Implementing care for vulnerable infants under 6 months of age and their mothers

‘Learning by doing’ case study series: **Pakistan**

August 2024

ENN

MAMI Global Network

Irish Aid
An Roinn Gnóthaí Eachtracha
Department of Foreign Affairs

Bill & Melinda Gates foundation

Authors

Emergency Nutrition Network (ENN): Hedwig Deconinck, Stephanie V. Wrottesley, Marie McGrath
The Indus Hospital Health Network: Saba Shahid and Riija Zaheer

Acknowledgements

We gratefully acknowledge the support of the Department of Foreign Affairs, Ireland, and the Bill & Melinda Gates Foundation, which enabled us to undertake this case study. The ideas, opinions and comments included here are entirely the responsibility of the document's authors and do not necessarily represent or reflect the policies of the donors. We thank the reviewers, Philip T. James and Nicky Dent (ENN), for their valuable suggestions.

Recommended citation

Hedwig Deconinck, Stephanie V. Wrottesley, Saba Shahid, Riija Zaheer and Marie McGrath (2024). Implementing care for vulnerable infants under six months and their mothers. 'Learning by doing' case study series: Pakistan. Emergency Nutrition Network (ENN). Oxford, UK. https://doi.org/10.71744/wcq4-mr10

Keywords

Infant health; mother child health; continuity of care; infants at-risk of poor growth and development; small vulnerable infants

Further information

For more information on the case study process and findings, please contact mami@ennonline.net.

To find out more information on the Pakistan case and to discuss how this work can be taken forward, please contact Dr Saba Shahid at saba.shahid@tih.org.pk.

Clinical health worker conducting the risk assessment.

Abstract

Background

Many infants are born vulnerable, or become so in the first six months of life, and thus are at an increased risk of poor growth and development, ill health and mortality. To mitigate risks and safeguard future health, comprehensive continuity of person-centred care for at-risk mother–infant pairs is needed, but it remains challenging to deliver this at the required level of quality and at scale. This case study investigates the process of implementing, adapting, normalising and embedding an integrated care pathway approach for the management of small and nutritionally at-risk infants under six months (u6m) and their mothers (the MAMI Care Pathway) in the Pakistan context, to inform sustainable scalability.

Method

In the Pakistan case the MAMI Care Pathway approach was integrated into paediatrician-led services in a private charity hospital in Karachi, Pakistan. In the case study, mixed methods were used to provide a detailed description of the planning and implementation processes, to explore influences on the adoption of the approach, and to appraise the potential scalability and sustainability of care. Different lenses examined health workers' experiences of implementing the MAMI Care Pathway, which enhanced their capacities through 'learning by doing'. Reflective discussions generated transferable insights into implementation.

The case study did not paint an exhaustive or exclusive picture of the implementation of the MAMI Care Pathway approach. For example, it did not seek the perspectives of mothers, as service users or decliners, and involved only a few clinical health workers. Nor did it evaluate the cost effectiveness, acceptability or feasibility of the Care Pathway approach or compare it to alternative approaches.

Results

In Pakistan, no national policies specifically cover at-risk infants u6m and their mothers. The MAMI Care Pathway approach was introduced at Indus Hospital to address a care gap by facilitating continuity of care for vulnerable mother–infant pairs from birth.

As a first step, a MAMI hospital policy paper was developed that defined a budget for operations and the re-allocation of staff to secure approval from the medical directorate department. In consultation with the hospital management, a maternal and child health (MCH)/MAMI clinic was then set up within the outpatient department (OPD) of the paediatric unit. The MCH/MAMI clinic operated three times per week, receiving vulnerable mother–infant pairs who were referred from paediatric and maternity services within the hospital.

Rotation in the MCH/MAMI clinic was established as a mandatory part of the paediatric residency programme that was well supported by the MAMI manager. Provision of services that addressed the mother–infant pair together and that monitored and addressed risk factors impacting growth and development over time required a new mindset and skills from the paediatric residents, such as guiding and motivating mothers to adhere to care over time and addressing wider issues beyond the medical condition. Many mothers did not return for follow-up visits due to logistical challenges and the view that the visits were not essential if their infants were not perceived to be sick. Also, vulnerability factors related to the socioeconomic household environment of the vulnerable mother–infant pairs were difficult to assess and influence.

The experience of implementing the MAMI Care Pathway approach in the tertiary hospital facilitated important learning on planning, strengthening capacities and implementing the MAMI Care Pathway in a specialised unit. The approach provided opportunities to reinforce maternal and child healthcare and strengthen collaboration between hospital services. Monitoring and evaluating the effectiveness of the approach was a research objective, which limited opportunities for immediate quality improvement. Reaching colleagues and major health actors, including the State Ministry of Health and the World Health Organization, was difficult from a hospital position, but leveraging the MAMI Global Network and academic and research networks may facilitate this.

Conclusion

The Pakistan case study provides insights into the feasibility of integrating the MAMI Care Pathway approach into a tertiary hospital to fill a locally perceived gap in care, with limited additional resources available. Addressing vulnerability factors for mother–infant pairs with a person-centred and continuity of care approach required skills and leadership that were available or acquired. The academic setting had the components needed to generate evidence. Successful implementation was highly dependent on a catalytic individual and decision-maker buy-in. This experience can inform to similar hospital settings, while also considering the potential for and implications for involvement of community and primary health care levels.

Table of contents

Abbreviations

ENN	Emergency Nutrition Network
IYCF	Infant and young child feeding
IMNCI	Integrated management of neonatal and childhood illness
LAZ	Length-for-age z-score
LBW	Low birthweight
MAMI	Management of small and nutritionally at-risk infants under six months and their mothers
MCH	Maternal and child health
MOH	Ministry of Health
MUAC	Mid-upper arm circumference
OPD	Outpatient department
PCM	Protein calorie malnutrition
u6m	Under six months of age
UNICEF	United Nations Children's Fund
WAZ	Weight-for-age z-score
WHO	World Health Organization

1. Addressing care gaps for vulnerable at-risk infants and their mothers

Infant vulnerability

Many infants are born vulnerable, or become so in the first six months of life. These infants are at increased risk of poor growth and development, immediate and long-term ill health, and increased mortality (1). Each year, an estimated 8.9 million infants (14.6%) are born with low birth weight (LBW) (2), carrying short- and long-term health risks, especially for those born premature (1). In low- and middle-income countries, an estimated 9.2 million (15.5%) infants under 6 months of age (u6m) are wasted, 10.3 million (17.4%) are underweight, and 11.8 million (19.9%) are stunted (3). An episode of wasting, particularly in the first three months of life, increases the risk of subsequent and persistent wasting, and concurrent wasting and stunting, as children age (4, 5). This poor start to life contributes to the global burden of 45 million children under five years of age who are wasted and 149 million who are stunted (6), affecting health outcomes in current and future generations and compromising individual and community potential (4, 7).

Gap in evidence to practice

Vulnerable or at-risk infants u6m may be described or present to services in many ways (8). They include newborns with LBW, especially those born preterm or small for gestational age; infants identified with wasting or acute malnutrition, stunting or underweight; infants who are nutritionally at risk, or with acute or chronic illness, disability or other growth and development concerns; and infants whose mothers have nutrition, physical or mental health or social challenges. Many services are provided for these infants, and sometimes their mothers, across health and nutrition services, including for reproductive health (e.g., for LBW, small and sick newborns), nutrition (wasting prevention and treatment), paediatric health (integrated management of neonatal and childhood illness (IMNCI) integrated community case management) and maternal health. However, continuity of comprehensive, quality care centred on at-risk mother–infant pairs is needed to mitigate immediate risks and safeguard future health (9), and this is challenging to deliver at scale (10). Care is therefore complex at both the individual level and service delivery level.

Connecting within and across services is the ideal but is elusive in practice. One critical barrier is lack of evidence on how to do this in different contexts. The 2013 World Health Organization (WHO) guideline update on wasting recommended outpatient care for stable and “uncomplicated” severely wasted infants u6m (11). However, uptake in national policy and practice has been low and slow, with most countries still recommending inpatient treatment. In 2023, WHO updated the guideline (12) to cover infants u6m at risk of poor growth and development. Knowing how to deliver such care in different settings is critical for national policy-makers and those who support their efforts. National decision-makers need contextualised evidence on what works, where, how and for whom in different settings, to enable informed policy and service development within cost and capacity. Without addressing the ‘how’, realising adequate care will remain elusive.

Health worker taking infant’s MUAC.

Commitment to country-led learning on 'how'

To help put the WHO 2013 guidelines into practice, the Emergency Nutrition Network (ENN) coordinated the development of the Management of Small and Nutritionally at-Risk Infants Under Six Months and their Mothers (MAMI) Care Pathway in 2015 through a global collaboration of experts and practitioners. Version 3 was released in 2021. The provisions are consistent with the 2023 WHO guideline update's extended scope (12). The MAMI Care Pathway applies, and expands on, updated health and nutrition guidance, including IMNCI and United Nations Children's Fund (UNICEF)/ WHO breastfeeding counselling materials and frameworks, as well as integrated continuity of care for at-risk infants u6m and their mothers across health and nutrition services. It has been used in pilot studies, small-scale programmes and, increasingly, government services to help navigate and plan care in multiple settings.

Evidence is needed to show that an intervention is effective, but also to assess the conditions under which it is implemented, to maximise the potential for replicability and sustainable delivery at scale. Learning from small-scale implementation is essential before expanding, which requires active planning from the outset. As a collective, the MAMI Global Network is an active forum practitioners around the world use to collaborate, exchange experience and support each other in caring for at-risk infants and mothers through policy, research and practice. Activities are guided by a five-year strategy (9) that aims to achieve sustainable, scaled care by supporting country leadership, priorities and action to help mothers and their infants to survive and thrive. The MAMI Global Network is committed to supporting learning to capture and appraise experiences of the MAMI Care Pathway and examine implementation models and delivery systems in different contexts.

Health worker taking infant's length.

2. Case study series

Three in-depth case studies were carried to explore different implementation modalities of the MAMI Care Pathway approach in three different small-scale settings: in **Pakistan**, **South Sudan** and **Yemen**.

Objectives

The overall objective of the case studies was to explore, capture and generate learning from the application of the MAMI Care Pathway approach in different contexts to inform approaches for sustainable scalability of care.

Specific objectives

1. Describe and learn about what was done, and how and why, in each context.
2. Describe and learn about what worked (or not), for whom and under what circumstances, to bring about routine practices.
3. Examine the spread, scale-up and sustainability of the approach within and across settings.
4. Provide suggestions on how to improve practice and ensure sustainability at scale.

Methods

We applied a mixed-methods approach within and across the three case study settings, including the following elements:

- Developing a *Planning and Implementation Process Framework for the MAMI Care Pathway Approach* to describe in detail the planning and implementation process in each context.
- Exploring the sequential steps of 'normalisation' (adoption) of care, spread, scalability and sustainability in sequential steps by applying the *Normalisation Process Theory (NPT)* (13–15); the *Non-adoption, Abandonment, Scale-up, Spread and Sustainability (NASSS) Framework* (16); and the *Checklist for Assessing the Potential Scalability of Pilot Projects or Research* (17, 18).
- Using these methods to apply different lenses to examine experiences in each context and to generate insights that may be transferable to other settings (19).
- Using a participatory and reflective approach of 'learning by doing, together', to deepen the understanding and build the capacity of all participants.

The Pakistan case was selected as an example of integrating the MAMI Care Pathway approach into paediatrician-led services in a private charity hospital in Karachi, Pakistan. **The country health context** **(section 3)** described the implementation environment for our phased investigation:

- First, we described the process of **planning and implementing** the MAMI Care Pathway approach to understand what was done, and how and why **(section 4)**.
- Second, we explored factors that influenced the process of **normalisation and adoption** of the approach and explored perceptions about what worked for whom and under what circumstances **(section 5)**.
- Third, we triangulated and synthesised data on descriptions and perceptions to appraise the **potential scalability and sustainability** of the approach **(section 6)**.
- Finally, we synthesised **insights** generated through the **collective learning** process into **suggestions** for policy, research and practice, to strengthen the potential for future scale **(section 7)**.

Annex 1 provides an overview of the MAMI Care Pathway approach (who, what, where). Annex 2 lists definitions. Annex 3 details the methods applied in the three case studies, and their limitations. Annex 4 presents a set of generic questionnaires and Annexes 5 and 6 provide more detailed information on the materials used for implementation and training. Annexes 7 and 8 present the detailed findings from the appraisal of the adoption process and readiness for scale.

The case study did not draw an exhaustive or exclusive picture of the implementation of the MAMI Care Pathway approach. For example, it did not seek the perspectives of mothers as service users or decliners, and only involved a few clinical health workers. Nor did it evaluate the cost effectiveness, acceptability, or feasibility of the Care Pathway approach, or compare it to alternative approaches.

Health worker assessing the infant and mother.

3. Country health context

Pakistan is a lower middle-income country that faces ongoing political and socioeconomic instability, as well as regular natural disasters, such as flooding, resulting in displacement, damaged infrastructure, and loss of livelihoods. From 2014 to 2015, an estimated 39% of people living in Pakistan experienced multidimensional poverty (poverty in regard to education, health and living standards).

Over the past three decades, Pakistan has documented improvements in maternal and child health (MCH) indicators, including a 59% reduction in maternal mortality since 1990 (20). However, rates of neonatal and infant mortality (41 and 55 deaths per 1,000 live births, respectively) remain high and have been slow to decline (Table 1). There are also substantial disparities in health access between provinces and districts, with many of the most vulnerable women and children lacking access to quality health services. There is currently limited understanding of the numbers of infants at risk of, or experiencing, poor growth and development, and of those whose mothers need additional care and support. However, data show that almost one-fifth of infants are born with LBW (19%) and fewer than half of infants (49%) are exclusively breastfed.

Table 1: Key health and nutrition indicators, Pakistan

Total population (million)	240.8 (2023) (21)
Fertility (births per woman)	3.2 (2023) (22)
Live birth (births per 1,000 people)	26 (2023) (22)
Neonatal mortality (neonatal deaths per 1,000 live births)	41 (2018) (23)
Infant mortality (infant deaths per 1,000 live births)	55 (2023) (22)
Low birth weight	19% (2023) (24)
Skilled birth attendance	74% (2019) (25)
Exclusive breastfeeding	49% (2018) (23)
Wasting (children 6–59 months)	18% (2018) (23)
Stunting (children 6–59 months)	40% (2018) (23)
Severe wasting and nutritional oedema (children 6–59 months)	2% (2018) (26)

The MAMI Care Pathway approach has been introduced in Pakistan at Indus Hospital, in the city of Karachi. Indus Hospital is a charitable, free-of-cost tertiary hospital that is funded through donations. The MAMI Care Pathway approach was implemented in the outpatient department (OPD) through the MCH/MAMI clinic, which is run three times per week by paediatricians and nurses, with support from a protein calorie malnutrition (PCM) clinic nutritionist when needed. Since Indus Hospital is a teaching facility, paediatric residents rotate through the MCH/MAMI clinic for months at a time as part of their training, with varying levels of experience depending on their stage of residency.

Preparation for implementing the MAMI Care Pathway approach started in June 2021, with the first mother–infant pairs enrolled from October 2021. There is a desire to spread the MAMI Care Pathway approach to the hospitals' satellite clinics in the future, which would require further commitment and resources that are not currently in place.

Figure 1. Location of Indus Hospital in Karachi, Pakistan (see blue dot ●)

4. Planning and implementation

This section describes the inquiry into the planning and implementation of the MAMI Care Pathway in the Pakistan case that included the following steps:

1. Understanding the health system.
2. Planning for service delivery: who, what and how.
3. Implementing services: steps taken to implement the MAMI Care Pathway approach.
4. Monitoring, improving quality and collaborative learning.
5. Making suggestions for improving planning and implementation.

4.1. Understanding the health system

Key information

- In Pakistan, no national policies specifically cater to at-risk infants u6m and their mothers. Care for infants u6m is informed by a mix of relevant WHO guidelines and primarily implemented through national guidance on IMNCI, infant and young child feeding (IYCF) counselling, and inpatient care, as part of community management of acute malnutrition services.
- At Indus Hospital, the MAMI Care Pathway approach was introduced to address a care gap and to facilitate early identification of infants u6m with malnutrition, growth problems, feeding problems and disabilities, and to facilitate continuity of care for vulnerable mother–infant pairs from birth.
- Introducing the MAMI Care Pathway approach provided opportunities to reinforce and integrate existing services that are relevant to at-risk infants u6m and their mothers, and to strengthen or introduce referral mechanisms between services.
- Opportunities for learning and capacity building of clinical health workers, such as strengthening IYCF counselling skills, were created.
- The Chair of Paediatrics at Indus Hospital spearheaded the introduction of the MAMI Care Pathway approach. She worked with a core group of internal multi-speciality stakeholders (the MAMI implementation group) to develop a MAMI hospital policy and adapt MAMI Care Pathway materials to the context. She also provided training to clinical health workers and support staff.

Burden and perceived health priority. Malnutrition services at Indus Hospital were implemented through the PCM clinic in the OPD, targeting children aged six months to five years. However, it was recognised that infants u6m with malnutrition, growth problems, feeding problems and disabilities were falling through the gaps in care. The MAMI Care Pathway approach was introduced to identify at-risk infants at an earlier age and to provide comprehensive care to children from birth to six months of age, while also considering the health, nutrition and social care needs of their mothers.

Policy context. No formal policy analysis was conducted prior to introducing the MAMI Care Pathway approach; however, knowledge and data from local literature were used to inform development of a MAMI hospital policy and guide implementation. Currently, there are no specific national policies to address at-risk infants u6m; however, their care is informed by various relevant WHO guidelines and implemented primarily through the approaches of IMNCI, IYCF counselling, and inpatient care, as part of community management of acute malnutrition services.

Local health system capacities. No formal capacity analysis or feasibility study was conducted prior to implementation of the MAMI Care Pathway approach as robust data on the resources, capacities and logistics of the hospital were available and planning was further informed by the Chair of Paediatrics' knowledge and local networks. Since Indus Hospital is a teaching facility, introduction of the MAMI Care Pathway approach provided an opportunity for learning and capacity building related to infant growth and development. For example, IYCF counselling skills were identified as inadequate and MAMI training on breastfeeding counselling and support has since improved these.

