



**MSc Project Report  
2015-2016**

**Improving the management of acute  
malnutrition in infants under 6 months  
(MAMI):**

**Testing, refining and understanding a  
new assessment and treatment tool**

Supervisor: Marko Kerac

Candidate number: 109403

Word count: 9877

Project length: Standard

**Submitted in part fulfilment of the requirements for the degree of MSc in  
Nutrition for Global Health**

**September 2016**



# Table of Contents

Abstract .....	5
Acknowledgements.....	6
Glossary .....	9
1 Introduction.....	11
1.1 Acute malnutrition .....	11
1.2 Acute malnutrition in infants <6 months .....	12
1.3 Developments in the management of acute malnutrition.....	14
1.3.1 Management of acute malnutrition in 6-59m olds.....	14
1.3.2 Management of acute malnutrition in 0-<6m olds.....	15
1.4 Acute malnutrition in infants <6 months in Malawi.....	16
1.5 Use of checklists in clinical settings .....	17
1.6 Operationalizing the C-MAMI tool .....	17
2 Aim and Objectives.....	19
2.1 Aim .....	19
2.2 Objectives.....	19
3 Methods.....	20
3.1 Study design .....	20
3.2 Study location .....	20
3.3 Sampling and sample size .....	21
3.4 Data collection .....	21
3.4.1 Researcher characteristics and reflexivity .....	21
3.4.2 Data collection process.....	22
3.5 Data management and analysis.....	26
3.5.1 Data management .....	26
3.5.2 Data analysis .....	26
3.5.3 Development of themes .....	27
3.6 Development of the checklist .....	28
3.7 Improving the reliability and validity of results .....	29

4	Results.....	31
4.1	Respondents.....	31
4.2	Interviews, role play and observations .....	31
5	Discussion .....	41
5.1	C-MAMI tool in community-based care .....	41
5.2	Implementing the tool.....	43
5.3	Fulfilling the study objectives .....	45
5.4	Limitations .....	45
6	Recommendations .....	46
7	References .....	48
8	Appendix.....	53

## Abstract

**Background:** Despite the WHO recommendation to treat uncomplicated acute malnutrition in infants <6 months in an outpatient setting, few countries have implemented these guidelines. The C-MAMI tool (Community management of acute malnutrition in infants) was developed to help identify, assess and manage malnourished and at-risk infants <6m of age. The tool's functionality has not yet been tested by potential users and a checklist version is needed to make it suitable for everyday use on the ground.

**Methods:** Two checklist adaptations of the C-MAMI tool were developed and piloted with the original whole tool in semi-structured interviews (n=24) with health workers from hospitals, clinics and the community in Malawi. Interviews involved role plays where health workers tested the tool. Observational data was also collected. Key informant interviews (n=5) were carried out to obtain feedback on the checklists from the original developers of the tool. Data was analysed with framework and thematic analysis.

**Results:** The C-MAMI tool was welcomed by health workers as necessary to fill an existing gap. A checklist version was found to be easier to use and preferred by potential users compared to the entire tool. However, many reported difficulties using the tool for the first time. Anthropometric/nutritional assessment was particularly difficult resulting in various assessment outcomes for the same scenario. Several items on the checklist were interpreted differently. Important differences exist among health workers in understanding the tool. These factors called for comprehensive training in the tool for it to be used effectively. A C-MAMI checklist is presented for use in the field.

**Conclusion:** The C-MAMI checklist is a viable option for identifying and managing acutely malnourished or at-risk infants <6m. Well-planned training is a prerequisite for successful implementation of the tool. Items in the checklist and tool need to be clarified to avoid misinterpretation and misclassification.

# **Acknowledgements**

## **Acknowledgement of academic support**

### **Project development**

Dr Kerac had initially proposed a project around field-testing the C-MAMI tool which could potentially involve operationalizing the tool and developing supporting documentation. I was interested in this aspect of the tool and we discussed possible ideas with Dr Kerac, Marie McGrath from ENN and Nicki Connell from Save the Children. In this meeting I proposed different ideas for the project based on what I had read and they provided comments and further ideas. Some topics such as investigating training needs emerged from this meeting while other ideas were dropped as the scope of the project was refined. The idea of developing a checklist came from Dr Kerac. I chose the priorities and objectives for the project according to my interests and perceived needs for the C-MAMI tool based on these discussions.

I developed the project design with role plays, with feedback and input from my supervisor, Dr Kerac. Dr Kerac also advised on project locations and on the ethical implications of different designs. An IMCI checklist developed in Bangladesh also acted as inspiration for a checklist design although this design was eventually not used.

### **Contact, input and support**

I met with Dr Kerac several times when preparing a proposal for and responding to requests by the local Malawian ethics committee COMREC. These meetings largely focused on technical aspects of the ethics proposal but we also discussed further details such as the project title and sampling. Dr Kerac took care of acquiring necessary letters of support. I requested feedback on my interview topic guide by Dr Kerac and Emilie Karafillakis, a qualitative researcher at LSHTM. From her experience of qualitative research interviews Ms Karafillakis provided feedback on the topic guide and suggestions for improvement. I met with her once for this purpose. As a result of her feedback, some questions were reworded to e.g. ensure they are not leading; the approach to certain topics was adjusted and some interview questions were made into probes.

### **Main research work**

I piloted the tool with a fellow-student and a family member who provided feedback and ideas on the role play process as well as the checklists. Thanks to their feedback some

changes were made in the checklist to make it more user-friendly, and further materials (card aids) were developed for the role play.

Dr Kerac provided important feedback on the checklist before it was used for the study. He gave feedback from a clinical viewpoint and with the background of having developed the C-MAMI tool. His feedback resulted in a major cut-down on unnecessary text and the checklist that resulted was much more concise than earlier versions.

Mary Lung'aho and Maryanne Stone-Jimenez who were consultants in the development of the C-MAMI tool offered to cross-check the references to the support action booklet in the checklist. I had created the references but as original developers of the tool they ensured the references in the checklist were correct and complete.

I was helped in a small number of semi-structured interviews by qualitative interviewer Green from MEIRU/Karonga Prevention Study who took information on social demographics and conducted part 1 of six interviews. He also explained the study and took consent from some participants. His help reduced time I spent with each respondent and allowed me to interview more people.

Apart from this I conducted all semi-structured and key informant interviews independently and transcribed and analysed results by myself.

### **Write-up**

Dr Kerac read one draft of the report and provided feedback. No major changes were made. A fellow-student also read parts of a draft and provided comments.

## **Acknowledgement of other support**

I was helped with the local COMREC ethics application by Dr Marko Kerac, Dr Natasha Lelijveld and Professor Moffat Nyirenda. Without their support and confidence in this project it wouldn't have been able to take place. Thanks especially to Dr Kerac for working hard to make this project happen.

Lawrence and Veronica from MEIRU's Lilongwe office were a huge help in recruiting participants and advising on practical matters of organising the interviews. Green from MEIRU's Karonga office recruited participants there and accompanied me to the different sites. Their support in coordinating the interviews was invaluable.

MEIRU staff in Lilongwe and Karonga were also very helpful with practical matters such as providing IT support and laminating checklists.

Thanks to the LSHTM Trust Funds for contributing to my flight tickets to Malawi.

Emmanuel Chimwezi is credited for translating consent forms and information sheets into Chichewa.

Lastly I would like to thank all interviewees. Thank you to the key informants who used their time to provide feedback on the checklists and if you ever read this, Zikomo kwambiri to you brothers and sisters that I interviewed in Malawi. I only realised when transcribing the interviews how much I learnt from you and I hope I can see you one day again in person to say this and maybe also to hand a refined C-MAMI package for you to use.

## Glossary

Children <6	Older infants and young children aged 6 to 59m
CMAM	Community-Based Management of Acute Malnutrition
C-MAMI	Community Management of Acute Malnutrition in Infants
CO	Clinical Officer
CTC	Community Therapeutic Care
DHS	Demographic and Health Survey
ENN	Emergency Nutrition Network
GMC	Growth monitoring card
HSA	Health Surveillance Assistant
IFE	Infant Feeding in Emergencies
IMCI	Integrated Management of Childhood Illness
Infant <6m	Infant aged 0 to 5.9 months
IYCF	Infant and Young Child Feeding
LBW	Low birth weight
LSHTM	London School of Hygiene and Tropical Medicine
MA	Medical Assistant
MAM	Moderate Acute Malnutrition
MAMI	Management of Acute Malnutrition in Infants
MEIRU	Malawi Epidemiology & Intervention Research Unit
MUAC	Mid-upper arm circumference
NCDs	Non-communicable diseases

NBA	Non-breastfeeding assessment
OTP	Outpatient therapeutic programme
RUTF	Ready-to-use therapeutic food
SAM	Severe Acute Malnutrition
WFH	Weight-for-height
WFL	Weight-for-length
WLZ	Weight-for-length z-score
WHO	World Health Organization

# 1 Introduction

## 1.1 Acute malnutrition

Acute malnutrition is a condition characterised by a catabolic or oedematous state.(1,2) It results from a combination of factors such as a recent poor diet, illness and poor absorption of nutrients, leading to failure to satisfy nutritional needs.(1,3) Acute malnutrition manifests as either rapid weight loss or bilateral pitting oedema. It can be defined with three independent criteria:

- a weight-for-height or weight-for-length z-score below -2 standard deviations of the WHO median
- a mid-upper arm circumference (MUAC) <125mm for children above 6 months
- bilateral pitting oedema.

Acute malnutrition can be classified as moderate or severe. A z-score between -2 (inclusive) and -3 is classified as moderate acute malnutrition (MAM) and a z-score -3 and below as severe acute malnutrition (SAM). With MUAC the respective cut-offs are <125 mm for MAM and <115 mm for SAM.(3,4) The use of MUAC is especially encouraged in the community setting for early identification of children who are malnourished.(4,5)

Globally 50 million children were acutely malnourished in 2014, which represents 7.5% of the world's children at the time.(6) Nearly a third of these children, 16 million, were severely malnourished.(6) Nearly all wasted children live in Asia or Africa, with the former carrying 68% of the global burden and the latter 28%.(6) These numbers are alarming due to the implications acute malnutrition has on risk of early mortality and morbidity(3,7): a worse nutritional status increases the risk of mortality in a dose-response relationship.(8,9) SAM children are at an 11 times higher risk of death than healthy children.(10) Globally 10% of deaths of children under 5 years is attributable to SAM.(5) For those who survive, severe acute malnutrition also has longer term negative consequences: children who undergo SAM inpatient treatment are in later life physically weaker and show signs of being at greater risk of non-communicable diseases (NCDs).(11)

## 1.2 Acute malnutrition in infants <6 months

The current case definition for severe acute malnutrition in infants comprises of

- weight-for-length less than  $-3$  Z-score, or
- bilateral pitting oedema.(4)

Malnutrition in infants under 6 months of age is a global public health problem but has only recently started to be recognised as one. While acutely malnourished children have received attention from international donors, governments and development partners leading to a decline in global levels of wasting,(12) infants <6 months have remained a neglected cohort(13). The 0-<6 month age group has often been excluded from nutrition surveys(14) and wasting among this age group has not received sufficient attention due to the false assumption that infants are fully breastfed and that malnutrition is therefore uncommon among them.(13)

The burden of undernutrition in infants under 6 months is, however, greater than was previously assumed (15,16) although data on infants <6 months remains scarce(13). Table 1 summarises results from an analysis from 2011.(16)

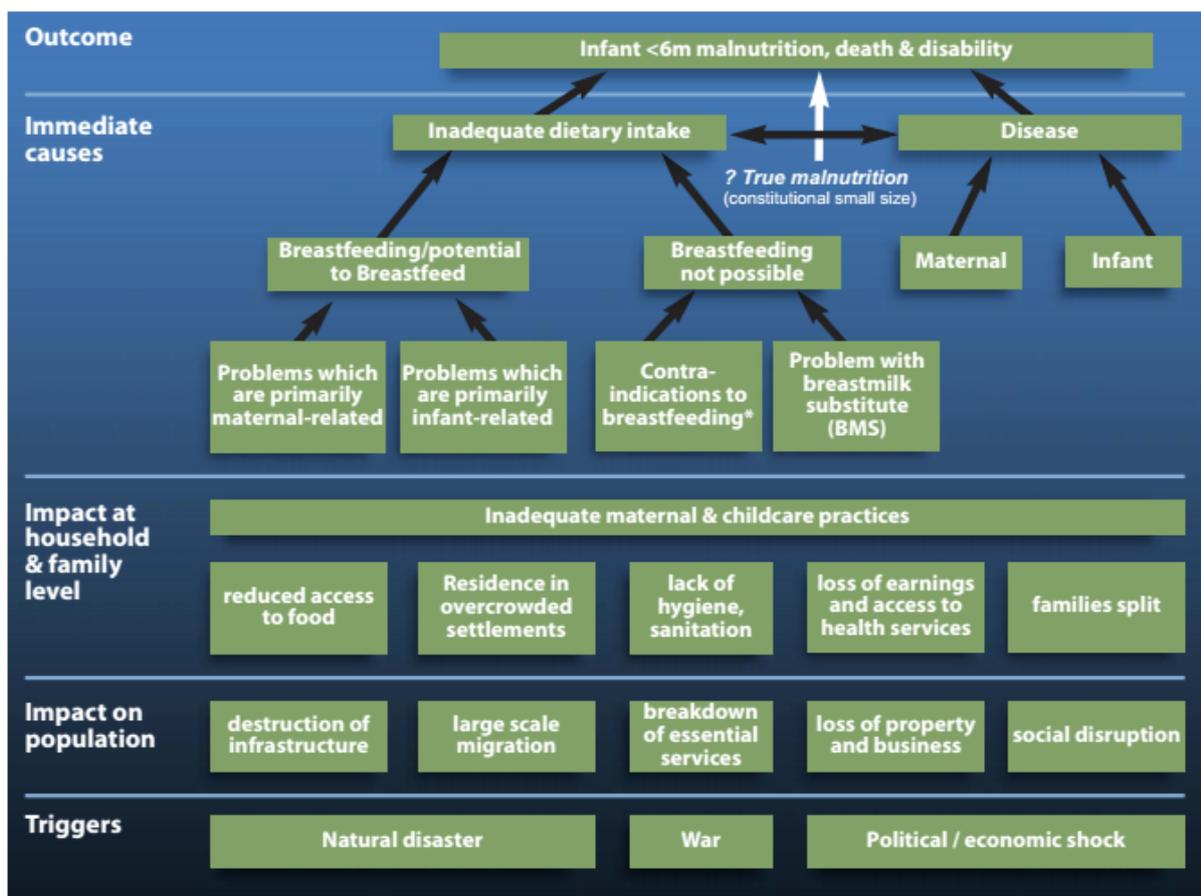
Form of malnutrition	Number (millions)
Severe acute malnutrition	3.8
Moderate acute malnutrition	4.7
<b>Total</b>	<b>8.5</b>

**Table 1: Global prevalence of malnutrition in infants <6m(16)**

In addition to a large existing burden of acute malnutrition in infants, infant malnutrition merits specific attention due to the differences and hence special needs that infants <6 months have compared to older children. The period from 0-<6 months involves a variety of physiological and developmental changes such as the development of the immune system and various organs. There are also pathological and feeding differences and mortality risk in infants <6m is higher than that in older children,(13) highlighting the vulnerability of this age group. For example, a therapeutic feeding programme in Kabul found that malnourished

infants <6m had a mortality rate of 17.2% compared to 12% in the age group 6-11m and 8.3% in the 12-17m group.(13,17)

Mortality risk of infants <6m is closely related to feeding practices.(13) Figure 1 is an adaptation of the UNICEF framework for causes of malnutrition and outlines the aetiology of infant malnutrition. As with the original UNICEF framework, inadequate dietary intake is intertwined with concurrent disease as a cause for malnutrition and death. However, as compared to older children, breastfeeding practices and related problems as well as the mother feature as important contributors to malnutrition in this age group. These factors have implications for the management of infant acute malnutrition.



\*acceptable, feasible, affordable, sustainable and safe conditions

Figure 1: Conceptual framework for causes of malnutrition in infants <6m (Source: MAMI project. 2010. Appendix B, p. 203)(13)

### 1.3 Developments in the management of acute malnutrition

#### 1.3.1 Management of acute malnutrition in 6-59m olds

Management of SAM was restricted to inpatient settings(18) until it was revolutionised by a community model of treatment. Community-based Management of Acute Malnutrition (CMAM) distinguished between uncomplicated and complicated SAM(13,19) whereby those children that don't present with medical complications may be treated as outpatients.(8) Figure 2 presents a framework for the different classifications of acute malnutrition and corresponding treatments. This treatment model has several benefits: uncomplicated SAM cases avoid unnecessary treatment in hospital which exposes them to other diseases; their carers don't face the high opportunity cost of accessing a hospital and leaving potential other children and economic activity behind; the model is resource-effective and encourages early presentation.(8,20) Home treatment is often a preferred option for parents and caretakers.(8,21)

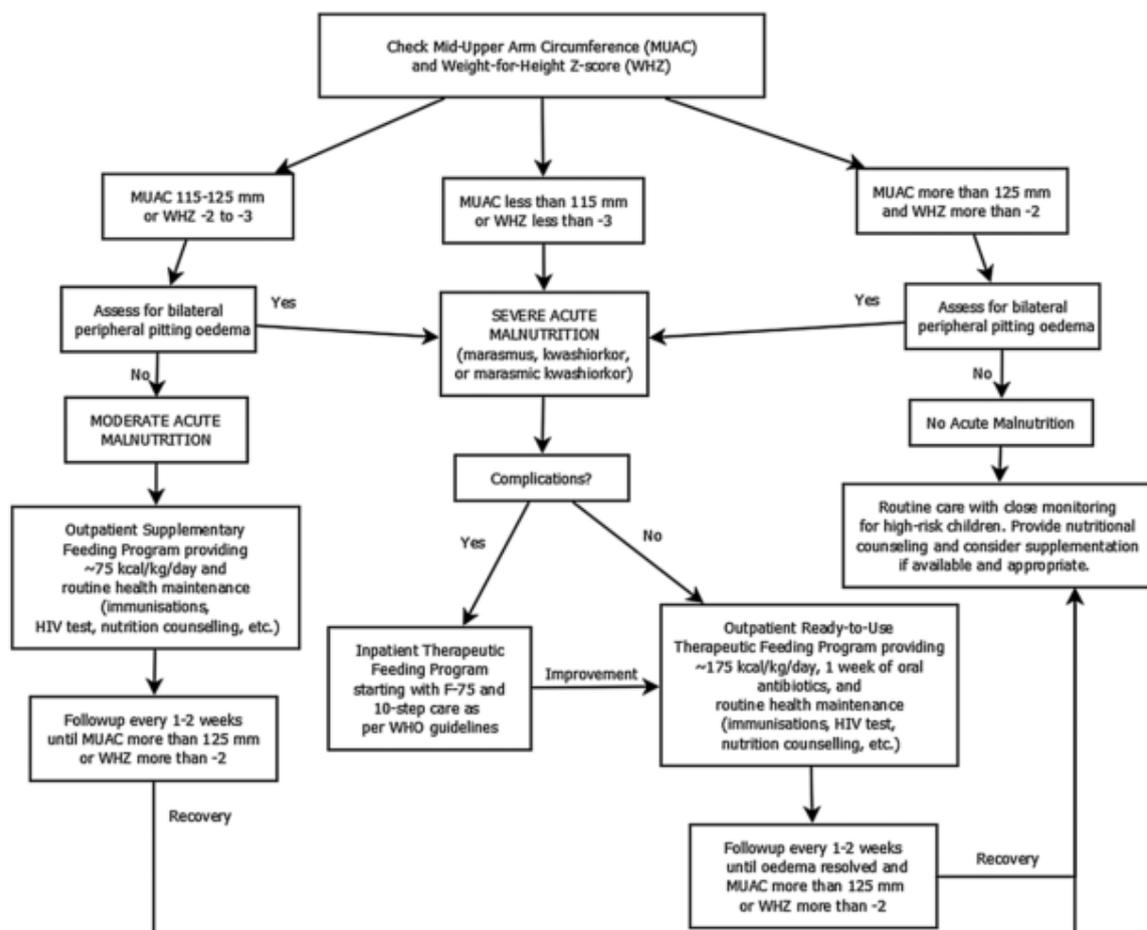


Figure 2: Diagnostic and treatment algorithm for acute malnutrition in children, including distinguishing between complicated and uncomplicated severe acute malnutrition.

(Source: Trehan I & Manary MJ. 2015.)(5)

CMAM is characterised by the following key features:

- ready-to-use therapeutic food (RUTF), an energy-dense, micronutrient-packed formulation which children receive at weekly visits to a clinic in the outpatient therapeutic programme (OTP)(8)
- early identification and active case finding in order to treat children before they develop complications(5,8)
- maximum coverage and access
- appropriate care according to the patient's needs - outpatient or inpatient.(8)

The CMAM model has gained wide recognition and popularity and is now implemented in more than 50 countries(22). It is endorsed by UNICEF, WHO and WFP as an effective treatment for acute malnutrition.(23) In optimal conditions recovery rates are about 90%.(5)

### **1.3.2 Management of acute malnutrition in 0-<6m olds**

The innovative CMAM approach to managing acute malnutrition developed for children 6m and above only. WHO recommends that all infants <6m be exclusively breastfed(24) which naturally excludes them from the CMAM programmes using RUTF as principal treatment. Until 2013, recommendations for outpatient care only existed for children above 6m, leaving inpatient care the only option for acutely malnourished younger infants despite its many disadvantages for uncomplicated cases.

The management of malnutrition in infants poses several challenges compared to the older age group. Due to the child's dependence on its mother and on breastmilk, management needs to consider the physical and mental condition of the mother as well and the mother and child need to be treated together. Instead of RUTF, breastfeeding support is the pre-eminent means to manage malnutrition or feeding problems in infants, but this requires resources in terms of time and staff skills. Additionally, there is a wide variety of factors that may directly underlie infant malnutrition that would need to be addressed, for example social issues such as mother's employment.(25) An assessment of acute malnutrition in infants <6m would have to cover a broader range of possible determinants of undernutrition.

The 2013 WHO SAM guidelines recommended outpatient treatment for infants <6m whose condition is not severe or severely at risk.(4) However, poor evidence underlies these recommendations and programmes continue to experience challenges managing infants <6m in both inpatient and outpatient settings.(13) There is also some discrepancy between the WHO's Integrated Management of Childhood Illness (IMCI) guidelines, which cover

children's general health, and the 2013 SAM guidelines in terms of managing malnourished infants. Most notably, the IMCI uses a cut-off of 2m and not 6m to determine treatment of acute malnutrition.(26)

Contradictory international guidance leaves potential national guideline makers and practitioners dubious as to the currently recommended standard. Most countries are yet to implement outpatient treatment for infants <6m in accordance with the WHO recommendation. A review of national SAM guidelines found that only one out of 46 guidelines assessed advises treating infant malnutrition in an outpatient setting.(27) Some organizations have created their own guidance and resources but an evaluation of available breastfeeding assessment tools found that none would be sensitive enough for outpatient care or specific enough for inpatient care.(13)

The MAMI (management of acute malnutrition in infants) project was conceived in response to a lack of evidence regarding management of infants <6m. It was implemented by Emergency Nutrition Network (ENN), first the UCL Centre for International Child Health and Development (CIHD) and later the London School of Hygiene and Tropical Medicine (LSHTM), and Action Contre la Faim (ACF) and produced a technical review on MAMI in 2010.(13) The MAMI work culminated in the 2013 WHO recommendation of treating uncomplicated SAM in infants as outpatients.(25)

It was recognised that the WHO guidance on managing acute malnutrition in infants was unlikely to be implemented in the field if it was not translated into more operational form. To address this issue and to harmonise IMCI and SAM guidelines, ENN and LSHTM led the development of the C-MAMI tool (Community management of acute malnutrition in infants <6m) to facilitate the management of uncomplicated cases of <6m infant acute malnutrition in the community.(28) The C-MAMI tool is a structured assessment and management tool for identifying and managing malnourished an at-risk infants <6m in the community, based on WHO guidance, and is modelled after the IMCI guidelines. The C-MAMI tool was presented at an interest group meeting in January and it was welcomed as a necessary tool for managing acute malnutrition in infants.

#### **1.4 Acute malnutrition in infants <6 months in Malawi**

Malawi has been a pioneer in implementing outpatient care for severely malnourished children(8). However, treatment of acute malnutrition in infants <6m has not yet been updated to match the WHO recommendation: the Malawian national SAM guidelines only

endorse inpatient treatment for any infant identified with SAM.(29) Additionally, in the 2015 Malawi paediatric handbook SAM and MAM is only defined in children above 6 months, with no mention of either condition in younger infants.(30)

Nevertheless, a 2011 estimate of the prevalence of infant wasting (defined as  $<-2$  WHO weight-for-height z-score) found that over 10% of 0- $<6$ m infants were wasted, compared to a prevalence of around 5% among children 6- $<60$ mo.(16) Despite the fact that it was undertaken 5 years ago, the study demonstrates the large difference in prevalence of wasting between younger and older infants. Recent droughts and repeated harvest failures led the country to declare a national emergency in April.(31) The number of infants  $<6$ m at risk is unknown but it can only be assumed to rise alongside acute malnutrition in the older age group.

