1
Record of anaemia	25	7
State of hydration	4	1
Record of temperature	93	26

10 Immediate tests

Thick blood smear	46	10
Hct or Hb	32	9
Blood glucose	0	0
Lumbar puncture	7	2

11 Hb < 4 g/dl

Blood group and cross-matching	67	8
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Cerebral malaria

12 Treatment of meningitis (when meningitis cannot be excluded)

	6	8
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Convulsions

13 Treatment of convulsions (when convulsions are present)

Diazepam rectally	5	6
Paraldehyde rectally	1	1
Paraldehyde i.m.	0	0
Paraldehyde i.m.	3	4
Blood glucose checked	0	0

Nursing care

14 Level of consciousness assessed using the BCS (registered regularly)

	0	0
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15 Regular recordings of vital signs (minimum 4 times a day)

	0	0
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16 Meticulous nursing of unconscious children

	0	0
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17 Anaemic children (Hb < 4) or less anaemic children with shock, impaired consciousness, deep and laboured breathing, heart failure, hyperparasitemia or borderline Hct: Blood transfusion given

	92	11
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Hypoglycemia

(Blood glucose < 2.5 mmol/L or < 45 mg/dl)

18 I.v. glucose given

	1	1
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19 Blood glucose rechecked

	0	0
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Acidosis

	0	0
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