While the MAMI Care Pathway approach was new to Indus Hospital, some services relevant to at-risk infants u6m were already being provided, including breastfeeding and nutrition counselling, inpatient management of sick infants, follow-up care for preterm and LBW infants, and screening for congenital metabolic disorder, hypothyroidism and congenital deafness. However, gaps in referral mechanisms – for example, from neonatology to the paediatric department and for infants u6m with medical problems like cerebral palsy, congenital heart disease, or inherited metabolic disorder – compromised continuity of care. For mothers, there was no formal referral system to the psycho-social department for mental health concerns or to the fertility clinic for family planning counselling. Introduction of the MAMI Care Pathway approach provided an opportunity to locate existing services under one umbrella, linking psycho-social, nutrition, speech therapy, cardiology, paediatric medicine, and hearing assessment services.

Stakeholders. The Chair of Paediatrics at Indus Hospital championed the MAMI Care Pathway approach, identifying and acting on the opportunities it presented to fill gaps in care for infants u6m and their mothers. She advocated for implementation of the MAMI Care Pathway approach and has since acted as the MAMI manager, overseeing planning and implementation of the approach at the hospital. A core MAMI implementation group was formed at the hospital, which includes stakeholders from key departments such as neonatology, paediatrics, psycho-social, family planning and hearing screening departments. This core group was involved in adapting MAMI Care Pathway materials (e.g., assessment forms) according to context specifications, in developing new materials (e.g., to support breastfeeding assessments), and in training of doctors and nurses. So far, no external stakeholders at national level have been involved in planning and implementation; however, there is recognised potential to engage government agencies like the People's Primary Healthcare Initiative, the Accelerated Action Plan Against Hunger, and the Pakistan Paediatric Association, who are delivering nutrition services and who can build on the number of facilities implementing the MAMI Care Pathway approach in future. During conceptualisation, and periodically through implementation, the Chair of Paediatrics sought feedback and shared progress with global practitioners, facilitated by ENN through the MAMI Implementers Working Group of the MAMI Global Network.

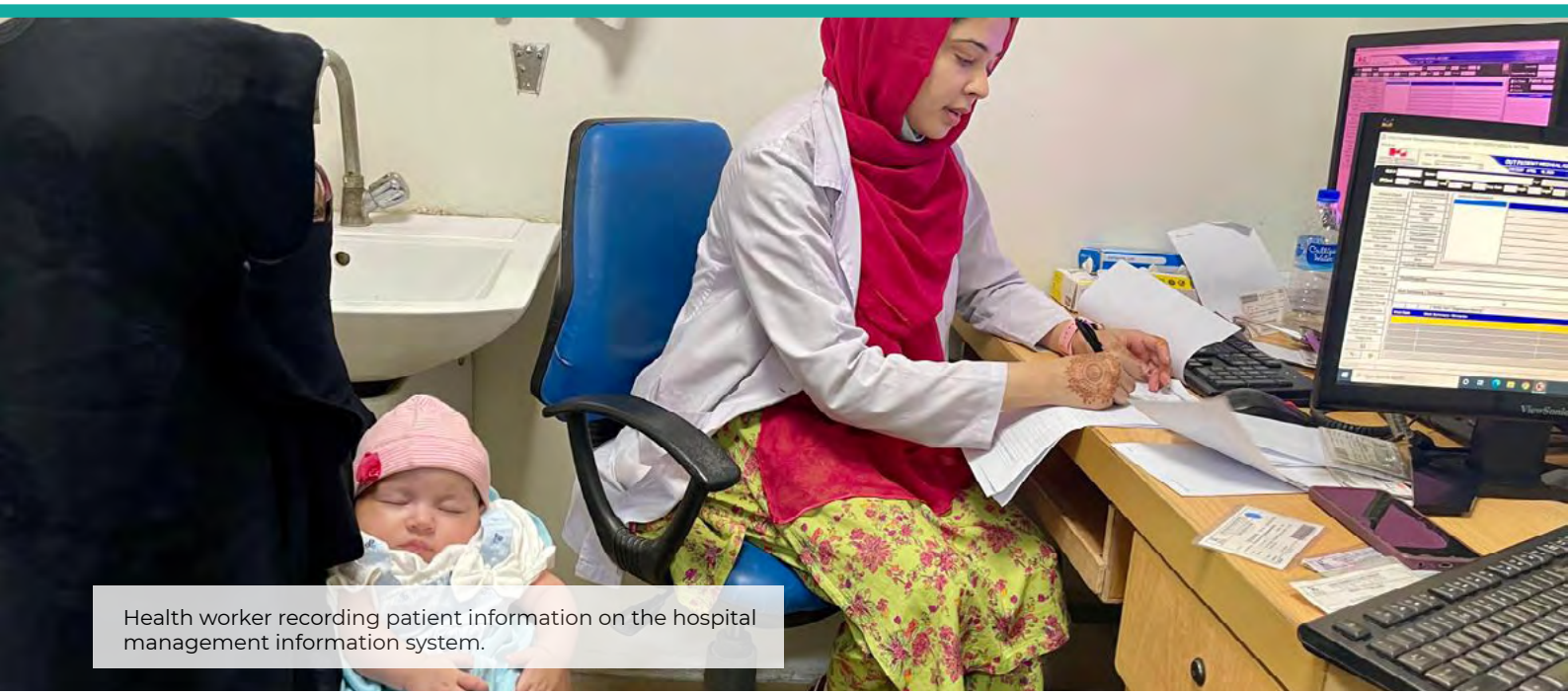
4.2. Planning for service delivery

Key information

- Planning for implementation was done internally: a MAMI hospital policy, including budgeting for medications, was drafted, and was approved by the hospital's medical directors.
- The MAMI Care Pathway approach was integrated into hospital services and utilised existing hospital staff and equipment. Referrals occurred within the hospital.
- All MAMI Care Pathway materials were used during implementation, following context-specific adaptation by the local MAMI implementation group. Initial piloting with 20 mother–infant pairs informed further adaptations.
- Forms were translated into Urdu as needed.
- Clinical health workers were trained to implement the MAMI Care Pathway approach, according to their level of care. The MAMI manager provided ongoing mentorship and support for providing quality care.

Agency's preparedness, stakeholder engagement and approval. All planning for implementation was done internally, starting with development of a MAMI hospital policy and budgeting for medications. Approval was received from the medical directorate department of the hospital after three months.

Defining the target population. Criteria for describing at-risk infants u6m during screening and assessment were defined by the neonatologist and paediatrician within the core MAMI implementation group (Box 1). For mothers, at-risk criteria were informed by the MAMI Care Pathway Package materials (27). A low Apgar score[1] was taken as a red flag that an infant may have cerebral palsy and to ensure active screening for cerebral palsy at 3-4 months of age.



Health worker recording patient information on the hospital management information system.

1 The Apgar score is a quick way for health professionals to evaluate the health of all newborns at one and five minutes after birth and in response to resuscitation. Most newborns score 7, 8 or 9 on the Apgar test, which is considered a good Apgar score. About 90% of infants have Apgar scores of 7 to 10 (https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2015/10/the-apgar-score).

Box 1. Criteria to identify small and nutritionally at-risk infants under 6 months of age (u6m) and their mothers during screening and assessment at Indus Hospital in Pakistan, 2021-2023

Criteria to identify at-risk infants u6m and their mothers during rapid screening in health units of the hospital, for referral for in-depth assessment in the maternal and child health (MCH)/ MAMI clinic

Infant u6m:

- Preterm infant <37 weeks
- Low birthweight newborn <2500 g
- Small-for-gestational age
- Infant receiving mixed feeding or top-up feeding

Mother of infant u6m:

- Mother with feeding difficulties
- Mother with mid-upper arm circumference (MUAC) <230 mm
- Mother with mental health concerns, according to mental health score

Criteria to identify high-risk infants u6m and their mothers during in-depth assessment for referral to inpatient care

Infant u6m:

- MUAC <110 mm
- Weight-for-age z-score (WAZ) <–3 or length-for-age z-score (LAZ) <–3
- Infant with confirmed medical condition (e.g., congenital heart disease, metabolic disease, cerebral palsy)
- Infant with weight loss at follow-up

Mother of infant u6m:

- Mother with depression identified by a psychologist
- Mother with persistent MUAC <230 mm after management
- Mother with persistent anaemia after management

Criteria to identify moderate-risk infants u6m and their mothers during in-depth assessment for enrolment in outpatient care

Infant u6m:

- Preterm infant <37 weeks
- Low birthweight newborn <2500 g
- Small-for-gestational age
- Infant receiving mixed feeding or top-up feeding
- Infant with feeding difficulties
- MUAC ≥110 and <115 mm
- WAZ ≥–3 and <–2 or LAZ ≥–3 and <–2

Mother of infant u6m:

- Mother with MUAC <230 mm
- Mother with mental health concern (mental health score PHQ-9)
- Mother with breastfeeding difficulty

Selecting implementation sites. The MAMI Care Pathway approach was integrated into hospital services for inpatients and outpatients and utilised existing staff and equipment. Referrals for specialised care occurred within the hospital, including to paediatric emergency for inpatient admission, the PCM clinic for children with undernutrition over six months of age, the psycho-social department for maternal counselling, and speciality clinics for cerebral palsy and congenital heart disease.

Designing the implementation modus. Following development of the hospital policy, local adaptations were made to the MAMI Care Pathway materials and forms. Implementation was initially piloted with 20 mother–infant pairs and feedback from health workers informed further adaptations. Data collection then began, using REDCap software. Data collected from the first 900 mother–infant pairs are currently being cleaned for further analysis and to inform future adaptations.

Adapting, aligning, simplifying, testing and using materials. All MAMI Care Pathway package materials were applied during implementation. Initial adaptations to the MAMI forms were made in consultation with the core MAMI implementation group at the hospital, and further amended in response to feedback during implementation (Table Annex 5). Forms were translated into Urdu and tested.

Training for implementation. Three MAMI training workshops were held between 2021 and 2023 for medical doctors, nurses, nutritionists and receptionists working at the hospital. The MAMI manager, nutrition nurse and research department supervisors also participated in management and supervisory capacities. Details of the training sessions are provided in Table Annex 6. The MAMI manager provided ongoing mentorship and support for providing quality care during implementation.

4.3. Implementing services

Key information:

- The MAMI Care Pathway approach was introduced at Indus Hospital in June 2021, with the first mother–infant pairs enrolled in October 2021. Research data collection stopped at enrolment of about 900 pairs. Implementation of the approach has continued since.
- All inpatient and outpatient services provided to mother–infant pairs at Indus Hospital are free of charge. All referrals took place within the hospital, including to inpatient care, and there were no community-based components.
- The MAMI Care Pathway approach was implemented in the OPD through MCH/MAMI clinics held three days per week. A maximum of 18 mother–infant pairs were seen at the MCH/ MAMI clinic per day.
- Not all mother–infant pairs were followed up until the infant reached six months of age. Sufficiently recovered infants were discharged and invited to return to the clinic if an issue was identified by the mother/caregiver.
- Sufficient skilled staff were available at the hospital to implement the MAMI Care Pathway approach. Refresher workshops were regularly conducted, and paediatric residents attended sessions on MAMI topics every six months.
- Motivating mothers to return for follow-up visits was a key challenge given practical and economic constraints and the cultural context, and this limited the accessibility of care. The high numbers of absentees compromised continuity of care for mother–infant pairs.

Access: Availability, geographic accessibility, affordability and acceptability. Indus Hospital is in the Korangi health district in Sindh province. As a free-of-cost hospital, all services are provided to mother–infant pairs free of charge. All referrals took place within the hospital, including to inpatient care and outpatient clinics.

Organisation of care. All activities implemented as part of the MAMI Care Pathway approach were provided at the hospital site in inpatient or outpatient services (no referral required outside the facility) and there were no decentralised community-based components. Table 2 lists the activities according to where they were provided and who

provided them across the hospital. Screening took place at the MCH/MAMI clinic in the OPD three days per week, with referrals between services facilitated by hospital receptionists. A maximum of 18 appointments were made for mother–infant pairs at the MCH/ MAMI clinic per day. Pairs identified as at risk were initially followed up weekly, and then fortnightly. Those mother–infant pairs who were not identified as at risk were followed up at one-, three- and six-month periods. Not all pairs were followed up until the infant reached six months of age; instead, if sufficiently recovered prior to six months, they ended care and were invited to return to the clinic if an issue was identified by the mother (or caregiver).

Table 2: MAMI Care Pathway components unpacked for integration into health services at Indus Hospital in Pakistan, 2021–2023

Activity	Detailed activities	What	Where	Who
Sensitisation	Sensitisation on risks	Through advocacy, counselling, charts and public message videos	In MCH/MAMI clinic, inpatient department and patient waiting areas	Doctors, nurses
	Health and nutrition promotion	Through advocacy, counselling, charts and public message videos	In MCH/MAMI clinic, inpatient department and patient waiting areas	Doctors, nurses
Screening	Screening (rapid assessment)	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
Assessment	IMNCI assessment, triage	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
	Anthropometry assessment	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
	MAMI risk assessment	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
	Feeding assessment	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
	Mental health assessment	Through MAMI forms, Edinburgh postnatal depression scale	MCH/MAMI clinic and psycho-social department	Doctors, nurses, psychologists
	Classification and referral	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
	Treatment and support plan	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
	Enrolment	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
Follow-up	Treatment and support	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
	Targeted counselling on feeding issues	Through MAMI forms	MCH/MAMI clinic	Doctors, nurses
	Targeted counselling on mental health issues	Through counselling sessions	Psycho-social department	Psychologists
	Targeted counselling other (specify)	In paediatric OPD		Doctors
	Referral in case of deterioration during enrolment	Inpatient admission	Paediatric ward/ neonatal intensive care unit	Doctor
	Evaluate progress	MCH/MAMI clinic		
	Evaluate outcome	MCH/MAMI clinic		
	Referral in case of non-recovery at six months	To nutrition clinic in hospital catering to children aged six months to five years	Nutrition clinic	Doctors, nurses

Organisation of staff. Sufficient skilled staff were available at the hospital to implement the MAMI Care Pathway approach. In addition to initial MAMI training, refresher workshops were regularly conducted, and paediatric residents (medical doctors) attended sessions on MAMI topics every six months. Family medicine residents who expressed an interest were also invited to attend these sessions to learn about the MAMI Care Pathway approach. REDCap software was used to monitor data flow and regular meetings were held with receptionists to discuss patient referrals to other outpatient and inpatient services.

Participation. Caregivers were not specifically asked about their experiences of, or satisfaction with, care during implementation and no qualitative data were collected. For teaching purposes, residents discussed cases and gaps in care, with a focus on mother–infant pairs who failed to improve or failed to attend their appointments. There were high numbers of absentees, which compromised continuity of care for infants up to six months of age. Follow-up for missed appointments was conducted via phone calls to mobile numbers, but many caregivers either did not answer or did not attend the facility, even after agreeing to do so on the phone.

Partnerships. As previously discussed, there was minimal engagement external to the hospital on implementing the MAMI Care Pathway approach, although the Chair of Paediatrics championed the approach during engagement with health actors at global and national levels when possible. For example, discussions with the Pakistan Paediatric Association were encouraging, but failed to result in active participation, with their focus currently being on developing a consensus guideline for acute care, which would include acute emergency care for infants u6m. UNICEF and WHO were reached out to, and visited Indus Hospital, but were primarily interested in services for children over six months of age. More broadly, the current remit of WHO in Pakistan tends to focus on supporting programmes in rural areas. While there was an intention to implement the MAMI Care Pathway approach in the hospital's satellite clinics, it was agreed that further simplification and monetary support were needed for this to be successful.

Indus Hospital, Karachi campus where MAMI clinics are run three times a week.

4.4. Monitoring, improving quality and collaborative learning

Key information:

- Data on implementing the MAMI Care Pathway approach were collected via the hospital's routine electronic records system and captured using REDCap software.
- Data collected via REDCap were exported by Indus Hospital's research department every two to three months for consolidation, cleaning and analysis.
- Duplication of monitoring data in hospital records and in REDCap was burdensome for health workers, but provided valuable information for case management and to identify mother–infant pairs who did not return for follow-up visits.
- Currently, there is no in-country sharing about the MAMI Care Pathway approach outside of Indus Hospital. Outside of Pakistan, experiences were shared through the MAMI Global Network's Implementers Group, and learning is planned for dissemination through peer-reviewed publications and other research channels.
- Those implementing the MAMI Care Pathway approach were accountable to Indus Hospital's administration and quality department for providing quality services, maintaining patient flow and ensuring continuity of care.

Monitoring and reporting. The Indus Hospital is fully digitised, with an electronic records system. Data on implementation of the MAMI Care Pathway approach were collected via the routine hospital system and also captured in REDCap (patient flow and monitoring data). Paper forms were kept by the clinicians and data were entered into REDCap using mobile phones each week. Data collected via REDCap were exported to Excel from the hospital's research department for consolidation and cleaning. This was done every two to three months, with data then transferred to SPSS software for analysis. Duplication of monitoring data for implementation of the MAMI Care Pathway in hospital records and in REDCap was burdensome for the health workers. At the same time, the data collected through REDCap were valuable in informing case management, allowing for identification of infants needing particular support and facilitating early referrals. These data also flagged mother–infant pairs who failed to return to the MCH/MAMI clinic for follow-up visits and allowed health workers to monitor the proportions of infants and mothers who experienced vulnerabilities, such as infants born preterm or identified as malnourished, and mothers experiencing depression. Table 3 summarises the data on implementation of the MAMI Care Pathway approach (screening, assessment, enrolment, and outcomes for at-risk pairs) over a 12-month period at Indus Hospital (December 2021–December 2022).

Table 3. Assessment, enrolment, and outcomes of mother–infant pairs, 12-month period (December 2021–2022), Pakistan

Key indicators:	
Pairs assessed	1,238
Pairs assessed identified at moderate risk (% of pairs assessed)	807 (65.2%)
Pairs assessed identified at high risk (% of pairs assessed)	NA
Pairs assessed boy/girl ratio	1.23
Key reasons infants' moderate risk	Mixed feeding, slow weight gain
Key reasons mothers' moderate risk	Work-related absence
Pairs enrolled in care	807
Pairs recovered at infant aged 6 months (% pairs attending care until infant aged 6 months)	MUAC: 358 (59.6%) WAZ: 447 (74.4%)
Pairs not recovered at infant aged 6 months (% of pairs attending care until infant aged 6 months)	MUAC: 243 (40.4%) WAZ: 154 (23.6%)
Pairs missed before or at infant aged 6 months (died, absented, did not return, lost to follow-up) (% of pairs enrolled)	206 (25.5%)

LBW= low birth weight; MUAC= mid-upper arm circumference; WAZ= weight-for age z score.