## **1.5 Use of checklists in clinical settings**

Checklists are commonly used in clinical and health care settings to simplify complex information and to improve quality of care by ensuring vital steps are not missed.(32) Checklists have also been developed based on various WHO guidelines to facilitate their implementation. Examples of this are a 10-step checklist based on IMCI guidelines(33), screening checklists for family planning services(34) and the WHO Safe Childbirth Checklist(35). The simpler a tool is the likelier it is to be implemented.(28) In a C-MAMI interest group meeting it was proposed that the tool be made into a simple checklist for easier uptake and use in communities.(36)

## **1.6 Operationalizing the C-MAMI tool**

It is envisioned that the next steps for the C-MAMI tool include piloting it and carrying out a cluster-randomised controlled trial on its efficacy.(28) This project contributes to the operationalization of the C-MAMI tool: it gathers feedback on the tool from front-line health workers and develops a simplified checklist version of the tool for field use. The C-MAMI tool has been made available to the NGO and stakeholder community and has already had extensive technical validation and review by international technical and clinical staff. However, to ensure it is effective in the field, further validation and refinement by the front-line healthcare workers is needed. The feedback will provide a qualitative understanding of the tool that will inform the future RCT as well as further development of the tool.

The primary outcome of the study will be a shortened version of the C-MAMI tool which is suitable for use in a wide range of settings including outpatient settings in the community, based on feedback gained from health workers testing the tool. The study will also map out associated training needs and capacity development for health workers using the tool, a recommendation which was made by the developers of the tool regarding further research.(37) Developing a checklist version of the C-MAMI tool is particularly important to make it as simple, fast and effective as possible for health workers in communities.(36) This project will adapt and test the tool in this new checklist format and draft supporting documentation which will be a step towards an operational C-MAMI package. I hope that the adapted field tool checklist can be adopted by nutrition programmes and clinics and further modified for different cultural contexts and languages.

## **2 Aim and Objectives**

### **2.1 Aim**

To test and optimise the C-MAMI tool in order to facilitate the implementation of an outpatient care model for infants <6m who are malnourished or have feeding problems.

### **2.2 Objectives**

Specific objectives are

1. Develop a checklist for the currently 33-page C-MAMI tool together with support materials
2. Gather user feedback on the C-MAMI tool and two different checklist versions of it
3. Identify possible training needs associated with the tool

It is hypothesised that a checklist version of the C-MAMI tool will be easier to use by health workers in their work than the tool in its entirety. It's further assumed that the checklist with direct references to support actions (4c) will be preferred by health workers with little training in C-MAMI topics.

## 3 Methods

### 3.1 Study design

This is a qualitative study and the methods employed are

- i) semi-structured and key informant interviews and
- ii) elements of ethnography.

**Interviews:** Participants in semi-structured interviews were engaged in a role play with the researcher to test the C-MAMI tool and were interviewed for their feedback. Key informant interviews were conducted with professionals who developed the C-MAMI tool to get their feedback on the C-MAMI checklist.

**Ethnography:** During interviews observations were made on how participants use the tool. Checklists completed by participants during the role play were analysed afterwards.

The epistemological position underlying this study is interpretivism which is reflected in the way interviews are conducted. Interviews are regarded as a resource providing “access to authentic accounts of subjective experiences”(38) and they can be kept open for probes about details.(38) The study also contains some positivist elements such as respondent validation and using the COREQ checklist(48, appendix 6) to report data.(40) Framework and thematic analysis are used to analyse the data.

### 3.2 Study location

This study was carried out on two main sites in Malawi, an urban site in Lilongwe and a rural one in Karonga district. In Lilongwe participants were recruited from a health clinic. In Karonga participants worked at various health clinics or a rural hospital. Interviews took place in a room in the participant's facility. Two central hospital workers were interviewed separately in a café. Key informant interviews were conducted by Skype from France and Malawi.

### **3.3 Sampling and sample size**

Inclusion criteria for semi-structured interviews were

- 1) a health worker whose role involves assessing the nutritional status of infants <6m
- 2) English-speaking – presently the tool only exists in that language.

Key informants consisted of those who were closely involved in developing the C-MAMI tool.

Sampling was purposive, partly convenience and on referral based on assumptions of who is likely to use the tool in the future as well as already existing contacts in Malawi. Sampling was done to saturation, which initially was estimated to be 20-30 people. A sample representative of different health workers in Malawi was targeted, including health workers from urban and rural setting and representing different professions: Health Surveillance Assistants (HSAs), Medical Assistants (MAs), Clinical Officers (COs) and central hospital workers. HSAs are community workers dividing their time between home visits and the clinic. MAs and COs are based in clinics.

I worked with local research organization Malawi Epidemiology & Intervention Research Unit (MEIRU) to recruit participants. In Lilongwe health clinic, the HSA supervisor chose interviewees according to their availability and inclusion criteria. In Karonga, a MEIRU staff member accompanied me to several health clinics and arranged interviews. Two interviewees were recruited from outside these areas, both personal contacts of the project supervisor. They were contacted by email and phone.

### **3.4 Data collection**

#### **3.4.1 Researcher characteristics and reflexivity**

Reporting for this section is done in accordance with COREQ guidelines:

- Interviewer: I conducted myself all interviews apart from part 1 of six interviews which were done by a local researcher. As those parts were not essential for analysis this researcher's characteristics are not described.
- Credentials: BBA
- Occupation: MSc student
- Gender: female
- Experience/training: Qualitative Methodologies module at LSHTM

- Relationship with respondents: I didn't know respondents to semi-structured interviews beforehand. I had met two key informants before and three were introduced to me.
- Participant knowledge about researcher: Respondents were briefed about the study aims and they knew I was testing the functionality of the tool/checklists. Key informants knew that I had developed the checklists.
- Interviewer characteristics: I hypothesised that a checklist would be preferred to the whole tool and that references would be preferred to none. My assumption is that an outpatient tool is beneficial in settings where undernutrition is prevalent.

### **3.4.2 Data collection process**

Key informants were interviewed to gain their feedback on the C-MAMI checklists, to ask about technical details and clarify questions related to the C-MAMI tool to help refine the checklist (Objective 1). Key informant topic guide is in appendix 11.

Semi-structured interviews were carried out to

- gather feedback about the C-MAMI tool and its checklists adaptations (Objective 2)
- identify possible training needs and any other issues regarding the use of the tool. (Objective 3)

The semi-structured interviews lasted between 1hr to 1hr45min and consisted of three parts:

- 1) Background information was collected about social demographics, training received and experiences with infants <6m.
- 2) The tool was explained to the interviewee and a role play carried out with three scenarios.
- 3) Interviewees were asked about their experience of using the tool.

This process is laid out in the topic guide in appendix 9.

The role play consisted of three scenarios, instructions to whose management are laid out in the C-MAMI tool:

- Scenario A: working mother with mastitis
- Scenario B: adolescent mother with "not enough breastmilk"
- Scenario C: non-breastfeeding mother lacking social support

The full profiles of these mothers with expected C-MAMI management actions are in appendix 8. The roles were chosen to cover various topics in the C-MAMI tool. Infant Feeding in Emergencies (IFE) Module 2 was consulted in preparing the roles. Local medical

professionals with whom the tool was piloted confirmed these are plausible scenarios in Malawi.

Three different versions of the C-MAMI tool were tested in the role play:

- the original C-MAMI tool, <http://www.enonline.net/c-mami> (Figure 3)
- checklist 4b (Figure 4, appendix 4)
- checklist 4c (Figure 5, appendix 5)

Checklists 4b and 4c differed in two major ways:

- 1) checklist 4c contains direct references to management actions
- 2) order of assessment in checklist 4b is ABCD (mother and infant), whereas in checklist 4c it's ACB (infant) and BACD (mother).

Summary screenshots are below while full versions are available online/in the appendix.

### C-MAMI Assessment for Nutritional Vulnerability in Infants aged <6 months: Infant

ASSESS	CLASSIFY	ACT (MANAGE)
<b>1. TRIAGE: Check for general clinical danger signs or signs of very severe disease (for infant only)</b>		
<b>Ask, Listen</b> • As per existing IMCI assessment protocols	<b>Identify, Analyse</b> • Any IMCI danger signs	<ul style="list-style-type: none"> <li>• Any general danger sign</li> <li>• Any signs of severe or very severe disease</li> <li>• NB Be careful when assessing DEHYDRATION due to diarrhoea: some signs (e.g. dry mouth, dry eyes, sunken eyes, decreased skin turgor) can occur in severe wasting without dehydration. Focus more on history (vomiting/diarrhoea/not drinking/thirst); poor urine output (absent or very dark/concentrated urine); recent weight loss; fast/weak pulse</li> </ul>
		<b>Pink: VERY SEVERE DISEASE</b>  <ul style="list-style-type: none"> <li>• Actions as per IMCI, with URGENT referral to inpatient care</li> <li>• Continue to anthropometric assessment once any life-threatening problems have been addressed: there may also be underlying undernutrition</li> </ul>
<b>2. (A)nthropometric/Nutritional Assessment</b>		
<b>CHECK FOR ACUTE MALNUTRITION</b> <b>LOOK AND FEEL:</b> Look for signs of acute malnutrition • Look for pitting oedema of both feet • Measure weight and length and determine weight-for-length (WFL) z-score where calculable • Record Mid Upper Arm Circumference (MUAC) for all infants (for on-going and future studies) <sup>a</sup> • NOTE: clinical assessment for visible wasting is not a reliable substitute for anthropometry and will result in cases being missed. It should only be done where length is <45cm and WFL z-score cannot be calculated.  <b>ASK:</b> • If growth monitoring card is available. If yes, note: • Birth weight • Current growth centile • Growth trend if previous data available • Growth velocity and growth pattern (e.g. whether tracking along or falling across centile lines) If no, record: • Weight for Age (W/A)	<b>Severe Acute Malnutrition / HIGH Nutritional Risk</b> • WLZ <-3 OR • Recent severe weight loss or prolonged (weeks-months) failure to gain weight • Sharp drop across growth chart centile lines  <b>AND</b> <b>Clinical complications:</b> • Oedema of both feet <sup>b</sup> • Any danger sign or sign of severe disease (as above) • Failure to respond to previous outpatient-based nutritional care	<b>Pink: COMPLICATED SEVERE ACUTE MALNUTRITION</b>  <ul style="list-style-type: none"> <li>• URGENT referral to inpatient care</li> <li>• Treat clinical complications as per IMCI/ appropriate local guidelines</li> <li>• Parenteral antibiotics to treat possible sepsis</li> <li>• Specific inpatient nutritional support in parallel with other treatments (e.g. re-establishing effective exclusive breastfeeding using supplementary suckling)</li> </ul>
	<b>Severe Acute Malnutrition / MODERATE Nutritional Risk</b> • WLZ <-3 OR • Moderate weight loss or recent (days-weeks) failure to gain weight • Moderate drop across growth chart centile lines  <b>AND</b> Clinically stable / none of above clinical complications	<b>Yellow 1: UNCOMPLICATED SEVERE ACUTE MALNUTRITION</b>  <ul style="list-style-type: none"> <li>• C-MAMI outpatient enrolment: Priority 1</li> <li>• Course of broad-spectrum oral antibiotic, such as amoxicillin</li> <li>• Detailed assessment of underlying cause(s) of malnutrition + tailored action to address these</li> <li>• Plot &amp; appraise growth chart for monitoring progress</li> </ul>

<sup>a</sup> There is growing evidence for use of MUAC in infants >2-6 months. However, age and nutritional status classification cut-offs have not yet been established. For these reasons, MUAC data are not intended for use in classification. However, we do strongly urge agencies to measure and collect MUAC data to contribute to strengthen future evidence in this area.  
<sup>b</sup> Nutritional oedema is rare in infants and therefore infants with oedema should always be admitted to investigate possible underlying medical cause.

Cont'd next page

Figure 3: Screenshot of the C-MAMI tool

2. Breastfeeding assessment (tick  any that apply)

Is infant breastfed?	<input type="checkbox"/> Yes, proceed with below examination <input type="checkbox"/> No, refer to Non-breastfeeding Assessment, then continue with II Assessment: Mother			
ASK/LISTEN	Feeding history: How often breastfed? Any problems or concerns? Gets other foods or drinks?			
IDENTIFY/ANALYSE	Structural & muscular abnormalities; Breastfeeding based on observation			
CLASSIFY	<b>Pink</b> Severe problem	<b>Yellow 1</b> Moderate Problem	<b>Yellow 2</b> Some problem	<b>Green</b> Not urgent
	<input type="checkbox"/> Structural problem (e.g. cleft lip/palate)	<input type="checkbox"/> Not well attached (If unsure, see 1.1)	<input type="checkbox"/> Mother has a breast condition	<input type="checkbox"/> No feeding problem
	<input type="checkbox"/> Abnormal tone/posture/ movement (e.g. arms/legs/neck too stiff or too floppy)	<input type="checkbox"/> Not suckling well		<input type="checkbox"/> Not acutely malnourished
	<input type="checkbox"/> Excessive jaw opening or jaw clenching	<input type="checkbox"/> <8 breastfeeds in 24 hours	<input type="checkbox"/> Respiratory difficulties e.g. nasal congestion	<input type="checkbox"/> No other issues
	<input type="checkbox"/> Not willing/able to suckle	<input type="checkbox"/> Gets other foods or drinks		
	<input type="checkbox"/> Coughing / choking while BF			

Figure 4: Screenshot of checklist 4b

3. Breastfeeding assessment

Is infant breastfed?	<input type="checkbox"/> Yes, proceed with below examination <input type="checkbox"/> No, refer to Non-breastfeeding Assessment, then continue with II Assessment: Mother			
ASK/LISTEN	Feeding history: How often breastfed? Any problems or concerns? Gets other foods or drinks?			
IDENTIFY/ANALYSE	Structural & muscular abnormalities; Breastfeeding based on observation			
CLASSIFY (tick <input checked="" type="checkbox"/> any that apply)	<b>Pink</b> Severe problem	<b>Yellow 1</b> Moderate Problem	<b>Yellow 2</b> Some problem	<b>Green</b> Not urgent
	<input type="checkbox"/> Structural problem (e.g. cleft lip/palate)	<input type="checkbox"/> Not well attached (See 1.1) Well attached:	<input type="checkbox"/> Mother has a breast condition (See 2.2 for specific condition and support; 2.1)	<input type="checkbox"/> No feeding problem
	<input type="checkbox"/> Abnormal tone/posture/ movement (e.g. arms/legs/neck too stiff or too floppy)	1. Mouth wide open 2. Lower lip turned out 3. Chin touching breast 4. Areola visible above		<input type="checkbox"/> Not acutely malnourished
	<input type="checkbox"/> Excessive jaw opening or jaw	<input type="checkbox"/> Not suckling well (See 1.2)	<input type="checkbox"/> Respiratory difficulties e.g. nasal congestion (See 2.1)	<input type="checkbox"/> No other issues
	<input type="checkbox"/> Not willing/able to suckle	<input type="checkbox"/> <8 breastfeeds in 24 hours (See 1.3)		
	<input type="checkbox"/> Coughing / choking while BF	<input type="checkbox"/> Gets other foods or drinks (See 1.4)		

Figure 5: Screenshot of checklist 4c

The process of how the checklists were developed is described in section 3.6. The checklists cover the assessment part of the C-MAMI tool and a 'support action booklet' covering the management part (i.e. pages 9-33 in the C-MAMI tool without the non-breastfeeding assessment, p.30) was printed out to accompany the checklists (figure 6).

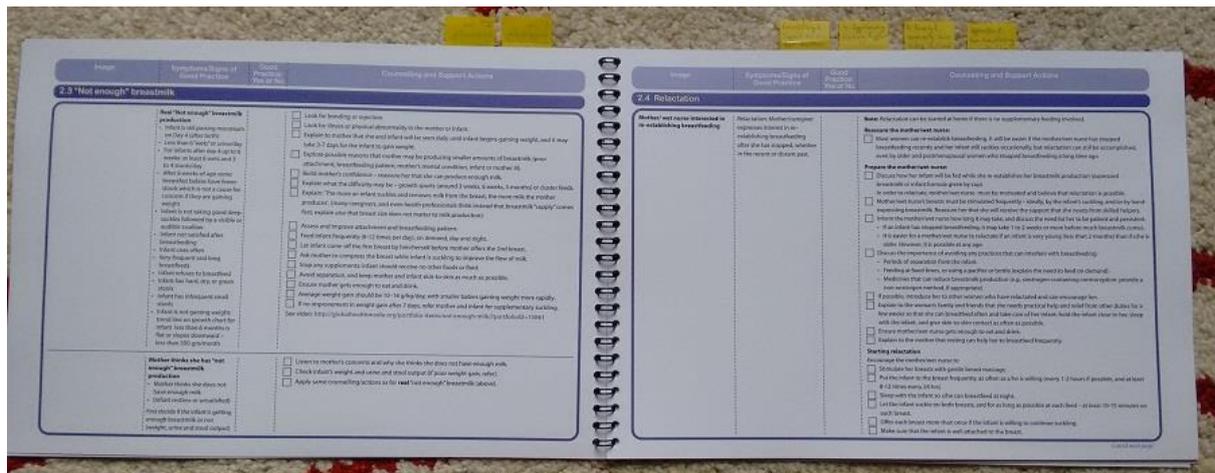


Figure 6: The support action booklet (management part of the C-MAMI tool)

For every interview each scenario was combined with a different checklist and the order of both was selected randomly. Randomisation was done using [www.random.org](http://www.random.org). The order was random but not blinded beforehand from the researcher due to practical reasons. In all cases the mother was played by me. This ensured that the scenario was consistent across interviews. Interviewees played themselves as health workers. No repeat interviews were carried out.

To start the role play interviewees were given a description of the scenario (appendix 7) and asked to carry out the assessment using the checklist/tool. After the assessment they were asked to point out the relevant support actions in the management part of the C-MAMI tool or in the support action booklet when assessment was done with the checklists. Card aids (appendix 12) gave interviewees observed information e.g. a child's weight. Pictures were taken of the checklists completed by participants.

Qualitative interviews typically follow a topic guide rather than a list of pre-set questions.(41) These interviews did not follow the topic guide literally although the topics were covered; this kind of flexibility is characteristic of interpretivist interviews.(38) The topic guide was reviewed by a qualitative researcher at LSHTM who provided feedback on the methodological aspects. It was also reviewed by the project supervisor for its content. The topic guide was piloted with four users. Two of these took place with a family member and fellow-student and two with contacts with a medical background in Malawi. The topic guide was adjusted based on the pilots and further modified during data collection.

Written consent was obtained from all participants. Ethical approval to the study was granted by LSHTM and COMREC committee in Malawi.

## **3.5 Data management and analysis**

### **3.5.1 Data management**

Interviews and role plays were audio-recorded and transcribed. Pictures were taken of completed checklists. No field notes were taken during semi-structured interviews. NVivo (QSR International, version 11 Pro, 2015) was used to manage transcripts and memos. Confidentiality was kept by replacing names with ID numbers. Copies of all data in digital form, including the project report and the checklists, were backed up on LSHTM's secure password-encrypted servers. Master versions were kept on a secure laptop and were saved to the LSHTM FilR regularly. Mendeley was used to manage references.

### **3.5.2 Data analysis**

The data was analysed using framework analysis, with great focus on its thematic analysis component. Framework analysis involves 4 stages of familiarisation with the data, thematic analysis, applying codes to data and presenting a summary of the results in a chart.(41) It provides a "deeper analysis of qualitative data"(41) than thematic analysis alone. Framework analysis is suitable for this study because it allows a comparison of themes across and within interviewee accounts.

All interviews were transcribed and coded by the same researcher who had carried out the interviews. Express Scribe Pro (NCH Software v.5.55) was used to help with transcription. For the objectives of this study it was sufficient to transcribe interviews without details of pauses and intonations. A coding tree (appendix 10) was constructed based on the analysis of the first few interviews and codes were then applied to subsequent transcripts. There are 8 main codes and 38 subcodes.

Completed checklists were analysed against what would be expected in each scenario. Notes were made of this comparison, they were coded and fed into themes. The management actions identified by interviewees were noted and compared to expected actions.

Memos are useful in moving from codes to themes(42) as they "capture the comparisons and connections you make"(43) and help "generate and develop ideas"(42). In this study memos were short notes of some codes and themes. A long memo was kept over the process of developing the checklist and the thoughts, decisions and inputs that shaped its development.

### **3.5.3 Development of themes**

Conventionally themes should emerge from the data, however some themes can be predetermined by the research question.(41) In this study themes evolved from both data and the topic guide. For example, it was an objective of the study to explore training needs for the C-MAMI tool, but many respondents addressed this topic before being asked. Other themes such as anthropometric measurements emerged completely from issues that arose in the interviews and role plays. Whatever the origin, it was aimed that all themes are well grounded in the empirical data of interview accounts and observational findings.

### 3.6 Development of the checklist

The development of the final version of the C-MAMI checklist underwent several phases. Figure 7 shows the development process by which a checklist was developed.

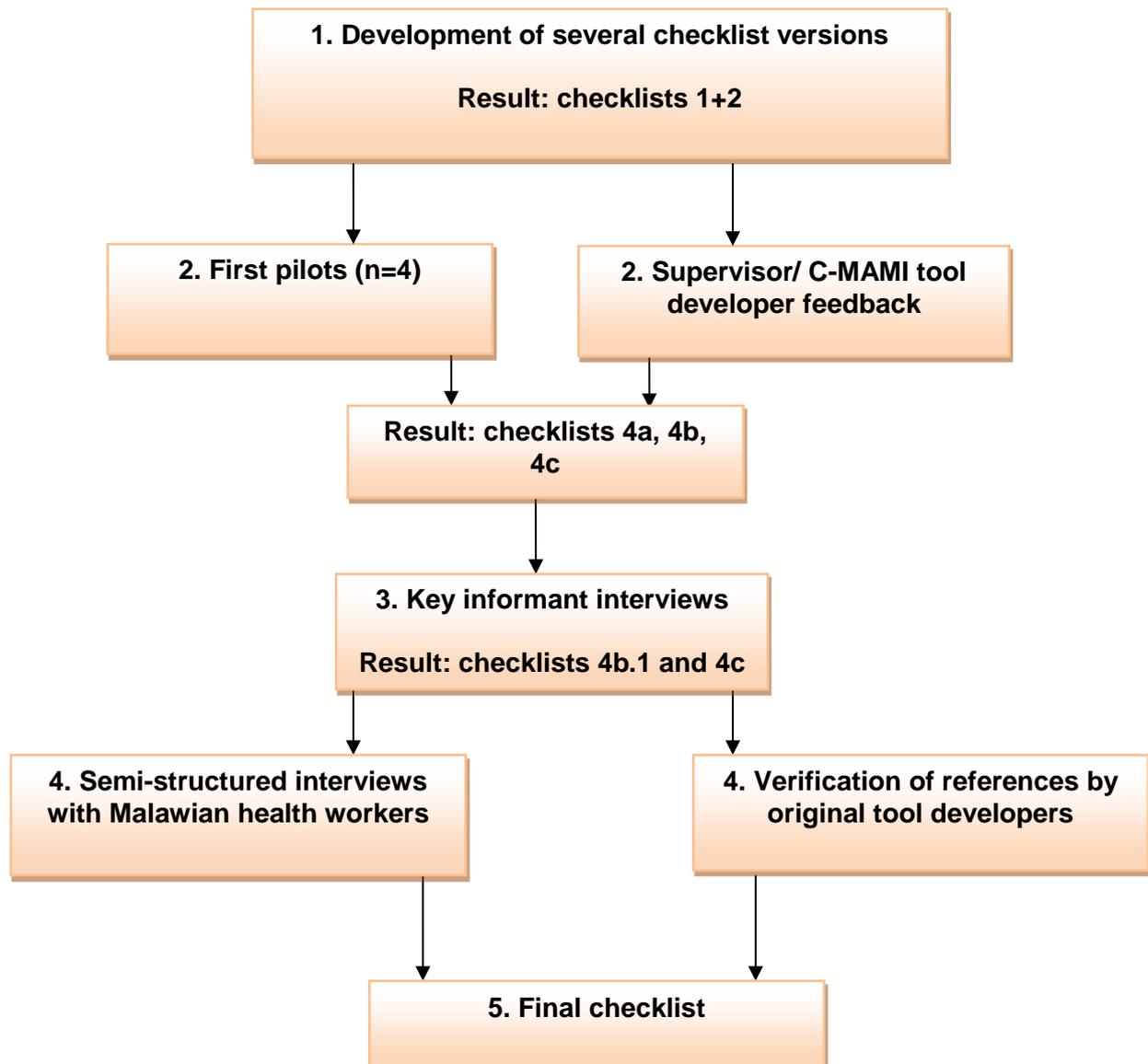


Figure 7: Process of developing the C-MAMI (Community management of acute malnutrition in infants <6m) checklist

Stage 1. This stage took place over a period of several months of independently designing initial versions of the checklist. It involved close study of the C-MAMI tool and research into similar checklists. Two checklists were proposed through this process: checklist 1 and 2 (appendix 3)

Stage 2. I piloted the checklists with four people who provided feedback on the checklists. Unnecessary text was pointed out by a supervisor and his feedback resulted in a major cut-down on text. The checklists became much more concise (4b, 4c).

Stage 3. I provided key informants with the new checklists and asked for their general feedback and opinions on specific choices I had made. Their input shaped the content and layout of the checklist before using the checklists for the study.

Stage 4. Two consultants in the development of the C-MAMI tool offered to cross-check the references to the support action booklet in the checklist. I had created the references but as original developers of the tool they ensured the references in the checklist were correct and complete. Simultaneously I started carrying out interviews piloting checklists 4b.1 and 4c (appendices 4 and 5).

Stage 5. Comments and observations were incorporated from semi-structured interviews and role plays. The final checklist of this process is in appendix 1. It is also accompanied by further explanations and rationale behind various choices.

### **3.7 Improving the reliability and validity of results**

- Semi-structured interviews were audio-recorded and transcripts weren't returned to interviewees for validation. Instead, answers were sometimes repeated and validated during the interview. Key informant interviews per Skype were not recorded but notes were taken. Respondent validation was done by sending to most key informants main outputs to review.
- Interviews with clinic staff always took place in a room chosen by them in their clinic with no other person present. Two hospital workers were interviewed separately in a café where nobody could overhear the conversation.
- All interviewees spoke English but it wasn't their first language, resulting in possible misinterpretation of parts of their accounts. Irwin(44) describes the challenge for researchers not to complete sentences when interviewing young children struggling to find words; a similar temptation existed here. Answers to obviously leading questions were not coded.

