


BMJ Open Quality Nutritional services for children in Beira, Mozambique: a study reporting on participatory use of data to generate quality improvement recommendations

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ABSTRACT

Background Existing literature suggest frequent gaps in the quality of care (QoC) provided to children with malnutrition in low-income and middle-income countries. Beira is the second largest city in Mozambique. This study included two phases: phase 1 was a systematic assessment of the QoC provided to malnourished children in Beira; phase 2 aimed at using findings of the assessment to develop recommendations, with a participatory approach, to improve QoC.

Methods In phase 1, all facilities offering nutritional care to children in Beira were included, and exit health outcomes were reviewed against international SPHERE standards. A sample of four (66%) facilities was randomly selected for a comprehensive assessment of all areas contributing to QoC using an adapted WHO tool. In phase 2, key stakeholders were identified, and using a participatory approach, a list of actions for improving the QoC for malnourished children was agreed.

Results In phase 1, outcomes of 1428 children with either severe acute malnutrition or moderate acute malnutrition (MAM) were reviewed. In-hospital recovery rate (70.1%) was almost in line with the SPHERE standard (75%), while at outpatient level, it was significantly lower (48.2%, risk ratio (RR) 0.68, $p < 0.0001$). Recovery rate was significantly lower in HIV seropositive compared with seronegative (39.2% vs 52.8%, RR 1.34, $p = 0.005$). High heterogeneity in MAM recovery rate was detected among facilities (range 32.5%–61.0%). Overall, out of all domains contributing to QoC in the sample, 28/46 (60.8%) indicated suboptimal care with significant health hazards and 13/46 (28.2%) indicated totally inadequate care with severe health hazards. In phase 2, a list of 38 actions to improve QoC for malnourished children was agreed among 33 local and national stakeholders.

Conclusions Large heterogeneity in QoC for malnourished children in Beira was detected. The study documents a concrete example of using data proactively, for agreeing actions to improve QoC.

BACKGROUND

Undernutrition is the main underlying cause of child mortality and morbidity in low-income countries, especially in sub-Saharan Africa.^{1 2} According to most recent global estimates, in 2017, globally 151 million children

under 5 years of age were stunted, and 51 million were wasted.^{1 2}

In Mozambique, malnutrition is a serious concern: 16.9% of babies are born with low birth weight; 5.9% children under 5 years suffer from acute malnutrition (moderate or severe) and 42.6% are chronically malnourished.³ Mozambique also ranks in the eighth position among the top 10 countries with the highest population prevalence of HIV with 12.3% of adults infected. Nearly 1 million women and about 200 000 children are living with HIV, with only 39% of HIV-positive children having access to life-saving antiretroviral treatment,⁴ a coverage sensibly lower than the regional estimate for East and Southern Africa (67%).⁵ The two conditions are closely connected: children affected by HIV compared with HIV negative have a higher risk of undernutrition and, if malnourished, they have a higher risk of not recovering and die despite treatment; malnutrition also affects the HIV status by increasing the risk of disease progression.^{6–8}

National guidelines on the management of malnutrition in children were developed by the Ministry of Health in 2011.⁹ According to the national guidelines, children with severe acute malnutrition (SAM) and complications are treated at hospital level, while the treatment of children with SAM and no complication or moderate acute malnutrition (MAM) is performed at outpatient level, in the health centres (HCs), integrated with the treatment of children with HIV, in the so-called consultation for children at risk.⁹

Beira is the second largest city in Mozambique, with a population of about 530 700, accounting for about one-third of the total population in the Sofala province.^{10 11} In this province, the prevalence of MAM and SAM in children is estimated to be significantly higher compared with the national

average (7.4% and 1.6%, respectively).¹² Child mortality in Sofala is also above the national average (105 vs 90 per thousand),¹² despite a rate of children accessing health services also higher than the average (69.7% vs 56.5% of children with fever and 69.2% vs 55.5% of children with diarrhoea access care),¹³ thus suggesting possible deficiencies in the quality of care (QoC) provided to children at facility level.

Previous studies highlighted major gaps in the QoC provided to children with malnutrition in low-income and middle-income countries (LMIC), although so far only few assessments were published.^{14–18} A participatory use of data to generate recommendations to improve the QoC for mother and children has been widely promoted by the WHO.¹⁹ This approach creates awareness, stimulates dialogue, supports ownership and fosters local commitment in improving quality of the health services.¹⁹ However, it has been relatively poorly documented in literature.²⁰ We could not retrieve any study reporting on the use of quality assessments to develop recommendations, with a participatory approach, to improve QoC for malnourished children. Generating data on the quality of the nutritional services in LMIC, as well as on participatory approaches to improve QoC, is important for researchers and for policy makers. This paper aims at documenting the findings of an assessment of the QoC for malnourished children in the city of Beira, Mozambique, and how these data were used for generating, with a participatory approach, recommendations to improve the QoC.