Improving quality and disseminating information and learning. So far, there had been no in-country sharing of information and learning about the MAMI Care Pathway approach outside of Indus Hospital. While attempts were made to involve national research institutions, there had been no progress in fostering collaborations. Outside of Pakistan, experiences were shared through the MAMI Global Network's Implementers Group, and there was a plan to disseminate learning through peer-reviewed publications and other research channels.

Improving, maintaining and sustaining quality services. The MCH/MAMI clinic was accountable to the Indus Hospital's administration and quality department for providing quality services, maintaining patient flow and ensuring continuity of care. Paediatricians, paediatric residents and other colleagues at the hospital were continually engaged to strengthen service provision and maintain quality care, and the approach was advocated for through informal discussions across the hospital. Educational brochures on topics related to MAMI, including breastfeeding, complementary feeding, anaemia and vitamin D deficiency, were developed for distribution in the OPD and videos were played in patient waiting areas to further promote and advocate for the MAMI Care Pathway approach.

4.5. Making suggestions for improving planning and implementation

Key information:

- Implementers appreciated the potential of the MCH/MAMI clinic to fill a care gap for at-risk infants u6m and their mothers.
- Implementation could be improved by strengthening guidance and materials on counselling on nutrition-specific and nutrition-sensitive topics, such as water, hygiene and sanitation, and family planning.
- More detailed guidance on care for specific at-risk groups was identified as needed; e.g., for infants with cerebral palsy.
- Since the WHO growth charts do not distinguish between preterm and term babies' growth, and since gestational age was available within this hospital setting, the INTERGROWTH-21 growth charts were used for preterm infant growth monitoring.

Based on their experiences of implementing the MAMI Care Pathway approach at Indus Hospital, the case study participants appreciated its potential to fill a care gap for at-risk infants u6m and their mothers. They also made several suggestions to further strengthen implementation. For example, there was a perceived need to either add – or to strengthen and contextualise – content on nutrition-sensitive and nutrition-specific counselling topics, such as on water, hygiene and sanitation, addressing common micronutrient deficiencies (e.g., iron, vitamin D, zinc), family planning and complementary feeding, as part of the MAMI Care Pathway approach. More detailed guidance on managing specific risk groups, such as infants with cerebral palsy, was also identified as needed.

During implementation of the MAMI Care Pathway approach it was recognised that the WHO growth charts do not distinguish between preterm and term babies' growth. Given the high numbers of infants born preterm in this setting, and the fact that data on gestational age were available within this hospital setting, the INTERGROWTH-21 growth charts were used for preterm infant growth monitoring.

5. Embedding the MAMI Care Pathway in routine services

Key information:

- Adequate training, orientation, and adaptation to their contexts helped health workers understand how the MAMI Care Pathway approach built upon and strengthened existing services for at-risk mother–infant pairs, they appreciated its value and they recognised what was required of them.
- Rotation in the MCH/MAMI clinic was introduced as mandatory for all paediatric residents, and implementing the MAMI Care Pathway approach was incorporated into their job descriptions and training.
- Training, context-adapted forms, and ongoing mentorship were critical for effective implementation and ensuring quality of care.
- Person-centred care for the mother–infant pair was a new approach that required a mind shift and a broader skill set from clinicians, as well as connecting paediatric and maternal (adult) health services.
- Since staff were appointed to undertake specific clinical and counselling tasks, sharing of tasks across roles within the implementation team was not common and frequent rotation disturbed routine practices.
- Standardised individual medical records were used for individual case management, to identify difficult clinical cases (red flags) and to monitor individual quality of care.
- Data on individual care were collected and analysed digitally but were not available for routine feedback on quality of care, or for encouraging learning or adaptive management.

This section describes whether and how clinical health workers in the tertiary care setting of Indus Hospital understood and adopted (normalised) the MAMI Care Pathway approach and embedded it in routine practice using a framework approach (13, 14). (See Annex 3 for methods and their limitations and Annex 7 for detailed findings). We interviewed the paediatric resident in charge of providing services to at-risk mother–infant pairs.

First, the inquiry explored the degree to which the approach was adopted in routine work, the contribution of individual and collective action to achieve this and what promoting and hindering factors were involved. Four components of the adoption process were considered: coherence, cognitive participation, collective action, and reflective monitoring. Next the likelihood of the MAMI Care Pathway becoming routine practice from a clinician's perspective was appraised.

Health worker taking infant's weight.

5.1. Exploring adoption

The clinician participating in the inquiry was asked 16 questions to explore whether she:

- Understood the components of the MAMI Care Pathway approach (coherence, or what it is about);
- Was committed to and engaged in implementing the practice (cognitive participation, or who does it);
- Worked with colleagues to enable the practice (collective action, or how it gets done); and
- Appraised the benefits of the practice (reflective monitoring, or how it is understood).

Understanding the MAMI Care Pathway (coherence)

The paediatric resident understood and saw the value of the MAMI Care Pathway approach. She compared how services were provided before and after implementing the MAMI Care Pathway approach and shared how the new components of care, such as measuring MUAC for infants u6m, monitoring growth across follow-up visits, and assessing issues related to the mother's health, were feasible following training and ensuring links were established across necessary inpatient and outpatient services. From her experience of implementing the MAMI Care Pathway approach, the paediatric resident appreciated its importance and cited its benefits, including opportunities for early identification of at-risk mother–infant pairs, resulting in fewer cases of malnutrition among older children (six months of age and beyond) and fewer referrals to the PCM clinic. Since in the MCH/MAMI clinic a cap was placed on the number of mother–infant pairs seen per day (maximum 18), clinicians were able to engage and counsel mothers on care practices, and, in turn, they became more engaged.

Coherence was influenced by the following factors:

Enablers

- Initial and repeated training and mentoring built a good base of understanding.
- The competent MAMI manager adapted and shared the new knowledge and materials relevant for their level of care and context.
- The roles and responsibilities were assigned based on staff competencies.

Barriers

- The clinician was initially uncertain about how to operationalise the MAMI Care Pathway, which included a more in-depth inquiry regarding the infant's health and added an inquiry regarding the mother's health and care practices.

Engaging with the MAMI Care Pathway (cognitive participation)

Commitment and engagement by practising staff were required to implement the MAMI Care Pathway approach in clinical practice. Because paediatric residents were required to rotate into the MCH/MAMI clinic as a new part of their defined role at the hospital, they invested the time needed to provide quality care in accordance with the MAMI Care Pathway approach. The MCH/MAMI clinic also had additional fixed staff (e.g., a senior "feeding nurse", a clinical nurse to monitor vital signs and triage, a receptionist to manage referrals) to support implementation. The MAMI manager was very involved, providing mentorship (supportive supervision) and being available for consultation when issues arose. There was enthusiasm and willingness to further implement the MAMI Care Pathway approach at the MCH/MAMI clinic, but there was no assurance that care would continue without the MAMI manager.

Cognitive participation was influenced by the following factors:

Enablers

- Involvement in implementation of the MAMI Care Pathway was mandatory because it became part of the paediatric residents' rotation and training.
- Access to a knowledgeable and supportive MAMI manager was inspiring and helped professional development.
- The ability to identify and address risks that would otherwise not be known or would be ignored increased levels of professional satisfaction.

Barriers

- Despite the MCH/MAMI clinic cap of 18 mother–infant pairs seen per day (maximum), the MAMI Care Pathway approach introduced more and longer consultations, creating long working days.

Health worker taking infant's weight.

Organising changes and relationships (collective action)

Operationalising the MAMI Care Pathway approach in the tertiary care setting required collective action from all clinical staff, the senior management of Indus Hospital, and the hospitals research department. Training and mentorship (including supportive supervision) ensured that health workers collaborated and were able to complete the tasks required at their level. However, more experienced paediatric residents showed greater competency in the tasks. In cases where the MCH/MAMI clinic was overburdened, additional staff, primarily the feeding nurse, were available to assist with counselling. While it was acknowledged that the skills required to implement the MAMI Care Pathway approach were not so different to those already used in their routine practice, training was required to ensure competency in growth monitoring and IYCF counselling, and practical advice was given on how to respond to different scenarios. The MAMI manager, and in some cases supervisors from other units, continuously motivated the residents in training and provided on-the-job support for implementing the approach.

Collective action was influenced by the following factors:

Enablers

- Comprehensive and contextually adapted implementation materials and forms (staff themselves participated in adaptation) ensured standardised and quality actions (appropriate tools).
- Competent, well-trained health workers were enabled to implement the approach with confidence; continuous on-the job mentoring expanded knowledge and improved skills.
- A competent manager and competent supervisors supported the implementation.

Barriers

- A broad set of skills was required to apply the MAMI Care Pathway approach, which combines components together as person-centred care covering many questions and dealing with many issues, both for infants and mothers.
- Staff were appointed to undertake specific clinical or counselling tasks; sharing of tasks across roles (e.g., when staff capacity was limited) was not common.
- Frequent staff changes disturbed routine practices.

Appraising the MAMI Care Pathway (reflective monitoring)

Implementing the MAMI Care Pathway approach required ongoing monitoring and reflection to ensure and maintain quality of care. Indus Hospital has a paperless data system, and a separate data collection system (using REDCap) was established for capturing research data on MAMI implementation. The MCH/MAMI clinic data were managed by the MAMI manager for research purposes and data on the quality of individual care were evaluated on a regular basis (weekly): for example, to review 'red flag' patients who required follow-up. Data on the quality of service delivery were not readily accessible.

Reflective monitoring was influenced by the following factors:

Enablers

- The standardised individual records were a tool for ensuring and monitoring the quality of individual care.
- Discussions of difficult clinical cases (red flags) were held on a regular basis for problem solving.

Barriers

- Data were collected and analysed digitally, and thus were not available for immediate feedback or to encourage learning or adaptive management.

5.2. Overall appraisal of the adoption process

The success of implementing the MAMI Care Pathway approach based on the interviews appraised the four adoption components on a five-point Likert sliding scale, with a score from 1 ("not adopted at all") to 5 ("completely adopted"):

Coherence, score 4.8. The confident MAMI manager translated existing knowledge and experiences from practice into good guidance for clinical health workers. Several advancements made this possible: specific recommendations on outpatient care for this age group were included in the 2013 WHO guideline on the management of severe acute malnutrition; materials for advocacy and implementation were available (e.g., MAMI Care Pathway materials, briefs and videos); learning experiences from other settings were available (e.g., in the ENN publication *Field Exchange* publication); and evidence was published in medical journals.

Cognitive participation, score 4.3. The score for the level of engagement with the MAMI Care Pathway may be explained by the fact that clinical health workers' involvement was not a choice, because they were allocated specific clinical tasks and task sharing across roles within the team (e.g., when staff capacity was limited) was not common. However, they received occasional support from other clinicians and had auxiliary health workers who assisted with defined tasks.

Collective action, score 4.3. Changes and relationships across implementing teams were facilitated by positive commitment to the assigned tasks and variation in staff skills.

Reflective monitoring, score 2.5. The low score for continuous reflection and improvement in quality of care indicated that quality of individual care was addressed but the quality of the service was not; e.g., health workers did not have an overall understanding of the quality and impact of the service and were not involved in adjustments or changes in implementation modalities and materials.

The scores for the four adoption components were plotted on a spider chart showing the degree of success in the adoption of the MAMI Care Pathway (Figure 2): the larger the area of the spider web, the better the success in adoption.

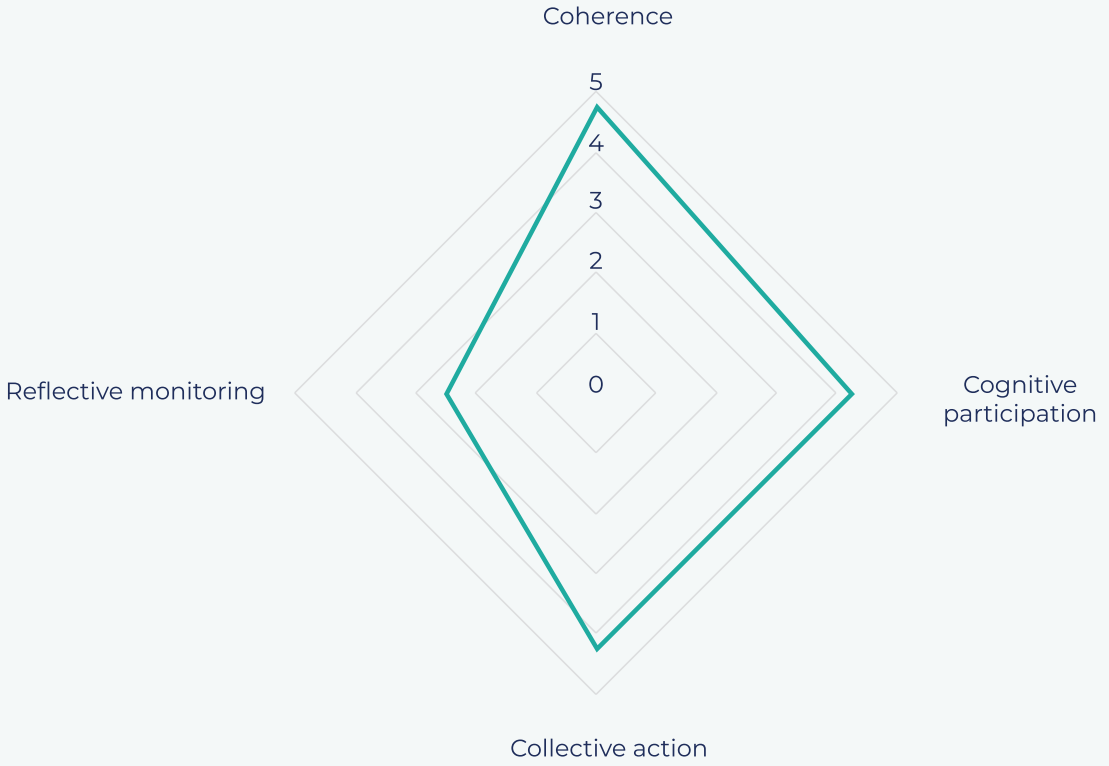


Figure 2: Interpreting the adoption of the MAMI Care Pathway approach in Indus Hospital, 2023
(Adoption was scored on a sliding scale from 1 "not adopted at all" to 5 "completely adopted".)

We concluded that the clinical health professionals successfully adopted the MAMI Care Pathway in the context of a conducive policy environment with senior management buy-in (average score of 4.0). Even though research data collection had ended, implementation had continued in the MCH/MAMI clinic. Paediatric residents were required to rotate in the MCH/MAMI clinic as part of their paediatric residency programme and therefore had been adequately trained and well supported by a motivational leader who championed the MAMI approach in the hospital. Subsequent steps in quality improvement could consider overcoming the barriers identified in this section to improve implementation and thus the effectiveness of the approach.

6. Considerations for scalability and sustainability

This section examines the readiness to scale up the MAMI Care Pathway approach, applying two methods to identify challenges and generate insights to improve scalability.

6.1. Exploring challenges to scale-up, spread and sustainability

Key information:

- Clinicians understood the condition of "small and nutritionally at-risk infants and their mothers" but found some vulnerability factors difficult to understand (e.g., maternal mental health, socioeconomic factors).
- The technology (methods, tools) involved in the MAMI Care Pathway required new skills to put the mother–infant pair at the centre of assessment and care, with sociocultural vulnerability factors difficult to access from a hospital setting.
- Both clinicians and mothers understood and appreciated the MAMI Care Pathway, which addressed a perceived need.
- Introducing the MAMI Care Pathway threatened the professional identity, values and scope of practices of some health workers, because care aspects fell outside of their comfort zone of expertise.
- Understanding, trust and appreciation increased for mothers, but some opportunity costs posed challenges that hindered their returning for follow-up.
- Organisation of care was driven by good leadership but was fragile due to limited resources and competition for financial resources among the different units of the hospital.
- Expanding learning was identified as important but was difficult to do in the single hospital setting.
- The paediatric outpatient department of a tertiary hospital was a conducive setting for testing implementation of the approach, and generated learning for integrating the MAMI Care Pathway into routine paediatric care.

The first method identified challenges and generated insights to improve scalability to explore facilitating or hindering factors that might predict the success of sustainable scalability of the MAMI Care Pathway (16). (See Annex 3 for methods and their limitations and Table Annex 8a for detailed findings.) We interviewed the Chair of Paediatrics (MAMI manager) only, as the paediatric resident had rotated to a new duty station.

Reflective participatory discussions examined the MAMI Care Pathway approach across seven domains to identify challenges related to the condition ("small and nutritionally at-risk infants and their mothers"), the technology, the value proposition, who the adopters are, the health or care organisation, the wider system, and embedding and adapting over time. Next, the case study investigators graded the challenges as 1 (simple – straightforward, predictable, few components),

2 (complicated, with multiple interacting components or issues), or 3 (complicated, dynamic, unpredictable, not easily disaggregated into constituent components).

The condition. The condition "small and nutritionally at-risk infants and their mothers" was considered by the MAMI manager to have been well understood by the paediatric resident working at the tertiary health care level. However, some risks were not easily detectable or predictable because the resident was not experienced in these (e.g., maternal mental health) or the speciality level did not usually consider these (e.g., socioeconomic factors). The mother–infant pair focus was a new way of approaching care for conditions.

We graded the vulnerable mother–infant condition as **complicated** (grade 2) because some factors that contributed to vulnerability were less clear to the clinician, and thus more difficult to detect, which potentially affected care provision.

The technology. The methods and tools used to assess, classify and support "small and nutritionally at-risk infants and their mothers" (technology) were mostly known. Putting the mother–infant pair at the centre of the assessment and care was new (change from a disease focus to focusing on the comprehensive wellbeing of the pair) and including maternal health and nutrition as part of infant care required additional skills. Detecting changes in the health and nutritional status of the infant was easy and detecting changes in the health and nutritional status of the mother was manageable, but changes in behaviour were difficult to assess from the hospital position. Detailed instructions, available in the MAMI Care Pathway package materials, were found easy to use and adapt to the level of care but were simplified for use in the clinic.

We graded the technology involved in detecting and addressing the vulnerable mother–infant condition as **complicated** (grade 2) because while this process was easy for the clinician, considering the mother–infant as a pair, and adding maternal physical and mental health issues in the assessment and care, were unusual and required new skills.