- Due to possible language and cultural barriers, interviewees were asked at the end of the interview to rate on scale 1-5 each checklist/tool. Scores helped to represent interviewee experiences in numerical form and possible discrepancies were clarified. Scoring served as a way of triangulating replies and no statistical test of significance was carried out.

## 4 Results

### 4.1 Respondents

Semi-structured interviews were carried out with 24 health workers. Five key informants were interviewed. No participant that was invited to participate refused. Table 2 summarises the characteristics of the sample.

Description of participant	Urban	Rural	Other	Male	Female	Total
Health Surveillance Assistant	7	7	-	7	7	14
Medical Assistant	1	4	-	4	1	5
Clinical Officer/clinician	1	2	-	3	-	3
Central hospital employee	-	-	2	-	2	2
<b>Total semi-structured</b>	<b>9</b>	<b>13</b>	<b>2</b>	<b>14</b>	<b>10</b>	<b>24</b>
Key informant	-	-	5	1	4	5
<b>Total</b>	<b>9</b>	<b>13</b>	<b>7</b>	<b>15</b>	<b>14</b>	<b>29</b>

Table 2: Characteristics of study participants

### 4.2 Interviews, role play and observations

Six themes emerged from the analysis of all data, including semi-structured interviews, key informant interviews, completed checklists and observations. These themes are broken down into sub-themes.

#### 1. General impressions about the tool

- Reception among health workers
- Experiences with the whole C-MAMI tool, checklists 4b and 4c
- Who should use the tool

#### 2. Training needs

#### 3. Difference made by the tool

- Identifying infants
- Identifying problems

#### **4. Obstacles/potential difficulties**

- Anthropometric measurements in the identification of malnutrition in infants
- Discrepancy between current practice and tool
- Health worker factors

#### **5. Using and interpreting the tool**

- Checklist improvements
- Clinical assessment
- Classification and boundaries

#### **6. Non-breastfeeding assessment and support**

- Positioning in checklist
- Current knowledge & challenges

This section presents the thematic analysis while the framework analysis chart is in appendix 2. Its consultation is insightful but not necessary to understand the results of the study.

#### **1. General impressions about the tool**

- **Reception among health workers**

All health workers interviewed welcomed the tool but many (n=11, 46%) were quick to mention that it was difficult to use for the first time or that frequent use was necessary to use it effectively. The way the tool is introduced emerged as an important factor in how it will be received and many suggested training is necessary:

*“They will like [the tool] but the only problem is – [...] they can have some problems, they need to have taught how they can follow this chart.” HSA, ID4*

Generally respondents thought other health workers would like the tool and didn't feel that it was too long. There were contradictory statements regarding the work load that the tool would add, some claiming that the work is already part of what they do while others compared the tool to current practice which is often referral without much management. Some reported there may be resistance due to health workers' attitude or ability to understand the tool. This is explored under the theme “Health worker factors”. The central

proposed solution to facilitating reception was training and many (n=10, 42%) suggested it without being probed.

Apart from these concerns the reception was positive. The tool was seen as filling a gap in treating malnourished infants, as a systematic guide that integrates current practice but provides a more comprehensive framework for assessment. Some described the tool as familiar concepts in a new format.

- **Experiences with the whole C-MAMI tool, checklists 4b and 4c**

Most respondents preferred the checklists over the whole C-MAMI tool because they were simpler to use. Two scenarios with the whole tool were stopped early because respondents had difficulties using it. With or without probing most preferred 4c due to references from assessment to support actions but some also preferred the original C-MAMI tool because of its comprehensiveness or 4b. With 4b respondents didn't make as many connections between the outcome of an assessment and management actions as with 4c. The C-MAMI tool helped some respondents undergo a more comprehensive assessment: for example, some asked to measure weight and length when they hadn't done so with a checklist.

- **Who should use the tool**

Staff in Malawian health clinics and rural hospitals consists of HSAs, MAs, nurses and clinical officers. HSA training constitutes 12 weeks, MAs study for two years and COs for four. Most respondents were HSAs and they said they should use the tool in their work. Most COs and MAs said all health workers should use or be aware of the tool and also endorsed HSAs. Reasons for this were that HSAs work in the community and the tool overlaps with their current work most. However, certain aspects of the tool e.g. clinical assessment are not currently HSAs responsibilities and it was suggested MAs and COs should do those parts of the assessment and management. Central hospital workers suggested that nurses use the tool in inpatient care.

## 2. Training needs

All respondents agreed that training is necessary in order to be able to use the tool effectively. There was some apparent reluctance to call this 'training' and many preferred 'orientation' or 'refresher', emphasising that they are already familiar with the content:

*"at our HSA training we learned all of them so it can be a refresher"* ID1.

Respondents wanted training to cover everything: how to use the tool as well as how to carry out support actions. Respondents were very familiar with some of the management actions such as '1<sup>st</sup> line breastfeeding', but less familiar with others such as breast problems and re-lactation where they tended to want to refer the case. The length of training was suggested to be 2-5 days.

Assessment outcomes varied between respondents and items in the checklist were interpreted in different ways, suggesting training is needed.

## 3. Difference made by the tool

Respondents compared the tool to current protocol. Many described a major difference was the way malnutrition is identified, the tool being comprehensive compared to currently "*we just look*" ID12. Anthropometry and oedema are used to identify malnutrition but only in children above 6m.

The tool was also described as systematic:

*"Cause if we don't use these things the one you think is severely malnourished might be moderately malnourished. So if we use this chart it will be standard."*ID15

Some respondents addressed the difference community-based care would make to the mother as well as themselves as being able to counsel instead of refer.

*"The guidelines [...] will help the mother to save time and money"*ID21.

*"If we could have used this one, most of the information could have been given to the grandmother [instead of referring her]"*ID10.

To some, this seemed to evoke a sense of empowerment and willingness to learn more:

*"That time I discovered I just referred her [...] using this I will be able to counsel"*ID11

- **Identifying infants**

Many respondents identified infants <6m as a distinct group that doesn't receive attention in the same way as older children do in terms of malnutrition:

*"We can miss a lot of children who are suffering from malnutrition because [...] we are only targeting those children that manage to eat" ID2.*

Several respondents claimed that the tool would provide an assessment to identify and manage infants which does not momentarily exist. With it, *"more people can be helped"* ID1 as currently *"we are missing these <6m infants due to some of the basics which are not put into our protocol"* ID9.

- **Identifying problems**

The C-MAMI tool is comprehensive and therefore participants noted it would help them identify problems, especially *"other problems that maybe the woman has not presented."* ID8 The tool would *"capture everything"* ID13 and *"using a checklist is more systematic because you can also pick up problems that we miss in the routine approach"* ID17.

Respondents said they are familiar with the contents of the tool but *"miss [...] some of the steps"* ID9 when currently seeing infants with feeding problems. A few respondents said they didn't know or had forgotten to look for at-risk signs in infants:

*"This tool has been an eye opener because there are specific things that maybe could be missed if you look at the most <5s but this is <6m"* ID17.

As a result of identifying more problems, some said they would correspondingly undertake more support actions with the tool.

#### **4. Obstacles/potential difficulties**

- **Anthropometric measurements in the identification of malnutrition in infants <6m**

The C-MAMI tool contains an anthropometric/nutritional assessment for mother and infant and this in itself became a theme in the study. Most of these findings presented come from

observational data. For the infant, the anthropometric assessment consists of weight-for-age if patients don't have a growth monitoring card (GMC); if they do, weight-for-length, recent weight loss, failure to gain weight, potential drop across growth centiles is recorded; in both cases oedema and responsiveness are noted. There was great variation in how this section was understood and completed, resulting in various treatment implications for the same scenario.

Classification by weight-for-length (WFL) z-scores was particularly difficult for participants. Mostly they skipped it or classified without asking for both weight and length. When probed about reasons for skipping interviewees mentioned unfamiliarity with the measurement and z-scores and confusion with weight-for-height, some providing no coherent reason. No one recorded weight-for-age when no GMC was available, as instructed in the tool.

When GMC wasn't available (scenario B) or there was only one data point (scenario A, 3 week-old child) most respondents asked for birth weight and compared that to current weight, thus evaluating weight gain or weight loss. Some did not ask the mother for details about recent changes - scenario A child had diarrhoea and no weight gain for the last days but had gained since birth - and this led to different classifications of the same scenario ranging from green to yellow 1, even pink. Assessment outcomes for 'recent weight loss' and 'failure to gain weight' seemed to vary the most.

Many skipped large parts of the nutritional assessment section and expressed uncertainty, difficulty and dislike for it: "*[checklists] is more technical, it has got numbers less than, point than 0, scores, and the like*" ID18. COs said they don't use WFL but that HSAs were trained on it, however HSAs weren't comfortable with it either. One HSA complained that district-level training they had had on the z-scores was insufficient: "*they [HSAs] didn't understand it. So they had questions, up to now they have those challenges*" ID18.

- **Discrepancy between current practice and tool**

Currently in Malawi when malnourished infants are identified, supporting the mother is emphasised. Many of these cases are referred to inpatient treatment, but sometimes MAs, COs and particularly HSAs are able to give the mother breastfeeding support such as positioning and expressing breastmilk.

Some of the current advice health workers give to mothers of malnourished infants is in contradiction with the tool. Most notably, in role plays health workers commonly told the

mother she doesn't have enough breast milk because of her diet and advised to eat "6 food groups" in accordance with public health messaging in Malawi.(45) Wet-nursing, endorsed in the tool, is "*completely out of question*" ID23 – it's strongly discouraged due to the high prevalence of HIV in the country.

The tool will partly be "*a new concept*" ID21 and even go against some current practices. In scenario A some health workers wouldn't take the weight of the 3-week old child because growth monitoring only begins at 6 weeks. One respondent didn't look for oedema because this is only done for children above 6m. The tool will imply managing a problem rather than referring and has community workers do things clinicians normally do. These differences will have to be understood and addressed if the tool introduced.

- **Health worker factors**

Differences among health workers in understanding the tool emerged as an important factor in how the tool will be received. Many respondents suggested there is a great difference among health workers in understanding and being able to use the tool:

*"We are different. Some do understand these things quite easily, some takes a bit of time"*  
ID21

*"Other people are slowness and they get things very slow. Others they are very fast. We are just told bla bla and they get it but others they need a certain briefing. Other they can get the book and read it and everything get it. But others you can give the book, read it, nothing."*  
ID4

A few reported there will necessarily be health workers who won't like the tool due to laziness or lack of incentives, but that if the implementation of the tool was well supervised or implemented by the Ministry of Health this wouldn't pose problems. Training was suggested to ensure that everyone is "*on the same boat*" ID4.

## **5. Using and interpreting the tool**

- **Checklist improvements**

As a result of the study a C-MAMI checklist was refined and is presented in appendix 1. A detailed explanation of the rationale behind the choices made is in appendix 13. Key informants interviews were particularly focused on refining the checklist and getting constructive feedback on how it should look like and what it should contain.

- **Clinical assessment**

There was a great deal of variation in the way questions were asked and interpreted. In mother's clinical assessment some health workers understood 'Twins' as "Have you ever had twins" and 'adolescent' mother' as "how old were you when you had your first child". Others understood them as current conditions. Poor pregnancy outcomes were also understood differently and respondents asked about e.g. bleeding and abortions. In the C-MAMI tool the meaning of some of these is clearer because there is space for longer sentences. The clinical assessment of mother and child were frequently confused with one another. In Malawi the clinical assessment is done by clinicians and some HSAs felt hesitant to do it.

- **Classification and boundaries**

This theme explores how text in the checklists and the tool were interpreted and how a case was subsequently categorised into pink, yellow 1, yellow 2 or green. The difference between text in yellow 1 and pink was not always clear to respondents. For example, in mother's anxiety/depression assessment, some respondents categorised the mother in pink as "depressed" while others chose "lack of social support" in yellow 1. It was already explained that there was great variation in classification in the anthropometric/nutritional assessment. This was the case for e.g. judging between 'recent' and prolonged' failure to gain weight where 'one month' was interpreted both ways.

Sometimes health workers struggled with how to make a decision on classification. Some read out each line and expected the mother to make the judgement, e.g. "Needs to express breastmilk". Sometimes it was unclear whether they should classify based on observation or

history. Most of those who asked for history detected recent changes in weight, unlike those who used GMC or birthweight and current weight only. “Refusing feeds” in the non-breastfeeding assessment was judged by either observation or history. Many didn’t detect that the mother in scenario B was ‘unconfident’. ‘Concerns’ in mother’s feeding assessment were understood as either the mother’s or health worker’s concerns.

Respondents were sometimes confused by the way the checklists are completed in the different sections: in anthropometry options are mutually exclusive and only one classification per line is expected. In other sections several conditions can be identified across different colour categories.

## **6. Non-breastfeeding assessment and support**

Non-breastfeeding is one of the most sensitive parts of the assessment and it divided opinions among key informants. Key informants had different views on whether parts of IFE Module 2, which the tool references, should be included in a future C-MAMI package.

- **Positioning in checklist**

All key informants agreed that the non-breastfeeding assessment should be on the checklist and not in an annex as in the whole C-MAMI tool, but there were differing opinions as to where non-breastfeeding assessment should be positioned. Some preferred it to be just after the breastfeeding assessment and some at the end because it’s not an equal option to breastfeeding.

For role plays the assessment was positioned at the end of the checklist so in a non-breastfeeding case, instead of conducting infant’s breastfeeding assessment, the checklist is turned over, the non-breastfeeding assessment conducted and then return to continue with the infant’s clinical assessment. Many respondents found this confusing. Many started going through the non-breastfeeding assessment after the mother’s assessment and had to be notified it is only for certain cases. Someone recommended having all of infant’s assessment and all of mother’s assessment on one page, meaning non-breastfeeding would be moved on the infant page.

- **Current knowledge and challenges**

In the non-breastfeeding scenario respondents often advised the mother to breastfeed but no one identified re-lactation as a support action. Respondents had knowledge about non-breastfeeding such as importance of hygiene and avoiding bottle-feeding.

A few respondents asked where to tick the reason for why mother stopped lactating which doesn't exist in the checklist. One suggested creating a separate section on this. Some had difficulties identifying "consuming less than 500ml".

Non-breastfeeding cases seem to be particularly difficult to manage due to inability to support them properly. Few facilities provide breastmilk substitutes.

*"You have to give the formula but if we don't have that programmes for the formula you tell the mother to go buy lactogen formula 1 while the mother cannot buy. So that's a problem."*

ID14

Someone also expressed doubt about handling non-breastfeeding cases in an outpatient setting:

*"Non-breastfeeding, that means child has to be referred. Even if they give advice on cup-feeding, it won't be that easy for them to deal with that scenario in the villages."*ID16

## 5 Discussion

### 5.1 C-MAMI tool in community-based care

There is growing interest among experts in a community-based model of care for malnourished infants <6m.(7) This qualitative study has explored operationalizing the C-MAMI tool which is based on WHO guidelines of managing uncomplicated acute malnutrition in infants <6m. The output of this research is a C-MAMI checklist (appendix 1).

The results confirm previous findings that infants <6m with feeding problems are currently being neglected by health systems(13). Importantly, health workers welcome the C-MAMI guidelines and its checklist adaptation as a means to identify and treat these infants. Most respondents seemed keen to use the tool in their work to help patients. In Malawi, the C-MAMI checklist would fill an existing gap and presents a viable option in ensuring infants and feeding problems are not missed. Further trials need to test the implementation of the tool.

It was hypothesised that a checklist with references (piloted as 4c) would be the preferred option for most health workers. Checklist 4c was preferred by most interviewees, including most key informants, largely due to the references. References are therefore included in the final checklist. They may clarify corresponding support actions and lead a user to cover more of them. Six out of 29 respondents (21%) preferred another form of the tool and 2 (7%) didn't have a preference. No specific characteristics unite those who preferred another tool. Those who preferred 4b said it was more straightforward or liked the assessment order. A few gave unclear reasons such as "*because you just concentrate in the mother*" ID20. One respondent who preferred the whole tool didn't like the checklists due to the anthropometric/nutritional section but skipped the corresponding section when using the whole tool. It's noteworthy that the whole tool led some people to do a more comprehensive assessment. Conversely, others didn't go through it in detail and it may need more training to use compared to a checklist. A few MAs and COs liked the whole tool because it's comprehensive but opted for 4c because it's practical: "*[the whole tool is] more detailed but [...] I have maybe 100 patients waiting for me*" ID15. It would be suitable if they had "*ample time*" ID21 which is often not the case in settings for which the C-MAMI tool is geared. The whole tool is significant as a reference document.

The sample included a large number of community workers and less nurses and NGO workers who could be assumed to be more familiar with IYCF and may therefore not need the references in 4c. Those hospital workers that were included, one of whom was a nurse,

did prefer the referencing as a general feature of the tool. Focus groups were considered as a design and they could have provided data on how the checklist is discussed. However, this would have made role plays difficult. The ethnographic approach which included observations and analysing completed checklists became an important source of data in this study. Combining semi-structured interviews and observational methods worked well to provide insights of how Malawian health workers understand and use the tool. The study initially intended to have a subset of health workers use the tool with a patient. Time constraints prevented this and further studies need to test the tool implemented with patients.

It's unsurprising that anthropometric measurements and particularly WFL are difficult for health workers and other studies report similar findings. One study found that WFL was an unreliable measurement in infants <6m.(46) Another reported staff had problems with numbers and calculations measuring infants <6m(47) which is concordant with my findings where cases were misclassified even when WFL was given. Respondents frequently confused WFL with WFH which concurs with CMAM experiences(8) and in my study perhaps testifies to the fact that the measurement isn't used often and the focus is on older children. One respondent highlights its practical difficulties: "*[mostly] we are not doing this [WFL] part but we are supposed to do it*" ID19. My study supports previous findings of WFL being an inappropriate measurement for infants <6m(46) and alternatives should urgently be explored for easier identification of at-risk infants.

The fact that many expressed the tool was difficult to use, in the first instance, highlights the importance of training for successful implementation of the tool. This has been found elsewhere: health worker performance in IMCI was improved with training.(48) It is crucial to note that health workers are different and some will take longer to learn. A comment by one of the HSAs that their training in z-scores had been insufficient highlights that trainings need to consider the audience by "*check[ing] if they have understood*" ID18. This will be true especially for the anthropometric/nutritional assessment that many don't feel comfortable with. A few suggested practicing using the tool in training. My study suggests that users may skip what they don't understand so training is central for effective use of the tool. The tool may introduce advice that isn't currently followed or even contradictory to current practice. Special attention should be on these areas. Finally, training will be an opportunity to address any concerns and explain the significance of the C-MAMI tool to improve reception of the tool.

## 5.2 Implementing the tool

Presently the exact meaning of each item on the tool/checklist and boundaries between items aren't clear. Classifying a child as 'severe' or 'moderate' in weight loss or weight gain or a mother as 'depressed' or 'lacking social support' has major implications on management: inpatient vs outpatient. The meaning of each item and boundaries between items, especially severe and moderate, need to be clarified by developers of the tool and conveyed in possible training. A guiding question in clarifying boundaries should be: 'who really needs to be treated as an inpatient?'

Questions on how a judgement should be made about each item were raised. Each item needs to be defined and it should be clear what is sought. It could help to standardise what questions should be asked as at the moment there was great variation, with "pregnancy outcomes" interpreted as abortion and bleeding during birth. The tool here instructs to take the "birth history of presenting infant" but does this mean LBW only, as suggested in the tool? It should be clarified how information should be obtained: through observation, history or both, e.g. when assessing anthropometry/nutrition where a GMC isn't available. Based on what should a judgement be made that a mother is unconfident? Clearly defined items and conveying them in training is likely to avoid much of the variation in the way assessment was done in role plays.

The checklist may need to be adapted to country customs and protocols. At implementation, practical questions need to be addressed regarding the 'logistics' of incorporating the tool into the current health care system. Where community workers are not currently doing clinical assessment, as in Malawi, there is an option between training them or adopting a similar system as presently with CMAM where HSAs do all other assessment and refer to clinicians for a clinical assessment. Another logistical question is what triggers the use of the checklist. Should a basic assessment be done on all <6months who visit the clinic? An HSA suggested using the checklist at the clinic during immunization and weighing. Should wet-nursing be removed from the checklist or just ignored in training as something not pertinent for the setting? How will the checklist work with clinicians who also go through IMCI with the infant? These matters need to be considered before wider implementation of the tool.

Health surveillance assistants (HSAs) who are the community health workers in Malawi, emerge as the potential principal users of the C-MAMI tool in the country. This may seem an unsurprising conclusion given that the profession comprised the largest number of interviewees, however several findings support this. Firstly, HSAs are "*the ones in the community*" ID17 and the likeliest people to detect early signs of malnutrition in infants. The

CMAM principle of early case finding and prevention(8) would be most realised if HSAs were using the C-MAMI tool. Secondly, all profession groups endorsed them. HSAs were often more confident than others with problems of breastfeeding such as good attachment and need to express breastmilk. Other areas they were clearly less confident in, such as breast problems and clinical assessment, for which they “*may not have the technical knowhow*” ID16. With adequate training HSAs would be able to cover at least a bulk if not all of the tool.

Non-breastfeeding cases are commonly referred although respondents had basic knowledge about the topic. These cases will potentially still be difficult to manage in the community with the C-MAMI tool as they are referred to where infant formula is available which makes re-lactation, whenever possible, a stronger option. As a result of discussions with some key informants, ‘willingness/possibility to re-lactate’ was added to the non-breastfeeding assessment of the checklist to ensure this is always considered as a treatment option. The non-breastfeeding section needs to be tested in practice to see if its contents are sufficient to manage non-breastfeeding infants in the community, e.g. if health workers are able to identify ‘appropriate BMS’ of which a list is currently not provided in the tool.

In terms of positioning the non-breastfeeding assessment in the checklist, there are arguments both for placing it on the infant’s or the mother’s page. It’s confusing to jump to the end of the checklist for the assessment but users may accidentally go through it with breastfeeding cases if positioned in the middle. My research doesn’t result in a strong recommendation for either option but weighs on the side of caution. After the role play one respondent asked if “*this method, is it existing nowadays? To choose not to feed the baby with the breast?*” ID9, a reminder that misunderstandings can easily occur. Parts of IFE module 2 that the C-MAMI tool references in non-breastfeeding management were not piloted, firstly because this study didn’t focus on management, secondly because IFE references should perhaps only be considered including if evidence is presented that current non-breastfeeding management content is insufficient. Perhaps a wise attitude with this would be ‘what do we need to include for health workers to be able to manage cases’ and not ‘how much can we include without causing misunderstandings’.

In a country like Malawi where outpatient treatment has made a huge difference in reducing mortality among children above 6m,(20) a similar model of care for infants <6m could have major benefits. Recent climate changes have caused a rise in the number of malnourished children, triggering international response,(31) but a scale-up in RUTF treatment doesn’t benefit infants <6m. Effective outpatient treatment is urgently needed in Malawi and other countries to support malnourished or at-risk infants <6m, in the same ways as it exists for older children.

### **5.3 Fulfilling the study objectives**

As a result of this study a first version of a C-MAMI checklist is presented (objective 1). The checklist needs further testing and some minor questions need to be clarified regarding content and layout, as mentioned in appendix 13. A support action booklet (or other tool covering the management actions) accompanying the checklist still needs to be made into a separate file. This study also gathered user feedback and has provided insights as to how the tool is used and understood (objective 2). This will be useful if the tool is implemented and developed further. Although identifying possible training needs was the third objective it hadn't been assumed that this theme would emerge as strongly as it did. Need for training was connected to a number of factors, including difficulty of carrying out anthropometric/nutritional assessment and differences among health workers in understanding the tool.

### **5.4 Limitations**

- This study largely focused on the assessment part of the C-MAMI tool. Due to time restraints, we didn't go through management actions in detail in the role play. This study is therefore not able to provide comprehensive feedback on the use of that part beyond health worker comments of which areas they were familiar with and which not.
- Sample size is relatively small and there is lack of representativeness in groups that could have provided additional insights: NGO workers and nurses. While nurses may be justified by the fact that the C-MAMI tool is perhaps primarily an outpatient tool, nurses do postnatal check-ups and are therefore a relevant group to consult.
- The interviewer was a white researcher playing a local woman in the role plays. This affected authenticity and respondents may have acted differently or produced different accounts than if the interviewer had been local.
- This is my first time doing qualitative interviews after receiving training in it and I sometimes interrupted respondents or posed leading questions.
- These results are representative of similar settings in Malawi but key informants suggest different issues might feature in other countries. The tool is meant to be used in a variety of settings and assumptions cannot be made about other settings based on this study.

## 6 Recommendations

This study concludes that a checklist version of the C-MAMI tool is appropriate and needed in the management acute malnutrition and feeding problems in infants <6 months in Malawi. A checklist is more convenient for field use than the whole C-MAMI tool.

The following recommendations are put forward as a result of this study:

- A C-MAMI checklist is recommended to be used to identify and assess malnourished and at-risk infants <6m in the community. It should be accompanied by potentially a support action booklet containing the management actions. The checklist in appendix 1 is proposed as a first version of such a checklist.
- Well-designed training has an essential role in the implementation of the C-MAMI tool. Different levels of understanding among health workers need to be taken into account to ensure everyone can use the tool. Due attention in training should be given to the anthropometric/nutritional assessment and points which deviate from current practice.
- The anthropometric/nutritional assessment and especially weight-for-length z-score are likely to pose problems in the identification of at-risk and malnourished infants. These criteria and their use in practice should be reviewed and clarified to ensure they are feasible for health workers in outpatient setting to carry out. It should be ensured their meaning is clearly understood.
- Each item in the checklist/tool needs to be clearly defined to avoid unnecessary referrals to inpatient care and missing at-risk cases. It should be established how information is to be obtained for each item and what is being looked for to avoid misunderstandings. These instructions could be laid out e.g. in a training guide.