METHODS

Study design

The study was designed as a quality improvement study and is reported according to the Standards for Quality Improvement Reporting Excellence Guideline V.2.0²¹ (online supplementary table 1).

The study included two phases: phase 1 was a systematic assessment of the QoC provided to malnourished children in Beira; phase 2 aimed at using findings of the assessment to develop, with a participatory approach, quality improvement recommendations.

Study setting

The study was conducted in the city of Beira. At the time of the assessment, only 5 out of the 10 existing HCs in Beira were offering nutritional services to children, while inpatient treatment was provided only by the Beira Central Hospital. Overall the activities were conducted from July 2015 to 2016.

Phase 1: assessment of the QoC

Health outcomes review

All facilities offering nutritional care to children at the time of the study were included. All children with SAM or MAM enrolled in the nutritional services in the 18 months before the study start, with no exclusion, were included in the health outcomes review. In line with the

national guidelines,⁹ children with a weight for height below $<-3SD$ from the mean according to WHO growth reference standards WHO 2006²² and/or bilateral pitting oedema were identified as cases of SAM, while children with a weight for height between $-3SD$ and $-2SD$, respectively, and no oedemas were identified as cases of SAM. An exit health outcome was assigned to each child, according to the five predefined categories: recovered, not-recovered, transferred, died and defaulted (for case definitions, see online supplementary table 2).

Characteristics and health outcomes of children were extracted at hospital level from the official patient forms and registers and at outpatient level from the official nutritional register of each HC. These are national forms, used for all children at time of hospitalisation/entry in the nutritional programme and during follow-up. The national guideline for treatment of malnourished children⁹ provides clear instructions on how to fill these forms/registers, and staff is trained accordingly.

Data were collected by a team of six data collectors—either nutritionist or doctor or nurses with experience in the management of children with acute malnutrition. They were trained and supervised by three expert paediatricians with long-term experience in the management of malnutrition in children.

Comprehensive assessment of the quality of nutritional services

A sample of four (66%) facilities was randomly selected for the comprehensive assessment of all areas contributing to QoC. The sample included the only hospital in the city providing inpatient care and and three HCs.

Health services were evaluated using an adaptation of the WHO tool for assessing the quality of child health-care¹⁹ and its subsequent versions,²³ which were widely used in different countries.^{24–26} The tool evaluates three domains that contribute to QoC: support services, case management and policies, and organisation of care. These are further divided in 16 subdomains for the evaluation of hospitals and 10 subdomains for the HCs. Using structured checklists, the assessment team attributed a score to each item of the tool, using predefined reference standards as the WHO recommendations.^{27–30} The checklists resulted in a summary score, ranging from 0 (totally inadequate care) to 3 (appropriate care),

The assessment team included: five paediatricians (three locals and two expatriates), three paediatric nurses (local), one nutritionist (local) and two public health experts/programme managers (one local and one expatriate). All the team had previous long-term experience in the management of malnutrition in children.

The assessment focused on the health system rather than on the single individual, in line with WHO methodology.^{19 23} Practical solutions to the problems encountered were discussed at each facility with a participatory approach (peer-to-peer review model) for facilitating a better understanding of the underlying causes of the observed problems and in preparation for the workshop where findings from all facilities were discussed.

Data quality assurance procedures

A list of data quality assurance procedures was adopted to ensure accurate data collection. These included, for the health outcome review: categories of exit were predefined; detailed case definitions were provided; simple data extraction tools were developed and tested; data collectors with previous experience were selected; standard operating procedures were developed and staff was trained accordingly; data were reported in real time in a predefined excel spreadsheet database; and data completeness and consistency was monitored in real time by the expert supervisors.

Data quality assurance procedures adopted for the comprehensive assessment of the nutritional services included: the WHO suggested methodology was strictly followed,^{19 23} the assessment tool was translated into the local language (Portuguese) and quality of the translation was double-checked by a bilingual native speaker prior to the assessment; the tool was circulated within the team 1 month before the visit to ensure adequate knowledge by all team members; results of the evaluation were recorded point by point in predefined checklists, and scores were calculated and agreed in the same day of the evaluation.