The value proposition (benefit, or unique selling point). The contribution of the MAMI Care Pathway to improving the health of infants by addressing issues early, preventing poor growth, and reducing future complications was appreciated. Rotating residents in the MCH/MAMI clinic offered the opportunity to train new incoming residents on the MAMI Care Pathway, who then, when moving on, would take their newly acquired skills to their new positions.

Mothers were initially satisfied with the care and attention, but many would not come for follow-up visits because they felt the baby was well, or for other reasons (e.g., mothers were working, could not afford the transport, or had to be accompanied).

We graded the value proposition of the vulnerable mother–infant condition as **simple** (grade 1) because the perceived benefit of the Care Pathway was understood and appreciated, addressing a perceived need.

The adopters. New paediatric residents rotated into the MCH/MAMI clinic and some staff were reorganised and allocated to the MCH/MAMI clinic to cover the clinic activities. At the start, the additional tasks and longer working hours created some resistance but this mostly disappeared when the benefits of the clinic were better understood. Also, other departments were affected as they were embraced by the MAMI Care Pathway approach (e.g., accepting referrals). Overall, it took four months to establish all MAMI activities and to start the clinic activities.

Mothers previously would go to the nursery to attend vaccination and then go home. With the MCH/MAMI clinic in place, mothers and infants at-risk received more attention and were asked to return for regular follow-up visits. Barriers to returning to follow-up visits included that the mother had to be accompanied by a family member to go to the clinic, employment of the mother, time investment of mother and companion, and the cost of transport. Some mothers brought other mothers and their infants with a problem, which showed that mothers conferred with and influenced each other, were able to identify risks and share knowledge that they could act upon, and valued the service as impactful. When mothers were in the clinic, they were happy and appreciative, but on leaving the clinic, other contextual factors came into play that were beyond the control or influence of the hospital system.

We graded adopters of the Care Pathway as **complex** (grade 3) because the MAMI Care Pathway required changes to professional career paths and scope of practices that were difficult to value. Also, while mothers who attended care experienced an increase in their understanding, trust and appreciation, there remained challenges in these areas for those who could not continue to attend care.

The health or care organisation. The initiative of starting and maintaining the MAMI clinic was driven by the Chair of Paediatrics, who, with the

agreement of the hospital's directors, took responsibility for making the clinic operational and championed the innovation to address an observed and unmet need. All organisational steps were managed by her, with the support of and trust from superiors and colleagues, and the financial resources from the hospital's charity system. Staff (paediatric residents and the nutrition nurse) were available through adapting the rotation system and were trained to take on their specific tasks.

We graded the health or care organisation as **complicated** (grade 2) because many organisational factors and good leadership were needed to establish the services, which were challenged in a hospital context with limited or competing resources.

The wider system. Interest was expressed in expanding learning to beyond the hospital premises and efforts made to this end, needed to become regularised (e.g., involving more clinicians in training, involving nutritionists and dieticians in managing infants u6m and not just those above six months, reaching out to the Paediatric Association of Pakistan, expanding to hospitals in Karachi with high burden of undernutrition but no services, reaching out to the Ministry of Health (MOH) and WHO for their involvement and learning). The MOH was committed to addressing malnutrition in children but there were disparities in service provision across provinces for which risk stratification would be required to ensure human resources and funding were allocated.

We graded the wider system as **complex** (grade 3) because many factors influenced financial and policy support, due to competing health priorities, and they were difficult to know or predict.

Embedding and adapting over time. The current setup showed the good potential of adopting the MAMI clinic as a routine service in a tertiary hospital. Challenges included further simplifying the approach, ensuring ongoing learning and implementation support, and solving financial challenges relating to staffing, training, and medicines. Also, the whole approach, carried forward by one influential person, was not sustainable.

We graded embedding and adapting the MAMI Care Pathway approach over time as **complex** (grade 3) because there were significant barriers to the further adaptation or co-evolution of the MAMI Care Pathway approach towards becoming a routine service in a single hospital setting, without this being mandated by a policy change.

The seven scores were plotted on a spider chart (Figure 3) indicating grade 1 challenges (simple) are understandable or predictable, and relatively straightforward to address; grade 2 challenges (complicated) are less understandable, controllable, and straightforward to address; and grade 3 challenges (complex) are incomprehensible or unpredictable, thus requiring systems dynamics methods to understand their changing or emergent behaviours. The scores aimed to indicate the feasibility of managing the identified challenges. The area of the spider web in figure 3 appraises the overall feasibility or ease of managing the challenges to implementing the MAMI Care Pathway approach in the Pakistan case at scale: the larger the area of the spider web, the more challenging the scalability.

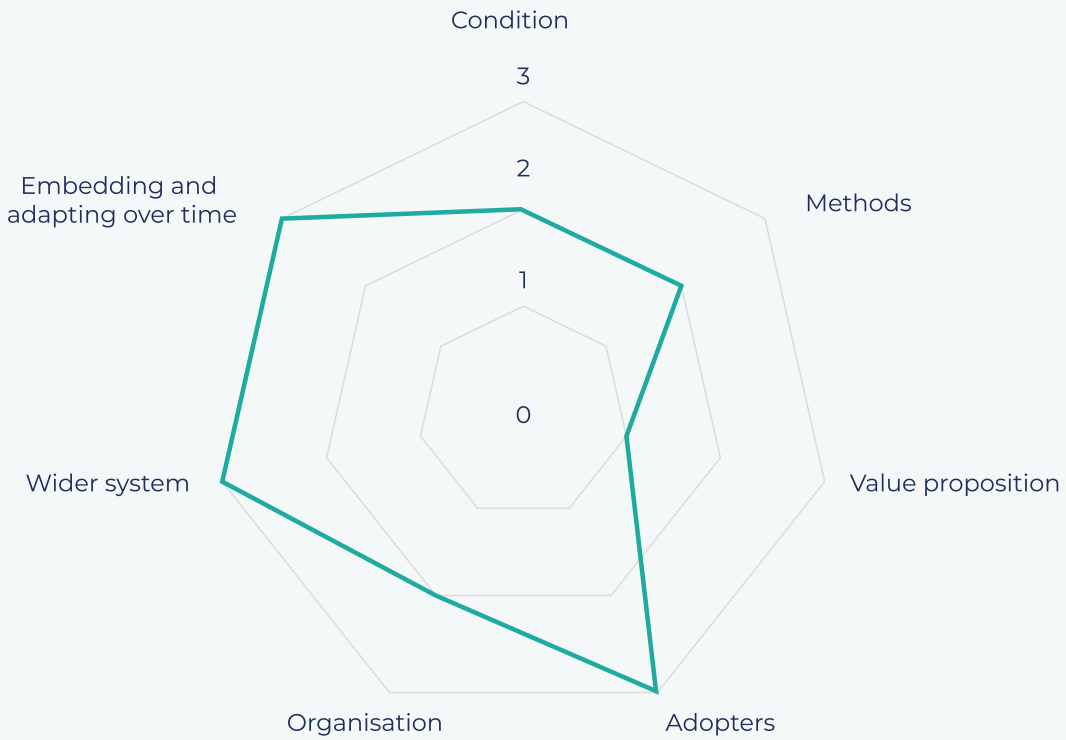


Figure 3: Appraising challenges to the scalability of the MAMI Care Pathway implementation in the Pakistan case, 2023
(Challenges were graded as 1 "simple", 2 "complicated" and 3 "complex" to address.)

We conclude that while clinicians involved in implementing the MAMI Care Pathway approach in the Pakistan case found addressing the condition "small and nutritionally at-risk infants and their mothers" with a person-centred and continuity of care approach challenging but feasible as part of tertiary hospital care. Key for sustainable scale-up was good leadership to organise services and secure resources, and aligning the hospital directors behind this new approach. Peer-reviewed publications would leverage learning in-house and beyond, secure resources and advocate for spreading the approach for scale-up.

Waiting area of the MAMI clinic.

6.2. Exploring potential scalability

Key information:

- Actions the Pakistan case took that facilitated future sustainable scale-up of the MAMI Care Pathway approach included the following:
  - Addressing a persistent health condition, or service.
  - Assessing and documenting health outcomes and the process of implementation.
  - Designing mechanisms to review progress and promote learning.
  - Sharing understanding on the importance of evidence on feasibility and outcomes prior to scale-up.
- Actions the case missed that might facilitate future sustainable scale-up included the following:
  - Engaging key stakeholders in a participatory process.
  - Considering expectations for scale-up in the design.
  - Considering constraining or supporting socio-cultural and gender factors.
  - Planning to advocate for changes in policies and regulations.
  - Testing the intervention under existing human and financial resources constraints.
  - Engaging with donors and technical partners to support early and continuous scale-up.
  - Keeping the intervention simple, without jeopardising outcomes.
  - Testing the intervention in a variety of sociocultural and geographic settings.
  - Planning advocacy for changes in policies and regulations.

The second method explored potential scalability to assess readiness for scale-up by considering critical steps in the design to enhance potential large-scale impact (18). (See Annex 3 for methods and their limitations and Table Annex 8b for detailed findings.) The case study team triangulated the case study information to populate the table in Annex 8b. They explored 12 key actions in the design of the approach to provide useful insights for scale-up decision-making. Table 4 shows whether these actions were taken or missed.

Table 4: Appraising potential scalability of the MAMI Care Pathway implementation at Indus Hospital in Pakistan, 2023

Appraisal of actions for sustainable scale-up	
1. Involved future stakeholders	No
2. Addressed a persistent health condition or service	Yes
3. Considered expectations about scale-up in the design	No
4. Considered constraining or supporting socio-cultural and gender factors	No
5. Kept package of interventions simple, without jeopardising outcomes	No
6. Tested in a variety of socio-cultural and geographic settings	No
7. Required no extra human and financial resources for implementation	No
8. Assessed and documented health outcomes and process of implementation	Yes
9. Engaged with donors and technical partners to support scale-up early and continuously	No
10. Planned to advocate for changes in policies and regulations	No
11. Designed mechanisms to review progress and incorporate new learning	Yes
12. Shared understanding on the importance of adequate evidence on feasibility and outcomes prior to scale-up	Yes

The findings suggest that the implementation modus of the MAMI Care Pathway at Indus Hospital in Pakistan was not designed with scale-up in mind. Instead, it was intended to make services routinely and sustainably available in their setting. Therefore, several of the recommended steps for scale-up were either not applicable or were not undertaken. However, discussions with the team indicated that thinking was evolving on this subject, and some initial steps had been taken, and some steps had been mulled over but not yet implemented.

There was certainly a desire and willingness to share learning, and help scale-up and expansion, as well as to involve paediatric associations. Peer-reviewed publications that are planned would support this endeavour and better attract the attention of paediatric colleagues.

7. Learning to inform practice and scale-up in Pakistan (summary findings)

The process of accessing learning from implementing the MAMI Care Pathway approach in the tertiary charity hospital in Pakistan involved an empirical investigation in a real-life context. Interviewing members of the implementation team to collect their perspectives, using several sources of evidence, and discussing emerging findings revealed implicit knowledge and expanded learning. Using different lenses to explore what was done, where, by whom, and how uncovered and helped further generate a range of rich learning about implementing the Care Pathway approach in the given context.

7.1. Planning and implementation

As a first step, a MAMI hospital policy paper outlining operations and re-allocating staff, including a budget, was approved by the medical directorate department. In consultation with the hospital management, the MCH/MAMI clinic was established as a new unit in the paediatric OPD where the necessary resources and support were made available. It took four months to gain approval and to set up the clinic. Three times a week, the MCH/MAMI clinic received a maximum of 18 vulnerable mother–infant pairs per day as outpatients who were referred from paediatric and maternity services within the hospital.

The organisation of clinical consultations by the MAMI Care Pathway approach was familiar to clinicians, but the implementation modality demanded a shift in mindset and good leadership. First, offering services that addressed both the infant and the mother in a paediatric unit required new knowledge and skills, as well as strengthened links with other specialised services in the hospital. Thanks to the MAMI manager's coordination, early hurdles were overcome. Second, taking a longer time to carry out in-depth assessment of, and to provide care to, infants, and including mothers and requiring them to return for follow-up visits until the infants reached six months of age, were new ways of working for a hospital unit.

On the other hand, it was difficult to assess and influence vulnerability factors related to the socioeconomic household environment of the vulnerable mother–infant pairs. Also, returning for follow-up visits was challenging for mothers who were working or lived far away, and was not seen as essential if their infants were not perceived to be sick. Mothers always needed to be accompanied by a family member.

7.2. Normalisation and adoption

Appraisal of the adoption of the MAMI Care Pathway approach generated detailed information on facilitators and barriers that will be useful to improve health workers' behaviours to ensure more sustainable health outcomes.

Because rotation in the MCH/MAMI clinic was made mandatory as part of the residency programme, the resident paediatricians received good support from their supervisor, the MAMI manager, to carry out their tasks and, in turn, were eager to perform their work properly. Monitoring and addressing risk factors that impact growth and development over time required a new skill set from the clinician, to guide and motivate mothers to comply with care.

7.3. Considerations for scalability and sustainability

Two methods applying different lenses examined the readiness to scale up the MAMI Care Pathway approach, not to determine whether the approach was scalable, but to provide insights on challenges that need to be addressed when preparing for scale-up. Challenges were characterised as easy (simple), difficult but possible (complicated) or challenging (complex) to overcome to consider in the future.

Challenges identified included the need to develop new skills to put the mother–infant pair at the centre of assessment and care, which fell outside of the comfort zone of available expertise, generate learning that is accessible to monitor quality of care, and establish links to primary care facilities that have health activities that reach communities.

The challenges to implementing the MAMI Care Pathway in a tertiary hospital system remains limited in scope in the absence of a community-based support system for the vulnerable mother–infant pairs closer to their homes.

7.4. Collective learning and suggestions to strengthen potential for scale

The experience of implementing the approach in the tertiary hospital facilitated important learning on planning, building capacities and implementing the MAMI Care Pathway in a specialised unit, which can be transferred to other similar sites. It was also assumed that the resident paediatricians would take their new knowledge and skills when they rotate to new sites and adopt elements of the approach in their future practice. A strengthened monitoring, evaluation, accountability and learning system, and peer-reviewed publications, were planned to support the learning process. Attempts were made to share experience and advocate for policy changes. Reaching colleagues and major health actors, including the State MOH and WHO, was difficult from a hospital position, but leveraging involvement in the MAMI Global Network and academic and research networks may facilitate this.

The findings of the detailed learning are intended to improve service delivery, encourage research and drive mindful, sustainable approaches for scale-up.

Regarding mothers' perceptions, as understood by health workers, we learned the following:

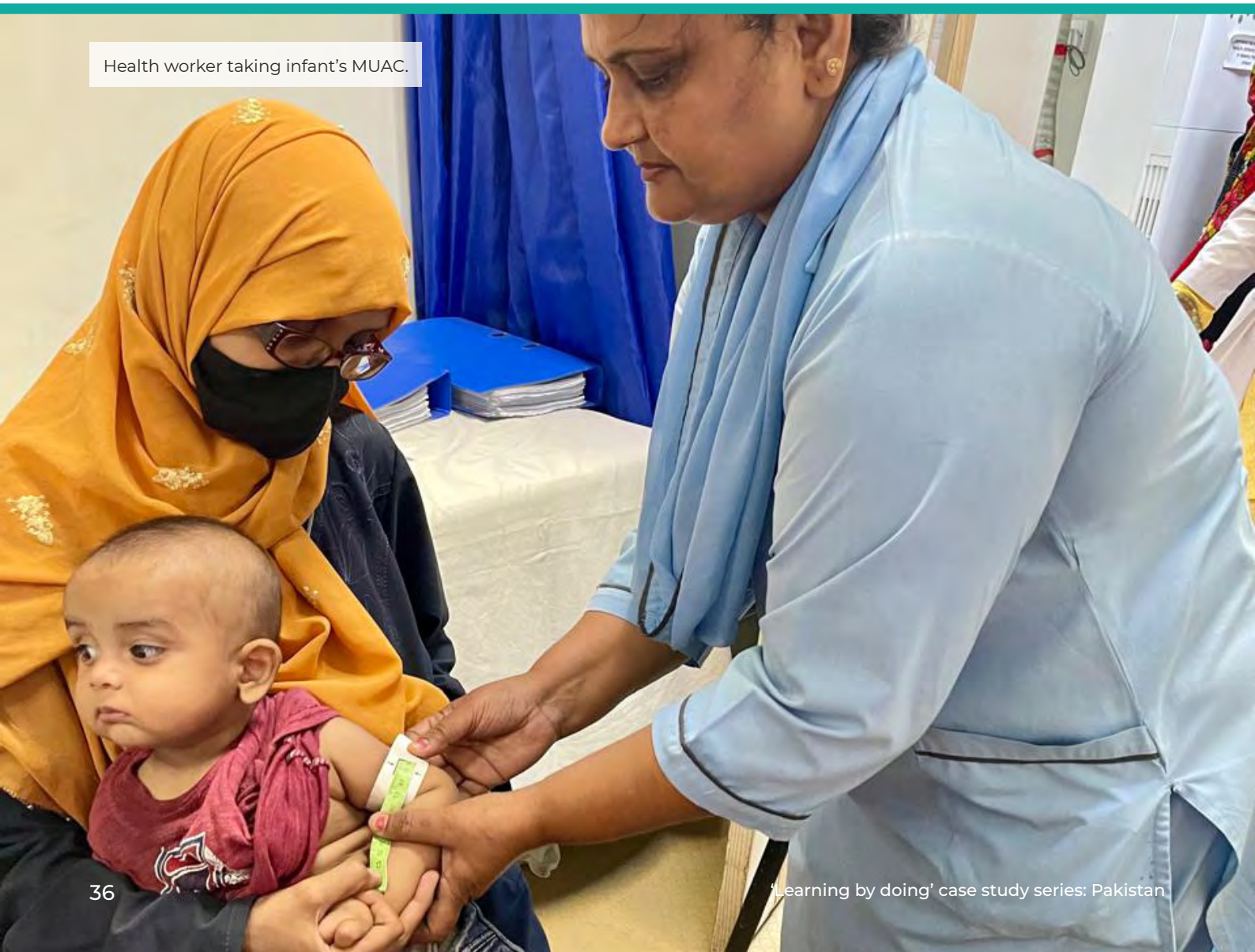
- Vulnerable mothers considered the integrated Care Pathway beneficial and were grateful for the care and support received.
- Adherence of mothers to care improved when there was clear communication and support.
- In cases where barriers in their home environments affected mothers' compliance with care, they could not be corrected.
- Because risk factors for the vulnerable mother–infant pair were mostly invisible, and because there was no perceived tangible benefit from doing so, interest in returning for follow-up or complying with care was easily lost.
- The ability to travel to the hospital with an attendant and the cost of doing so were perceived as major barriers to attending follow-up visits.