Recommendations for further research:

- The scope of this study was limited to the assessment part of the C-MAMI tool. The management actions of the C-MAMI tool should also be tested to develop a potential support action booklet accompanying the checklist.

- Research should be extended to NGOs nutrition programmes as practices might be different from the clinics included in this study. Nurses as potential users of the tool in Malawi should also be explored.
- What should prompt the use of the tool, as using the whole checklist may in many settings not be feasible to use on every child.

## 7 References

1. Manary MJ, Sandige HL. Management of acute moderate and severe childhood malnutrition. *BMJ*. 2008;337:a2180.
2. Global Nutrition Cluster. The Harmonised Training Package: Resource Material for Training on Nutrition in Emergencies (HTP) version 2. Module 1. Part 1 : Fact Sheet. Available at: <http://nutritioncluster.net/training-topics/harmonized-training-package/> . 2011.
3. WHO. WHA Global Nutrition Targets 2025 : Wasting Policy Brief. 2014.
4. World Health Organization. Guideline: Updates on the management of severe acute malnutrition in infants and children. Geneva; 2013.
5. Trehan I, Manary MJ. Management of severe acute malnutrition in low-income and middle-income countries. *Arch Dis Child* [Internet]. 2015;100(3):283–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/25421910><http://adc.bmj.com/content/100/3/283.full.pdf>
6. The United Nations Children’s Fund, World Health Organization, The World Bank Group. Levels and trends in child malnutrition: UNICEF-WHO-World Bank Group joint child malnutrition estimates. Key findings of the 2015 edition. New York; 2015.
7. Angood C, McGrath M, Mehta S, Mwangome M, Lung’aho M, Roberfroid D, et al. Research Priorities to Improve the Management of Acute Malnutrition in Infants Aged Less Than Six Months (MAMI). *PLoS Med*. 2015;12(4).
8. Collins S, Saddler K, Dent N, Khara T, Guerrero S, Myatt M, et al. Key issues in the success of community-based management of severe malnutrition. *Food Nutr Bull*. 2006;27(3):S49–82.
9. Pelletier D. The relationship between child anthropometry and mortality in developing countries: implications for policy, programs and future research. *J Nutr*. 1994;124:2047S – 81S.
10. McDonald CM, Olofin I, Flaxman S, Fawzi WW, Spiegelman D, Caulfield LE, et al. Nutrition Impact Model Study. The effect of multiple anthropometric deficits on child mortality: meta-analysis of individual data in 10 prospective studies from developing countries. *Am J Clin Nutr*. 2013;97(4):896–901.

11. Lelijveld N, Seal A, Wells JC, Kirkby J, Opondo C, Chimwezi E, et al. Chronic disease outcomes after severe acute malnutrition in Malawian children (ChroSAM): a cohort study. *Lancet Glob Heal* [Internet]. 2016;0(0). Available from: [http://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(16\)30133-4/abstract](http://www.thelancet.com/journals/langlo/article/PIIS2214-109X(16)30133-4/abstract)
12. The World Bank Group. Prevalence of wasting, weight for height (% of children under 5) [Internet]. 2016 [cited 2016 Aug 22]. Available from: <http://data.worldbank.org/indicator/SH.STA.WAST.ZS?end=2014&start=1990&view=chart>
13. ENN, CIHD, ACF. MAMI Project. Technical Review: Current evidence, policies, practices & programme outcomes. Jan 2010. 2010;
14. Lopriore C, Dop M, Solal-Céligny A, Lagnado G. Excluding infants under 6 months of age from surveys: impact on prevalence of pre-school undernutrition. *Public Heal Nutr*. 2007;10(1):79–87.
15. Victora CG, de Onis M, Hallal PC, Blossner M SR. Worldwide timing of growth faltering: revisiting implications for interventions. *Pediatrics*. 2010;125(3):473–80.
16. Kerac M, Blencowe H, Grijalva-Eternod C, McGrath M, Shoham J, Cole TJ, et al. Prevalence of wasting among under 6-month-old infants in developing countries and implications of new case definitions using WHO growth standards: a secondary data analysis. *Arch Dis Child*. 2011;96(11):1008–13.
17. Golden M. Comment on including infants in nutrition surveys: experiences of ACF in Kabul City. *F Exch*. 2000;9:16–7.
18. WHO. Management of severe malnutrition: a manual for physicians and other senior health workers. Geneva; 1999.
19. Collins S, Yates R. The need to update the classification acute malnutrition. *Lancet*. 2003;362(249).
20. Murray E, Manary M. Home-based therapy for severe acute malnutrition with ready-to-use food. *Paediatr Int Child Heal*. 2014;34(4).
21. LSHTM. Perceptions of caregivers and health workers on a community based approach to the management of infant acute malnutrition in Bangladesh. MSc Project Report. London School of Hygiene and Tropical Medicine; 2015.

22. UNICEF, Valid International. Global CMAM mapping in UNICEF supported countries. *F Exch.* 2011;41(10).
23. WHO, WFP, UNICEF. A Joint Statement by the World Health Organization, the World Food Programme, the United Nations System Standing Committee on Nutrition and the United Nations Children's Fund. [Internet]. 2007. Available from: [http://www.who.int/maternal\\_child\\_adolescent/documents/a91065/en/](http://www.who.int/maternal_child_adolescent/documents/a91065/en/)
24. WHO. Nutrition: Exclusive Breastfeeding [Internet]. 2016 [cited 2016 Aug 30]. Available from: [http://www.who.int/nutrition/topics/exclusive\\_breastfeeding/en/](http://www.who.int/nutrition/topics/exclusive_breastfeeding/en/)
25. Kerac M, Mwangome M, Mcgrath M, Haider R, Berkley JA. Management of acute malnutrition in infants aged under 6 months ( MAMI ): Current issues and future directions in policy and research. *Food Nutr Bull.* 2015;36(1):30–4.
26. WHO. Integrated Management of Childhood Illness. Chart Booklet. Geneva; 2014.
27. McGrath M. Updated review of national guidelines on MAMI: key findings. In: Management of Acute Malnutrition in Infants under 6 months (MAMI) Interest Group Meeting ENN, LSHTM & Save the Children. London, UK; 2016.
28. Kerac M. cMAMI Tool. Presented at MAMI Interest Group Meeting. London, UK;
29. Malawi. Guidelines for community management of acute malnutrition. 2012.
30. Ministry of Health. Malawi Standard Treatment Guidelines. 5th ed. 2015.
31. Concern Worldwide. Our work in Malawi [Internet]. 2016 [cited 2016 Sep 1]. Available from: <https://www.concern.net/where-we-work/africa/malawi>
32. WHO. WHO Safe Childbirth Checklist Implementation Guide: Improving the quality of facility-based delivery for mothers and newborns. Geneva; 2015.
33. MOTI M, VINCE J. Does Integrated Management of Childhood Illness (IMCI) make a difference to the assessment of sick children in Papua New Guinea? *PNG Med J.* 51(3-4):138–48.
34. fhi360. Tools: Service delivery tools and job aids for family planning providers [Internet]. 2016 [cited 2016 Sep 8]. Available from: <https://www.fhi360.org/resource/service-delivery-tools-and-job-aids-family-planning-providers>

35. WHO. WHO Safe Childbirth Checklist [Internet]. 2015. Available from: [www.who.int/patientsafety/implementation/checklists/childbirth/](http://www.who.int/patientsafety/implementation/checklists/childbirth/)
36. ENN, LSHTM, Save the Children. Management of Acute Malnutrition in Infants under 6 months (MAMI) Interest Group Meeting. Meeting Report.
37. ENN, LSHTM. C-MAMI Tool. Version 1.0,.
38. LSHTM. Interviews and Interviewing. Presented by Tim Rhodes in module Qualitative Methodologies. London; 2016.
39. TONG A, SAINSBURY P, CRAIG J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Heal Care*. 2007;19(6):349–57.
40. Barbour R. Checklists for improving rigour in qualitative research: a case of the tail wagging the dog? *BMJ*. 2001;322(7294):1115–7.
41. Green J, Thorogood N. *Qualitative Methods for Health Research*. London, UK: SAGE; 2004.
42. LSHTM. Thematic analysis practice seminar. Presented by Jo Reynolds in module Qualitative Methodologies. London; 2016.
43. Charmaz K. Memo-writing. In: *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*. London, UK: SAGE; 2006.
44. Irwin L, Johnson J. Interviewing Young Children: Explicating Our Practices and Dilemmas. *Qual Health Res*. 2005;15(6):821–31.
45. Ministry of Health. *National Guidelines on Nutrition Care, Support, and Treatment (NCST) for Adolescents and Adults*. Lilongwe; 2014.
46. Mwangome MK, Fegan G, Mbunya R, Prentice AM, Berkley JA. Reliability and accuracy of anthropometry performed by community health workers among infants under 6 months in rural Kenya. *Trop Med Int Heal*. 2012;17(5):622–9.
47. Tilley N. An investigation of anthropometric training by NGOs. *F Exch*. 2008;(32).
48. Nguyen D, Leung K, McIntyre L, Ghali W, Sauve R. Does Integrated Management of Childhood Illness (IMCI) Training Improve the Skills of Health Workers? A Systematic

Review and Meta-Analysis. PLoS One. 2013;8(6):e66030.

## **8 Appendix**

Appendix 1: Final checklist

Appendix 2: Framework analysis

Appendix 3: Checklists 1 and 2

Appendix 4: Piloted checklist 4b

Appendix 5: Piloted checklist 4c

Appendix 6: Consolidated criteria for reporting qualitative studies (COREQ) checklist

Appendix 7: Descriptions for setting the scene

Appendix 8: Role descriptions

Appendix 9: Interview topic guide

Appendix 10: Coding tree

Appendix 11: Key informant interview questions

Appendix 12: Card aids in role plays

Appendix 13: Rationale behind checklist

Appendix 14: Consent form

Appendix 15: Information sheet

Appendix 16: Other findings

## Appendix 1: Final checklist (also available in Excel)

### COMMUNITY MANAGEMENT OF ACUTE MALNUTRITION IN INFANTS <6 MONTHS (C-MAMI): CHECKLIST 1.0

#### I ASSESSMENT: INFANT

Ensure the child has been assessed for IMCI danger signs and that any life-threatening problems have been addressed (see IMCI)

#### 1. Anthropometric/Nutritional Assessment (tick where appropriate)

Growth monitoring card?	<input type="checkbox"/> Not available, record weight for age: _____				
	<input type="checkbox"/> Yes				
CLASSIFY	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent	ACTION
Weight-for-length	-	<input type="checkbox"/> <-3	<input type="checkbox"/> >= -3 to <-2	<input type="checkbox"/> >=-2	
Recent weight loss	<input type="checkbox"/> severe	<input type="checkbox"/> moderate	-	<input type="checkbox"/> none	
No weight gain	<input type="checkbox"/> prolonged (weeks-months)	<input type="checkbox"/> recent (days-weeks)	-	<input type="checkbox"/> normal	
Dropping centiles on growth chart	<input type="checkbox"/> sharp	<input type="checkbox"/> moderate	-	<input type="checkbox"/> none	
Oedema	<input type="checkbox"/> yes	-	-	<input type="checkbox"/> no	
Non-responder	<input type="checkbox"/> yes	-	-	<input type="checkbox"/> no	
MEASURE	Record Mid Upper Arm Circumference (MUAC) (for on-going and future studies)				

#### 2. Breastfeeding assessment

Is infant breastfed?	<input type="checkbox"/> Yes, proceed with below examination					
	<input type="checkbox"/> No, refer to <b>Non-breastfeeding Assessment</b> , then continue with <b>3. Clinical Assessment</b>					
ASK/LISTEN	Feeding history: How often breastfed? Any problems or concerns? Gets other foods or drinks?					
IDENTIFY/ANALYSE	Structural & muscular abnormalities; Breastfeeding based on observation					
CLASSIFY (tick <input checked="" type="checkbox"/> any that apply)	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent		
	<input type="checkbox"/> Structural problem (e.g. cleft lip/palate)	<input type="checkbox"/> Not well attached (See 1.1 if unsure or to support)	<input type="checkbox"/> Mother has a breast condition (See 2.2 A, B, C, D or E and 2.1)	<input type="checkbox"/> No feeding problem		
	<input type="checkbox"/> Abnormal tone/posture/ movement (e.g. arms/legs/neck too stiff or too floppy)	<input type="checkbox"/> Not suckling well (See 1.2)		<input type="checkbox"/> No other issues		
	<input type="checkbox"/> Excessive jaw opening or jaw	<input type="checkbox"/> <8 breastfeeds in 24 hours (See 1.3)		<input type="checkbox"/> Respiratory difficulties e.g. nasal congestion (See 2.1)		
	<input type="checkbox"/> Not willing/able to suckle	<input type="checkbox"/> Gets other foods or drinks (See 1.4)				
	<input type="checkbox"/> Coughing / choking while BF					

#### 3. Clinical assessment (tick any that apply)

IDENTIFY/ANALYSE	Possible underlying clinical problems				
CLASSIFY	<input type="checkbox"/> HIV+	<input type="checkbox"/> Risk of HIV	<input type="checkbox"/> TB+	<input type="checkbox"/> Risk of TB	<input type="checkbox"/> Preterm
	<input type="checkbox"/> Any other concerns, what? (e.g. diarrhoea)		<input type="checkbox"/> LBW		
	<input type="checkbox"/> Check vaccinations				

#### II ASSESSMENT: MOTHER

#### 1. Anthropometric/nutritional assessment (tick where appropriate)

CLASSIFY	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent	
MUAC	<input type="checkbox"/> <180 mm	<input type="checkbox"/> 180 to <230 mm	-	<input type="checkbox"/> >=230mm	
BMI (if possible)	<input type="checkbox"/> <17	<input type="checkbox"/> 17 to <18.5	-	<input type="checkbox"/> >=18.5	
Oedema	<input type="checkbox"/> yes	-	-	<input type="checkbox"/> no	

## 2. Breastfeeding and Non-breastfeeding assessment

<b>ASK/LISTEN</b>	Feeding history		
<b>IDENTIFY/ANALYSE</b>	Breastfeeding and non-breastfeeding based on observation & conversation		
<b>CLASSIFY</b> (tick <input checked="" type="checkbox"/> any that apply)	-	<b>Yellow 1: Enrol mother and infant in C-MAMI if meets any condition</b>	
	-	<b>Breastfeeding mother</b>	
	-	<input type="checkbox"/> Re-lactating (See 2.4)	
	-	<input type="checkbox"/> Discharged from Supplementary Feeding Programme (See 3)	
	-	<input type="checkbox"/> Needs to express breastmilk and cup-feed (See 2.1)	
-	<input type="checkbox"/> Breast conditions e.g. engorgement; mastitis; nipples sore/cracked/large/flat; thrush (See 2.2. A, B, C, D or E, or 2.6 A)		
-	<input type="checkbox"/> Perception of not having enough breastmilk (See 2.3)		
-	<input type="checkbox"/> Other concerns: mother lacks confidence (see 2.6 B); is concerned about her diet (see 2.6 C); works away from infant (see 2.6 D)		
-	<b>Non-breastfeeding mother</b>		
-	<input type="checkbox"/> Concerns about meeting infant's nutritional needs (See 6.2, 6.3)		
-	<input type="checkbox"/> Working away from home (See 2.6 D)		
-	<input type="checkbox"/> Delegating infant feeding and care to another (See 2.6 D)		

## 3. Clinical assessment (tick any that apply)

<b>IDENTIFY/ANALYSE</b>	Clinical problems in mother; Birth history of presenting infant		
<b>CLASSIFY</b>	-	<b>Yellow 1: Enrol mother and infant in C-MAMI if meets any condition</b>	
	-	<input type="checkbox"/> Anaemia (See 2.6 G)	<input type="checkbox"/> Twins (See 2.6 E)
	-	<input type="checkbox"/> History of poor pregnancy outcomes	<input type="checkbox"/> TB (See 2.6 H)
	-	<input type="checkbox"/> Adolescent mother (under 19 yrs) (See 2.6 F)	

## 4. Depression/Anxiety (tick any that apply)

<b>CLASSIFY</b>	<b>Pink Severe problem</b>	<b>Yellow 1 Moderate Problem</b>	<b>Yellow 2 Some problem</b>	<b>Green Not urgent</b>
	<input type="checkbox"/> Traumatized, rejects infant	<input type="checkbox"/> Lack of care and social support (See 5.1-5.5)	-	<input type="checkbox"/> No concerns
	<input type="checkbox"/> Depressed			
	<input type="checkbox"/> Gender based violence			
	<input type="checkbox"/> Marital conflict			

## Non-breastfeeding Assessment

<b>ASK/LISTEN</b>	Mother present? Feeding history: When & why stopped BF? Feeding utensils? Gets other foods or drinks?			
<b>IDENTIFY/ANALYSE</b>	Structural & muscular abnormalities; Non-breastfeeding based on observation			
<b>FEEDING</b>	Wet nurse available? Type and quantity of BMS used? BMS safely prepared?			
<b>CLASSIFY</b> (tick <input checked="" type="checkbox"/> any that apply)	<b>Pink Severe problem</b>	<b>Yellow 1 Moderate Problem</b>	<b>Yellow 2 Some problem</b>	<b>Green Not urgent</b>
	<input type="checkbox"/> Structural problem (e.g. cleft lip/palate)	<input type="checkbox"/> Willing/possibility to relactate (See 2.4)	<input type="checkbox"/> Respiratory difficulties e.g. nasal congestion (See 2.1)	<input type="checkbox"/> No feeding problem
	<input type="checkbox"/> Abnormal tone/posture/ movement (e.g. arms/legs/neck too stiff or too floppy)	<input type="checkbox"/> Consuming less than 500ml of BMS per 24 hours (See 6.3)		<input type="checkbox"/> No other issues
	<input type="checkbox"/> Excessive jaw opening or jaw	<input type="checkbox"/> Inappropriate BMS (See 6.2-6.4)		
	<input type="checkbox"/> Not able to feed by cup or bottle	<input type="checkbox"/> Gets other foods or drinks (See 6.3)		
	<input type="checkbox"/> Coughing / choking while feeding	<input type="checkbox"/> Declines feeds		
<input type="checkbox"/> Possibility to try supplementary suckling (See 4.1)	<input type="checkbox"/> Mother absent (See 6.1)			

<b>ASK/LISTEN</b>	<b>Are there any other concerns (about the infant, carer, home/social environment) that need further review?</b>

## Appendix 2: Framework analysis

The framework analysis displays some of the themes and sub-themes in a table and also shows what management actions respondents identified with each checklist/tool. Abbreviations and footnotes are explained below the framework.

ID	Sex	Yrs worked	Profession	Location	Age	Preferred tool	Difficult/ Possible obstacles	Nutritional assessment & Measurements *	Management actions**			Differences w/ and w/o checklist	Opinion on 4b	Opinion on 4c	Opinion on whole C-MAMI tool	Other comments
									#1	#2	#3					
1	F	16	HSA	Llw	42	4c due to references	Not familiar with BMI Lazy HSAs	In A, skipped anthro bec child <3 mo	c-mami, changed to 4c bec difficult - C 2/4	4b - B 1/7 + 1	4c - A 3/7 + 1	"This can make the work to be easier and more people will be helped"	"Maybe this one can be more difficult because there are no references"	-	"Maybe this one can confuse somebody"	Checklists need to be used frequently to get familiar with it
2	M	9	HSA	Llw	33	4c due to references	-	skipped parts of assessment	4b - C 0/4, Y1 referral (correct) + other	4c - A 2/7 + 3/7	c-mami - B 3/7 + other	"we can miss a lot of children who are suffering from malnutrition because most of the time [...] we are only targeting those children that manage to eat" "it can assist us to capture more children"	-	Shorter; can use references when face challenges from checklist	-	Compares checklist colours to MUAC tape - tool easy to understand; tool will help "health workers to more about the nutrition status from the child"
3	F		Senior HSA	Llw	49	4c due to references	Not familiar with BMI; Discrepancy: current advice and tool; clinical assessment	Skipped WFL; mixed WFL and WFA; skipped large parts of anthro or made judgement without information; misclassification of mother's muac	4c-B 7/7	4b - C 2/4	c-mami - A 3/7 + 2	no difference if process of referral is the same	this one (4b) is difficult bec it has no references	likes references	Preferred this to 4b because it has many notes	-

4	M	10 + other job	HSA	Llw	42	4c due to references, hence simple	using checklist w/o training. Differences among HSAs: some get things very slow	Mixing WFL with WFH; normally dont do WFH for u6m; no wfa recorded despite no GMC being available	c-mami - c 3/4	4b - A 4/7 + 1	4c - b 4/7 + 1/7	"the difference is just that we follow this chart but in the past we only tell them continue bfeeding" ; advice is similar	-	very easy because when you find a problem it directs you to the advise	-	Emphasis on importance of training so that all HSAs understand
5	F	16	HSA	Llw	42	4b bec straightforward	-	Skipped WFL and others, reason: it fell in green category	c-mami - c 1/4 + referral to Y1	4c- B 1/7 + 3	4b - a 1/7	"sometimes because we don't use this we just work with our knowledge like this" "Yes there are things I could have added [when last time saw infant <6m]"	more straightforward and clearer than 4c; prefers layout in mum's BF assessment	-	"because it has so many pages so I was confused how to use it"	Skipped mothers assessment in #2; tool "helps to remind me what to do"
6	F	16	HSA	Llw	35	4b due to order of assessment	difficult to measure child's full status because used to referring	Asked what WFL is; skipped WFL; didnt look for oedema bec "below 6 we don't use oedema"	4B - b2/7	c-mami - a5/7	4c - c0/4 ; advised on hygiene + other	"in the past we just maybe talk about growth monitoring, maybe immunisation, without asking maybe the status of the child" "We just go for the <5yr children, they are there but we don't have idea to check the 6m below"	likes ABC order	-	-	Would like to know more about managing infants. "we don't know all the things in the past. We know just half of them"
7	M	17	HSA supervisor	Krg, C, PR	39	4c due to references	Differences among HSAs in understanding the tool; found first time difficult to use	Correctly classifies wfl	C-MAMI - A referral to Y1 (correct)	4b - C 3/4	4c - B 5/7 + 1	Tool goes deeper, helps identify causes of malnutrition; "asking a lot of question from different angle to another angle would be able to capture more, know more"	Average, scored 3 but preferred to whole tool	simpler to give advice and care	found it easy and quick but preferred checklists	Tool helps identify causes of malnutrition; "[oedema] is almost new because we are not doing with infant <6m.