Data analysis

Data were entered in an electronic database and analysed using Open Epi. Health outcomes were assessed against the international SPHERE standards, which define performance indicators for the management of acute malnutrition.^{31 32} We explored with subgroups analyses how health outcomes changed by HIV status (HIV positive vs HIV negative), by severity of malnutrition (SAM vs MAM), by type of malnutrition (marasmus vs kwashiorkor vs marasmic-kwashiorkor) and by facility. We assessed whether there was an association between the rate of recovery and abandons and the total number of children treated in the facility, or the coverage population, by univariable logistic regression. Categorical variables were presented as absolute numbers, percentages and risk ratios with 95% CIs and compared using the Fisher's exact test or Yates corrected χ^2 , as appropriate. Quantitative variables were expressed as means and SD and compared using the t-test for unpaired data. All statistical tests were two sided. A p value of less than 0.5 was considered statistically significant.

Phase 2: participatory development of quality improvement recommendations

Identification of key stakeholders

Key stakeholders were preidentified and actively sensitised to participate to a 1-day workshop for its full duration. Participants to this meeting included clinical and managerial staff, both those in the position to be decision makers (eg, representative of Ministry of Health, regional and local health authorities, chiefs of units), development partners (UNICEF and other NGOs), academia and staff working in the facilities assessed (both clinical work and

responsible for data collection). Overall, 33 participants attended the workshop.

Workshop preparation and conduction

The agenda and the objectives of the workshop were clarified to participants in the days before the meeting. It was made clear that during the workshop, results of the quality assessment were going to be presented, main gaps in the QoC were going to be collectively identified and actions for improvement were going to be proposed by participants and agreed in plenary.

The expected outputs of the workshop were summarised again at its start. During the workshop, a non-blaming, supportive, action oriented and participatory approach was facilitated by the coordinators. Results of assessment were presented, and time was allowed for plenary discussion. Key information from similar studies in other low-income settings¹⁴⁻¹⁷ were also reported to increase commitment through comparison with other experiences. After the plenary discussion, participants were divided into three working groups (actions at hospital level, HC level and at community level). Each group was supported by a moderator who facilitated team dynamics. Groups were allowed time for agreeing a list of recommendations for improving the quality of nutritional services in Beira. The summary of each group discussion was presented, synthesised in posters, discussed and further agreed in plenary.

Ethical considerations

This study did not imply any experiment in human subjects. This assessment was planned together with local health authorities, which were informed in detail about the methods of the evaluation, including all sources of data, tools for data collection and types of data collected. The assessment did not imply any direct intervention. Individuals (health staff and children care taker) were involved in the evaluation only as source of data related to the health system and not related to their individual health. All individuals involved in the assessment were duly informed and gave their verbal consent to participate. The privacy of all individuals involved in the assessment was protected by not recording any single detail related to their personal identity. Given all the above, the need for a formal ethical approval was deemed unnecessary from local health authorities.

Patients and public involvement statement

Patients were involved in phase 1 of the study as source of data for the comprehensive assessment of the quality of nutritional services. Their views were collected and considered.

RESULTS

Phase 1: assessment of the QoC

Six facilities (one hospital and five HCs), accounting for 100% of facilities providing nutritional care in Beira, were assessed for the exit health outcomes (figure 1). Records