From service implementation, we learned the following:

- Quality MAMI care was provided by a team of multiple experts, filling a gap in care for vulnerable infants and their mothers that was previously not addressed.
- MAMI medical records need to be simplified and adapted to the healthcare level (e.g., condensed on breastfeeding support, and expanded on medical conditions and developmental disabilities).
- The shift from a disease focus to a person-centred and continuity of care focus was new for the paediatrician and required adapting hospital procedures. Linking with specialised services and referring cases in-house were well coordinated by a dedicated person.
- Because the organisation of the MCH/MAMI clinic was well managed, care provision was smooth, and the quality of individual case management was monitored closely.

From the health system, we learned the following:

- The MAMI manager was influential in setting up the MCH/MAMI clinic and getting agreement from the hospital direction for allocating staff and residents and using technical and financial resources.
- Adapting and simplifying the approach to the hospital context was necessary and was carried out as a continuous process.
- Monitoring and evaluating the effectiveness of the approach was a research objective and results were not (yet) made available for quality improvement, which limited opportunities.
- Learning in house and beyond was limited and remained largely in the hands of the MAMI manager, but sharing learning was considered and is planned.



Health worker taking infant's MUAC.

8. Conclusion

In the Pakistan case, the MAMI Care Pathway was introduced in an urban tertiary hospital in response to a locally identified gap in care need, and with limited resources could easily establish quality care to at-risk infants and their mothers. Addressing vulnerability factors for the condition “small and nutritionally at-risk infants and their mothers” with a person-centred and continuity of care approach required skills that were available. The academic setting had the components required to generate evidence. Successful implementation was highly dependent on a catalytic individual and decision-maker buy-in. This experience can inform applying the approach in similar hospital settings, while also considering involving primary healthcare levels and the community.

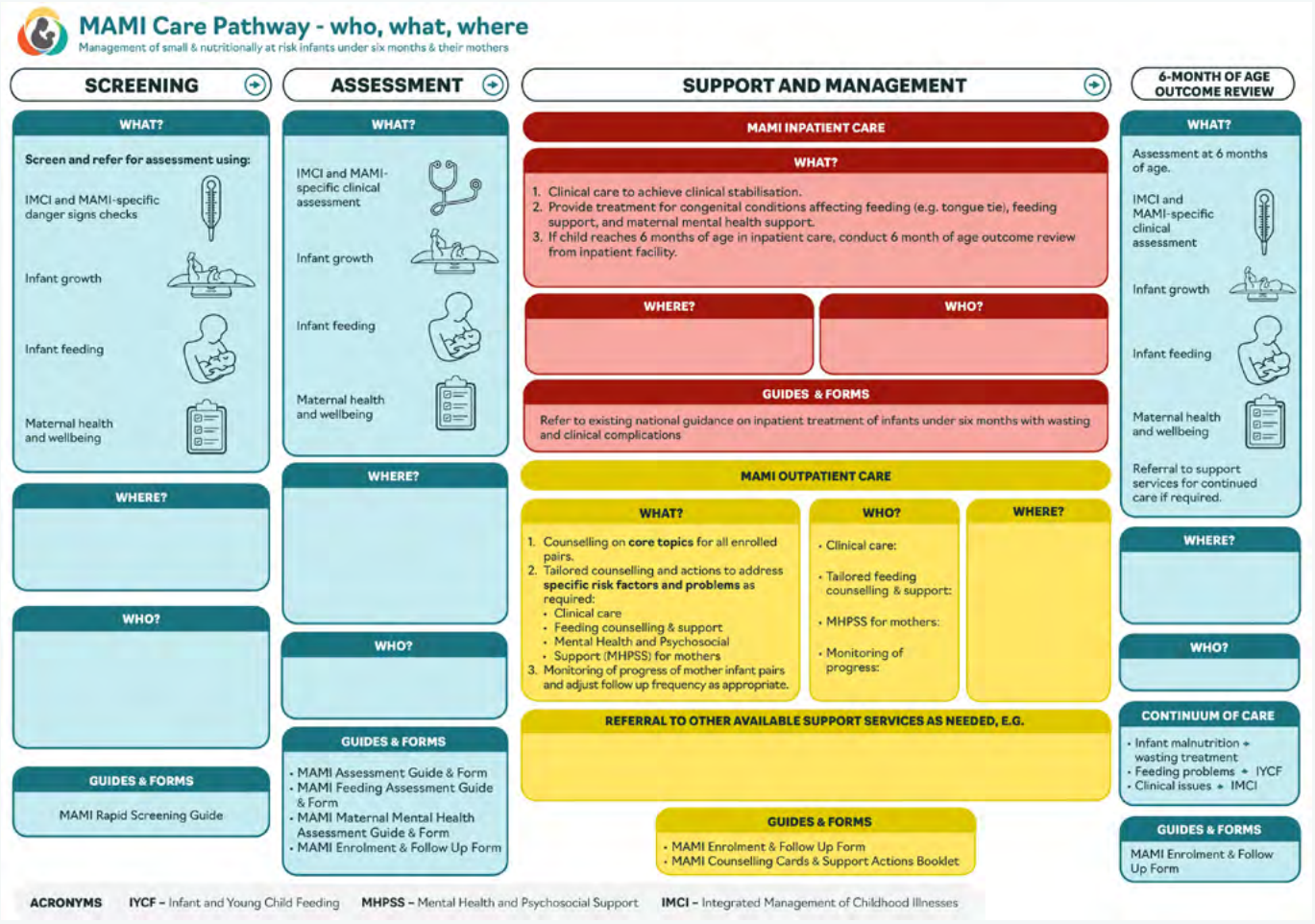
References

1. Lawn, J.E., Ohuma, E.O., Bradley, E., Idueta, L.S., Hazel, E., Okwaraji, Y.B., et al. (2023) Small babies, big risks: global estimates of prevalence and mortality for vulnerable newborns to accelerate change and improve counting. *Lancet*, 401(10389), 1707-19.
2. Blencowe, H., Krasevec, J., de Onis, M., Black, R.E., An, X., Stevens, G.A., et al. (2019) National, regional, and worldwide estimates of low birthweight in 2015, with trends from 2000: a systematic analysis. *Lancet Glob Health*, *7*(7), e849–e60.
3. Kerac et al. (2024) Prevalence and assessment of malnutrition in infants aged <6 months in low- and middle-income countries: secondary data analysis. Under review.
4. Mertens, A., Benjamin-Chung, J., Colford, J.M., Coyle, J., van der Laan, M.J., Hubbard, A.E. et al. (2021) Risk factors and impacts of child growth faltering in low- and middle-income countries. *medRxiv*, *2020*.06.09.20127100.
5. Mertens, A., Benjamin-Chung, J., Colford, J.M., Hubbard, A.E., van der Laan, M.J., Coyle, J. et al. (2020) Child wasting and concurrent stunting in low- and middle-income countries. *medRxiv*, 2020.06.09.20126979.
6. Global Nutrition Report Stakeholder Group (2022) *2021 Global Nutrition Report: The state of global nutrition*.
7. Martorell, R., Zongrone, A. (2012) Intergenerational influences on child growth and undernutrition. *Paediatr Perinat Epidemiol*, *26*(Suppl 1), 302–14.
8. McGrath, M., Wrottesley, S.V., Brennan, E., Samnani, A., Deconinck, H. (2024) *Invisible pursuit: global policy guidance on care of vulnerable infants under 6 months and their mothers, a scoping review*.
9. ENN (2021) *MAMI Global Network Strategy 2021–2025*.
10. Muriuki, A., Yahner, M., Kiragu, M., de Graft-Johnson, J., Izulla, P. (2022) On the road to universal coverage of postnatal care: considerations for a targeted postnatal care approach for at-risk mother–baby dyads in low-income and middle-income countries informed by a consultation with global experts. *BMJ Open*, *12*(6), e058408.
11. WHO (2013) G*uideline: Updates on the management of severe acute malnutrition in infants and children*.
12. WHO (2023) *WHO guideline on the prevention and management of wasting and nutritional oedema (acute malnutrition) in infants and children under 5 years*.
13. May, C.R., Finch, T., Ballini, L., MacFarlane, A., Mair, F., Murray, E., et al. (2011) Evaluating complex interventions and health technologies using normalization process theory: development of a simplified approach and web-enabled toolkit. *BMC Health Services Research*, *11*(1), 245.
14. Murray, E., Treweek, S., Pope, C., MacFarlane, A., Ballini, L., Dowrick, C., et al. (2010) Normalisation process theory: a framework for developing, evaluating and implementing complex interventions. *BMC Medicine*, *8*(1), 63.

15. May, C., Rapley, T., Mair, F.S., Treweek, S., Murray, E., Ballini, L. et al. (2015) *Normalization Process Theory on-line users' manual, toolkit and NoMAD instrument*.
16. Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C. et al. (2017) Beyond adoption: A new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-Up, spread, and sustainability of health and care technologies. *J Med Internet Res.*, *19*(11), e367.
17. WHO (2010) *ExpandNet. Nine steps for developing a scaling-up strategy*.
18. WHO (2011) *ExpandNet. Beginning with the end in mind: planning pilot projects and other programmatic research for successful scaling up*.
19. Gilson, L. (2012) *Health policy and systems research: a methodology reader*. Report No.: 9789241503846 (CD ROM) 9789241503136.
20. UNICEF (2018). *Policy brief - Improving quality of care around the time of birth in Pakistan*.
21. World Population Review (2023). *Total population by country 2023: Pakistan*. https://worldpopulationreview.com/countries.
22. Macrotrends (2023) *Macrotrends: Health* https://www.macrotrends.net.
23. National Institute of Population Studies (Pakistan), ICF (2019) *Pakistan Demographic and Health Survey 2017-18*
24. Ngo, N., Bhowmik, J., Biswas, R.K. (2022) Factors associated with low birthweight in low-and-middle income countries in South Asia. *Int J Environ Res Public Health*, *19*(21).
25. National Institute of Population Studies (Pakistan), ICF (2020) *Pakistan Maternal Mortality Survey 2019*.
26. Action Against Hunger (2023) *State of Acute Malnutrition: Global and country data*. https://acutemalnutrition.org/en
27. MAMI Global Network, ENN, London School of Hygiene & Tropical Medicine (2021) *MAMI Care Pathway Package, Version 3*.

Annexes

Annex 1. MAMI Care Pathway package who, what, where matrix



Source: MAMI Global Network, ENN, London School of Hygiene & Tropical Medicine (2021) *MAMI Care Pathway Package, Version 3.*

Annex 2. Definitions

Adoption. Implementing new ways of thinking, acting and organising in healthcare, and integrating new systems of practice into existing organisational and professional settings. (1)

Continuity of care. The provision of services that are coordinated across levels of care – primary care and referral facilities – and across settings and providers; the provision of care throughout the life cycle; care that continues uninterrupted until an episode of disease or risk is resolved; the degree to which people experience a series of discrete health care events as coherent and interconnected over time and consistent with their health needs and preferences. (2)

Embedding. Routinely incorporating a practice or practices as an integral part of the everyday work of individuals and groups. (1) (3)

Family-centred care. An approach to care delivery that can be practised in health facilities at all levels and that promotes a mutually beneficial partnership among parents, families and health care providers to support health care planning, delivery and evaluation. The principles of family-centred care include dignity and respect, information sharing, participation and collaboration. (4)

Implementation. The social organisation of bringing a practice or practices into action. (1)

Innovation. A health intervention or practice that is new in the local setting and tested in a pilot project or research. (5)

Integrated care pathways. Structured multidisciplinary care plans that detail essential steps in the care of patients with a specific clinical problem and that describe the expected progress of the patient (6). See ***clinical pathway.***

Integrated services. The management and delivery of health care services so that people receive a continuum of health promotion, disease prevention, diagnosis, treatment, disease management, rehabilitation and palliative care through different levels and sites of care in the health system, according to their needs throughout the life course. (7)

Integration. Reproducing and sustaining a practice or practices among the social matrices of an organisation or institution. (1)

Normalisation. The successful implementation and integration of interventions into routine work. (1)
People-centred care. Care that is focused on and organised around the health needs and expectations of people and communities, rather than diseases, encompassing clinical encounters as well as attention to the health of people in their communities and their crucial role in shaping health policy and health services. (8)

Person-centred health care. The conscious adoption of the perspectives of individuals, families and communities as participants in and beneficiaries of trusted health systems; respecting patients' values, preferences and expressed needs in coordinating and integrating care, information, communication and education, physical comfort, emotional support, alleviation of fear and anxiety, involvement of family and friends, transition and continuity. (9)

Quality of care. Health services for individuals and populations that increase the likelihood of desired health outcomes and that are consistent with current professional knowledge, (10) characterised by effectiveness, efficiency, accessibility, patient-/people-centred care, equity and safety (11). The quality of patient care focuses mostly on technical quality, appropriate referral, continuity of care and patient-centredness. (12)

Scale-up. The deliberate attempt to increase the impact of a health service innovation (successfully tested in a pilot or experimental project) to benefit more people and foster lasting policy and programme development. (13)

Spread. The geographic expansion of a health service, making the service available. (3)

Sustainability. The potential to sustain beneficial outcomes for an agreed period at an acceptable level of resource commitment within acceptable organisational and community contingencies. (2, 14)

Sustainability of health services. The capacity to provide ongoing prevention and treatment for a health problem after termination of major financial, managerial and technical assistance from an external donor. (15)

Sustainable. Able to be maintained, to be upheld or to persist over the long term. (3)

System. A set of things working together as parts of a mechanism or an interconnecting network; a complex whole. (16)

Tacit knowledge. Knowledge-in-practice developed from direct experience and action; highly pragmatic and situation-specific knowledge that is subconsciously understood and applied, difficult to articulate, and usually shared through interactive conversation and shared experience. (17)

Theoretical framework. A conceptual tool that is useful in making sense of a complex social reality and that helps design a research question, guide the selection of relevant data, interpret the data and propose explanations of causes or influences. (18)

Theoretical generalisability. A process of reflective learning and reflective practice (what, how, why). (19)

Theory. A set of analytical principles or statements designed to structure observation, understanding and explanation of the world; an explanation of how and why specific relationships lead to specific events. (20)

References

1. May, C.R., Mair, F., Finch, T., MacFarlane, A., Dowrick, C., Treweek, S. et al. (2009) Development of a theory of implementation and integration: Normalization Process Theory. *Implementation Science*, *4*(1), 29.
2. WHO (2011) *Health systems strengthening glossary*.
3. Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C. et al. (2017) Beyond adoption: A new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-Up, spread, and sustainability of health and care technologies. *J Med Internet Res*, *19*(11), e367.
4. WHO (2019) *Survive and thrive: transforming care for every small and sick newborn*.
5. WHO, ExpandNet (2011) *Beginning with the end in mind: planning pilot projects and other programmatic research for successful scaling up*.
6. Campbell, H., Hotchkiss, R., Bradshaw, N., Porteous M. (1998) Integrated care pathways. *BMJ*, *316*(7125), 133–7.
7. WHO (2008) *Integrated health service. What and why?* Technical brief 1.
8. WHO (2010) *People centred care in low- and middle-income countries*. Meeting report.
9. Social Care Institute for Excellence (2023). Person-centred care. https://www.scie.org.uk/prevention/choice/person-centred-care.
10. Lohr, K.N. (Ed.) (1990) *Medicare: A strategy for quality assurance, volume I*. Institute of Medicine, the National Academies Press.
11. WHO (2023) *Quality of care* https://www.who.int/health-topics/quality-of-care#tab=tab_1.
12. Kruk, M.E., Freedman, L.P. (2008) Assessing health system performance in developing countries: a review of the literature, *Health Policy*, *85*(3), 263–76.
13. WHO (2007) *Practical guidance for scaling up health service innovations*.
14. Swerissen, H. (2007) *Understanding the sustainability of health programs and organisational change*.
15. Health Systems 20/20 (2008) *Brief: Health Systems Assessment Approach: A how-to manual.*
16. Oxford University Press (2023) *Oxford Advanced Learner's Dictionary.* https://www.oxfordlearnersdictionaries.com/definition/english/system.
17. Wikipedia the free encyclopedia (2023) *Tacit knowledge*. https://en.wikipedia.org/wiki/Tacit_knowledge.
18. Reeves, S., Albert, M., Kuper, A., Hodges, B.D. (2008) Why use theories in qualitative research? *BMJ*, *337*, a949.
19. Gilson, L. (2012) *Health policy and systems research: a methodology reader*. Report No.: 9789241503846 (CD ROM)9789241503136. Alliance for Health Policy and Systems Research, WHO, Geneva, Switzerland
20. Nilsen, P. (2015) Making sense of implementation theories, models and frameworks. *Implement Sci*, *10*, 53.

Annex 3. Methods and limitations

These case studies used a mixed-methods design in which different theories applied different lenses to examine the introduction, implementation and adoption of the MAMI Care Pathway in each case context and to generate learning and ideas on improving implementation and scalability.

Inquiry tools

First, a *Planning and Implementation Process Framework for the MAMI Care Pathway Approach* was developed, inspired by the 2010 WHO ExpandNet "Nine steps for developing a scaling-up strategy", the 2011 WHO ExpandNet "Beginning with the end in mind" (1) and tacit knowledge of co-researchers (Box A3.1). This was used to generate a detailed description of the planning and implementation process within the defined context of each country case.

Box A3.1: Planning and Implementation Process Framework

Context
- Country context
- Organisational context

Situation analysis prior to starting
- Burden and perceived health priority
- Policy context
- Local health system capacities
- Stakeholders

Planning for implementation
- Initiating discussions – agency's preparedness
- Engaging key stakeholders
- Defining the target population
- Selecting sites for implementation
- Designing the implementation modus – tailoring the innovation to the local context and capacities
- Using, adapting, aligning, simplifying, testing materials
- Training for implementation

Service delivery – implementation
- Access: availability, geographic accessibility/delivery points, affordability, acceptability
- Organisation of care in the community, in the health facility
- Organisation of staff
- Participation
- Partnerships

Monitoring, improving and collaborative learning
- Monitoring and reporting
- Improving quality
- Disseminating information and learning
- Maintaining and sustaining quality services
- Ensuring accountability to users, managers and funders of the services
- Advocating for implementation and scale-up

Suggestions for improving implementation

Second, the *Normalisation Process Theory* provided a conceptual framework that helped to understand and evaluate the processes by which the MAMI Care Pathway approach was routinely operationalised in everyday work (2-4). The theory used a participatory method to explore the four components of the adoption process to uncover what individuals and groups either do or do not do to enable normalisation of the intervention:

1. Coherence – meaning and sense-making – defines and organises the components of a practice;
2. Cognitive participation – commitment and engagement – defines and organises the people implicated in a complex intervention;
3. Collective action – work done to enable the intervention to happen – defines and organises the enacting of a practice; and
4. Reflective monitoring – reflecting on or appraising the benefits – defines and organises the assessment of the outcome of a practice.