8	M	5	MA	Krg, C, PR	29	4c due to references	-	WFL confused with WFH	4c - A 4/7 + 4	4b - C 2/4	cmami - b [n/a stopped bec difficult to follow]	"Only if I look at the problem that the mother present with but to go about all these measurements, looking at psycho part, and now that Ive seen this woman how can I help her socially, psychologically, all these things we are far from it"; helps find conditions woman hasnt presented	Checklists easier and faster decision	Easier bec where there is a problem there is a reference, refer to the booklet for action	difficult to follow; unpractical when seeing many patients	Atm u6m neglected, we focus on mn in older children
9	M	8 + other job	HSA+ TB officer	Krg, H, PB	41	4c due to references but no strong pref.	-	Skipped WFL	c-mami - c 1/4 + referral to Y1 + other	4c - b 7/7	4b - a 4/7 + 1/7	"We assess the infant only if he is over 6m [apart from] that we just assess the mother"; more children picked up with tool; "assist to assess the infant using this tool without missing anything"	similar to 4c	similar to 4b	gave grade 3	
10	F	18	MA	Krg, H, PB + other PR job	39	4b and 4c bec straight to the point	Difficult to use if not using often, not used to charts like this	Unfamiliar with WFZ	4b - a 4/7 + 1/7	4c - c 3/4 + other	cmami - b 2/3	"you can overlook a problem but if you have something it guides you and it helps that means we are not going to miss anything" "if we could have used this one, most of the information could have been given to the grandmother [instead of referral to hospital]"	similar to 4c	similar to 4b, easier than whole tool	complicated, difficult	Frequent use of tool will make it easier to use

11	M	9	HSA	Krg, H, PB	30	4b bec straightforward	HSAs have a lot of work already even though tool isn't long	Skipped WFL bec only do WFH	4c - A2/7 + 2/7 +1	4b - b2/7 + 1	cmami - c1/4	"It will be different in the sense that using checklist I will not refer the child I will just counsel her. That time I discovered I just referred her [...] So I think using this [...] will be easier" "find more women or children who are malnourished"; checklist includes more topics than current assessment	straightforward	thinks had some difficulties with 4c because of references		"The research has come at a time here in Malawi, this year there is hunger and [...] 50% of infants this year will be malnourished"; checklist should be in chichewa
12	M	35	HSA supervisor	Krg, H, PB	59	4c due to references	-	Confused WFL with WFH; incorrect classification of WFL, MUAC, BMI	4c - C -	cmami - B -	4b - a -	"we just look [if child is growing well or not]. But we don't have checklist."	checklist is better than whole tool	likes references and lamination - clear to read	clear	"a checklist that would be better. Because the moment we are using clist for 6m+ bec child <6m is not getting food supplement"
13	F	16	HSA	Krg, H, PB	(39)	4c	-	Skipped WFL, reason: forgot; skipped weight loss; misclassified mum's muac; doesnt weigh child bec 3 weeks old	4c - C 2/4	4b -a 2/7	cmami - B 0/7 + 1/7. correct referral to Y1	"We are supposed to ask [about BF] but [...] we do not always do that. But the nutrition assessment we always do. We ask but not in detail." "you capture everything rather than just asking what is problem" "I think problems of BF will be less since we will be counselling mothers on BF"	Checklist is easier than whole tool	Checklist is easier than whole tool	little bit difficult	-

14	M	13	CO	Krg, C, PR	39	C-MAMI bec simpler	At first may look long but not when get used to it	Skipped WFL	4b - A 1/7 + 2/7	4c - b 3/7 +1/7	c-mami - c 3/3	"the checklist helps you that you have forgotten"	"you can miss the counselling, the information you can give to the patient"; prefers whole tool	following references is easy	easy and simple to use	Tool useful, can be used by non-medical professionals. "Child can be easily assessed and referred"
15	M	4	CO	Krg, H, PB	25	4C due to references	Checklists difficult to use without training	Asked for WFL but not sure about it so skips; incorrect classification of WFL; found anthro assessment most difficult; unfamiliar with z-scores "-3"	4b - A5/7	c-mami - b3/3 + 1	4c - C3/4 + 1	"[without checklist] I might skip some important points" "Because if we don't use these things the one you think is severely malnourished mightly moderately malnourished. So if we use this chart it will be standard."	simple	simple and time-saving	detailed and easy to use but unpractical with many patients	"This [role play] is my wake up call that have to remember these points when assessing the kids"
16	M	2	MA	Krg, H, PB	28	4b due to order of assessment	-	Skipped WFL and recent weight loss	4c - a 3/7 + 1 (4/4)	c-mami - c 0/4 + 2/4	4b - b 4/7 + 1 (2/2)	"if we were to adopt this tool it would help us a lot in terms of assessment, identifying critical infants [...]. In the long run I think this will be very fine, so helpful"	prefers checklists; You know the content references are not needed	prefers checklists	difficult because has never come across it	Tool is comprehensive and will be helpful in identifying critical infants
17	M	9	MA	Krg, H, PB + other PR job	38	4c and c-mami	-	Skips large parts of nutr. Assessment; doesnt use WFL	4c - b 1/7	c-mami - A 1/3	4b - c 3/4 + 1/4	"using a checklist is more systematic bec you can also pick up problems that we miss in the routine approach" "[currently we] just look for the obvious ones but when looking at obvious ones we might miss htngs that are hidden"	leaves you "hanging in the air"	make a huge difference to be told where to go	-	likes checklists because they are "prolem focused and solution focused"; Infants now at risk of malnutrition due to erratic rains; tool "tackles a problem from a number of angles"

18	M	18	HSA	Krg, C, PR	42	c-mami bec its similar to other tools and less numbers	"is more technical it has got numbers less than, point than 0, scores, and the like, those are the things we haven't trained more on that so it ends up a bit difficult."	Incorrect classification of WFL; found numbers/z-scores difficult bec not much trained on them; currently WFH charts used but muac preferred	cmami - b 3/3 + 1	4c - c 0/4 + 1	4b - a 4/7	-	like it because it talks about an individual first and ends with that.	"Sometime s they are talking about the mother and the child and the milk so you may not know where you are and who you are targeting"	finds whole tool easier because has more text and less numbers	Previously received poor training on anthro measurements, consequently health workers are not strong in it; tool equips with knowledge for early problem solving
19	M	9	HSA	Krg, C, PR	33	4c due to references and whole tool due to bmi	-	Confused WFL with WFH; misclassification of WFL; skipped WFL although given, reason: supposed to do it but maybe bec of work load dont	4c - A 2/7 + 1/7	4b - b 1/7	cmami-c 0/3	"yeah there is a difference bec now we are not using checklist. we just using measurement like .. and we are just asking the mother"	checklists are simpler than whole tool; more difficult than 4c because no references	checklists are simpler; 4c simple because gives direction	very difficult but prefers to 4b because tool gives BMI classification	Colours are easy; simple tool to use because guides well
20	F	9	HSA	llw	36	4c	-	Correctly classifies wfl; ticks wfl without having asked for measurements	4b - c2/4 + advice	4c - b3/6	cmami - aY1	"assist us to identify more infants in our community"	compared to whole tool, checklists are easier to carry, easier to use for identification	compared to whole tool, checklists are easier to carry, easier to use for identification	-	-

21	M	7	MA	llw	31	4c due to references	z scores a "new concept" for most; some will experience tool as more work; "most health centres are not used to managing acute malnutrition in infants <6m"	Anthro: not sure what to put; unfamiliar with wfl and z-scores; classified wlf without information	4c - b 1/7 +1	4c - c 3/4 + 1	cmami - a	more work than to refer as currently do; "the idea of the clist could be good but it would take a bit of time to get use do to it. Because its like a new flow of how you'll be assessing the baby"; no difference in outcome of assessment but saves mum time and money bec treated locally	checklists easy, fast and practical	checklists easy, fast and practical	Good but not practical when seeing many patients; good for when one has ample time	"these are the same things that we do each and every day its just – the form is just new." "refer a mother and a baby to a central hospital is so expensive. So the new guidelines is quite good."
22	M	16	Clinician	llw	60	4c	Some health workers' attitude: think waste of time, no incentive to use tool	Asked what WFL is; incorrect BMI; skipped much of nutr. Assessment	4c - c 2/4	cmami - b -	4b - a 2/7	"some of these babys are malnourished. So they are not fully examined. So we are missing them." "Where you have been lost, you have to use these tools to have full information"	-	references make it easy	-	"these tools they are very very important"
23	F	8	paediatric consultant	CH, other	30	no favourite	health workers might find difficult WFL, dropping centiles and assessing structural abnormalities	Correct classification	cmami - a 3/4	4b - c 3/3	4c - b 3/7	-	checklists easier to use; prefers this for order	checklists easier to use; prefers this for references	cumbersome and long but is important as background doc to refer to when needed	tool is beneficial
24	F		nurse	CH, other		4c	Some lazy health workers wouldnt like tool		-	-	-	-	-	is much better	-	outpatient treatment important to avoid hospital referrals; early treatment crucial

PR - private

Llw = Lilongwe

Krg = Karonga

CH = central hospital

PB = public

H = rural hospital

C = health clinic

\*Measurements: non-exhaustive list; is a simplified summary. Results are from any 3 checklists or scenarios. E.g. "Skipped WFL" means respondent skipped WFL in at least one assessment

\*\*These are the management actions identified by respondents at the end of each role play. #1, #2 and #3 refer to the order of role play. First is indicated which tool was tested (4b/4c/cmami for the whole tool) and then the scenario (a/b/c). The numbers indicate the amount of support actions identified out of the total number of expected support actions for that case.

When whole C-MAMI tool was used respondents were asked to choose a colour to which they would refer and this is sometimes indicated in the framework to complement actions.

Where the whole assessment was not done, the total nr of support actions was reduced to cover the assessment that was done e.g. when using the whole C-mami tool normally only infant's assessment was done hence total nr of expected support actions were correspondingly adjusted to cover infant support actions only.

The meaning of entries are as follows:

+ x = additionally talked about x amount of a non-expected actions in the booklet

+ x/y = talked about another expected action but didn't point out. Not counted because testing usability of tool, not health workers' existing knowledge

x/y where x is the amount of support actions identified by interviewee and y is the total amount of expected support actions for that scenario

+ other = talking about something which isn't a separate support action in the booklet, e.g. hygiene

## Appendix 3: Checklists 1 and 2

### Checklist 1:

#### COMMUNITY MANAGEMENT OF UNCOMPLICATED ACUTE MALNUTRITION IN INFANTS <6 MONTHS (C-MAMI): CHECKLIST 1

How to use this checklist

1. Ask, Listen and Identify, Analyse - help you to assess an infant and mother's condition.

2. Colour codes - help you to classify the condition

Pink – urgently refer to inpatient treatment.

Yellow 1 – priority 1, enrol into C-MAMI outpatient care.

Green – reassurance and discharge with general advice only. Yellow 2 – priority 2, enrol into C-MAMI outpatient care, if resources allow.

If any aspect of assessment falls into a 'pink' zone in any category then the mother-infant dyad should be referred for further assessment/inpatient care even if other parts of the assessment are in 'yellow' or 'green' zones.

3. Manage - outlines appropriate action points with reference to the counselling and support booklet accompanying this checklist.

#### ASSESSMENT: INFANT (tick or circle where appropriate)

##### 1. Triage: Check for general clinical danger signs or signs of very severe disease (for infant only)

Ask, Listen	• As per existing IMCI assessment protocols	
Identify, Analyse	• Any IMCI danger signs	
Classify (tick where appropriate)	<b>Pink: Very severe disease</b> <input type="checkbox"/> Any general danger signs <input type="checkbox"/> Any signs of severe or very severe disease • NB. Be careful when assessing DEHYDRATION due to diarrhoea: some signs (e.g. dry mouth, dry eyes, sunken eyes, decreased skin turgor) can occur in severe wasting without dehydration. Focus more on history (vomiting/diarrhoea/not drinking/thirst); poor urine output (absent or very dark/concentrated urine); recent weight loss; fast/weak pulse	<b>Green: No immediate danger</b> <input type="checkbox"/> No general danger sign <input type="checkbox"/> No sign of severe or very severe disease
	<b>Manage</b> • Actions as per IMCI, with URGENT referral to inpatient care • Address any life-threatening problems. Only then continue to anthropometric assessment.	• Continue with below assessment

##### 2. Anthropometric/Nutritional Assessment

Ask	Is growth monitoring card available? <input type="checkbox"/> No, record weight for Age (W/A) <input type="checkbox"/> Yes, note the below: <input type="checkbox"/> Birth weight <input type="checkbox"/> Current growth centile <input type="checkbox"/> Growth trend if previous data available <input type="checkbox"/> Growth velocity and growth pattern (e.g. whether tracking along or falling across centile lines)			
Ask, Classify	<b>Pink:</b> Complicated severe acute malnutrition	<b>Yellow 1:</b> Uncomplicated severe acute malnutrition	<b>Yellow 2:</b> Uncomplicated moderate acute malnutrition	<b>Green:</b> Low nutritional risk
Weight-for-length z-score	<-3	<-3	>=-3 to <-2	>=-2
Recent weight loss	severe	moderate	-	none
Failure to gain weight	prolonged (weeks-months)	recent (days-weeks)	-	normal
Drop across growth chart centile lines	sharp	moderate	-	none
Oedema of both feet	yes	-	-	no
Failure to respond to previous outpatient-based nutritional care	yes	-	-	no
Look and feel	<input type="checkbox"/> Record Mid Upper Arm Circumference (MUAC) (for on-going and future studies). NOTE: clinical assessment for visible wasting should only be done where length is <45cm and WFL z-score cannot be calculated.			
Manage (circle completed actions)	<b>Pink:</b> • URGENT referral to inpatient care • Treat clinical complications as per IMCI/appropriate local guidelines • Parenteral antibiotics to treat possible sepsis • Specific inpatient nutritional support in parallel with other treatments (e.g. re-establishing effective exclusive breastfeeding using supplementary suckling)	<b>Yellow 1:</b> • C-MAMI outpatient enrolment: Priority 1 • Course of broad-spectrum oral antibiotic, such as amoxicillin • Detailed assessment of underlying cause(s) of malnutrition + tailored action to address these • Plot & appraise growth chart for monitoring progress	<b>Yellow 2:</b> If resources allow: • C-MAMI enrolment: Priority 2 • Detailed assessment of underlying cause(s) of malnutrition + tailored action to address these • Plot & appraise growth chart for monitoring progress If programme capacity limited • No enrolment for time being • General nutrition/feeding advice • Plot growth chart to aid review • Review in 1-2 weeks to check whether has got better or worse (in which case enrol/step-up)	<b>Green:</b> • No C-MAMI enrolment • Praise, reassure • General advice / counselling on: - general nutrition recommendations - routine healthcare services • Advise to return if worsens or develops new problems

##### 3. Clinical assessment

Identify, Analyse	Following identified:	Comments:
• Possible underlying clinical problems	HIV At risk <input type="checkbox"/> Tested, positive <input type="checkbox"/> Tested, negative <input type="checkbox"/>	
Manage	TB At risk <input type="checkbox"/> Tested, positive <input type="checkbox"/> Tested, negative <input type="checkbox"/>	
• Investigate and treat as per national / local guidelines	<input type="checkbox"/> Preterm <input type="checkbox"/> Low birth weight, _____ g	

4. Breastfeeding assessment

Is infant breastfed? \_\_\_ Yes, proceed with below examination

\_\_\_ No, refer to **Non-breastfeeding Assessment** at the end of this checklist, then continue below with **Assessment: Mother**

<b>Ask, Listen</b>	<ul style="list-style-type: none"> <li>Feeding history</li> <li>How often breastfed?</li> <li>Any problems or concerns?</li> <li>Other foods or drinks received?</li> </ul>	<b>Identify, Analyse</b>	<ul style="list-style-type: none"> <li>Structural abnormalities through physical examination (use clean or gloved finger to feel inside mouth for hidden cleft palate)</li> <li>Muscular abnormalities</li> <li>Breastfeeding based on observation</li> </ul>
<b>Classify</b>			
<b>Severe feeding problem/risk</b> ___ Structural abnormalities (e.g. cleft lip/palate, or more complex conditions affecting the face, jaw and mouth) ___ Abnormality of tone, posture and movement interfering with breastfeeding: ___ Unable to support head or trunk control ___ When held arms and legs fall to the sides ___ Infant's body stiff, hard to contain or move ___ Excessive jaw opening or jaw clenching ___ Not willing/able to suckle at the breast ___ Coughing and eye tearing (signs of unsafe swallowing) while breastfeeding	<b>Moderate feeding problem</b> ___ Not well attached to the breast ___ Not suckling effectively ___ Less than 8 breastfeeds in 24 hours ___ Receives other foods or drinks	<b>Mild/possible feeding problem</b> ___ Breastfeeding difficulties based on mother's breast conditions ___ Non-severe respiratory difficulties interfering with breastfeeding e.g. nasal congestion	<b>No feeding problem</b> ___ No feeding problem ___ No signs of inadequate feeding ___ Not acutely malnourished ___ No additional issues for mother-infant dyad
<b>Manage (circle completed actions)</b> Refer infant to highest category of colour, even if only meets one criterion in that category. Carry out additional support actions for any other problems identified.			
<b>Pink:</b> <ul style="list-style-type: none"> <li>URGENT referral to inpatient care</li> <li>Specialist referral for more detailed assessment and treatment of any structural problem</li> <li>Specialist referral for more detailed assessment and support for any disability</li> <li>Feeding support tailored to addressing main underlying problem (e.g. aim for re-establishment of effective exclusive breastfeeding wherever possible e.g. using supplementary suckling – see "Supplementary suckling support")</li> </ul>	<b>Yellow 1:</b> <ul style="list-style-type: none"> <li>C-MAMI enrolment: Priority 1</li> <li>Refer to 1<sup>st</sup> Line Breastfeeding Counselling and Support Actions</li> </ul>	<b>Yellow 2:</b> <ul style="list-style-type: none"> <li>If resources allow:                             <ul style="list-style-type: none"> <li>C-MAMI enrolment: Priority 2</li> <li>Breastfed infant: Refer to 2nd Line Breastfeeding Counselling and Support Actions</li> <li>Plot &amp; appraise growth chart for monitoring progress</li> </ul> </li> <li>If programme capacity limited:                             <ul style="list-style-type: none"> <li>No enrolment for now</li> <li>General nutrition/feeding advice</li> <li>Plot growth chart to aid review</li> <li>Review in 1-2 weeks to check whether has got better or worse (in which case enrol/step-up)</li> </ul> </li> </ul>	<b>Green:</b> <ul style="list-style-type: none"> <li>No C-MAMI enrolment</li> <li>Praise, support, reassure</li> <li>General advice / counselling on:                             <ul style="list-style-type: none"> <li>general IYCF / nutrition recommendations</li> <li>routine healthcare services e.g. vaccinations, growth monitoring</li> </ul> </li> <li>Advise to return if worsens or develops new problems</li> </ul>

**ASSESSMENT: MOTHER** (tick or circle where appropriate)

1. Breastfeeding assessment

<b>Ask, Listen</b>	Feeding history	<b>Identify, Analyse</b>	<ul style="list-style-type: none"> <li>Breastfeeding based on observation &amp; conversation</li> <li>Non-breastfeeding based on observation &amp; conversation</li> </ul>
<b>Classify</b>			
<b>Yellow 1:</b> <b>Mother: Breastfeeding mother meets ANY of the indications for support</b> ___ Re-lactating ___ Discharged from Supplementary Feeding Programme ___ Needs to express breastmilk and cup-feed ___ Breast conditions: engorgement; sore and cracked nipples; plugged ducts and mastitis; flat, inverted, large or long nipples; nipple pain; thrush ___ Perception of not having enough breastmilk ___ Other concerns: mother lacks confidence; concerns about her diet; working away from her infant <b>Mother: Non-breastfeeding mother meets ANY of the indications for support</b> ___ Concerns about meeting the nutritional needs of her infant ___ Working away from home ___ Delegating infant feeding and care to another			<b>Green:</b> ___ None of the aforementioned problems
<b>Act (Manage)</b> <ul style="list-style-type: none"> <li>Mother-infant dyad enrolled in C-MAMI</li> <li>Breastfed infant: analysis &amp; actions</li> <li>Refer to 2nd Line Breastfeeding Counselling and Support Actions</li> <li>Refer to Counselling and Support Actions for Mother</li> <li>Non-breastfed infant: analysis &amp; actions</li> <li>Refer to Appendix 1: Non-breastfeeding Counselling and Support Actions</li> </ul>			<b>Green:</b> <ul style="list-style-type: none"> <li>No C-MAMI enrolment</li> </ul>

2. Anthropometric/Nutritional Assessment (circle where appropriate)

<b>Identify, Analyse</b>	• Check for severe malnutrition in mother		
<b>Ask, Classify</b>	<b>Severe maternal malnutrition</b>	<b>Moderate maternal malnutrition</b>	<b>No immediate nutritional concern</b>
MUAC (always measure)	<180 mm	180 to <230 mm	>=230 mm
BMI (if possible)	<17	<18.5	>=18.5
Pitting oedema of both feet	yes	-	no
<b>Act (Manage)</b>	<ul style="list-style-type: none"> <li>• REFER mother-infant DYAD to inpatient facility</li> <li>• Nutrition support for mother</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to Counselling and Support Actions for Mother</li> <li>• Link between facility and community</li> <li>• Advise on:                             <ul style="list-style-type: none"> <li>- recommended nutrition practices</li> <li>- recommended health services</li> <li>- recommended care practices</li> <li>- WASH practices</li> <li>- Health education/information</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• General nutrition advice and support, as resources allow</li> </ul>

3. Clinical assessment

<b>Ask, Listen</b>	• Clinical problems in mother	
<b>Identify, Analyse</b>	• Birth history of presenting infant	
<b>Classify</b>		
<b>Yellow 1:</b> ___ Anaemia ___ Tested HIV positive ___ Tested TB positive ___ Twin delivery (presenting infant/children) ___ History of poor pregnancy outcomes (presenting infant low birth weight (LBW)) ___ Adolescent mother (under 19 years) of presenting infant	<b>Green:</b> ___ None of the aforementioned situations	
<b>Act (Manage)</b>		
<b>Yellow 1:</b> <ul style="list-style-type: none"> <li>• Mother-infant dyad enrolled in C-MAMI</li> <li>• Ensure mother is referred for or receiving appropriate treatment for underlying condition (e.g. antiretroviral drugs for HIV; iron supplementation for anaemia)</li> <li>• Emphasise importance of adherence to ART for mother's health and to reduce HIV transmission risk to infant</li> <li>• Refer to <b>2nd Line Breastfeeding Counselling and Support Actions</b></li> </ul>	<b>Green:</b> • No C-MAMI enrolment	

4. Depression/Anxiety

<b>Classify</b>		
<b>Pink:</b> Severe maternal depression/anxiety/distress	<b>Yellow 1:</b> Mother-infant dyad enrolled in C-MAMI	<b>Green:</b> No C-MAMI enrolment
<b>Mother:</b> ___ Mother traumatised, in emotional crisis, rejecting infant ___ Depressed (feels alone/no social support, unsatisfied, has little decision-making, has little power over life) ___ Gender based violence ___ Marital conflict	<b>Mother:</b> ___ Lack of care and social support	___ None of the aforementioned situations
<b>Manage (circle completed actions)</b>		
<ul style="list-style-type: none"> <li>• REFERRAL to facility to conduct clinical assessment: for example - WHO (Five) Well-Being Index</li> <li>• REFERRAL to facility for community support</li> </ul>	<ul style="list-style-type: none"> <li>• Mother-infant dyad enrolled in C-MAMI</li> <li>• Refer to Family and Community Counselling and Support Actions for Mother                             <ul style="list-style-type: none"> <li>- Support during pregnancy</li> <li>- Group support</li> <li>- Family support</li> <li>- Partner support</li> <li>- Community support</li> </ul> </li> </ul>	• No C-MAMI enrolment

**Non-breastfeeding Assessment**

<b>Ask, Listen</b>	<ul style="list-style-type: none"> <li>• Mother present? If not, where is she (death/illness/other)?</li> <li>• Feeding history</li> <li>• Not breastfed: Ever breastfed? When did they stop and why? Feeding utensils (bottle/cup)? Potential for wet nursing?</li> <li>• Other feeds: infant receives any water, other liquids or milk? When started? Infant receives any solid or semi-solid foods? When started?</li> </ul>	<b>Identify, Analyse</b>	<ul style="list-style-type: none"> <li>• Structural abnormalities through physical examination (use clean or gloved finger to feel inside mouth for hidden cleft palate)</li> <li>• Muscular abnormalities</li> <li>• Non-breastfeeding based on observation</li> </ul>	<b>Feeding Assessment</b>	Artificial feeding/non-breastmilk feeding/other foods or liquids/wet nurse potential <ul style="list-style-type: none"> <li>• Availability of wet nurse in family/community</li> <li>• Type and quantity of breast milk substitute (BMS) used</li> <li>• Safe preparation of BMS (dilution, hygiene)</li> <li>• Feeding method</li> </ul>
<b>Classify</b>					
<b>Severe feeding problem/risk</b>		<b>Moderate feeding problem</b>		<b>Mild/possible feeding problem</b>	
<ul style="list-style-type: none"> <li>___ Structural abnormalities (e.g. cleft lip/palate, or more complex conditions affecting the face, jaw and mouth)</li> <li>___ Abnormality of tone, posture and movement interfering with breastfeeding:</li> <li>___ Unable to support head or trunk control</li> <li>___ When held arms and legs fall to the sides</li> <li>___ Infant's body stiff, hard to contain or move</li> <li>___ Excessive jaw opening or jaw clenching</li> <li>___ Not willing/able to feed by cup or bottle</li> <li>___ Coughing and eye tearing (signs of unsafe swallowing) while feeding</li> </ul>		<ul style="list-style-type: none"> <li>___ Inappropriate BMS being used</li> <li>___ Consuming less than 500ml of BMS per 24 hours</li> <li>___ Refusing feeds</li> <li>___ Receives other foods or drinks in addition to BMS</li> <li>___ Mother absent</li> </ul>		<ul style="list-style-type: none"> <li>___ Non-severe respiratory difficulties interfering with feeding e.g. nasal congestion</li> </ul>	
<b>No feeding problem</b> <ul style="list-style-type: none"> <li>___ No feeding problem</li> <li>• No signs of inadequate feeding</li> <li>• Not acutely malnourished</li> <li>• No additional issues for mother-infant dyad</li> </ul>					
<b>Manage (circle completed actions)</b> Refer infant to highest category of colour, even if only meets one criterion in that category. Carry out additional support actions for any other problems identified.					
<b>Pink:</b>		<b>Yellow 1:</b>		<b>Yellow 2:</b>	
<ul style="list-style-type: none"> <li>• URGENT referral to inpatient care</li> <li>• Specialist referral for more detailed assessment and treatment of any structural problem</li> <li>• Specialist referral for more detailed assessment and support for any disability</li> <li>• BMS or infant formula used as part of the treatment plan, depending on the protocol in place</li> <li>• Feeding support tailored to addressing main underlying problem</li> </ul>		<ul style="list-style-type: none"> <li>• C-MAMI enrolment: Priority 1</li> <li>• Refer to Appendix 1: Non-breastfeeding Counselling and Support Actions</li> </ul>		If resources allow: <ul style="list-style-type: none"> <li>• C-MAMI enrolment: Priority 2</li> <li>• Refer to Appendix 1: Non-breastfeeding Counselling and Support Actions</li> <li>• Plot &amp; appraise growth chart for monitoring progress</li> </ul> If programme capacity limited: <ul style="list-style-type: none"> <li>• No enrolment for now</li> <li>• General nutrition/feeding advice</li> <li>• Plot growth chart to aid review</li> <li>• Review in 1-2 weeks to check whether has got better or worse (in which case enrol/step-up)</li> </ul>	
<b>Green:</b>					
<ul style="list-style-type: none"> <li>• No C-MAMI enrolment</li> <li>• Praise, support, reassure</li> <li>• General advice / counselling on:               <ul style="list-style-type: none"> <li>• general IYCF / nutrition recommendations</li> <li>• routine healthcare services e.g. vaccinations, growth monitoring</li> <li>• Advise to return if worsens or develops new problems</li> </ul> </li> </ul>					

**The following MAMI counselling and support actions were given**

- 1. 1st Line Breastfeeding Counselling and Support Actions**
  - 1.1 Good attachment
  - 1.2 Effective suckling
  - 1.3 Frequency of breastfeeds
  - 1.4 Receives other liquids or foods
- 2. 2nd Line Breastfeeding Counselling and Support Actions**
  - 2.1 Breastmilk expression, cup feeding and storage of breastmilk
  - 2.2 Breast problems      2.3 "Not enough" breastmilk
  - 2.4 Relactation            2.5 Low weight infant
  - 2.6 Other breastfeeding related concerns:
    - A. Persistent nipple pain: maternal nipple thrush
    - B. Mother lacks confidence to breastfeed
    - C. Mother expresses concerns about diet
    - D. Mother expresses concerns about working or being away from her infant and her ability to breastfeed her infant
    - E. Twin delivery
    - F. Adolescent mother
    - G. Mother with severe anaemia or signs of anaemia
    - H. Mother tested positive for tuberculosis
    - I. Mother tested positive for HIV
  - 2.7 Keeping low weight infant warm at home

- 3. Counselling and Support Actions for Mother**
  - 3.1 Nutrition                      3.4 WASH
  - 3.2 Health Services            3.5 Health Education/Information and social support
  - 3.3 Care
- 4. Supplementary Suckling Support**  
Information for the Community Worker to help explain to the mother of a *complicated* case the process she may experience when admitted to a facility for inpatient treatment
- 5. Family and Community Counselling and Support Actions for Mother**
  - 5.1 Informal Support      5.2 Groups support (or organised support)
  - 5.3 Family support      5.4 Partner support
  - 5.5 Community support

**Appendix 1: Non-breastfeeding Counselling and Support Actions**

1. Mother Absent
2. Use infant formula as breastmilk substitute (BMS)
3. Preparing infant formula
4. Cup-feeding



## Checklist 2:

### COMMUNITY MANAGEMENT OF UNCOMPLICATED ACUTE MALNUTRITION IN INFANTS <6 MONTHS (C-MAMI): CHECKLIST 2

#### How to use this checklist

1. **Ask, Listen and Identify, Analyse** - help you to assess an infant and mother's condition.