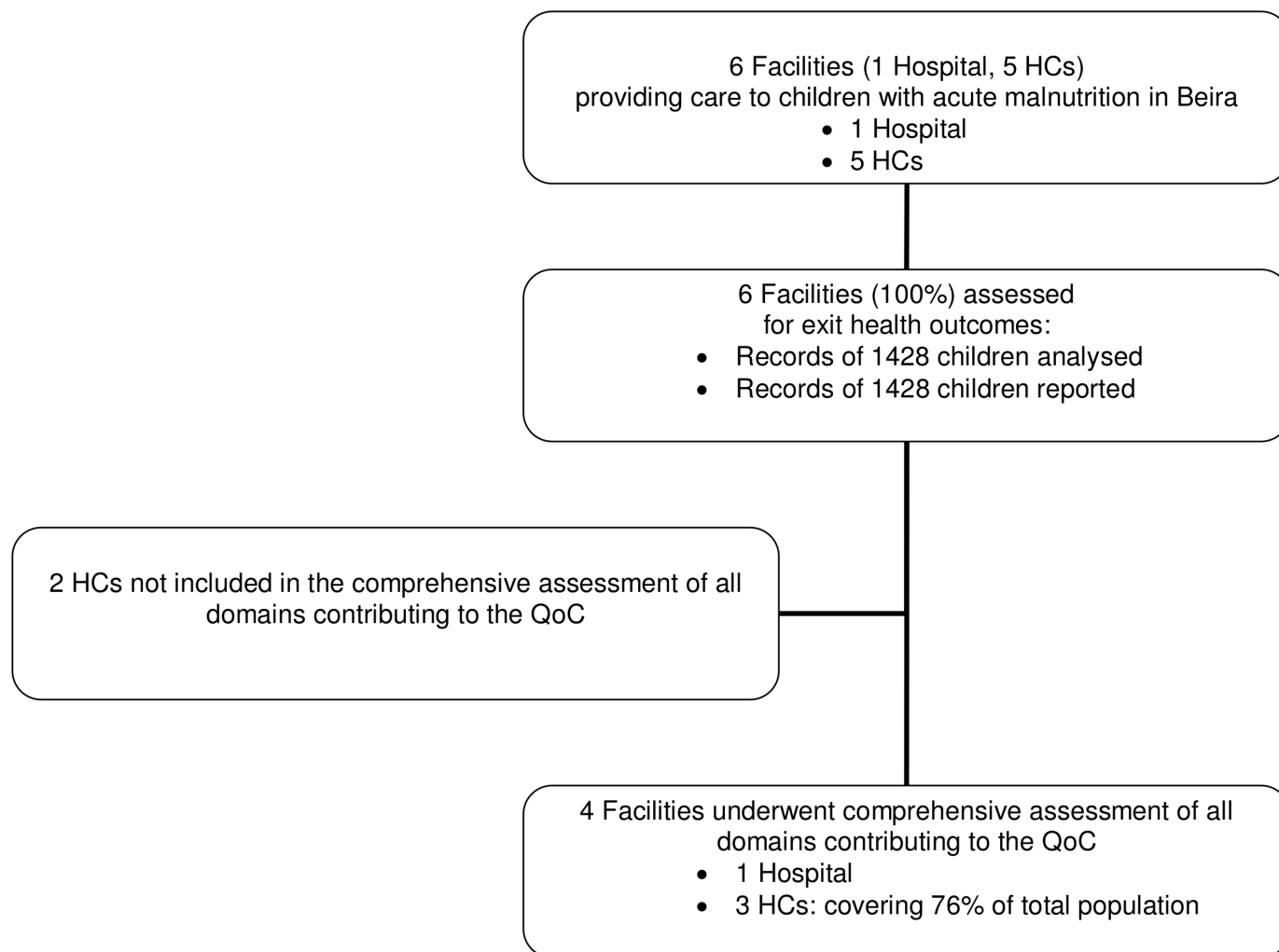


Figure 1 Study flow diagram. HCs, health centres; QoC, quality of care.

of 1428 children (492 outpatients; 936 inpatients) were analysed ([figure 1](#)) for the health outcomes. Four facilities (one hospital and three HCs) were assessed for all components relevant to quality of nutritional services. The three selected HCs covered a population of 190 000 out of 249 000 (76%) total population covered by outpatient nutritional services in Beira. Additional characteristics of the facilities are reported in the online supplementary table 3.

Health outcomes review

Overall, at inpatient level 656 (70.1%) children recovered, 139 (14.9%) died and 110 (11.8%) defaulted. When compared with the SPHERE standards,²³ the recovery rate was significantly below the SPHERE (70.1% vs 75%, $p=0.01$), while the death rate and the abandon rate were both significantly higher (14.9% vs 10% $p=0.001$ and 11.8% vs 15% $p=0.04$, respectively) ([table 1](#)).

At outpatient level, overall, 237 (48.2%) recovered, 210 (42.7%) defaulted and 17 (0.6%) died. When compared with the SPHERE standards^{22 23} the recovery rate was far below the standard (48.2% vs 75%, $p<0.0001$), while the rate of abandons was significantly higher than the standards (42.7% vs 15% $p<0.0001$).

Statistics also revealed that few cases of malnourished children were enrolled in the nutritional programme, when compared with the coverage area and to the estimated local prevalence of malnutrition, thus suggesting possible problems in case detection or into access to care.

Subgroup analyses of children with malnutrition treated at inpatient are reported in online supplementary table 4. When children were stratified by type of malnutrition, about half (52%) of children had marasmus, one-quarter (26%) had kwashiorkor and the remaining (22%) had marasmic-kwashiorkor. The recovery rate did not significantly differ among groups. Children with marasmus and with marasmic-kwashiorkor showed a trend for higher risk of death compared with children with kwashiorkor, although the difference was not statistically significant (16.1%–11.3%, risk ratio (RR) 1.42, 95% CI 0.94 to 2.14, $p=0.08$; 16.1% vs 11.3%, RR 1.43, 95% CI 0.89 to 2.30, $p=0.1$).