The success of implementing the MAMI Care Pathway approach by health workers adopting the practice was scored by the case study team on a five-point Likert sliding scale from "not at all" (grade 1) to "completely" (grade 5).

Third, the *Non-adoption, Abandonment, Scale-up, Spread and Sustainability* (NASSS) *Framework* was adapted and used in a participatory process to synthesise insights on evaluating adoption challenges that impact on scaling up and sustainability (5) (Figure A3.1). It was used as a reflexive guide to generate ideas on challenges related to the following: (1) the condition, (2) the technology, (3) the value proposition, (4) the adopters, (5) organisation, (6) the wider system, and (7) embedding and adapting over time. A grading system was used to express whether the challenges identified were simple, complicated, or complex: (1) simple – meaning understandable or predictable, relatively straightforward to address; (2) complicated – meaning less understandable, controllable, thus less straightforward to address; and (3) complex – meaning not understandable or predictable, a dynamic or emergent behaviour.

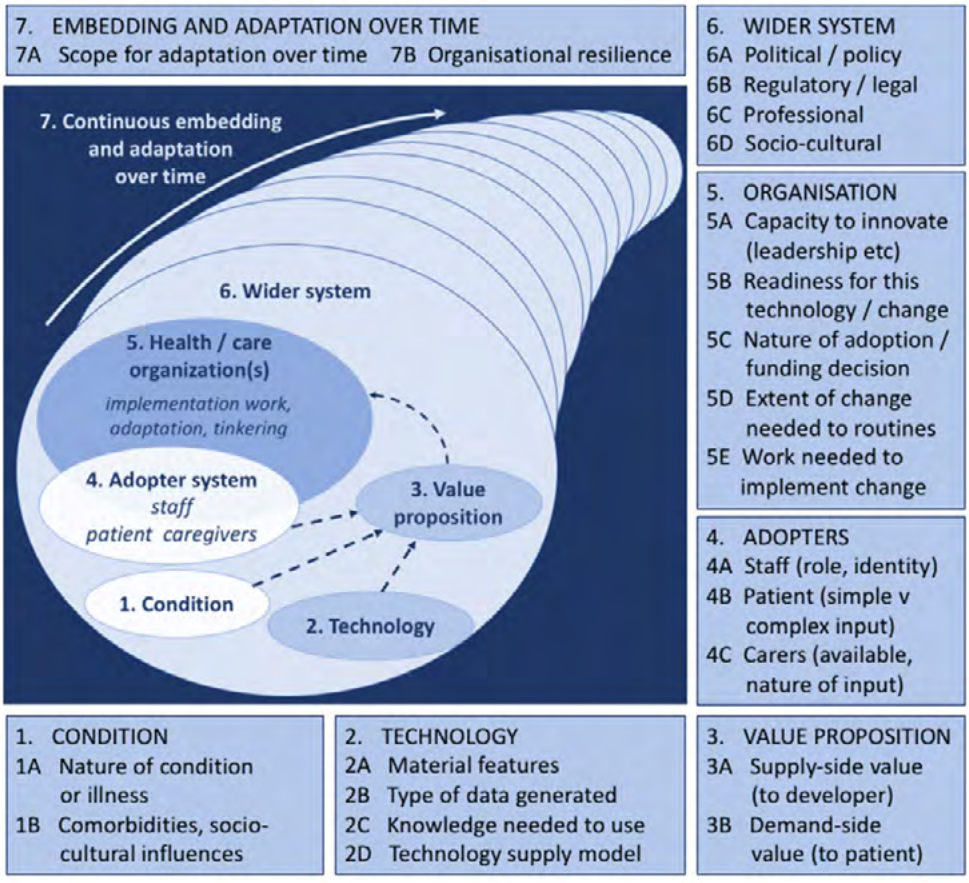


Figure A3.1. The NASSS Framework for considering influences on the adoption, non-adoption, abandonment, spread, scale-up, and sustainability of a health intervention.

Fourth, the *Checklist for Assessing the Potential Scalability* of pilot projects or research (1, 6) was used to explore how easy or difficult it would be to scale up each case and to provide insights into what steps to take to facilitate sustainable scale-up. The checklist provides recommendations in 12 steps on how to design pilot projects considering scale-up that lead to lasting and larger-scale impact (Box A3.2).

Box A3.2: Twelve recommendations on how to design pilot projects with scaling up in mind

Step 1	Engage in a participatory process involving key stakeholders
Step 2	Ensure the relevance of the proposed innovation
Step 3	Reach consensus regarding expectations for scale-up
Step 4	Tailor the innovation to the socio-cultural and institutional settings
Step 5	Keep the innovation as simple as possible
Step 6	Test the innovation in the variety of socio-cultural and institutional settings where it will be scaled up
Step 7	Test the innovation under the routine operating conditions and existing resource constraints of the health system
Step 9	Advocate with donors and other sources of funding for financial support beyond the pilot stage
Step 8	Develop plans to assess and document the process of implementation
Step 10	Prepare to advocate for necessary changes in policies, regulations and other health systems components
Step 11	Develop plans for how to promote learning and disseminate information
Step 12	Plan on being cautious about initiating scale-up before the required evidence is available

Case study selection

Case selection sought a variety of implementation modalities or characteristics, such as the following:

- Implementing a care pathway addressing at-risk infants and their mothers, as a pilot, research or programme;
- Differences in terms of context, implementers, geography;
- Either government-led or partner-led;
- In a development, emergency or fragile setting;
- In a low- or middle-income country setting, either urban, rural or mixed;
- With the availability of data on processes and outcomes;
- With expressed interest and availability to participate in the case study;
- Either in an English- or French-speaking environment.

A primary selection criterion was that participating in this process would add value and contribute to local learning and progress on implementing the MAMI Care Pathway approach.

The country cases selected encompassed a variety of settings where the MAMI Care Pathway approach was applied:

- **Pakistan**: Paediatrician-led services in a private charity hospital in Karachi.
- **South Sudan**: An implementation study where the MAMI Care Pathway approach was integrated into maternal and child health services in urban and rural sites by MIHR project.
- **Yemen**: Pilot implementation integrated into a health and nutrition emergency programme by ADRA.

Data collection

An iterative and participatory process of reflective learning took place across four phases that built on each other. Data tools consisted of generic questionnaires that served as interview guides specifically developed for the MAMI Care Pathway approach and adapted to each country case (Box A3.3) (see Annex 3).

The first phase of investigation was largely descriptive, involving written feedback and clarification. Next, the shared information was built upon, through interviews, to further explore 'how' things happened or not, paying particular attention to social dimensions.

The second phase consisted of participatory discussions with clinical service providers which explored adoption of the MAMI Care Pathway approach as part of their routine work.

The third phase brought together senior managers and clinical health workers to discuss challenges in adopting the MAMI Care Pathway approach.

The fourth phase synthesised the discussion in the third phase across the country cases, allowing for reflection on potential scalability based on triangulating information collected across the three cases.

Box A3.3: Data tools

Phase 1 (Annex 4a): Questionnaire (written and oral investigation) using the Planning and Implementation Process Framework; respondents were (sub-)national health, nutrition, and MAMI managers or advisors.

Phase 2 (Annex 4b): Interview guide applying *Normalisation Process Theory;* respondents were clinical healthcare workers implementing the Care Pathway approach.

Phase 3 and Phase 4a (Annex 4c): Checklist for participatory group discussions using the *NASSS Framework*; respondents were the participating national and (sub-)national health, nutrition, MAMI managers or advisors who discussed their country context in phase 3, and then came together to discuss across countries in phase 4a.

Phase 4b (Annex 4d): *Checklist for Assessing the Potential Scalability* using the information generated across phases.

Respondents were asked to provide their informed consent prior to their participation and withdrawal from the inquiry was possible at any time.

Data were collected through written feedback and during interviews, which were digitally recorded following receipt of consent from all interviewees. Respondents could skip questions for any reason. Where possible, the reason for not answering was recorded but this was not mandatory. Audio recordings were transcribed verbatim within 48 hours of collection using Otter.ai software. All digital data were stored in a password-protected digital space accessible only to investigators. All country-specific data were shared with the country teams.

During data collection and analysis, notes on possible biases, interferences or limitations were recorded and reported on.

Analysis

The stepwise and iterative inquiry appraised the case experiences by applying different lenses to generalise learning through repeated cycles of testing and building ideas (theories) about why things have worked or not, and how (mechanisms of action). This 'theory-driven' iterative analysis involved the following steps:

Descriptive data analysis: Data on introducing and implementing MAMI were summarised by topic to understand processes of planning, introducing, adapting, implementing, monitoring and improving the MAMI Care Pathway approach, to uncover what was done, and how, to appraise readiness for scale-up.

Explorative data analysis: Data on the perceptions of clinical healthcare workers on implementing and adopting the MAMI Care Pathway approach were analysed for emerging themes to explore perceptions on what worked, for whom, and under what circumstances, and to appraise adoption.

Explanatory data analysis: Data on descriptions and perceptions were triangulated and synthesised to inform updates to and evolution of our theories/ideas on the MAMI Care Pathway approach and to identify practical, pragmatic ways to help progress towards scalable, sustainable care.

Data were analysed both deductively (testing our ideas/theories) and inductively (finding new ideas/theories), involving the respondents and requesting their opinion, as well as confirming the generated ideas/theories. Data were synthesised in each step by intuitive-reflective appraisal – which involved perceptions about what immediately felt right or made sense, and then questioning these by considering other possibilities.

Participatory and adaptive, reflexive learning: Interviewers and interviewees were involved in reflective learning building upon each step, thereby 'learning together by doing.' This collaborative 'learning together' deepened the understanding of embedding and adapting the MAMI Care Pathway approach in diverse local systems of health. Besides the strengthening of own capacities and understanding of respondents by tapping into implicit and often invisible and under-appreciated tacit knowledge, this approach was useful for contributing to overall collective learning on the 'how' of the MAMI Care Pathway approach.

Limitations

Each country case covered the introduction and implementation of the MAMI Care Pathway approach on a small scale in a specific context, which limited the generalisability of learnings across broader systems and services within and across countries. Each case study also engaged a limited number of respondents (between two and four, depending on the case), which restricted the breadth of perceptions. However, the different lenses applied through the case study phases generated an in-depth understanding for each case context, while identifying common theories/ideas which influence implementation, adoption, scale-up and sustainability, even across the diverse case contexts, thereby contributing to collective learning.

The qualitative approach involved online interviews, which lack the human presence needed to build trust and to convey the subtleties of eye contact or body language which contribute to multidimensional and nuanced understanding of the ideas/perspectives shared (7).

Specifically, during Phase 2 (*interviews guided by the Normalisation Process Theory*), only one or two clinical health workers responsible for implementing the MAMI Care Pathway approach (assessment, support and progress monitoring of the mother–infant pair) were interviewed. The low numbers of people involved likely limited the extent of perceptions on the normalisation process. The clinical health worker responding was also either an existing, or a newly recruited, staff member accompanied by a trained supervisor or assistant, which may have influenced their answers. Responses often fell into discussions on 'perceived benefits' of the MAMI Care Pathway approach, rather than building on perceptions of the adoption process. Finally, discussions went in various directions, and sometimes the same elements were repeated, or questions were not answered well, or the answer fitted a question that would come later. This resulted in some reorganisation of responses to fit the flow of the interview guide after the discussion.

References

1. WHO, ExpandNet (2011) *Beginning with the end in mind: planning pilot projects and other programmatic research for successful scaling up*.
2. May, C.R., Finch, T., Ballini, L., MacFarlane, A., Mair, F., Murray, E. et al. (2011) Evaluating complex interventions and health technologies using normalization process theory: development of a simplified approach and web-enabled toolkit. *BMC Health Services Research*, 11(1), 245.
3. Murray, E., Treweek, S., Pope, C., MacFarlane, A., Ballini, L., Dowrick, C. et al. (2010) Normalisation process theory: a framework for developing, evaluating and implementing complex interventions, *BMC Medicine*, 8(1), 63.
4. May, C., Rapley, T., Mair, F.S., Treweek, S., Murray, E., Ballini, L. et al. (2015) N*ormalization Process Theory on-line users' manual, toolkit and NoMAD instrument*.
5. Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., A'Court, C. et al. (2017) Beyond adoption: A new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-Up, spread, and sustainability of health and care technologies. *J Med Internet Res, 19*(11), e367.
6. WHO, ExpandNet (2010) *Nine steps for developing a scaling-up strategy.*
7. You, S. (2021) Feminist Perspectives [Internet]. King's College London. https://www.kcl.ac.uk/challenges-and-gains-in-conducting-online-interviews-during-the-pandemic.

Annex 4a. Data tool: Planning and implementing the MAMI Care Pathway approach

[Note that the questions in blue colour are discussed orally, all others are dealt with in writing.]

Responder(s) *(name and function):* _____

Date of response: _____

Agency: _____

1. Context

1.1 Country context relevant to MAMI

1. Describe the demographic and socio-economic context of your country, or the area where you are active.
   (E.g., development or emergency context, stable or fragile/fast changing/chronic, demographic pressure, climate change, political instability or insecurity, rural versus urban population, poverty, migration trends)

2. Describe key determinants that define vulnerability in infants under six months of age (u6m) and young children (data from the most recent survey/surveillance).
   (E.g., exclusive breastfeeding rate, inappropriate/harmful feeding and care practices, adolescent mothers, low birth weight)

1.2 Organisational context for starting MAMI

3. Give name of agency or programme, and a brief description.
   (E.g., expertise/mandate, aim, activities, period of interventions, impact area, future plans, donor)
4. Give the justification for starting MAMI.
   (E.g., expected change, added value, opportunity, contribution, the MAMI Care Pathway could bring)
5. Explain who or what was the tipping point for deciding to start MAMI.
   (E.g., what or who was driving, motivating, enabling the decision; who or what enabled it just then and not earlier)
6. Give the aim or objective of the MAMI project that was defined at the start (and expected result if stated).

2. Situation analysis prior to starting MAMI

2.1 Burden and perceived health priority

7. Give national key health and nutrition indicators (and trend) (with source and year, most recent survey, surveillance). Use the example table to answer.

Example table: Health and demographic information

Information (Year, Source)	Data
Population (YYYY, Ref)	
Population at the MAMI sites YYYY, Ref)	
Fertility rate (YYYY, Ref)	
Live birth rate YYYY, Ref)	
Neonatal mortality YYYY, Ref)	
Infant mortality (YYYY, Ref)	
Low birth weight (YYYY, Ref)	
Assisted deliveries (YYYY, Ref)	
Exclusive breastfeeding YYYY, Ref)	
Global acute malnutrition 6-59m YYYY, Ref)	
Trend information (YYYY, Ref):	

8. Prior to introducing MAMI, was the "vulnerability in infants u6m" recognised as a health or nutrition priority? Specify why or why not, by whom (in your opinion).
   (E.g., for the Ministry of Health (MOH) not a priority presuming that the needs are covered by the various policies and services; for [Agency] a priority because of deteriorating indicators in their impact area)

2.2 Policy context

9. Did you do a policy analysis prior to starting MAMI?

10. If yes, describe what you did, scope, which tool you used. Use the example table to answer.
    (E.g., national integrated management of acute malnutrition (IMAM) guideline covers inpatient treatment of wasting based on weight-for-height z-score (WHZ) <-3 z-score and presence of nutritional oedema in infants u6m; community infant and young child nutrition (IYCN) strategy advises to assess breastfeeding problems and counsel or refer during community growth monitoring sessions; guidelines on mental health cover post-partum depression; guidelines on small and sick newborns include targeted counselling)

    Example table: Health and nutrition policy covering infants u6m and their mothers

Policy, guideline (title, year)	Defined vulnerability in infants u6m and their mothers	Proposed interventions
xx	xx	xx

If no, why not?

2.3 Local health system capacity

11. Did you do a capacity analysis/implementation readiness of the local health system or a feasibility study prior to starting MAMI (or any quick appraisal of readiness of the health facilities that involve in MAMI)?
    - If yes, describe what you did, which tool you used, when you did it in regard to starting MAMI, what are the headlines on what you found.
    - If no, why not?

12. List which MAMI activities were already covered at the community, primary care and tertiary care levels in the planned MAMI sites that were identified prior to starting MAMI?
    (E.g., counselling on breastfeeding difficulties is done by nutrition assistants in the health centre and by community health workers and volunteers in the community as part of the national IYCN strategy)

13. List gaps in services, care, referral for infants u6m and their mothers that were identified prior to starting MAMI?

2.4 Stakeholders

14. Did you do a stakeholder analysis prior to starting MAMI (quick appraisal of who is a MAMI stakeholder, and how to solicit their interest for involving early for what)?
    - If yes, describe what you did, which tool you used, when you did it in regard to starting MAMI, what are headlines on what you found. Please share any report on findings.
    - If no, why not?
15. Could you identify who is a relevant current or future stakeholder to involve in the design, planning, implementation; list who and specify why?
16. Did (could) you identify potential MAMI champions able to generate political will? If yes, who are they?
    (Note: a champion is an influential person who promotes 'a topic' and inspires others to take a more active role in that topic.)
17. List key stakeholders you contacted and had preliminary discussions with on, e.g., introducing MAMI, sharing plans, probing their interest to be involved. Use the example table to answer.
    (E.g., MOH Community Health Department – ways of strengthening active case finding of vulnerable infant-mother pairs, as part of existing community services)

    Example table: Level of interest of key stakeholders to involve in MAMI

Agency, department	Discussion topics on MAMI and level of interest	Name and email contact if appropriate
xx	xx	xx

3. *Planning for MAMI implementation*

18. Give an indicative time line (# months) for inception discussions, designing and planning.

3.1 Initiating discussions - Agency's preparedness

19. Describe key elements of the initial discussions and steps your agency undertook internally, prior to deciding and planning for MAMI implementation.
    (E.g., internal discussion and decision, securing funds for which time span from which source–part of ongoing project, cost extension, additional budget–, hiring staff, securing equipment, planning)
20. Describe key elements of the initial discussions and steps your agency undertook externally, prior to deciding and planning for MAMI implementation.
    (E.g., contacted MOH to discuss the relevance or perceived need, explore their interest in the innovation, feasibility, alignment or integration into the country's health system, roles and responsibilities, departments and technical partners to involve)
21. From whom did you seek approval for introducing MAMI, and how was this approval granted or formalised?
22. Was there a request for a formal description of the project prior to starting? If yes, describe the process, involvement of stakeholders and timeline.
    (E.g., a project outline was shared and reviewed and approved by the MOH, taking two weeks; a study protocol was developed in participation with the MOH and approved (no IRB) taking two months)
23. Did you consult professional expertise within your agency; did you seek support externally? If yes, give profile of expertise and timeline.