2. **Colour codes** - help you to classify and manage the condition

**Pink** - urgently refer to inpatient treatment. **Yellow 1** - priority 1, enrol into C-MAMI outpatient care.

**Green** - Reassurance and discharge with general advice only. **Yellow 2** - priority 2, enrol into C-MAMI outpatient care if resources allow.

If any aspect of assessment falls into a 'pink' zone in any category then the mother-infant dyad should be referred for further assessment/inpatient care even if other parts of the assessment are in 'yellow' or 'green' zones. Always refer the mother-infant dyad to the highest category of colour, even if they only meet one criterion in that category.

3. **References** ("See...") - The checklist contains references to appropriate counselling and support actions for identified problems. These support actions can be found in the counselling and support booklet accompanying this checklist. Other relevant support actions may be carried out in addition to those referred to: e.g. 1<sup>st</sup> line breastfeeding contains general useful advice and reminders for all mothers.

It is recommended to go through entire checklist first and then come back to carry out support actions for each identified condition.

#### ASSESSMENT: INFANT

1. Triage (circle where appropriate)	Pink	Yellow 1	Yellow 2	Green
Any general danger signs?	Yes	-	-	No
Any signs of severe or very severe disease?	Yes	-	-	No

Only continue to anthropometric assessment once any life-threatening problems have been addressed.

2. Anthropometric/ Nutritional Assessment	Complicated severe acute malnutrition	Uncomplicated severe acute malnutrition	Uncomplicated moderate acute malnutrition	Low risk
Weight-for-length z-score	<-3	<-3	>= -3 to <-2	>=-2
Recent weight loss	severe	moderate	-	none
Failure to gain weight	prolonged (weeks-months)	recent (days-weeks)	-	normal
Drop across growth chart centile lines	sharp	moderate	-	none
Oedema of both feet	yes	-	-	no
Failure to respond to previous outpatient-based nutritional care	yes	-	-	no

#### 3. Clinical assessment

Identify, Analyse	Following identified:	Comments:
<ul style="list-style-type: none"> <li>Possible underlying clinical problems</li> </ul>	HIV At risk ___ Tested, positive ___ Tested, negative ___	
<ul style="list-style-type: none"> <li>Manage</li> </ul>	TB At risk ___ Tested, positive ___ Tested, negative ___	
<ul style="list-style-type: none"> <li>Investigate and treat as per national / local guidelines</li> </ul>	___ Preterm ___ Low birth weight, _____ g (See 2.7 Keeping LBW Infant Warm at Home)	

#### 4. Breastfeeding assessment (tick where appropriate)

Is infant \_\_\_ Yes, proceed with below examination

breastfed? \_\_\_ No, refer to Non-breastfeeding Assessment at the end of this checklist, then continue below with Assessment: Mother

Ask, Listen	Identify, Analyse	Pink: Severe feeding problem/risk	Yellow 1: Moderate feeding problem	Yellow 2: Mild/possible feeding problem	Green: No feeding problem
Feeding history:	<ul style="list-style-type: none"> <li>Structural &amp; muscular abnormalities</li> </ul>	<ul style="list-style-type: none"> <li>Structural abnormalities (e.g. cleft lip/palate, or more complex conditions affecting the face, jaw and mouth)</li> </ul>	<ul style="list-style-type: none"> <li>Not well attached to the breast (See 1.1 Good Attachment)</li> </ul>	<ul style="list-style-type: none"> <li>Breastfeeding difficulties based on mother's breast conditions (See 2.2 Breast problems; 2.1 Breastmilk expression, cup feeding and storage of breastmilk)</li> </ul>	<ul style="list-style-type: none"> <li>No feeding problem</li> </ul>
How often breastfed?	<ul style="list-style-type: none"> <li>Breastfeeding based on observation</li> </ul>	<ul style="list-style-type: none"> <li>Abnormality of tone, posture and movement interfering with breastfeeding</li> <li>Unable to support head or trunk control</li> </ul>	<ul style="list-style-type: none"> <li>Not suckling effectively (See 1.2 Effective Suckling)</li> </ul>	<ul style="list-style-type: none"> <li>Non-severe respiratory difficulties interfering with breastfeeding e.g. nasal congestion (See 2.1 Breastmilk expression, cup feeding and storage of breastmilk)</li> </ul>	<ul style="list-style-type: none"> <li>No signs of inadequate feeding</li> </ul>
Any problems or concerns?		<ul style="list-style-type: none"> <li>When held, infant's arms and legs fall to the sides</li> <li>Infant's body stiff, hard to contain or move</li> </ul>	<ul style="list-style-type: none"> <li>Less than 8 breastfeeds in 24 hours (See 1.3 Frequency of breastfeeds)</li> </ul>		<ul style="list-style-type: none"> <li>Not acutely malnourished</li> </ul>
Other foods or drinks received?		<ul style="list-style-type: none"> <li>Excessive jaw opening or jaw clenching</li> <li>Not willing/able to suckle at the breast</li> <li>Coughing and eye tearing (signs of unsafe swallowing) while breastfeeding</li> </ul>	<ul style="list-style-type: none"> <li>Receives other foods or drinks (See 1.4 Receives other liquids or foods)</li> </ul>		<ul style="list-style-type: none"> <li>No additional issues for mother-infant dyad</li> </ul>

Refer the mother-infant dyad to the highest category of colour, even if they only meet one criterion in that category.

**ASSESSMENT: MOTHER (tick where appropriate)**

**1. Breastfeeding assessment**

Ask, Listen	Identify, Analyse	Yellow 1: Mother-infant dyad enrolled in C-MAMI if meets ANY of the indications for support
Feeding history based on observation & conversation	<ul style="list-style-type: none"> <li>Breastfeeding based on observation &amp; conversation</li> <li>Non-breastfeeding based on observation &amp; conversation</li> </ul>	<p><b>Breastfeeding mother</b></p> <ul style="list-style-type: none"> <li>Re-lactating (See 2.4 Relactation)</li> <li>Discharged from Supplementary Feeding Programme (See 3 Counselling and Support Actions for Mother)</li> <li>Needs to express breast milk and cup-feed (See 2.4 Breastmilk expression, cup feeding and storage)</li> <li>Breast conditions: engorgement; sore and cracked nipples; plugged ducts and mastitis; flat, inverted, large or long nipples; nipple pain; thrush (See 2.2. Breast problems; 2.6 A Persistent nipple pain: maternal nipple thrush)</li> <li>Perception of not having enough breastmilk (See 2.3 "Not enough" breastmilk)</li> <li>Other concerns: mother lacks confidence; concerns about her diet; working away from her infant (See 2.6 Other breastfeeding problems)</li> </ul> <p><b>Non-breastfeeding mother (See Appendix 1: Non-breastfeeding Counselling and Support Actions)</b></p> <ul style="list-style-type: none"> <li>Concerns about meeting the nutritional needs of her infant</li> <li>Working away from home</li> <li>Delegating infant feeding and care to another</li> </ul>

**2. Anthropometric/ Nutritional Assessment**

	Pink: Severe maternal malnutrition	Yellow 1: Moderate maternal malnutrition	Green: No immediate nutritional concern
MUAC	<180 mm	180 to <230 mm	>=230 mm
BMI	<17	<18.5	>=18.5
Pitting oedema of both feet	Yes	-	no

**3. Clinical assessment**

Ask, Listen	Identify, Analyse	Yellow 1: Mother-infant dyad enrolled in C-MAMI
<ul style="list-style-type: none"> <li>Clinical problems in mother</li> <li>Birth history of presenting infant</li> </ul>		<ul style="list-style-type: none"> <li>Anaemia (See 2.6 G. Mother with severe anaemia or signs of anaemia)</li> <li>Tested HIV positive (See 2.6 I. Mother tested positive for HIV)</li> <li>Tested TB positive (See 2.6 H. Mother tested positive for TB)</li> <li>Twin delivery (presenting infant/children) (See 2.6 E. Twin delivery)</li> <li>History of poor pregnancy outcomes (presenting infant low birth weight (LBW))</li> <li>Adolescent mother (under 19 years) of presenting infant (See 2.6 F. Adolescent mother)</li> </ul>

**4. Depression/Anxiety**

Severe maternal depression/anxiety/distress	Mother-infant dyad enrolled in C-MAMI
<p><b>Mother:</b></p> <ul style="list-style-type: none"> <li>Mother traumatised, in emotional crisis, rejecting infant</li> <li>Depressed (feels alone/no social support, unsatisfied, has little decision-making, has little power over life)</li> <li>Gender based violence</li> <li>Marital conflict</li> </ul>	<p><b>Mother:</b></p> <ul style="list-style-type: none"> <li>Lack of care and social support (Discuss with mother and family members possible steps suggested in Family and Community Counselling and Support Actions for Mother)</li> </ul>

**Non-breastfeeding Assessment**

Ask, Listen	Identify, Analyse	Feeding Assessment	Severe feeding problem/risk	Moderate feeding problem	Mild/possible feeding problem	No feeding problem
<ul style="list-style-type: none"> <li>Mother present? If not, where is she?</li> <li>Feeding history - Not breastfed? Ever breastfed? When did they stop and why? Feeding utensils? Potential for wet nursing? - Other liquids, solid or semi-solid foods received? When started?</li> </ul>	<ul style="list-style-type: none"> <li>Structural &amp; muscular abnormalities</li> <li>Non-breastfeeding based on observation</li> </ul>	<ul style="list-style-type: none"> <li>Availability of wet nurse in family/community</li> <li>Type and quantity of breast milk substitute (BMS) used</li> <li>Safe preparation of BMS?</li> <li>Feeding method</li> </ul>	<ul style="list-style-type: none"> <li>Structural abnormalities (e.g. cleft lip/palate, or more complex conditions affecting the face, jaw and mouth)</li> <li>Abnormality of tone, posture and movement interfering with breastfeeding:                             <ul style="list-style-type: none"> <li>Unable to support head or trunk control</li> <li>When held arms and legs fall to the sides</li> <li>Infant's body stiff, hard to contain or move</li> <li>Excessive jaw opening or jaw clenching</li> <li>Not willing/able to feed by cup or bottle</li> <li>Coughing and eye tearing (signs of unsafe swallowing) while feeding</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Inappropriate BMS being used</li> <li>Consuming less than 500 ml of BMS per 24 hours</li> <li>Refusing feeds</li> <li>Receives other foods or drinks in addition to BMS</li> <li>Mother absent</li> </ul> <p>(See Appendix 1: Non-breastfeeding Counselling and Support Actions)</p>	<ul style="list-style-type: none"> <li>Non-severe respiratory difficulties interfering with feeding e.g. nasal congestion</li> </ul> <p>(See Appendix 1: Non-breastfeeding Counselling and Support Actions)</p>	<ul style="list-style-type: none"> <li>No feeding problem</li> <li>No signs of inadequate feeding</li> <li>Not acutely mal-nourished</li> <li>No additional issues for mother-infant dyad</li> </ul>

## Appendix 4: Checklist 4b.1 (piloted)

### COMMUNITY MANAGEMENT OF ACUTE MALNUTRITION IN INFANTS <6 MONTHS (C-MAMI): CHECKLIST 4b.1

#### I ASSESSMENT: INFANT

Ensure the child has been assessed for IMCI danger signs and that any life-threatening problems have been addressed (see

#### 1. Anthropometric/Nutritional Assessment (tick where appropriate)

Growth monitoring card?	<input type="checkbox"/> Not available, record weight for age				
	<input type="checkbox"/> Yes				
CLASSIFY	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent	ACTION
Weight-for-length	-	<input type="checkbox"/> <-3	<input type="checkbox"/> >= -3 to <-2	<input type="checkbox"/> >=-2	
Recent weight loss	<input type="checkbox"/> severe	<input type="checkbox"/> moderate	-	<input type="checkbox"/> none	
No weight gain	<input type="checkbox"/> prolonged (weeks-months)	<input type="checkbox"/> recent (days-weeks)		<input type="checkbox"/> normal	
Dropping centiles on growth chart	<input type="checkbox"/> sharp	<input type="checkbox"/> moderate		<input type="checkbox"/> none	
Oedema	<input type="checkbox"/> yes	-		<input type="checkbox"/> no	
Non-responder	<input type="checkbox"/> yes			<input type="checkbox"/> no	
MEASURE	Record Mid Upper Arm Circumference (MUAC) (for on-going and future studies)				

#### 2. Breastfeeding assessment (tick any that apply)

Is infant breastfed?	<input type="checkbox"/> Yes, proceed with below examination				
	<input type="checkbox"/> No, refer to <b>Non-breastfeeding Assessment</b> , then continue with <b>II Assessment: Mother</b>				
ASK/LISTEN	Feeding history: How often breastfed? Any problems or concerns? Gets other foods or drinks?				
IDENTIFY/ANALYSE	Structural & muscular abnormalities; Breastfeeding based on observation				
CLASSIFY	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent	ACTION
	<input type="checkbox"/> Structural problem (e.g. cleft lip/palate)	<input type="checkbox"/> Not well attached (If unsure, see 1.1)	<input type="checkbox"/> Mother has a breast condition	<input type="checkbox"/> No feeding problem	
	<input type="checkbox"/> Abnormal tone/posture/ movement (e.g. arms/legs/neck too stiff or too floppy)	<input type="checkbox"/> Not suckling well		<input type="checkbox"/> Not acutely malnourished	
	<input type="checkbox"/> Excessive jaw opening or jaw clenching	<input type="checkbox"/> <8 breastfeeds in 24 hours	<input type="checkbox"/> Respiratory difficulties e.g. nasal congestion	<input type="checkbox"/> No other issues	
	<input type="checkbox"/> Not willing/able to suckle	<input type="checkbox"/> Gets other foods or drinks			
	<input type="checkbox"/> Coughing / choking while BF				

#### 3. Clinical assessment (tick any that apply)

IDENTIFY/ANALYSE	Possible underlying clinical problems				
CLASSIFY	<input type="checkbox"/> HIV	<input type="checkbox"/> TB	<input type="checkbox"/> Preterm	<input type="checkbox"/> LBW	
	<input type="checkbox"/> Any other concerns, what?				

#### II ASSESSMENT: MOTHER

#### 1. Anthropometric/nutritional assessment (tick where appropriate)

CLASSIFY	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent	ACTION
MUAC	<input type="checkbox"/> <180 mm	<input type="checkbox"/> 180 to <230 mm	-	<input type="checkbox"/> >=230mm	
BMI	<input type="checkbox"/> <17	<input type="checkbox"/> 17 to <18.5		<input type="checkbox"/> >=18.5	
Oedema	<input type="checkbox"/> yes	-		<input type="checkbox"/> no	

**2. Breastfeeding and Feeding assessment** (tick  any that apply)

<b>ASK/LISTEN</b>	Feeding history	
<b>IDENTIFY/ANALYSE</b>	Breastfeeding and non-breastfeeding based on observation & conversation	
<b>CLASSIFY</b>	<b>Yellow 1: Mother-infant dyad enrolled in C-MAMI if meets ANY condition</b>	
	<b>Breastfeeding mother</b>	
	<input type="checkbox"/> Re-lactating	
	<input type="checkbox"/> Discharged from Supplementary Feeding Programme	
	<input type="checkbox"/> Needs to express breastmilk and cup-feed	
	<input type="checkbox"/> Breast conditions e.g. engorgement; mastitis; nipples sore/cracked/large/flat;	
	<input type="checkbox"/> Perception of not having enough breastmilk	
	<input type="checkbox"/> Other concerns: mother unconfident; concerns about her diet; working away from	
	<b>Non-breastfeeding mother</b>	
	<input type="checkbox"/> Concerns about meeting the nutritional needs of her infant	
	<input type="checkbox"/> Working away from home	
	<input type="checkbox"/> Delegating infant feeding and care to another	

**3. Clinical assessment** (tick  any that apply)

<b>IDENTIFY/ANALYSE</b>	Clinical problems in mother; Birth history of presenting infant	
<b>CLASSIFY</b>	<b>Yellow 1: Mother-infant dyad enrolled in C-MAMI</b>	
	<input type="checkbox"/> HIV	<input type="checkbox"/> TB
	<input type="checkbox"/> History of poor pregnancy outcomes	<input type="checkbox"/> Adolescent mother (under 19 yr)

**4. Depression/Anxiety** (tick  any that apply)

<b>CLASSIFY</b>	<b>Pink Severe problem</b>	<b>Yellow 1 Moderate Problem</b>	<b>Yellow 2 Some problem</b>	<b>Green Not urgent</b>
	<input type="checkbox"/> Traumatized, rejects infant	<input type="checkbox"/> Lack of care and social support	-	-
	<input type="checkbox"/> Depressed (e.g. feels alone)			
	<input type="checkbox"/> Gender based violence			
	<input type="checkbox"/> Marital conflict			

**Non-breastfeeding Assessment** (tick  any that apply)

<b>ASK/LISTEN</b>	Mother present? Feeding history: When & why stopped BF? Feeding utensils? Gets other foods or			
<b>IDENTIFY/ANALYSE</b>	Structural & muscular abnormalities; Non-breastfeeding based on observation			
<b>FEEDING</b>	Wet nurse available? Type and quantity of BMS used? BMS safely prepared?			
<b>CLASSIFY</b>	<b>Pink Severe problem</b>	<b>Yellow 1 Moderate Problem</b>	<b>Yellow 2 Some problem</b>	<b>Green Not urgent</b>
	<input type="checkbox"/> Structural problem (e.g. cleft lip/palate)	<input type="checkbox"/> Inappropriate BMS	<input type="checkbox"/> Respiratory difficulties e.g. nasal congestion	<input type="checkbox"/> No feeding problem
	<input type="checkbox"/> Abnormal tone/posture/ movement (e.g. arms/legs/neck too stiff or too floppy)			
	<input type="checkbox"/> Excessive jaw opening or jaw clenching	<input type="checkbox"/> Refusing feeds		<input type="checkbox"/> No other issues
	<input type="checkbox"/> Not willing/able to feed by cup or bottle	<input type="checkbox"/> Gets other foods or drinks		
	<input type="checkbox"/> Coughing / choking while feeding	<input type="checkbox"/> Mother absent		

**ASK/LISTEN** Are there any other concerns (about the infant, carer, home/social environment) that need further review?

--

## Appendix 5: Checklist 4c (piloted)

### COMMUNITY MANAGEMENT OF ACUTE MALNUTRITION IN INFANTS <6 MONTHS (C-MAMI): CHECKLIST 4c

#### I ASSESSMENT: INFANT

Ensure the child has been assessed for IMCI danger signs and that any life-threatening problems have been addressed (see IMCI)

#### 1. Anthropometric/Nutritional Assessment (tick where appropriate)

Growth monitoring card?	<input type="checkbox"/> Not available, record weight for age				
	<input type="checkbox"/> Yes				
CLASSIFY	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent	ACTION
Weight-for-length	-	<input type="checkbox"/> <-3	<input type="checkbox"/> >= -3 to <-2	<input type="checkbox"/> >= -2	
Recent weight loss	<input type="checkbox"/> severe	<input type="checkbox"/> moderate	-	<input type="checkbox"/> none	
No weight gain	<input type="checkbox"/> prolonged (weeks-months)	<input type="checkbox"/> recent (days-weeks)	-	<input type="checkbox"/> normal	
Dropping centiles on growth chart	<input type="checkbox"/> sharp	<input type="checkbox"/> moderate	-	<input type="checkbox"/> none	
Oedema	<input type="checkbox"/> yes	-	-	<input type="checkbox"/> no	
Non-responder	<input type="checkbox"/> yes	-	-	<input type="checkbox"/> no	
MEASURE	Record Mid Upper Arm Circumference (MUAC) (for on-going and future studies)				

#### 2. Clinical assessment (tick any that apply)

IDENTIFY/ANALYSE	Possible underlying clinical problems				
CLASSIFY	<input type="checkbox"/> HIV	<input type="checkbox"/> TB	<input type="checkbox"/> Preterm	<input type="checkbox"/> LBW	

#### 3. Breastfeeding assessment

Is infant breastfed?	<input type="checkbox"/> Yes, proceed with below examination				
	<input type="checkbox"/> No, refer to <b>Non-breastfeeding Assessment</b> , then continue with <b>II Assessment: Mother</b>				
ASK/LISTEN	Feeding history: How often breastfed? Any problems or concerns? Gets other foods or drinks?				
IDENTIFY/ANALYSE	Structural & muscular abnormalities; Breastfeeding based on observation				
CLASSIFY (tick <input checked="" type="checkbox"/> any that apply)	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent	ACTION
	<input type="checkbox"/> Structural problem (e.g. cleft lip/palate)	<input type="checkbox"/> Not well attached (See 1.1) Well attached:	<input type="checkbox"/> Mother has a breast condition (See 2.2 for specific condition and support; 2.1)	<input type="checkbox"/> No feeding problem	
	<input type="checkbox"/> Abnormal tone/posture/ movement (e.g. arms/legs/neck too stiff or too floppy)	1. Mouth wide open 2. Lower lip turned out 3. Chin touching breast 4. Areola visible above		<input type="checkbox"/> Not acutely malnourished	
	<input type="checkbox"/> Excessive jaw opening or jaw	<input type="checkbox"/> Not suckling well (See 1.2)	<input type="checkbox"/> Respiratory difficulties e.g. nasal congestion (See 2.1)	<input type="checkbox"/> No other issues	
	<input type="checkbox"/> Not willing/able to suckle	<input type="checkbox"/> <8 breastfeeds in 24 hours (See 1.3)			
	<input type="checkbox"/> Coughing / choking while BF	<input type="checkbox"/> Gets other foods or drinks (See 1.4)			

#### II ASSESSMENT: MOTHER

#### 1. Feeding assessment

ASK/LISTEN	Feeding history				
IDENTIFY/ANALYSE	Breastfeeding and non-breastfeeding based on observation & conversation				
CLASSIFY (tick <input checked="" type="checkbox"/> any that apply)	-	Yellow 1: Enrol in C-MAMI if meets ANY condition			ACTION
	-	<b>Breastfeeding mother</b>			
		<input type="checkbox"/> Re-lactating (See 2.4)			
		<input type="checkbox"/> Discharged from Supplementary Feeding Programme (See 3)			
		<input type="checkbox"/> Needs to express breastmilk and cup-feed (See 2.4)			
		<input type="checkbox"/> Breast conditions e.g. engorgement; mastitis; nipples sore/cracked/large/flat; thrush (See 2.2. and 2.6 A)			
		<input type="checkbox"/> Perception of not having enough breastmilk (See 2.3)			
		<input type="checkbox"/> Other concerns: mother lacks confidence; concerns about her diet; working away from infant (See 2.6)			

	-	<b>Non-breastfeeding mother (See Non-breastfeeding Assessment and Support Actions)</b>
	-	<input type="checkbox"/> Concerns about meeting the nutritional needs of her infant
	-	<input type="checkbox"/> Working away from home
	-	<input type="checkbox"/> Delegating infant feeding and care to another

**2. Anthropometric/nutritional assessment** (tick  where appropriate)

CLASSIFY	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent
MUAC	<input type="checkbox"/> <180 mm	<input type="checkbox"/> 180 to <230 mm	-	<input type="checkbox"/> >=230mm
BMI	<input type="checkbox"/> <17	<input type="checkbox"/> 17 to <18.5	-	<input type="checkbox"/> >=18.5
Oedema	<input type="checkbox"/> yes	-	-	<input type="checkbox"/> no

**3. Clinical assessment** (tick  any that apply)

<b>IDENTIFY/ANALYSE</b>	Clinical problems in mother; Birth history of presenting infant		
<b>CLASSIFY</b>	-	<b>Yellow 1: Mother-infant dyad enrolled in C-MAMI</b>	
	-	<input type="checkbox"/> Anaemia (See 2.6 G)	<input type="checkbox"/> Twins (See 2.6 E)
	-	<input type="checkbox"/> History of poor pregnancy outcomes	<input type="checkbox"/> TB (See 2.6 H)
	-	<input type="checkbox"/> Adolescent mother (under 19 yrs) (See 2.6 F)	<input type="checkbox"/> HIV (See 2.6 I)

**4. Depression/Anxiety** (tick  any that apply)

CLASSIFY	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent
	<input type="checkbox"/> Traumatized, rejects infant	<input type="checkbox"/> Lack of care and social support (See 5.)	-	-
	<input type="checkbox"/> Depressed (e.g. feels alone)			
	<input type="checkbox"/> violence			
	<input type="checkbox"/> Marital conflict			

**Non-breastfeeding Assessment**

**ASK/LISTEN** Mother present? Feeding history: When & why stopped BF? Feeding utensils? Gets other foods or drinks?

**IDENTIFY/ANALYSE** Structural & muscular abnormalities; Non-breastfeeding based on observation

**FEEDING** Wet nurse available? Type and quantity of BMS used? BMS safely prepared?

CLASSIFY (tick <input checked="" type="checkbox"/> any that apply)	Pink Severe problem	Yellow 1 Moderate Problem	Yellow 2 Some problem	Green Not urgent
	<input type="checkbox"/> Structural problem (e.g. cleft lip/palate)	<input type="checkbox"/> Inappropriate BMS	<input type="checkbox"/> Respiratory difficulties e.g. nasal congestion	<input type="checkbox"/> No feeding problem
	<input type="checkbox"/> Abnormal tone/posture/ movement (e.g. arms/legs/neck too stiff or too floppy)	<input type="checkbox"/> Consuming less than 500ml of BMS per 24 hours		<input type="checkbox"/> Not acutely malnourished
	<input type="checkbox"/> Excessive jaw opening or jaw	<input type="checkbox"/> Refusing feeds		<input type="checkbox"/> No other issues
	<input type="checkbox"/> Not willing/able to feed by cup or bottle	<input type="checkbox"/> Gets other foods or drinks		
	<input type="checkbox"/> Coughing / choking while feeding	<input type="checkbox"/> Mother absent (All: See Appendix 1)		

**ASK/LISTEN** Are there any other concerns (about the infant, carer, home/social environment) that need further review?

--

## Appendix 6: Consolidated criteria for reporting qualitative studies (COREQ) checklist

Source: Tong A, Sainsbury P, Craig J. 2007.(39)

**Table 1** Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description
<b>Domain 1: Research team and reflexivity</b>		
Personal Characteristics		
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group?
2.	Credentials	What were the researcher's credentials? <i>E.g. PhD, MD</i>
3.	Occupation	What was their occupation at the time of the study?
4.	Gender	Was the researcher male or female?
5.	Experience and training	What experience or training did the researcher have?
Relationship with participants		
6.	Relationship established	Was a relationship established prior to study commencement?
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? <i>e.g. personal goals, reasons for doing the research</i>
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? <i>e.g. Bias, assumptions, reasons and interests in the research topic</i>
<b>Domain 2: study design</b>		
Theoretical framework		
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? <i>e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i>
Participant selection		
10.	Sampling	How were participants selected? <i>e.g. purposive, convenience, consecutive, snowball</i>
11.	Method of approach	How were participants approached? <i>e.g. face-to-face, telephone, mail, email</i>
12.	Sample size	How many participants were in the study?
13.	Non-participation	How many people refused to participate or dropped out? Reasons?
Setting		
14.	Setting of data collection	Where was the data collected? <i>e.g. home, clinic, workplace</i>
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?
16.	Description of sample	What are the important characteristics of the sample? <i>e.g. demographic data, date</i>
Data collection		
17.	Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?
20.	Field notes	Were field notes made during and/or after the interview or focus group?
21.	Duration	What was the duration of the interviews or focus group?
22.	Data saturation	Was data saturation discussed?
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?
<b>Domain 3: analysis and findings</b>		
Data analysis		
24.	Number of data coders	How many data coders coded the data?
25.	Description of the coding tree	Did authors provide a description of the coding tree?
26.	Derivation of themes	Were themes identified in advance or derived from the data?
27.	Software	What software, if applicable, was used to manage the data?
28.	Participant checking	Did participants provide feedback on the findings?
Reporting		
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? <i>e.g. participant number</i>
30.	Data and findings consistent	Was there consistency between the data presented and the findings?
31.	Clarity of major themes	Were major themes clearly presented in the findings?
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?