Overall 303 (32.4%) children treated at hospital level were HIV seropositive. The rate of HIV infection was significantly higher in children with marasmus (194/492 (39.4%), RR 2.42, 95% CI 1.78 to 3.30, $p<0.0001$) and marasmic-kwashiorkor (70/204 (34.3%), RR 2.11, 95%

Table 1 Health outcomes of malnourished children

	Inpatient			Outpatient		
	N	%	SPHERE standard	N	%	SPHERE standard
Recovered	656	70.1	>75%	237	48.2	>75%
Abandons	110	11.8	<15%	210	42.7	<15%
Died	139	14.9	<10%	3	0.6	<3%
Not recovered	0	0	NA	17	3.5	NA
Transferred	0	0	NA	25	5.1	NA
Unknown*	31	3.3	NA	0	0	NA
TOTAL	936	100		492	100	

*Children for which the outcome was unclear were classified as ‘unknown’.
NA, not applicable (there is not a SHPERE standard for these indicators⁹).

CI 1.49 to 2.97, $p < 0.0001$) compared with those with kwashiorkor (39/240 (16.3%)).

Subgroup analyses of children with malnutrition treated at outpatient level are reported in online supplementary table 5. When stratified by severity of malnutrition, 209 (42.5%) had SAM and 283 (57.5%) had MAM, and outcomes did not significantly differ among groups, except for the rate of children transferred, which was higher in children with MAM compared with SAM (7.4% vs 1.9%, $p = 0.008$). When stratified by HIV status, 166 (33.7%) children were classified as HIV infected, without significant difference in the population of children with SAM or MAM (33.0% vs 34.2% $p > 0.05$). Recovery rate was significantly lower in HIV-positive children compared with HIV negative (39.2% vs 52.8%, $p = 0.004$). Rate of non-recovery in SAM and rate of abandons and deaths in MAM were also significantly worst in HIV-positive children compared with HIV negative.

When health outcomes were stratified by HC (online supplementary figure 1), the total number of children treated in each facility varied among HCs from 187 to 56. Low heterogeneity was detected on the outcomes of children with SAM, while significant heterogeneity was found among different HCs for children MAM, with rates of recovery ranging from 32.5% to 61.0% (RR 1.87, 95% CI 1.16 to 3.03, $p = 0.006$) and rates of abandonment ranging from 27.3% to 65.0% (RR 2.38, 95% CI 1.25 to 4.53, $p = 0.009$). Neither the rate of recovery nor rate of abandons were significantly associated with the total number of children with malnutrition treated in each facility or with the population in the coverage area.

Comprehensive assessment of the quality of nutritional services

Table 2 reports the summary evaluation scores for the four (66%) facilities selected for this direct comprehensive assessment. Overall, among all domains contributing to QoC, 28/46 (60.8%) indicated suboptimal care with significant health hazards, and 13/46 (28.2%) indicated totally inadequate care with severe health hazards.

A full list of priority gaps observed in QoC is reported in table 3, while the key aspects are described below, following the assessment tool structure: (A) support

services; (B) case management; and (C) policies and organisation of care.

Gaps in the support services included the lack of staff (eg, one nurse alone in each HC, one single nurse alone for 28 beds during weekends and night shifts at hospital level) and a high staff turnover especially among nurses. Substandard physical structures were detected especially at hospital level, with one single room for all children with SAM including infectious cases (tuberculosis and salmonellas) and severe problems in water supply (at time of the site visit running water was lacking from most taps at hospital level) and power supplies. Availability of equipment and supplies was on average fair; however, serious failures in the technical maintenance systems often prevented the use of equipment (eg, most power plugs were found out to work, with subsequent difficulty in using electric equipment). Examples of poor maintenance included relatively simple problems that were left without a solution, such as uncalibrated weighting scales and lack of tape on the length measuring board.

With respect to case management, emergency treatment was seriously substandard both at hospital and at HC level. Low adherence to existing national recommendations, despite the existence of a very comprehensive national guideline and despite previous training was common especially at outpatient level. Inappropriate use of relatively simple devices, such as the length measuring board or the mid-upper arm circumference tape, was observed. A serious lack of comprehension and use in practice of the existing systems for statistical reporting was observed.

In regards to support services, serious deficiencies in basic services for personal hygiene (water, soap or hand disinfectant), with risk of transmission of infections both among health staff and patients were detected in some facilities. Lack of maintenance included substandard cleaning of the water reservoirs of the oxygen delivery systems. However, there were also some excellent examples of good hygiene practices, with some staff very attentive to infection prevention. Complete lack of supervision and lack of effective audit systems were identified among