- Did your agency conduct formative research prior to starting MAMI, or did you use in-house formative research? If yes, what? Share any reports.
  (Note: formative research typically is done before starting a programme to understand practices and behaviours, needs for an intervention, e.g., a knowledge, attitudes, practices (KAP) survey for a reproductive health project)

3.2 Engaging key stakeholders in the planning process

24. Did you engage with the national and/or local MOH for planning the integration/implementation? Explain how and on what.
25. Who else you engaged with? Explain how and on what.
    (E.g., UNICEF in face-to-face meeting and orientation workshop, for planning and review of materials, offering support for training as resources persons, offering scales and MUAC tapes)
26. In case you organised a meeting or workshop, describe who (and number) participated, how many days, what was the objective and outcome, what topics were covered, what documentation was shared.
27. Did key health and nutrition actors perceive MAMI a relevant innovation? Explain why or why not.
28. Are there lessons you want to share about the process?

3.3 Defining the target population

29. What criteria have been used to define vulnerability in infants u6m, and their mothers?
30. How were key health and nutrition actors involved in defining the target population for MAMI?
31. Are there lessons you want to share about the process?

3.4 Selecting sites for implementation

32. How did you define a MAMI implementation site in your project?
    (E.g., specify the type of health facilities selected for implementing the outpatient Care Pathway, whether referral sites for inpatient care are involved, whether communities in the health catchment area covered, whether links between different sectors at different levels are established)
33. What criteria were used to select the sites?
    (E.g., agency-supported health facilities; referral hospital with inpatient care for severe acute malnutrition)
34. Did key health and nutrition actors involve in selecting the sites? Explain.
35. Are there lessons you want to share about the process?

3.5 Designing the implementation modus

36. Did you tailor the implementation design for MAMI to the local context and capacities? If yes, explain how you did this, with whom and with what tools (if any)?
    (E.g., participatory discussions with key stakeholders in a meeting using the 'who what where map'; informal discussion amongst agency staff)
37. Did you foresee ways of testing and/or adapting the implementation modus based on learning and feedback?
38. How did you appraise the capacity for absorbing MAMI by the local health system, at the selected health facility sites prior to implementing? What tools did you use, what difficulties did you anticipate, how did you plan to fill the gaps?
    (E.g., consider gaps in knowledge, skilled health workers, equipment, space, referral services)
39. Are there lessons you want to share about the process?

3.6 Using, adapting, aligning, simplifying, testing materials

40. Did you use and/or adapt the MAMI Care Pathway v3 materials? If yes, list which of the v3 materials were adapted and how this was done. Use the example table to answer.

    Example table: Adaptation of MAMI Care Pathway v3 materials

MAMI Care Pathway v3 material adapted	Description of adaptation(s) (what)	Method (how)
X	xx	xx
X	xx	xx

41. Did you use existing materials for use in the MAMI Care Pathway? Use the example table to answer.

Example table: Existing materials used and/or adapted in MAMI

Other materials used (adapted)	Description (what)	Method (how)
X	xx	xx
X	xx	xx

42. Did you develop additional materials? Use the example table to answer.

Example table: Materials developed for use in MAMI

Materials developed for use	Description (what)	Method (how)
X	xx	xx
X	xx	xx

43. Who was involved in deciding the final version of materials to use?
44. Did you test the adapted materials prior to using them for implementation? If yes, describe how this was done.
45. Which (if any) materials were translated in a local language?
46. Describe how you overcame the local language barrier.
(E.g., developed a local language vocabulary as a cheat sheet and field tested it).
47. What were key challenges in the adaptation process?
48. Are there lessons you want to share about the process?

3.7 Training for implementation

49. Did you train health workers ahead of implementing MAMI? If yes, explain who was trained (participants), on what (topics), by whom (trainers), how (method), with what materials, for how long (number of days), aiming to achieve what (learning objectives). Use the example table to answer.

Example table: Training for MAMI prior to starting

Training (type and dates)	Participants targeted (profile and #)	Topics covered	Materials used	Learning objectives
xx	xx	xx	xx	xx

50. Were the national and/or local MOH involved in training? If yes, explain.
51. Were supervisors and managers involved in training? If yes, explain.
52. Were existing national or global training materials used? If yes, explain.
(E.g., on breastfeeding, IMNCI, counselling)
53. Did the training develop specific skills? If yes, explain.
(E.g., on using the IMNCI approach, measuring anthropometry, assessing breastfeeding, assessing mental health, targeted counselling)?
54. What skills were considered pre-requisite (skills training not covered)?
55. If you used the MAMI Care Pathway v3 materials, describe how you used these for training.
56. Are there lessons you want to share about the process?

4. *Service delivery – implementation*

[Notes:
***Health services delivery** is about how services are organised and managed to ensure access, quality, safety, and continuity of care across health conditions across different locations and over time. Its core principles are:*

Comprehensive, equitable, sustainable, coordinated, continuous, holistic, preventive, empowering, goal oriented, respectful, collaborative, co-produced, endowed with rights and responsibilities, shared accountability, evidence-informed, led by whole-systems thinking, ethical.

***People-centred care** is an approach to care that consciously adopts the perspectives of individuals, carers, families and communities as participants in, and beneficiaries of, trusted health systems that respond to their needs and preferences in humane and holistic ways. People-centred care also requires that people have the education and support they need to make decisions and participate in their own care.*

https://apps.who.int/iris/bitstream/handle/10665/155002/WHO_HIS_SDS_2015.6_eng.pdf?sequence=1&isAllowed=y]

57. Give an indicative time line for starting implementation support (enrolling first pair).

58. Give an indicative time line (# months) for ending implementation support (exiting of last pair, if relevant).

4.1 Access: availability, geographic accessibility/delivery points, affordability, acceptability

59. Specify the geographical area and sites where MAMI is implemented. Use the example table to answer. (E.g., region, districts, health facilities, start/end date)

Example table: MAMI sites

Region	Health district	Primary care health centre	Referral hospital
Total			

60. Did implementation start at all sites at the same time? If not, why not, how then?
61. Are services free of cost for small vulnerable infants and their mothers? Explain
62. If referral is needed, who organises, who pays for transport? Explain.
63. If referral for inpatient care is needed, who pays the admission fee, who pays for food for the caregiver? Explain.
64. Has your agency plans to expand or scale up MAMI in-country? In other countries? Specify what actions would facilitate this move?

4.2 Organisation of care in the community (evidence-based, continuity (referral), coordinated, integrated, comprehensive, people-centred, equipped, equity)

65. What activities are provided at the community, how, where by whom? Use the example table to answer.

Example table: Who delivers where what services in the community

Activities	How	Where	By whom
Sensitization			
Health and nutrition promotion			
Screening			
Referral			
Follow-up in the home during enrolment			

66. Which MAMI activities were already in place? Did they have to be strengthened or re-organised?
67. Which MAMI activities had to be newly added?
68. Is active screening working well in the community? What screening criteria do you use?

69. How are community health workers/volunteers linking to the health facility? Explain.

70. How did community health workers perceive the extra tasks they were asked to do? Did they express concerns, and if so, what were they?

4.3 Organisation of care in the health facility (evidence-based, continuity (referral), coordinated, integrated, comprehensive, people-centred, equipped, equity)

71. What activities are provided at the health facility, how, where by whom? Use the example table to answer.

    Example table: Who delivers where what services in the primary healthcare centre

Activities	How	Where	By whom
Sensitization on risks			
Health and nutrition promotion			
Screening (rapid assessment)			
IMNCI assessment, triage			
Anthropometry assessment			
MAMI risk assessment			
Feeding assessment			
Mental health assessment			
Classification and referral			
Treatment and support plan			
Enrolment			
Treatment and support			
Targeted counselling on feeding issues			
Targeted counselling on mental health issues			
Targeted counselling other (specify)			
Frequency of attendance decision for follow-up			
Referral in case of deterioration during enrolment			
Evaluate progress			
Evaluate outcome			
Referral in case of non-recovery at 6m			
Follow-up after exit			

72. Which MAMI activities were already in place? Did they have to be strengthened or re-organised?

73. Which MAMI activities had to be newly added?

74. Is routine screening done in all health services and units frequented by infant-mother pairs? What screening criteria are used?

75. Was referral for maternal mental health possible?

76. How is referral to inpatient care organised for pairs whose status deteriorates, does it work well, or not?

77. How is counter-referral to outpatient care organised for pairs discharged from hospital, does it work well, or not?

78. What further support was most needed at 6 months?

79. Is there a follow up period after pairs exit at infant age 6m? If yes, for how long? and how is it organised?
80. Describe how are pairs are followed across services and in time (continuity of care).

4.4 Organisation of staff: numbers, skill sets, sharing of tasks, supportive supervision, mentoring, job aids

81. Were sufficient number of skilled workers available to absorb MAMI? Explain.
82. What guidance or job aids did you use or develop? Explain.
83. Did you use v3 materials (if any) for organising and supporting health facility y implementation (job aids), and how?
84. How are clinical health workers linking, collaborating, sharing tasks, communicating on MAMI care at the health facility? Explain.
85. How are clinical health workers linking, communicating on MAMI care to other health facilities? Explain.
86. How organised and ready for quality implementation were you at the start (your opinion)? What went well, what went less well? Were roles and responsibilities clear for all implementers prior to starting? Explain.
87. Is supportive supervision and mentoring being provided? If yes, how is it organised, which tools are used?
88. How did health workers perceive to adopt the innovation/increase consistency/merge with what they were already doing? Specify for the different activities at the different levels.
89. How did clinical health workers perceive the extra tasks they were asked to do? Did they express concerns, and if so, what were they?

4.5 Participation

90. Do you involve caregivers (community members) in care? Explain.
91. Prior to assessing risks and enrolling, did you ask the caregiver's perceived need and interest in receiving this service?
92. Were caregivers well informed and had a choice, were encouraged to take active part in care, how?
93. How did caregivers perceive the effort to return for follow-on visits? How do you motivate them?
94. Prior to assessing MAMI risks and enrolling pairs, did you ask the caregiver's perceived need and interest in receiving this service?
95. Did you assess the caregiver's satisfaction during and when exiting the MAMI Care Pathway?

4.6 Partnerships

96. What is the role of the local health management system; how are MOH focal points involved in planning, supervising and improving quality, mentoring, evaluating?
97. Are there other technical partners providing support at the MAMI Sites? Who are they, what do they cover, how you collaborate?
98. Are there other technical partners providing support at the MAMI Sites? Who are they, what do they cover, how you collaborate?
99. Is there a communication or coordination system linking the various partners?

5. *Monitoring and collaborative learning*

5.1 Monitoring and reporting

100. Have you a monitoring system in place? If yes, to what degree you use existing data and systems?

101. List the indicators you report on monthly and give results for the period of reporting. Use the example table to answer.

Example table: Key indicators (country or site, period of reporting)

	Total
Sensitization	
MAMI sensitization in the community (# of people reached)	
MAMI sensitization in the health facility (# of people reached)	
Screening (rapid assessment)	
Total pairs screened in the community	
Pairs screened at risk, referred for in-depth assessment	
Total pairs screened in the primary care facility	
Pairs screened at risk, referred for in-depth assessment	
In-depth assessment	
Total pairs assessed	
a. Pairs assessed - male infant	
b. Pairs assessed - female infant	
Pairs assessed classified at moderate risk (yellow)	
Pairs assessed classified at high risk (red) and referred	
Enrolment in outpatient care	
Total pairs newly enrolled	
a. Pairs newly enrolled - male infant	
b. Pairs newly enrolled - female infant	
Referral during outpatient care	
Total pairs referred to hospital	
a. Pairs referred to hospital - infant high risk	
b. Pairs referred to hospital - mother high risk	
Outcome of outpatient care	
Total pairs exited from the outpatient Care Pathway	
Total pairs exited at infant age 6m	
Pairs not recovered at infant age 6m and referred to continue care	
a. Pairs not recovered at infant age 6m - infant special care	
b. Pairs not recovered at infant age 6m - mother special care	
Pairs recovered at infant age 6m	
Total pairs exited before infant age 6m	
Pairs died before the age of 6m	
Pairs lost to follow up (defaulted) before the age of 6m	

Example table: MAMI enrolment by age group (country or site, period of reporting)

	Total
Age of infants at enrolment in outpatient care	
<1 month	
1–<2 months	
2–<3 months	
3–<4 months	
4–<5 months	
5–<6 months	

102. Do you consolidate monthly monitoring data on service performance? Do you use digitized tools? Explain.

103. Do you consolidate individual data on assessment and enrolment? Do you use digitized tools? Explain.

104. Describe if and what qualitative data you collect, for what purpose, how you collect it, with what tools, and how you consolidate and report on them?

105. Do you capture lessons? Explain.

106. What key lessons have you learned that you think would be helpful for managing small and nutritionally at-risk infants u6m and their mothers?

107. What key successes you want to share?

108. What key challenges did you face? Which actions you have undertaken to overcome these, and did you succeed to overcome these, or not?

5.2 Improving quality

109. Are monitoring results (data tables and figures and lessons) used for quality improvement (QI) to identify weaknesses in data collection and quality of care that needs improvement (e.g., in monthly meetings)? Explain.

110. Do you use adaptive management for quality improvement and learning (e.g., using the plan-do-verify-adapt cycle)? Explain.

111. What has MAMI added to your work and experience?

5.3 Disseminating information and learning

112. How is in-country sharing of information on MAMI organized? Explain the different pathways.

113. How is wider sharing of information on MAMI organized, outside of the country? Explain the different pathways.

114. What learning methods or communication platforms are being used by your managers, by the implementers, and how did they come about? Explain.

115. Have you established a national learning and information sharing entity (e.g., community of practice, Country Chapter)? Explain.

116. Have you involved national research institutions in MAMI? Explain.

117. How did you explore their potential involvement in documenting lessons, evaluating evidence gaps and proposing research studies (including donors).

118. Is any evaluation in progress or planned? Explain.

119. Have you identified any research gaps? If so, what are they?

5.4 Maintaining and sustaining quality services

120. Are the MAMI activities that you implement sustainable? Explain.
121. How can the specific MAMI activities be made more sustainable? what are barriers and facilitators? Explain.
122. Are they resilient to shocks? Explain.
123. Can the specific MAMI activities be made more resilient? what are barriers and facilitators? Explain.

5.5 Ensuring accountability to…

124. Who are you accountable to, how and for what?

5.6 Advocating for … strengthening services and adapting policies

125. Are you engaging decision-makers, champions, gate-keepers in MAMI?
126. What advocating tools you use or have you developed to highlight the burden, the importance of addressing MAMI, the effectiveness of MAMI?
127. Are you involved/do you plan to engage in national policies, guidelines, strategies, processes for contributing to evidence and learning? If yes, in what way?
128. Is the accountability of MAMI in your implementation design sufficient, or what is missing, what should be strengthened and how?

6. *Recommendations*

129. List or describe changes you suggest for simplifying or improving the v3 materials.
130. List or describe additional resources you wish to have to improve planning, organizing, implementing, monitoring, learning, or expanding the evidence base.
131. What do you identify as most important gap / need that should be addressed, by whom and at what level?
132. Share any other general or specific recommendations you have?

Annex 4b. Data tool: Adopting the MAMI Care Pathway approach

Name of the responder and position: _____

Date of response: _____

Agency: _____

QUESTIONS Clinical healthcare worker – key informant interview

PRE-QUESTIONS

1. Please confirm, your name is [...], your current position is [...]
2. Where are you working, in which establishment, health facility?
3. Since how long have you worked there? Give start date.
4. When was the MAMI Care Pathway introduced at your health facility? Give start date.
5. What is your function in relation to the MAMI Care Pathway?
6. (If started working after MAMI was introduced) Were you exposed to MAMI before joining the health facility? Where? In what function?
7. (If started working after MAMI was introduced) Did you have specific MAMI knowledge and skills prior to joining the current position?

QUESTIONS

Questions seek the opinion of the clinical health worker about implementing the MAMI Care Pathway in his/her setting versus what they did before for small vulnerable infants and their mothers. Ask the respondent to explain their answer (if yes, explain how, if no, explain why not) and give a grade on a Likert scale from 0 (not at all) to 5 (completely):

Coherence – meaning and sense-making

1. Is the MAMI Care Pathway easy to describe? Can you appreciate how it differs from current ways of working, from what you did before to support small vulnerable infants and their mothers?
   Participants distinguish the intervention from current ways of working: not at all to completely

2. Do you and your colleagues have a common understanding of the aims, objectives and expected outcomes of the MAMI Care Pathway?
   Participants collectively agree about the purpose of the intervention: not at all to completely

3. Do you understand what implementing the MAMI Care Pathway requires from you (specific tasks and responsibilities)?
   Participants individually understand what the intervention requires of them: not at all to completely

4. Can you easily grasp the potential value, benefits and importance of the MAMI Care Pathway?
   Participants construct the potential value of the intervention for their work: not at all to completely

Cognitive participation – commitment and engagement

5. Are you (or other key individual) able and willing to get others involved in the MAMI Care Pathway? Are you actively engaged in making the MAMI Care Pathway work in your setting?
   Key individuals drive the intervention forward: not at all to completely

6. Do you believe and agree that being involved is right, and that by accepting the MAMI Care Pathway as part of your work you contribute to its implementation?
   Participants agree that the intervention should be part of their work: not at all to completely

7. Do you have the capacity and are you willing to organise you and your colleagues and collectively contribute to the work involved for implementing the MAMI Care Pathway?
   Participants buy in to the intervention: not at all to completely

8. Do you have the capacity and are you willing to collectively define the actions and procedures needed to keep the practice going (invest your time, energy to keep it going)?
   Participants continue to support the intervention: not at all to completely

Collective action – work done to enable the intervention to happen

9. Are you and your colleagues able to undertake the tasks required to implement the MAMI Care Pathway (to operationalise its components in practice)?
   Participants perform the tasks required by the intervention: not at all to completely

10. Do you maintain trust in the intervention and in each other's work and expertise in implementing the MAMI Care Pathway?
    Participants maintain their trust in the intervention and in each other: not at all to completely

11. Is the work required for implementing the MAMI Care Pathway distributed to participants with the right mix of skills and training? Did it impact on the division of labour, resources, power, responsibilities between colleagues (tasks and skill sharing)? Was extensive training needed before implementing the MAMI Care Pathway? (originally Q13)
    The work of the intervention is appropriately allocated to participants: not at all to completely

12. Is the implementation of the MAMI Care Pathway adequately supported by the advisor/manager?
    The intervention is adequately supported by its host organisation: not at all to completely

Reflective monitoring – reflect on or appraise the benefits

13. Do you have access to information on the quality of care and outcome of the MAMI Care Pathway (monitoring and evaluation information)?
    Participants access information about the effects of the intervention: not at all to completely

14. Do you collectively agree on the quality of care and the effects of the MAMI Care Pathway because of formal monitoring?
    Participants collectively assess the intervention as worthwhile: not at all to completely

15. Do you individually think the MAMI Care Pathway is worthwhile?
    Participants individually assess the intervention as worthwhile: not at all to completely

16. Can you make changes to the intervention as an individual or group in response to the appraisal?
    Participants modify their work in response to their appraisal of the intervention: not at all to completely

Annex 4c. Data tool: Scale-up, spread and sustainability of the MAMI Care Pathway approach

Applying the (non-)adoption, abandonment, scale-up, spread, and sustainability (NASSS) framework in real time (Greenhalgh et al., 2017).