## **Appendix 7: Descriptions for setting the scene**

A.

23-year old Memory presents at the clinic with her infant because of breast pain and weakness.

Assess the mother and infant using the checklist and give her support using the “support action and counselling booklet”.

B.

18-year old Chimwala presents at the clinic with her infant to get some infant formula. She says that her baby is hungry and that her own milk is not enough.

Assess the mother and infant using the checklist and give her support using the “support action and counselling booklet”.

C.

32-year old Alile presents with her infant. She was referred to the clinic by a community health worker because the baby’s weight has been moderately dropping across growth chart centile lines.

Assess the mother and infant using the checklist and give her support using the “support action and counselling booklet”.

## Appendix 8: Role descriptions

### A. Mother with mastitis

**Mother who has mastitis needs to be shown how to express breastmilk and cup feed. Mother started working outside of the house.**

Memory (23 yrs, 2<sup>nd</sup> baby) has a 3-week old baby and presents at the clinic because of breast pain and weakness.

She was breastfeeding exclusively until a week ago when she started going out to help work in the tea plantation. When mother is out working grandmother feeds herbal drinks from bottle. Now fed herbal drink at night, breastfeeds once before work and three times after. There are longer periods between feeding, no regular feeds. Baby wants to feed frequently and stays for a long time on the breast when she does feed.

Infant still feeding on the other breast but since mother started working feeds have been shorter and less frequent. Infant has suckled less from infected breast (twice in two days) since pain was unbearable. Breast problems started a few days after work started. Attachment could also be improved.

Symptoms: "Sometimes part of a breast becomes hot, hard and very painful. In light-skinned women, the area may look very red. The woman feels ill and has a fever. This is mastitis."<sup>1</sup>

#### **Expected support actions:**

Treat mastitis as per C-MAMI. Teach how to express milk till infant can suckle on the other breast.

Encourage frequent and exclusive breastfeeding. Encourage to take the baby with her if possible or have other family members work at the tea plantation until the baby is 6mo old.

Show how to express breastmilk and cup feed while mum away, discourage bottle.

Encourage to feed in the night also, eg sleep together with baby. Encourage exclusive breastfeeding. Provide support to improve breastfeeding and attachment.

#### **C-MAMI enrolment: Priority 1**

##### **1<sup>st</sup> line breastfeeding support**

##### **2<sup>nd</sup> line:**

##### **2.1. Breastmilk expression, cup feeding and storage of breastmilk**

##### **2.2. Breast problems C. mastitis**

##### **2.6.D Other breastfeeding problems: working away from home**

#### **Diagnosis per checklists:**

##### **INFANT:**

1. No signs of severe disease

2. Growth monitoring card available. Age: 3 weeks, weight: 3.2kg. (SD -1-0)

Green. Failure to gain weight in last couple of days (Y1, is she able to diagnose that?)

Mother thinks baby hasn't gained weight (?)

3. None

4. Pink: none.

Y1: Feeding history: as above.

Breastfeeding observation: baby seems to be in a slightly uncomfortable position but this doesn't seem to prevent breastfeeding completely; makes smacking sounds, rapid swallows.

Y2: One breast but not other. Too painful for mother to try on other breast. No nasal congestion

---

<sup>1</sup> IFE additional p.15

MOTHER:

1. Y1: (needs to express breastmilk and cup feed), breast condition, Other concerns (working away from infant)
2. Green: BMI 23.3, MUAC 239mm
3. None
4. None

## **B. Adolescent mother**

### **Adolescent mother who lacks confidence to breastfeed and has attachment problems when breastfeeding.**

Chimwala is an 18-year old with a 2-month old child. She lives with her in-laws and her own family is not far away. It's her first child. Her in-laws and maternal grandmother give her a lot of advice regarding the baby which she follows. The in-laws are not unkind but don't give her appropriate advice regarding breastfeeding.

Her child has been crying a lot for food and people tell Chimwala her milk is not enough to feed the baby. They think it's because of the recent drought and lack of harvest due to which Chimwala hasn't been eating well herself so she doesn't have enough to give to the baby. The baby is given some other foods: grandmother introduced mzuwula to protect the child from illness; thin porridge introduced in response to perceived hunger. Family has given other foods believing she doesn't produce enough.<sup>2</sup> Chimwala heard that from the health clinic she can get infant formula to feed to the child.

Chimwala doesn't feel her milk is adequate – baby is often hungry and she is worried doesn't produce enough breastmilk. Mother is concerned that her own nutrition isn't right. Baby is thin but no weight loss. Weight gain has been moderate.<sup>3</sup>

#### **Expected support actions:**

Try to re-establish exclusive breastfeeding, increasing amount of breastmilk (may be less since breastfeeding less); assure mother that she is able to breastfeed; closely engage with and involve her in-laws and husband, if possible health worker could visit the home.

#### **C-MAMI enrolment: Priority 1**

##### **1<sup>st</sup> line breastfeeding support**

**2<sup>nd</sup> line: 2.3: "Not enough" breastmilk; 2.6 B confidence ; 2.6 C Concerns about diet;**

##### **2.6 F Adolescent mother**

**Counselling and Support Actions for Mother** (checklist 1) – MK: is this expected after mother's breastfeeding assessment for any outcome? Or just for those discharged from SFP? 5.3 and 5.4 (Family and partner support)?

## **Diagnosis**

INFANT:

1. No diseases/problems.
2. No growth monitoring card. Age: (2 months/7weeks) weight: 3.6kg (-3 - -2 z-score) – moderate acute malnutrition. Hasn't been to clinic since birth so no growth/weight monitoring card available, but no weight loss, however hasn't gained weight. No drop across chart. Make her a growth monitoring card. No oedema, no previous care. Could be classified either to Y1 or Y2 due to lack of information on recent weight gain.
3. None

---

<sup>2</sup> (IFE p. 31 case study)

<sup>3</sup> (IFE 8.1)

4. Nothing in pink

Picture: bad attachment. IFE Not suckling well, not feeding often enough, gives other foods. 12 times a day – tries when hungry. Other foods: thin maize porridge, mzuwula.

No Y2: breast conditions, no respiratory difficulties.

MOTHER:

1. Tick breast condition, perception of not having enough milk, other concerns.
2. Mum: Green though thin, BMI 19.5, MUAC 235mm (if Y1 in checklist 1 suggests 3 counselling and support actions for mother)
3. Adolescent mum
4. None

### **C. Non-breastfeeding mother**

#### **Mother stressed and worried about family problems & drought and feeding children. Experiences lack of care and social support.**

Alile, a 32-year old mother with a 4-month old baby who is not breastfeeding comes from a poor background. The recent drought and lack in harvest has hit them hard and they had to sell their patch of land. She is stressed and worried about feeding her other 2 children and she's also had to take care of her sister's children because their mother is sick with TB. Husband out all day trying to do the odd jobs. If sister's condition deteriorates she doesn't know what to do. Receives some WFP rations but this is insufficient to provide for everyone. She stopped breastfeeding after 3 months because became very stressed as sister's condition got worse and couldn't deal. Before this she was breastfeeding exclusively and she had also breastfed her older children.

Now baby receives some old BMS mixed with water from well, sweetened condensed milk and tea. These are fed from a cup. Child has diarrhoea and has been refusing to eat.

She had visits from a community health worker but didn't have time to come to clinic until now. CHW referred her because of baby moderate drop across growth chart centile lines.

#### **Expected support actions:**

Emphasise that nothing should be given apart from BMS. Explain appropriate use of BMS. Suggest using cup and could emphasise bottle hygiene. Promote sanitation and refer to a support group if one exists.

#### **C-MAMI enrolment priority 1.**

**Non-breastfeeding assessment and support: 2. Use infant formula as breastmilk substitute (MK: management action refers to IFE 2 module) 3. Preparing infant formula**

#### **Family and Community Counselling and Support Actions for Mother**

#### **Diagnosis:**

##### **INFANT**

1. No danger signs
2. GMC available: Age: 4 months/17weeks. Weight: 4.2kg (WHZ <-3) – uncomplicated SAM. moderate drop across growth chart centiles, failure to gain weight (Y1)
3. None
4. Non breastfeeding assessment:  
P: none. Y1: Inappropriate BMS, Consumed enough before got diarrhoea before then appetite went, receives other drinks. Y2: none.

##### **MOTHER**

1. Concerns about meeting nutritional needs of infant
2. MUAC 232mm, BMI 19.3 - Green.
3. None
4. Lack of social support/care

## Appendix 9: Interview topic guide

### 1. Introduction:

- Reiterate the purpose of the study
- Go through informed consent form, gain written consent, reminder of right to withdraw
- Any questions?

### 2. Social demographics

- Age
- Profession (title)
- Years worked

### 3. Interview part I: Current practice

- Have you had any training in Infant and Young Child feeding or breastfeeding? Can you briefly tell me about it?
- Think of the last time you saw an infant <6months who was malnourished or had feeding problems. Could you tell me about that visit?
  - Probes: reason for presentation, what steps you took to manage them, did it include advice on breastfeeding?

### 4. Role play

- Researcher to explain the C-MAMI tool

### 5. Interview part II: Feedback

- What did you think of the checklists and the tool?
  - Did you think one of the checklists was easier or more difficult to use than the other?
- [Refer to experience managing infant that they described in the beginning of the interview] Would it have been different if you had used this checklist/tool?
  - How?
- Let's say this tool was introduced in clinics/nutrition programmes in Malawi. How do you think health workers would feel about that?
  - [If only positive things have been said] Are there some health workers that might find it difficult or not like it
- Do you think specific knowledge or training is needed to use this tool? What kind of knowledge/training helps to use the tool?
  - Support actions e.g. breastfeeding (or other specific example): would most health care workers know what to say or do?
  - How long should the training be?
  - What should the training cover?
- Do you think it would make a difference whether the health worker using this tool is a man or a woman?
- Please evaluate each checklist on the scale 1-5 (5 being the best and 1 the worst) of each checklist in the following categories: ease of use, length of assessment, overall opinion.
- Do you have any other comments that you want to share?

## **Appendix 10: Coding tree**

### **1. General impressions about tool**

- expressing that it not easy just using like that
- Reception among health worker
- Who should use the checklist
- Length of clist
- Opinions on Original C-mami tool, 4b, 4c

### **2. Training needs**

- Length
- Areas of training
- Training need - Suggested without prompt
- Knowledgeable (Emphasis on having already done training)
- Implications for training (Things to consider)

### **3. Difference b/w not using the tool**

- Missing problems
- Missing infants: target normal on 6m+ children

### **4. Obstacles/ potential difficulties**

- discrepancy b/w current advice and tool
- Health worker factors
- Health worker differences
- Logistics
- Measurements (WFL; defining severe and moderate)

### **5. Current practice**

- Health worker advise & actions
- Tendency to digress to what doing/saying per current practice
- Training received

### **6. Using and interpreting the tool**

- Checklist improvements
- Clinical assessment
  - o Asking about hiv
  - o asking about tb
  - o confusion b/w mum and child's assessment
  - o poor pregnancy outcomes
  - o other
- interpreting mother's D assessment
- Anthro assessment, child (compared to the above this includes not just the difficult points but how they used anthro assessment eg w/ or w/o gmc)
- order of assessment
- country differences
- deviant cases
- boundaries (need to define each line and hence boundaries; different outcomes)
- Other issues

### **7. Non-breastfeeding assessment and support**

- current awareness + knowledge
- positioning in checklist

### **8. Other findings**

- Colours
- Gender
- Mixing u6m and 6m+

## **Appendix 11: Key informant interview questions**

The exact questions varied per key informant but follow a similar structure to the one below. First interviewees were asked questions about the checklists and then they were asked to comment on my comments about the C-MAMI tool.

### **Content & formatting**

- What is your general impression about the checklists?
- Are there things missing in any checklist that should absolutely be there
- What do you think of the formatting and layout? Are there other kinds of layout that could work better?
- What would need to be changed about any checklist before they could be widely distributed?
- If a C-MAMI operational package was developed, what else should be part of this apart from a checklist and a support action booklet?

### **Comments about the C-MAMI tool:**

- I've changed the order of assessment in all checklists so that breastfeeding is the last part of infant assessment and first part of mother's assessment. It made sense to me to have those two one after the other instead of doing breastfeeding for infant, other assessments in between and return to breastfeeding for mother as similar issues may come up.
- I went through the checklists and tried to use them from the point of view of a health worker. I felt some of the action points in the C-MAMI tool are not specific enough for a health worker to easily follow: e.g. in the infant breastfeeding assessment one is asked to do a feeding assessment using 1st and 2nd line breastfeeding assessment tools, however these are together 10+ pages long - it's not clear if these all should be covered in order to classify. Checklists 2 and 4c try to tackle this by referencing specific sections within 1st and 2nd line bfeeding in order to connect specific problems to specific sections in the support material. I'd be interested in hearing your opinion on this.
- Continuing from the previous point, in infant's breastfeeding assessment, I omitted the instruction to "assess" using 1<sup>st</sup> and 2<sup>nd</sup> line breastfeeding because it's not clear what exactly a health worker is expected to do in what chronological order. As mentioned above both together are 10+ pages and not every problem will be relevant to everyone.
- Non-bfeeding management section – compared to the rest of the C-MAMI tool I felt that there are less clear links between the assessment and corresponding support action. E.g. in the assessment category Y1 identifies infant receiving other foods and drinks but in the counselling actions there is no line advising to stick to BMS only. Y2 category identifies nasal congestion but there's no solution in support actions even though the assessment refers there. I wasn't able to link all points in the assessment to points in the support actions as with the rest of the tool (checklists 2 and 4c)

- should I test relevant parts of the IFE module 2 together with the tool? One of the roles in the role play is a non-breastfeeding case but instructions how to manage this case are insufficient in the tool because it refers to Module 2 for specific instructions on how to use formula (p. 31). Module 2 materials would complement the non-breastfeeding section.

Should the relevant IFE module 2 parts be included in a possible C-MAMI operational package? If so, which pages of IFE Module 2 should be part of this package?

Note: the following references to IFE Module 2 exist in the C-MAMI tool:

- P. 31: "2. Use infant formula as breastmilk substitute (BMS)" This action refers in its entirety to IFE.
- P. 32+33: refer to advice on hygiene and feeding practice regarding bottle use. (referring to 9.7 in IFE: How to keep feeding utensils clean and safe)

### **Some other differences between C-MAMI tools and checklists**

- infant breastfeeding assessment: references to 1st and 2nd line breastfeeding assessment have been omitted in the "assess" part and only included in the "act/"manage" categories of the assessment

- several places in the checklists omit mentions of "meets ANY criteria" or "OR" between conditions as in the C-MAMI tool as I thought it's understandable without. Is there any difference between the wording "meets ANY criteria" (in pink area) "OR" (in yellow 1 area)

- Non-breastfeeding assessment is included in both checklists and not just in the appendix as in the January MAMI meeting where the tool was presented general feedback was that it shouldn't be in the appendix. Should Non-breastfeeding management be the 6<sup>th</sup> chapter in the management actions booklet instead of Appendix 1? Should it be moved "further up" in the checklist ie after the infant breastfeeding assessment?

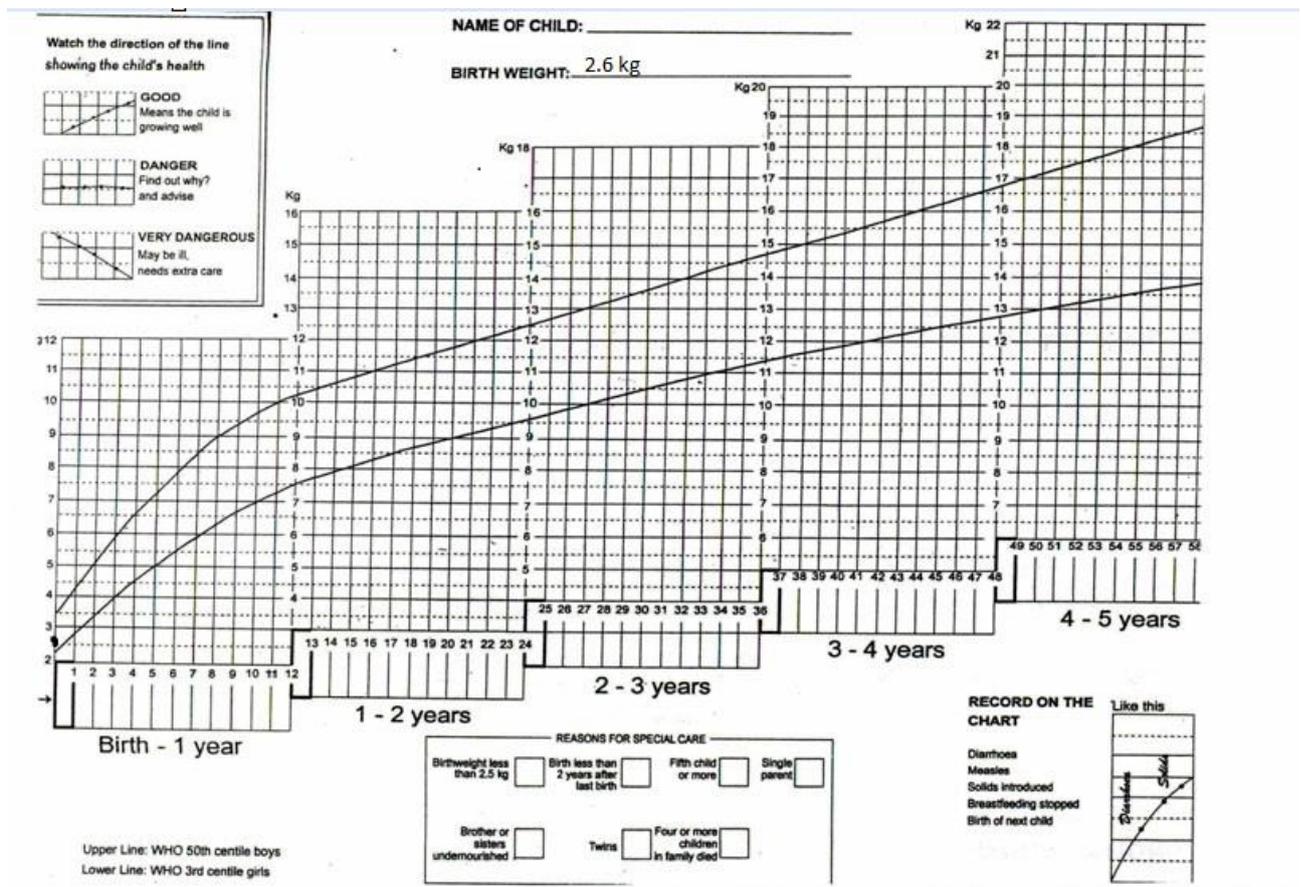
- since the checklists include the non-breastfeeding assessment it's therefore it's been omitted from the support actions and counselling materials booklet (management counselling and support actions are still there).

## Appendix 12: Card aids in role plays

### Scenario A

You find no general danger signs

You find no signs of severe or very severe disease



Source: [http://wikieducator.org/Lesson\\_5:\\_Growth\\_and\\_Development](http://wikieducator.org/Lesson_5:_Growth_and_Development)

You weigh the child: 3.2kg

For a 3-week old girl, the WHO weight-for-age chart indicates this is between 0 and -1 standard deviations of the medium.

You weigh the child: 3.2kg

Length of the child: 51 cm

The WHO weight-for-length chart indicates this is between -1 and -2 standard deviations of the medium.

You find no oedema in feet.

You find no structural or muscular abnormalities.



You hear:

- Baby makes smacking sounds
- Baby makes rapid sucks.

Source: Infant Feeding in Emergencies (IFE) Module 2, Version 1.1 (2007). Core Manual p. 12.

Looking at the other breast you see:

- Swelling, breast is hard
- No cracked or bleeding nipple
- Redness to the left of the nipple

No nasal congestion

Temperature 38.2 C (only shown if suggests measuring)

MUAC is 239mm

Mother's height: 163cm

weight: 62 kg.

This gives a BMI of 19.3.

## Scenario B

You find no general danger signs

You find no signs of severe or very severe disease

You weigh the child: 3.6kg

For a 2-month/7-week old girl, the WHO weight-for-age chart indicates this is between -2 and -3 standard deviations of the medium.

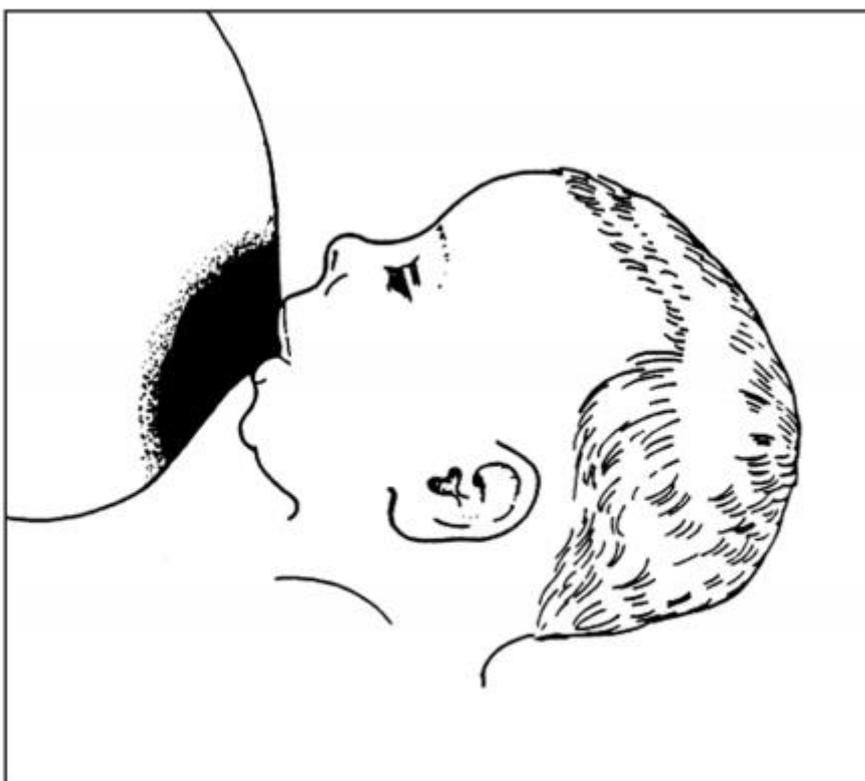
You weigh the child: 3.6kg

Length of the child: 52 cm

The WHO weight-for-length chart indicates this is between 0 and -1 standard deviations of the medium.