Table 2 Summary evaluation scores

		Hospital	HC1	HC2	HC3	Mean score
Support services	1. Physical structures staff, water and power	1	1	1	2	1.2
	2. Statistics and medical records	1	1	0	0	0.5
	3. Pharmacy and medicine availability	1	1	1	2	1.2
	4. Equipment and supplies	1	1	0	1	0.7
	5. Laboratory support	1	1.5	1.5	2.5	1.5
	6. Layout of the ward	1	NA	NA	NA	NA
	7. Food preparation area	1	NA	NA	NA	NA
Case management	8. Case identification, triage and emergency treatment	1	1	0.6	0.6	0.8
	9. Case management	1.5	2	0.5	0.8	1.2
	10. Monitoring and follow-up	1	NA	NA	NA	NA
	11. Discharge and postdischarge follow-up	1.5	NA	NA	NA	NA
Policies and organisation of care	12. Infection prevention	0	NA	NA	NA	NA
	13. Guidelines and training	1	1.5	0	2	1.1
	14. Audit systems	1	0	0	0	0.3
	15. Access to hospital and continuity of care	1	1	0	1	0.8
	16. Patients' rights	1	NA	NA	NA	NA

The table reports the summary scores of the direct assessment based on the assessment tools, for each of the key area assessed (16 for the hospital and 10 for the HCs). Scoring system: score 3=good care according to international standards; score 2–2.9=suboptimal care but low health hazard; score 1–1.9=suboptimal care with significant health hazard; score 0–0.9=totally inadequate care and/or harmful practice with severe health hazards.

HC, health centre; NA, not applicable.

the factors contributing to low QoC. Audits systems, when existing, tended to hide problems rather than point them out, with the consequence that problems remained largely unsolved. Heterogeneity in QoC within the same services—such as two units in the same HC with very different hygiene practices—suggested that quality was affected by specific factors (eg, human factors), but also that in principle, was achievable.

Overall, the following key strengths were observed: two HCs had been recently renovated; the national guideline⁹ and appropriate job aids (eg, algorithms on diagnosis and treatment, tables with recommended drug dosages, tools for statistical reporting and so on) were available in all facilities; most staff reported to have received training on the national guidelines; some staff showed very good knowledge, appropriate skills and high motivation to work; a group of ‘activists’ supported the staff by helping with the nutritional assessment and with counselling and cooking lessons; and access for patients into the nutritional programme did not imply any payment, at least officially (according to national regulations, all basic drugs and diagnostic tests to be provided for free).

Phase 2: participatory development of quality improvement recommendations

Overall, a list of 38 possible recommendations to improve the quality of nutritional services was identified (table 3). It was recognised that some of the actions clearly required dedicated funding (eg, procurement and maintenance of equipment and restructuring of buildings), while others (eg, strengthening the system of internal audits and supportive supervision by senior staff) could be implemented potentially at a reasonably low cost through internal reorganisation of work and division of responsibilities. Possible key drivers for changing behaviours were also identified, such as local champions who could act as supervisors.

DISCUSSION

This is one of the few studies reporting on the QoC of nutritional services in LMIC, and the first study reporting on the use of a quality assessment to develop recommendations, with a participatory approach, to improve QoC for malnourished children. The assessment, conducted based on predefined criteria (SPHERE and