You find no oedema in feet.

You find no structural or muscular abnormalities.



- The baby has cheeks drawn in.

- The baby fusses at the breast, and comes on and off the breast.

Source: Infant Feeding in Emergencies (IFE)

Module 2, Version 1.1 (2007).  
Core Manual p. 11.

Breasts look normal

No nasal congestion

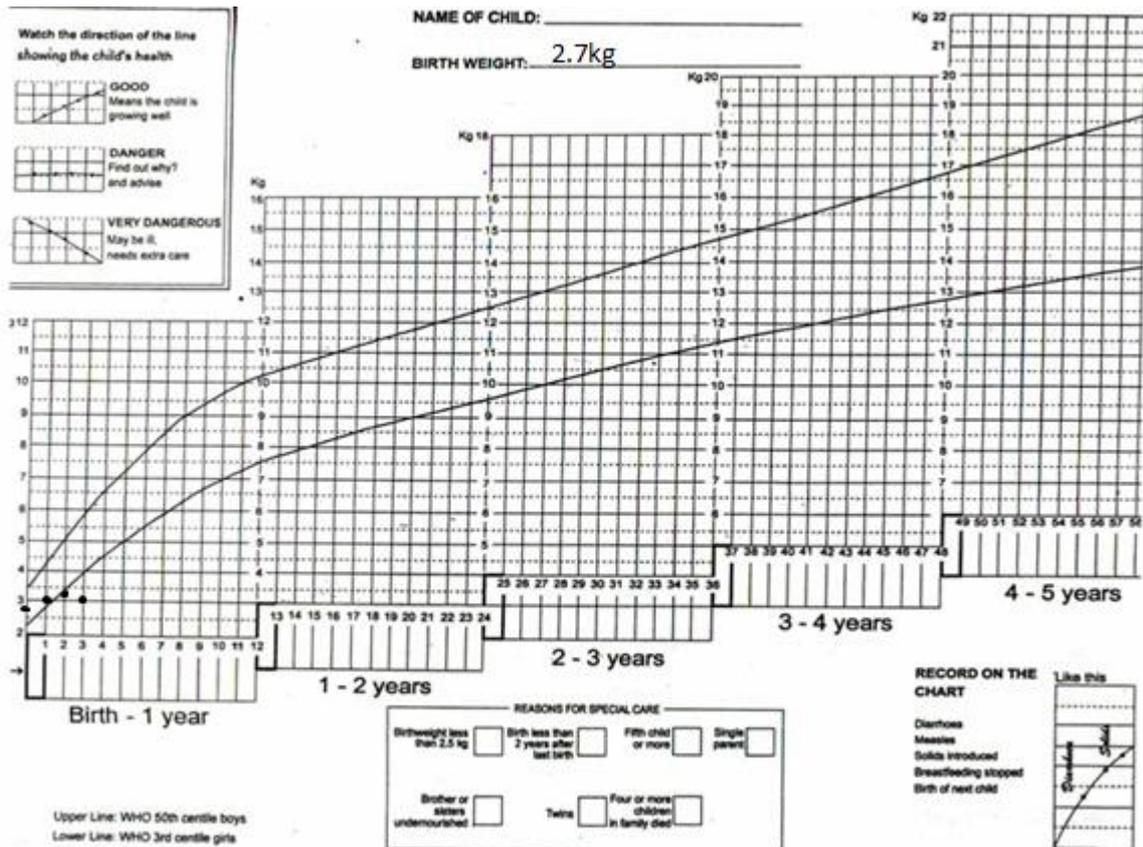
MUAC is 235mm

Mother's height: 165cm      weight: 53 kg

**Scenario C:**

You find no general danger signs

You find no signs of severe or very severe disease



Source: [http://wikieducator.org/Lesson\\_5:\\_Growth\\_and\\_Development](http://wikieducator.org/Lesson_5:_Growth_and_Development)

You weigh the child: 4.2kg

For a 4-month/17-week old girl, the WHO weight-for-age chart indicates this is less than -3 standard deviations of the medium.

You weigh the child: 3.4 kg

Length of the child: 54 cm

The WHO weight-for-length chart indicates this is between -2 and -3 standard deviations of the medium.

You find no oedema in feet.

You find no structural or muscular abnormalities.

BMS given to baby, refuses to feed.

No nasal congestion

MUAC 232mm

Mother height: 169 cm weight: 55kg Mother's BMI is 19.3

## Appendix 12: Rationale behind checklist

This appendix describes the checklist in appendix 1 and explains some of the decisions made as well as uncertainties.

**Triage:** question about if the whole classification should be here, with the possibility to tick in red. Many health professionals in developing countries are familiar with IMCI and would probably know to refer if child is in serious condition, so for now the classification hasn't been included and there is only a sentence as a reminder.

### 1. Anthropometric/Nutritional Assessment (Infant)

- WFA: No one recorded WFA when GMC was unavailable. Therefore a line has been added as a reminder. It has not been tested.
- WFL: There is no -3 in pink category because
  - 1) pilots found it confusing whether to tick if both Y1 and pink have -3
  - 2) -3 in itself is not enough to refer to inpatient (depends on if uncomplicated or complicated). Another criterion must fall on pink anyway for the patient to be referred.
- Yellow 2: There are hyphens on each line but no obvious difference was found when instead of having a hyphen on each line the empty cells were all combined and there is only one hyphen

### 2. Breastfeeding (Infant)

- References to 1st and 2nd line breastfeeding in order to assess yellow 1 and yellow 2 conditions are left out, unlike in the whole C-MAMI tool. Instead, a reference is added to the support action booklet for 'attachment' to help a health worker make a judgement on that. ('If unsure, see 1.1') Key interviewees agreed the checklist cannot refer to the entire 1<sup>st</sup> and 2<sup>nd</sup> line breastfeeding as both together are 10+ pages. 'Breast condition' is another item on the checklist which may require health workers to consult the support action booklet to identify the condition. The reference in the box ('See 2.2 A, B, C, D or E and 2.1') has however just been kept like that, the alternative being to add "See 2.2 A, B, C, D or E for *specific condition and support* and 2.1". I left it out because it seemed to me not to bring much added value and makes the box bulkier; but the words could be added back in if facilitates use of the tool.
- 'Not well attached (See 1.1 if unsure or to support)'. The other piloted checklist had here a list of the four points mentioned in the tool of how to recognise good attachment. This

was suggested by a key informant. I removed it because it was bulky and respondents didn't seem to use it (and those who were trained in feeding didn't need it). The reference is still there in case someone needs the support action booklet to identify good attachment. It may be considered that the list be inserted for support somewhere in the checklist if not in the same box.

- 'Not acutely malnourished' is in the whole tool but was removed from the green category because a key informant noted its definition here can be problematic. Malnutrition is assessed in anthro/nutritional assessment, no need for it to be in breastfeeding?

### **3. Clinical assessment (Infant)**

- Order of conditions (HIV, TB, preterm, LBW): a key informant suggested that the order could be changed according to how common a condition is. In places where HIV is uncommon but LBW is, LBW could be put first.
- Other concerns: Some key informants and health workers suggested incorporating other questions, particularly diarrhoea and immunizations. The checklist was tested without tickbox for diarrhoea and immunizations, just said 'other'. Should other IMCI items be included? Other conditions could be added which are not listed, e.g. respiratory infection. This clinical assessment could also be adapted according to the setting. For immunizations, the checklist only instructs checking them but doesn't contain details as the tool is focused on nutrition.

### **Breastfeeding and Non-breastfeeding (Mother)**

- Name of this section was changed to 'Breastfeeding and Non-breastfeeding' from just 'Breastfeeding' because mother's breastfeeding assessment covers both breastfeeding and non-breastfeeding mothers. Some respondents in the pilot phase skipped this section if the infant was non-breastfed. For clarity the section was therefore renamed breastfeeding and non-breastfeeding assessment'. An alternative was just 'Feeding Assessment' but this was break up the current ABC order.
- Some participants expressed unfamiliarity with the word 'dyad' so to simplify the language on the checklist, this has been changed from "Yellow 1: Mother-infant dyad enrolled in C-MAMI" to 'mother and infant'.

#### **4. Depression/anxiety**

- Wrote just 'Depressed' on its own – it was confusing for respondents to add the detail of 'feels alone' as this led to wrong diagnoses.
- Added a green box to tick to indicate no concerns. This was lacking in the tool and many respondents made remarks about this and just ticked green anyway even though there was no box.
- Respondents suggested adding other factors that can lead to infant malnutrition, such as mother's financial situation. Someone also suggested adding mother's education as research has shown this has one of the strongest links to child malnutrition. These options could be explored in further use of the tool/be brought to expert opinion.

#### **Non-breastfeeding**

- Lines were added before the non-breastfeeding assessment to emphasise it is a separate section because many respondents continued to go through it not realising it was for special cases only. To further clarify, after the title it could be added '(for non-breastfeeding cases only)'.
- 'Not willing/able to feed by cup or bottle' changed to 'Not able to feed by cup or bottle' to make clearer this is a structural rather than behavioural problem - this change was suggested by ML & MSJ
- 'Possibility to try supplementary suckling' was added to non-breastfeeding assessment (pink) and 'Willing/possibility to relactate' to non-breastfeeding assessment (yellow 1). This was the conclusion after discussing with certain key informants how to ensure that health workers always try see if relactation and supplementary suckling are options.
- 'Refusing feeds' changed to 'declining feeds' (infant is structurally able but is unwilling) to better distinguish it from 'Not able to feed by cup or bottle' (a structural problem) –this change was suggested by ML & MSJ

#### **General comments:**

'Tick where appropriate' – the instruction if an assessment has only one outcome per row (e.g anthro/nutritional assessment)

'Tick any that apply' - the instruction where many outcomes are possible (e.g. breastfeeding assessment)

#### **Order of assessment:**

- The infant and mother's assessment in the C-MAMI tool follow an "ABC(D)" order (anthropometry/nutrition, breastfeeding, clinical, depression/anxiety)
- Order was different in checklists 4b (ABC, ABCD) and 4c (ACB, BACD) for better flow of having breastfeeding assessments next to each other.
- Result: most health workers said the order didn't make a difference. A few respondents said they preferred ABC. A key informant noted in Bangladesh health workers would memorise the checklist and supported the ABCD order
- Conclusion: There's not enough evidence to change the original ABCD order to what was hypothesised and there might be potential benefits to it in some countries.

#### **Positioning of non-breastfeeding assessment:**

In a C-MAMI interest group meeting it was proposed that the non-breastfeeding annex could be integrated in the tool as a section. Therefore, non-breastfeeding assessment (NBA) was included in the checklist. Perhaps it's desirable to have the non-breastfeeding assessment separately from the checklist. I didn't test that in my research. Arguments emerged for and against whether NBA should be positioned at the end of the checklist or whether it should come just after the breastfeeding assessment.

NBA at the end PRO:

- Some key informants: having NBA in the middle of the assessment makes it seem equal to breastfeeding – non-breastfeeding shouldn't be the 1<sup>st</sup> line option
- Some respondents started going through NBA (it was positioned in the end for the research). Lines were added before NBA no emphasise it is a separate section, but this could be more difficult to indicate if NBA is in the middle and some health professionals might just go through it anyway (though this shouldn't happen if they're trained).

NBA at the end CON:

- In terms of layout, someone gave feedback that infant and mother should both have their own page. NBA could be the last item on the infant page.
- Some respondents found it fiddly/confusing to jump to the end for NBA and then back to first page for clinical (again, training could solve this problem?)

Result: This research doesn't result in a recommendation for next version as to where NBA should be positioned. I kept it at the end for now but further work could investigate other options, e.g. if NBA is on the infant page but well cut-off from the rest of the assessment.

### **Recommendations for update of the tool: (rationale behind updates discussed above)**

#### Mother's breastfeeding

- Change Mother's 'Breastfeeding' assessment to 'Breastfeeding and Non-breastfeeding' (of just 'Feeding')
- Consider replacing 'dyad' with simpler language e.g. 'mother and infant'

#### Non-breastfeeding:

- Change 'refusing feeds' to 'declining feeds'
- Change 'Not willing/able to feed by cup or bottle' to 'Not able to feed by cup or bottle'
- Add 'Possibility to try supplementary suckling' to non-breastfeeding assessment (pink) and 'Willing/possibility to relactate' non-breastfeeding assessment (yellow 1)

#### Mother's clinical assessment

- Review whether 'history of poor pregnancy outcomes' may need to be reworded to be more specific – is only LBW meant here as suggested in the tool?

#### Mother's anxiety/depression

- Review point about depression and whether 'feels alone, no social support, unsatisfied' should be removed or reworded to avoid confusion
- Add potentially other factors such as mother's education?

#### Infant's clinical assessment

- Review whether other items could be added e.g. about immunizations

## Appendix 14: Consent form

### Consent Form for Research Study

Please complete this form after you have listened to an explanation about the research.

Title of Project: *Improving the management of acute malnutrition in infants under 6 months (MAMI): Testing, refining and better understanding a new assessment/treatment tool*

This study has been approved  
by the Ethics Committee  
[Project ID Number]:

- Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part.
- If you have any questions arising from the explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.
- I understand that if I decide at any other time during the research that I no longer wish to participate in this project, I can notify the researchers involved and be withdrawn from it immediately.
- I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be treated as strictly confidential. Whenever the researchers write about anything I have told them, including using quotations from my interview, they will not use my name.
- The interview will be recorded with a voice recorder. (phase 1 only)
- I agree  disagree  (tick as appropriate) to the presence of a researcher during the consultation (phase 2 only)

#### Participant's Signature or thumbprint

I .....

agree that the research project named above has been explained to me to my satisfaction and I voluntarily agree to take part in a) phase 1 b) phase 2 of the study. ***(circle appropriately – patients would only be able to participate in phase 2 of the project)***

The notes written above about the project have been read to me and I understand what the research study involves.

My questions have been answered by.....

Signed: \_\_\_\_\_ :

Date:

#### Researcher's Signature

I .....

confirm that I have carefully explained the purpose of the study to the participant and that consent is freely given

Signed:

Date:

## Appendix 15: Information sheet

**You will be given a copy of this information sheet.**

Title of Project: *Improving the management of acute malnutrition in infants under 6 months (MAMI): Testing, refining and better understanding a new assessment/treatment tool*

This study has been approved by the Ethics Committee [Project ID Number]:

Name, Address and Contact Details of Investigator:	<b>XXX &amp; Dr Marko Kerac</b> 1) Nutrition Group, Department of Population Health, London School of Hygiene & Tropical Medicine, Keppel Street, London WC1E 7HT c/o marko.kerac@lshtm.ac.uk 2) MEIRU (Malawi Epidemiology Intervention Research Unit) c/o CHSU (Community Health Sciences Unit) Mthunthama Road, Area 3, Lilongwe, Malawi. c/o manuela.kasonya@kpsllmw.org cell: 0995 211 639
Name, Address and Contact Details of COMREC	COMREC (College of Medicine Research and Ethics Committee)- College of Medicine, University of Malawi 3rd Floor - John Chiphangwi Learning Resource Centre Private Bag 360 Chichiri Blantyre 3 Malawi. Phone nr. 01871911

We would like to invite you to participate in this research project.

### **WHAT IS THE RESEARCH ABOUT?**

We are conducting a study to test a new tool that has been developed to identify and manage uncomplicated acute malnutrition in infants under 6 months. This C-MAMI tool (community management of acute malnutrition in infants <6 months) is based on current guidance by the World Health Organisation and is technically and clinically correct. However, it needs further feedback by front-line healthcare workers to make it suitable for field use. The results of the study will enable us to refine and finalise the C-MAMI tool for wider use in Malawi.

### **WHAT DOES THE RESEARCH INVOLVE:** (There are two parts to this research)

Interviews will take 30-45 minutes.

PART (1) We will first ask you general questions about how malnutrition is currently managed in infants <6 months. We will then provide you with two checklist versions of the C-MAMI tool and aid materials and explain how they are used. Thereupon you will be presented with three scenarios and asked to use the tool to assess and treat the imaginary patient, impersonated by the researcher. The purpose of this role play is to help you to evaluate the usefulness of the tool.

After the role plays we will ask you about your experiences using the two checklists and to give your feedback.

PART (2) – This part will only concern a subset of interviewees in a facility where professional breastfeeding support and/or referral possibilities are available. In this phase you will use the tool to support your everyday task of assessing infants aged <6m in a clinical setting while a researcher is either present or absent. After the consultation your

opinion and feedback will be asked for.

***ABOUT TAKING PART IN RESEARCH:***

You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand what the project involves and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. If you decide to take part you are still free to withdraw at any time and without giving a reason.

***WHO IS CARRYING OUT THE STUDY?***

This study is carried out by a Masters student of the London School of Hygiene and Tropical Medicine as part of the MSc Nutrition for Global Health. It is supervised by the school and supported by local partners.

***IS THE RESEARCH CONFIDENTIAL?***

Yes. Any information that you share with us will only be seen by members of the research team. All information will be stored securely. Whenever we write or talk about anything we have been told, we never use your real name.

***WHAT ARE THE BENEFITS OF TAKING PART?***

No financial or other compensation will be provided in return of participating in the study. However, participants will have the opportunity to enhance their skills and knowledge in assessing vulnerable infants <6m. This is because the C-MAMI tool has already undergone extensive international-level review and is technically and clinically correct. By helping the researchers think about how to adapt the tool for optimal local use their critical thinking can be further enhanced.

The results will be shared with participants and participating organizations.

***WHAT ARE THE RISKS OF TAKING PART?***

There are no risks to in taking part. You will not be forced to do or say anything that you are uncomfortable with.

## **Appendix 16: Other findings**

In this appendix other findings and issues around using the checklist are listed.

### **Privacy**

**Some questions can be perceived as sensitive because of their personal nature** (e.g. clinical assessments – HIV; depression assessment – gender-based violence).

One health worker expressed she would feel **uncomfortable asking the mother about marital conflict** as this could be perceived by families as unnecessarily asking about private matters.

Options:

- conduct assessment in a private place
- omit certain questions if this will make mothers uncomfortable/not trust the C-MAMI tool. Should the assessment only be carried out on points for which follow-up care is available?  
E.g. if a mother is diagnosed as depressed (pink - inpatient), is there a facility that will be able to help her? **Is it better to omit those questions for which no help will be available?** Otherwise asking about personal matters may lead to mothers/carers and health workers having a negative experience with the C-MAMI tool.

### **Support by family members & relatives**

**Hardly anyone mentioned including relatives in the support actions** i.e. counselling not just the mother but those who influence her. Particularly the mother in scenario B (adolescent unconfident mother) was obviously influenced by others and it was expected that respondents counsel relatives as well (support action 5).

This could be because there aren't many references in the checklist to family support and counselling actions. **Should more references to family support actions be established in the checklist?**

### **Relactation**

Point about **relactation was often not clear**. Someone asked directly what relactation means, from some others it came across indirectly. Many also knew what it means so maybe some just read it out because it was there? In training, indicate they don't have to ask everything to the mother if it's not relevant to her.

Does 'relactating' in the tool mean they're starting now or they have stopped at some point and are now lactating again? Note in non-bf assessment relactation has been added as an option.

### **C-MAMI tool colours**

Some commented on the colours in the checklist/tool

- 1) Commenting on the **additional colour**/expressing unfamiliarity with Y2 as that doesn't exist on the MUAC tape or IMCI.

- 2) asking **why the 'severe' category is pink and not red.**
- 3) Colours are **familiar** from current tools

### **Gender of health worker**

In Malawi, gender of the health worker **does not play a role** in who can carry out the assessment and management. However, this conclusion is based on health worker and not patient accounts.

### **<6m infants**

- a health worker didn't want to measure MUAC of <6m infant
- some didn't take anthro measurements because growth monitoring starts at 6 weeks
- HCWs often mixed up under and over 6m children and said u6m malnutrition was a new concept. This may imply that **when disseminating/implementing the tool, emphasis needs to be put on the fact that it's for u6m only** and that the protocol for older children remains the same

### **Other issues in the use of the tool/checklist**

- Many community health workers **didn't know what's BMI**. Higher trained professionals (2/3 yrs+) were familiar with it. But it's optional in the tool anyway.
- HCWs often asked questions in the green column after having already ticked other coloured columns, e.g. Does your child have any feeding problem? Do you think it's acutely malnourished? Normally green should only be ticked if no other condition is found?
- What to do when an option is not given to be ticked? Write in the action category? E.g. one mother was getting information about BMS from neighbour and some HCW wanted to tick that somewhere.
- How HCWs obtain information: relying on mother's answer can give wrong result, e.g. asking if she needs to express breast milk, asking about 'any other issues' (mother says no because doesn't see working away from home as an issue)
- tendency to ask questions per usual protocol instead of following checklist, especially if they don't understand what they're supposed to do (start to ask e.g. questions related to mother's diet)
- SFP – 'supplementary feeding' was sometimes mixed with 'complementary feeding'. Terminology needs to be clarified in training.
- Mum's bf+non-bf assessment: sometimes hcws go through both without realising they should either go through bf or non-bf
- Sometimes when asked to point out appropriate support actions people point out many things in the booklet that look similar, (e.g. 2.2 and 2.6 A) without being specific of the conditions - supports having references to distinguish between conditions
- Some interpreted pictures in support action booklet as don't dos; looked at pictures to give advice which was different to what was instructed (e.g. talking about bf positions in 1.3)

- Pathway i.e. what to do next when: what to do when mother presents with breast problems – do hcws start diagnosing that or start from the beginning of assessment? in our role play started from beginning to do the whole assessment
- Pathway: In non-bf, a participant found out that “The infant only drinks a little. Should I find out the reason why?” - unexpected situation: should they find out why, or what should be the next action?
- mother lacking confidence often missed: someone interpreted adolescent mother as confident because she is able to speak up for how she feels, seeks advice
- Different ticking conventions
  - o confusion as in the anthro section for a ‘no’ or ‘normal’ they have to tick green, whereas in clinical ‘no’ is no tick, leave it blank.
  - o Sometimes respondents ticked a box once they asked the question, not if the condition is identified
  - o tendency not to mark anything when a condition is green or normal
  - o ticks green (no other issues) in addition to yellow 1. Shouldn’t they be mutually exclusive (ie either tick green or another colour category)?
  - o ‘So we tick what is appropriate or what is not appropriate?’ different concept of what to tick

### **Difficulties understanding what lines mean**

- Tendency to read out straight from the tool instead of observing themselves
- ‘does child have abnormal tone?’ ‘Is your child needs expressed milk’ – observe or history?
- some people look at the heading ‘severe’ or ‘moderate’ instead of the conditions to tick. - ensure that training guide or something explains how they should ask questions
- In training, meaning of each line should be well explained because unexpected things can be misunderstood: ‘R: [about working away from home] you mean if mother is just staying at home, that’s the problem?’ This person is unsure about what is undesired behaviour
- Tendency to give own advice when doesn’t understand what the tool says
- misinterpreting lines
  - o have you ever been told how to prepare breast milk? [for ‘needs to express breast milk’]
  - o ‘Concerns’ by mum or hcw?
- Clinical assessment: examples of formulations of questions
  - o Adolescent: how old when became pregnant, How old when you gave birth to first child?
  - o HIV: have you ever tested for hiv? during your pregnancy have you gone for HIV test?
  - o Anaemia: some ask to check there (eyes, palms) others ask if they have history of anaemia. How should they check for it?
  - o TB: have you ever been found with TB? Is there any history of TB in your family?
- Different interpretations of mum’s anxiety/depression: At a certain point of time did you have depression or anxiety? do you feel depressed or alone? Do you have

problem in your family? Do you give enough care to the infant? Don't you feel lonely at some point in time? Have you socialised with the child?

### **Suggestions by respondents and key informants of what to add**

These are suggestions often by just one person and not tested by this research, but listed as possible ideas and feedback:

- Psychological support to mother when taking care of sister with TB: there can be stigma around her as someone supporting a TB patient and some think TB patients also have HIV
- Add financial situation and mother's education (latter is strongly associated with child's nutritional status) to mother's depression/anxiety assessment.
- Should have a note saying if mother has TB, children u5 staying with her need to be tested (however currently in tool instructs to treat per national guidelines so no need? Or should this be added in possible country adaptations of the tool?)
- Comment that anthro part has no reference to support actions. Can be difficult to know what to do. - Though if they undergo training, it will be very because colours indicate?
- Non-bfeeding assessment: there's nowhere to tick to indicate when bfeeding was stopped
- [not a suggestion to add but some asked how many minutes mother bf for which is not in the tool]
- clinical assessment: more space for other conditions
  - o ask about previous admissions to find out about history (suggestion by hospital worker)
  - o add 'other'
- Bf/non-bf assessment: Abnormal tone, stiffness: one respondent who works in a hospital said even for her it can be difficult to identify severe stiffness, let alone community health workers – training needed on this point.
- Fill in blank boxes of the checklist with words (e.g. all those Y2 boxes where there is no text)
- coughing could be mixed with respiratory difficulty so there's a possibility of confusion in classification
- have infant assessment and mother's assessment each on their own page (this is discussed more in this appendix under positioning of non-bf assessment)

### **Questions to clarify:**

- If carer is other than the infant's mother, will all parts of the mother's assessment still be carried out? Is all of anthropometry/clinical necessary?
- What pathway should each problem take? Eg if in non-bf patient says they stopped 2 weeks ago, where should that be marked and what are the consequences? All questions should potentially lead so some treatment/support action. The pathway especially needs to be clarified with the anthro section as there are no references to support action booklet.

- If they don't have a growth monitoring card (GMC): health worker should record weight for age and then continue to go through what points in the anthro/nutritional assessment?
- If GMC is available, what details should be asked about in addition to checking the GMC? Ie when are points to be classified through observation (GMC), history, or both?
- With 'recent weight loss' 'failure to gain weight' and 'Dropping centiles on growth chart', clarify line between severe and moderate.