Table 3 Gaps in QoC identified and proposed solutions agreed

Area evaluated	Priority problems observed	Proposed solutions
1. Physical structure, staff, water and power	Hospital level <ul style="list-style-type: none"> ▶ Lack of specialised doctors (1 doctor for 28 beds) and nurses (one single nurse for the night shifts) and high turnover among nurses. ▶ Lack of running water in most taps. ▶ Lack of basic services for hygiene of patients and staff. ▶ Irregular power supply/no efficient back up system (lamps broken). ▶ Serious lack of maintenance of power sources with impossibility to use available equipment for reanimation (aspirator and oxygen concentrator). Health centre (HC) <ul style="list-style-type: none"> ▶ Lack of running water in one HC. ▶ Lack of staff in some HCs. ▶ Serious deficiencies in the emergency rooms. 	1. Advocacy with funding partners to ensure funds for physical restructuring of the ward (water, power and toilets). 2. Develop curricular training specific to health workers involved in management of malnourished children. 3. Employ one additional doctor at hospital level. 4. Reorganise nurses' shifts to ensure presence of at least two nurses at night. 5. Reorganise the emergency room. 6. When there is lack of running water, organise appropriate receptacles for water and use hand disinfectant.
2. Statistics and medical records	<ul style="list-style-type: none"> ▶ Serious inconsistencies and frequent lack of data in the official registers and medical forms. ▶ Lack of adequate knowledge and use of existing instruments and tools for statistical reporting among the staff. ▶ Inadequate systems for statistical reporting at hospital level, with inconsistencies in annual reports. 	7. Strengthen training on existing statistical reporting tools, as for the national guidelines. 8. Supportive supervision with periodical audits. 9. M&E as a priority.
3. Pharmacy and medicine availability	<ul style="list-style-type: none"> ▶ Lack of an essential drug list. ▶ No temperature and humidity control in the pharmacy store. ▶ At hospital lack of mebendazole, phenobarbital, zinc, potassium, oral quinine oral and some drugs found expired. At HC lack of drugs for emergency treatment and other essential drugs. ▶ Lack of stable supplies of therapeutic foods: F75, F100, Resomal, MultiMix, Plumpy Nut, CSB and water with sugar. 	10. Develop a list of essential drugs. 11. On the job supportive supervision on pharmacy management. 12. Compulsory preparation of water with sugar to be administered to each child at entry.
4. Equipment and supplies	<ul style="list-style-type: none"> ▶ Serious lack of maintenance of essential equipment (eg, scales). ▶ Serious lack of appropriate use of existing equipment (Ambu bag, length measuring board and MUAC tape). ▶ Some lack in availability of equipment (scales for children). ▶ Breakdown in supplies of drugs and foods. 	13. Create an effective system for technical maintenance (will need external support). 14. Procure certain basic equipment.
5. Laboratory support	<ul style="list-style-type: none"> ▶ Quality was very heterogeneous among different services. 	15. Strengthen the lab quality control systems.
6. Layout of the ward	<ul style="list-style-type: none"> ▶ One single room for all children with SAM (no separation for TB cases and other infectious diseases cases such as salmonellas). 	16. Consider changing the ward layout (will need external support).
7. Food preparation	<ul style="list-style-type: none"> ▶ Serious mistakes in preparation of F75 and F100 not according to the recipe (450 Kcal instead of 750 Kcal). ▶ Some problems in food storage. 	17. On-the-job training and supportive supervision. 18. Presence of a nutritionist.
8. Case identification, triage and emergency treatment	<ul style="list-style-type: none"> ▶ Low number of children identified in respect of expected prevalence of malnutrition. ▶ No triage implemented at HC level and serious lack in emergency treatment. 	19. Train all personnel in triage and emergency treatment. 20. Strengthen collaboration with activists for case finding in the community.
9. Case management	<ul style="list-style-type: none"> ▶ Lack of adequate knowledge and use of existing guidelines and tools (job aids, tables and so on). ▶ Lack of adherence to existing guidelines and frequent inconsistencies in case management. 	21. Develop a 'plan of work' for each health worker. 22. Strengthen training on guidelines of management of SAM and MAM. 23. Print wall posters with clinical algorithms and other job aids. 24. Establish a system of routine audit of case management.
10. Monitoring and follow-up	<ul style="list-style-type: none"> ▶ Serious lack of adequate monitoring of hospitalised children, especially at night and during weekends 	25. On the job training and supervisions. 26. Establish a system of routine audit M&E.

Continued



Table 3 Continued

Area evaluated	Priority problems observed	Proposed solutions
11. Discharge and postdischarge follow-up.	▶ Lack of communication resulting in lack of continuity of care among services.	27. Strengthen communication systems (consider pilot use of mobile phones).
12. Infection prevention	▶ Existing guidelines are not disseminated, implemented and monitored. ▶ Audit system not pointing out real problems.	28. Disseminate existing guidelines. 29. Strengthen the existing system of audits M&E.
13. Guidelines and training	▶ Most staff were trained, but in several cases, this was not effective. ▶ Lack of monitoring and of supportive supervision.	30. On-the-job training and supervision. 31. Establish a system of routine audit M&E.
14. Audit systems	▶ Serious lack of audits systems.	32. Establish effective systems of routine audit with a real problem-solving attitude. 33. Disseminate a culture against 'hiding of problems'.
15. Access to hospital care and continuity of care	▶ Serious deficiencies in communication among services, with gaps in continuity of care.	34. Strengthen collaboration with activists for case finding. 35. Develop alternative methods for community mobilisation on malnutrition, using different platforms (ie, activists, the health committees, 'agents for health preventions'). 36. Strengthen communication systems (consider pilot use of mobile phones).
16. Patients' rights	▶ Substantially substandard.	37. Disseminate the chart on patient rights. 38. Supportive supervision and periodical audit M&E.

CSB, corn and soy blended flour; F75, Formula F75 (this is a special food for children with SAM); F100, Formula F100 (this is a specially food for children with SAM); HC, health centre; MAM, moderate acute malnutrition; M&E, monitoring and evaluation; MUAC, mid-upper arm circumference; QoC, quality of care; SAM, severe acute malnutrition; TB, tuberculosis.

WHO standards),^{19 31 32} overall showed that, while health outcomes at hospital level were only slightly substandards, actions are needed to ensure that in the future better outcomes are achieved at outpatient level and for HIV seropositive children. The study also documents how findings of the quality assessment were used to generate and agree, in participatory manner, a list of recommendations for improving the quality of the nutritional services.

Results of the study may be of interest for both researchers and policy makers. First, this assessment contributes to the current debate on the need to improve QoC for children in LMIC by generating evidence on this topic. Overall, results of this study in Mozambique are in line with the few existing studies conducted in other LMIC. A study at hospital level in Kenya reported that only 4% of children received sugar at admission, only 25% had their temperature recorded, none received vitamin A and none of the feeds prescribed was correct both in type and volume.¹⁴ Similarly, an assessment in Benin¹⁵ observed that only 47.4% of the HCs were using the growth charts, 35% could not perform basic anthropometric measurements and no doctors provided nutritional counselling. A recent study in Uganda reported a mean cure rate among malnourished children treated at HCs of 52.9%.¹⁸ Lack of adherence to WHO recommendations was also reported in Brazil.¹⁷ Although results of the present study refer to year 2015–2016, a later assessment (unpublished) confirmed similar findings.³³ Taken together, the above described literature may be used for further advocating better QoC for children in Mozambique and in other LMICs.

Second, the model described in this study, that is, using the assessment proactively to develop a list of locally agreed recommendations, may be used in similar settings to build local ownership and facilitate implementation of changes. Future studies should explore what are the most effective follow-up strategies to achieve these changes.

High rates of abandons similar to what observed in this study were reported by other evaluations in sub-Saharan Africa.¹⁸ Abandons may be due to multiple underlying causes, including: low perception of the need/advantages for accessing care, difficulty in accessing care due to lack/cost of transports, conflicting priorities for the mother such as the need for working and attending other children, poor information about service provision, perception of poor QoC and lack of effective systems for tracing defaulters. Some of these factors have been reported in literature,¹⁵ but none specific study investigated reasons for abandons from nutritional services in Mozambique and related effective interventions. A recent randomised study in Uganda reported that high intensity supportive supervision to staff of the nutritional services, combined with tools for tracing defaulters (maps and telephone credit), and incentives to community health workers, significantly decreased defaulter rate from around 40% to 2%.³⁴ Future studies should further explore factors affecting defaulters from nutritional services in Beira and related effective interventions.

The significant heterogeneity in health outcomes detected among HCs, in particular for children with MAM, is in line with previous observations, reporting large heterogeneity in QoC, even among nearby facilities.^{17 18 35}

Literature and experience in the field have showed that the identification of ‘best performers’, and their appointment as local drivers of a quality improvement process (ie, by actively engaging champions in diffusing best practices in the nearby facilities), can actually help implementing changes.³⁴ Significant differences in outcomes by HIV status and type of malnutrition have been previously reported in literature.^{36 37}

Results of this study may not be directly generalised to all health services in Mozambique neither to other countries. Notably, the high HIV prevalence among children with malnutrition in our sample (about one-third) may have affected results. However, similarly low recovery rates (around 50%) were recently observed in other settings, such as Uganda, where HIV prevalence in malnourished children is almost negligible (about 1%)³⁸ thus suggesting that other factors affected the health outcomes.

This study has the limitation that data on the health outcome review derive from historical data in the patients’ files and in the nutritional registers, and we acknowledge that, in settings with low resources, these data may not be fully accurate. However, these are the only official data. Other systems of data gathering, such as direct evaluations of case management, or prospective data collection by on site data collectors, have other serious risk of bias (eg, the presence of external evaluators/data collectors can affect the QoC delivered, usually by increasing it compared with the ‘standard’). Literature shows that investment in strengthening data collection can be important drivers in quality improvement projects.³⁸ Supportive supervision should also be implemented, with the aim of both monitoring practices—including data quality—and providing direct technical support.

In regards to the study sample, although this may be perceived as relatively small study, it must be stressed that for the evaluation of health outcomes, 100% of the facilities providing nutritional services in Beira at time of the study were included. Future evaluations may consider larger sample size, including also other regions in Mozambique.

To our knowledge at the moment in Mozambique, there are no official tools for assessing the quality of nutritional services. The tool that we used was adapted from a WHO tool¹⁹ and its subsequent versions,²³ which were widely used in different countries.^{24–26} It was a standard-based tool, using WHO guidelines as reference. It had the advantage of evaluating systematically, together with clinical case management, different dimensions affecting the QoC delivered, such as the supportive services, and organisational factors such as training policies and audit mechanisms. Methods of the assessment were in line with other assessments performed with similar WHO tools.^{39 40}

While the present study did not aim and did not have the resources to reassess changes in QoC in the long term, future studies should document progresses, together with system changes, over time.

Conclusions

Data on this quality assessment may be used for further advocating better QoC for children in Mozambique and in other LMIC. The model proposed in this study, that is, using the assessment proactively to develop a list of locally agreed recommendations, may be used to build local ownership and facilitate implementation of changes. Future studies should further explore and document what are the most effective and sustainable approaches to achieve these changes in different settings.

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