Respondents			
Date of interview			
Context (where, for how long, whom, purpose/design)			
ORIGINAL NASSS QUESTIONS	**ADAPTED NASSS QUESTIONS**	**GRADING CONSIDERATIONS** 1= understandable or predictable aspects are relatively straightforward to address (simple). 2= less understandable or predictable aspects or many factors are involved (complicated). 3= inherently not understandable or predictable, but dynamic or emergent aspects are involved (complex).	**RESPONSE**
Domain 1: The condition or illness (risk factors) Addresses how far the **condition** "small and nutritionally at-risk infants and their mothers" is a) well-characterised, well-understood and predictable, and b) how care is being affected by socio-cultural factors and co-morbidities.			
1a. What is the nature of the condition or illness?	1a. Is the condition "small and nutritionally at-risk infants and their mothers" well-characterised, well-understood and predictable?	1) Is the condition well-characterised, well-understood, predictable? OR 2) Not fully characterised, understood or predictable? OR 3)Poorly characterised understood, unpredictable?	
1b. What are the relevant socio-cultural factors and co-morbidities?	1b. Are socio-cultural factors and co-morbidities relevant for the condition "small and nutritionally at-risk infants and their mothers"?	1) Are socio-cultural factors and co-morbidities unlikely to affect care significantly? OR 2) To affect care and must be factored in? OR 3) Pose significant challenges to care planning and service provision?	
Domain 2: The technology Addresses whether **the methods (technologies)** of the MAMI Care Pathway used for detecting, classifying, and supporting "small and nutritionally at-risk infants and their mothers" a) are newly introduced, b) need new knowledge, c) need continued support, and d) need specific adaptations.			
2a. What are the key features of the technology?	2a. What are key features of the methods (technologies) used to assess, classify and support "small and nutritionally at-risk infants and their mothers"? Are methods known, do they exist?	1) Are methods (technologies) used to assess, classify and support "small and nutritionally at-risk infants and their mothers" already installed or existing, dependable? OR 2) Are they new and need to be developed? OR 3) Do they need to be embedded in an existing (complex) system?	
2b. What kind of knowledge does the technology bring into play?	2b. Is new knowledge generated or made visible when applying the methods to assess, classify and support "small and nutritionally at-risk infants and their mothers"? Has it the potential to detect changes in health and nutrition status?	1) Do the methods used to detect, classify and support "small and nutritionally at-risk infants and their mothers" make risks or changes in risks visible or measurable? OR 2) Partially or indirectly visible/measurable? OR 3) Changes are unpredictable or can be contested.	

2c. What knowledge and/or support is required to use the technology?	2c. What knowledge and/or technical support is required to assess, classify and support "small and nutritionally at-risk infants and their mothers"?	1) No new knowledge is required to assess, classify and support "small and nutritionally at-risk infants and their mothers"? OR 2) Detailed instructions and training are needed. OR 3) Advanced training and support are necessary.	
2d. What is the technology supply model?	2d. Are the methods used in the MAMI Care Pathway generic and standardised?	1) Are the "small and nutritionally at-risk infants and their mothers" methods used in the approach generic, standardised and straightforward to implement? OR 2) Are significant organisational changes in the management of health services needed? OR 3) Is it highly vulnerable to support withdrawal?	
Domain 3: The value proposition Explores whether the MAMI Care Pathway is considered a **valuable intervention and for who** it has value: a) the care provider and b) the user.			
3a. What is the developer's business case for the technology (supply-side value)?	3a. How do health workers perceive the value of the MAMI Care Pathway? Do they understand the value of the short-/mid-/long-term benefits?	1) Is the perceived benefit of the MAMI Care Pathway approach well-understood, over the short/mid/long term? OR 2) Is it undervalued (at risk?) OR 3) Is it unlikely that it will be maintained (after the pilot period), and at risk?	
3b. What is its desirability, efficacy, safety, and cost effectiveness (demand-side value)?	3b. How do the mothers (caregivers) perceive the value of the MAMI Care Pathway? Do they understand the need, do they appreciate the care, is the opportunity cost a barrier?	1) Is the MAMI Care Pathway approach considered needed, desirable, safe, cost-effective by the user? OR 2) Is it unknown, contested? OR 3) Is it considered not needed, undesirable, unsafe, ineffective or unaffordable by the user?	
Domain 4: The adopter system Explores whether the MAMI intervention has been **adopted (accepted) and by who:** a) health staff, b) mothers, c) lay support system of the mother.			
4a. What changes in staff roles, practices, and identities are implied?	4a. Did important changes have to be made for health workers (staff in the health facility) to take on their role in the MAMI Care Pathway? Did new skills have to be learned, new staff be appointed, new tasks be taken on?	1) When adopting the care pathway, were there no changes in staff roles and practices? OR 2) Did existing staff have to learn new skills and/or were new staff appointed? OR 3) Did it pose a threat to current professional identities, values and scope of practices (risk of job loss)?	
4b. What is expected of the patient (and/or immediate caregiver) – and is this achievable by, and acceptable to, them?	4b. Were specific or new actions expected of the mother?	1) Nothing is expected of the mother (principal caregiver). OR 2) Routine tasks and changes in behaviour are expected. OR 3) Complex tasks are expected? Are these achievable, acceptable?	
4c. What is assumed about the extended network of lay caregivers?	4c. By offering MAMI, are other lay caregivers in the mother's network affected (e.g., family members, volunteers, community members), and are there new requirements or expectations for them? Is the wider network requested to be involved?	1) Nothing is required from the extended network of lay caregivers. OR 2) Caregivers are assumed to be available. OR 3) A network of caregivers is needed/expected to coordinate their inputs.	

Domain 5: The organisation Addresses whether **the organisation** of the MAMI intervention required important changes and inputs in the given organisational context: a) capacity, b) readiness to adopt, c) easiness of adoption and funding decision, d) changes in teamwork, and e) tasks to be undertaken (the work).			
5a. What is the organisation's capacity to innovate?	5a. Did the organisational setup have the capacity to innovate, change, and adapt ways of working, and did it have the resources for doing so?	1) Local health system is well-organised (good managerial capacity, well-supported), flexible and available resources, good management, risk taking is encouraged. OR 2) Resources are inflexible, local leadership is suboptimal and risk taking is not encouraged. OR 3) Severe resource pressure, weak leadership, weak resilience.	
5b. How ready is the organisation for this technology-supported change?	5b. Was the organisational setup ready / open to innovating, changing, and adapting ways of working, and did it have the resources for doing so?	1) High tension for change, openness to innovation, widespread support. OR 2) Little tension for change, moderate innovation. OR 3) No tension for change, poor innovation, opponents to change.	
5c. How easy will the adoption and funding decision be?	5c. How easy will the adoption and funding decision for the MAMI Care Pathway be (resources, cost savings, new infrastructure to manage by MOH, NGO or donor lead)?	1) Single organisation with sufficient resources; anticipated cost savings; no new infrastructure or recurrent costs required. OR 2) Multiple organisations with partnership relationship; cost–benefit balance favourable or neutral; new infrastructure found (e.g., repurposing staff roles, training). OR 3) Multiple organisations with no formal links and/or conflicting agendas; funding depends on cost savings across system; costs and benefits unclear; new infrastructure conflicts with existing and significant budget implications.	
5d. What changes will be needed in team interactions and routines?	5d. What changes were needed in MOH, NGO, and health worker team organisation to adopt MAMI? Did team interactions and team routines change (new), align or conflict?	1) No new team routines or care pathways needed. OR 2) New team routines or care pathways that align readily with existing ones. OR 3) New team routines or care pathways that conflict with existing ones.	
5E. What work is involved in implementation and who will do it?	5e. What work is involved in implementing and improving the quality, and who will do it?	1) Established shared vision, few simple tasks, uncontested and easily monitored. OR 2) Some work needed to build shared vision, engage staff, enact new practices, monitor impact. OR 3) Significant work needed to build shared vision, engage staff, enact new practices, monitor impact.	
Domain 6: The wider context Explores whether **financial and policy requirements** are in place nationally for rollout.			
6a. What is the political, economic, regulatory, professional (e.g., medicolegal) and socio-cultural context for programme rollout?	6a. Are financial and policy requirements for MAMI in place for programme rollout? a) what was it like in the previous context, b) what is it like in the new context?	1) Financial and regulatory requirements are in place nationally; professional bodies and civil society are supportive. OR 2) Are being negotiated nationally; professional bodies and lay stakeholders not yet committed. OR 3) Raise tricky or legal or other challenges, professional bodies and lay stakeholders are opposed.	

Domain 7: Embedding and adaptation over time Explores the feasibility of **embedding and adapting** the MAMI approach over time: the feasibility of a) continuing to adapt and evolve over the medium and long term, and b) building organisational resilience.			
7a. How much scope is there for adapting and co-evolving the technology and the service over time?	7a. What is the feasibility of continuing to embed and adapt the MAMI approach (intervention modalities) over time (medium- to long-term)? Are you expecting certain barriers?	1) Strong scope for adapting and embedding the MAMI approach. OR 2) Potential for adapting and co-evolving the MAMI services is limited and uncertain. OR 3) Significant barriers to the further adaptation or co-evolution of the MAMI approach.	
7b. How resilient is the organisation in regard to handling critical events and adapting to unforeseen eventualities?	7b. What is the organisation resilience to detecting and overcoming critical issues or barriers (barriers related to embedding, handling critical events, adapting to unforeseen eventualities?)	1) Sense-making, collective reflection and adaptive action are ongoing and encouraged. OR 2) Are difficult and viewed as a low priority. OR 3) Are discouraged in a rigid, inflexible implementation model.	

Annex 4d. Data tool: Planning for successful scale-up of the MAMI Care Pathway approach

Questions related to potential scalability	Yes (+)	No (–)	More information / action needed
1. Is input about the project being sought from a range of stakeholders (e.g. policy-makers, programme managers, providers, NGOs, beneficiaries)?			
Are individuals from the future implementing agency involved in the design and implementation of the pilot?			
Does the project have mechanisms for building ownership in the future implementing organisation?			
2. Does the innovation address a persistent health or service delivery problem?			
Is the innovation based on sound evidence and preferable to alternative approaches?			
Given the financial and human resource requirements, is the innovation feasible in the local settings where it is to be implemented?			
Is the innovation consistent with existing national health policies, plans and priorities?			
3. Is the project being designed in light of agreed-upon stakeholder expectations for where and to what extent interventions are to be scaled up?			
4. Has the project identified and taken into consideration community, cultural and gender factors that might constrain or support implementation of the innovation?			
Have the norms, values and operational culture of the implementing agency been taken into account in the design of the project?			
Have the opportunities and constraints of the political, policy, health sector and other institutional factors been considered in designing the project?			
5. Has the package of interventions been kept as simple as possible, without jeopardising outcomes?			
6. Is the innovation being tested in the variety of socio-cultural and geographic settings where it will be scaled up?			
Is the innovation being tested in the type of service delivery points and institutional settings in which it will be scaled up? 7. Does the innovation being tested require human and financial resources that can reasonably be expected to be available during scale-up?			
Will the financing of the innovation be sustainable?			
Does the health system currently have the capacity to implement the innovation? If not, are there plans to test ways to increase health systems capacity?			

8. Are appropriate steps being taken to assess and document health outcomes, as well as the process of implementation?			
9. Is there provision for early and continuous engagement with donors and technical partners to build a broad base of financial support for scale-up?			
10. Are there plans to advocate for changes in policies, regulations and other health systems components needed to institutionalise the innovation?			
11. Does the project design include mechanisms to review progress and incorporate new learning into the implementation process?			
Is there a plan to share findings and insights from the pilot project during implementation?			
12. Is there a shared understanding among key stakeholders about the importance of having adequate evidence related to the feasibility and outcomes of the innovation prior to scaling up?			

WHO ExpandNet (2011) *Beginning with the end in mind: planning pilot projects and other programmatic research for successful scaling up*.

1. Engage in a participatory process involving key stakeholders
2. Ensure the relevance of the proposed innovation
3. Reach consensus on expectations for scale-up
4. Tailor the innovation to the socio-cultural and institutional settings
5. Keep the innovation as simple as possible
6. Test the innovation in the variety of socio-cultural and institutional settings where it will be scaled up
7. Test the innovation under the routine operating conditions and existing resource constraints of the health system
8. Develop plans to assess and document the process of implementation
9. Advocate with donors and other sources of funding for financial support beyond the pilot stage
10. Prepare to advocate for necessary changes in policies, regulations and other health systems components
11. Develop plans for how to promote learning and disseminate information
12. Plan on being cautious about initiating scale-up before the required evidence is available

Annex 5. Implementation materials

Table Annex 5. Summary of materials for implementing the MAMI Care Pathway approach at Indus Hospital in Pakistan, 2021–2023

Materials from the 2021 MAMI Care Pathway package	Description of change (what)	Method (how)
Feeding form	Expanded points relating to good latching and positioning	Adapted prior to implementation through consultation with the core MAMI implementation group and further refined after pilot testing
Initial visit form	Included use of the INTERGROWTH-21 growth charts in the "growth parameters" section	Adapted prior to implementation through consultation with the core MAMI implementation group and further refined after pilot testing
Follow-up form	Included use of the INTERGROWTH-21 growth charts in the in the "monitoring" section	Adapted prior to implementation through consultation with the core MAMI implementation group and further refined after pilot testing
Existing materials		
IYCF – Pakistan counselling cards	Unchanged	
IMNCI treatment protocols	Unchanged	
Materials newly developed		
Checklist form for breastfeeding assessment	Developed for use during direct observation of breastfeeding	Developed prior to starting implementation and adapted after pilot testing
Assessment of medical conditions form		Developed prior to starting implementation and adapted after pilot testing
Conversion of all forms in REDCap software for data collection		Developed prior to starting implementation and adapted after pilot testing

Annex 6. Training sessions

Table Annex 6. Outline of training conducted at Indus Hospital in Pakistan, 2021–2023

Training (type and dates)	Participants targeted	Objectives	Topics covered	Materials used
Three workshops (2021–2023)	Medical doctors, nurses, nutritionists and receptionists	Participants able to: • Identify danger signs in infants u6m • Plot anthropometric measurements on growth charts • Identify incorrect breastfeeding methods • Effectively counsel mothers on breastfeeding and complementary feeding • Identify maternal depression • Provide preliminary mental health counselling • Perform correct referrals	• Danger signs • Breastfeeding • Growth monitoring • Identification of children with medical problems (cerebral palsy, congenital heart disease and hypothyroidism) • Follow-up care • Referrals • Maternal nutrition and wellbeing	• PowerPoint interactive lectures • Breast models • Picture cards • Videos

Annex 7. Appraising the adoption process

Table Annex 7. Findings on the degree of normalisation* of the MAMI Care Pathway approach at Indus Hospital in Pakistan, 2021–2023

Normalisation domain question	Summary of finding
1. Is the MAMI Care Pathway easy to describe? Can you describe how it differs from current ways of working, from what you did before for at-risk infants under six months of age (u6m) and their mothers?	Before the MCH clinic for infants u6m and their mothers (aka MCH/MAMI clinic) opened, they worked quite differently: examined the baby, did not MUAC, and gave some counselling. Now they examine infants differently and in more depth: monitor height and weight and track growth across follow-up visits; also assess issues related to mother's health. Before, all infants with nutritional issues were referred to the PCM clinic of the hospital for malnourished children up to five to six years. Now, the MCH/MAMI clinic supports the at-risk mother–infant pair.
2. Do you and your colleagues have a common understanding of the aims, objectives and expected outcomes of the Care Pathway?	There was a common understanding of the purpose. The large burden of malnourished infants and their mothers needed counselling/support; e.g., on infant feeding. A training workshop explained the need and taught staff how to implement MAMI care and built enthusiasm. After being trained, they understood how to do the work, and why they should do it. Refresher training is done every six to seven months. "Our first impression was, why do we need to do this additional clinic?" "We all have seen the difference since the MCH/MAMI clinic (after vs. before)." Participants collectively agreed about the purpose of the intervention: Grade 5
3. Do you understand what implementing the Care Pathway requires from you (specific tasks and responsibilities)?	In the beginning it was new to routinely follow up mother–infant pairs. After training and learning about the tasks, the clinic ran well. Everyone was comfortable with the work once it was thoroughly explained. "Health workers enjoy the work: two residents work as a team to monitor and examine the patient and fill the forms. They enjoy counselling the mothers, directly dealing with mothers and infants." Participants individually understood what the intervention required of them: Grade 5

4. Can you easily grasp the potential value, benefits and importance of the Care Pathway?	All involved understood that early identification of cases (in regard to maternal and infant issues) through the MCH/MAMI clinic results in fewer malnutrition cases at older ages and fewer cases being referred to the PCM clinic. Children with other vulnerabilities (e.g., Down's syndrome) could be identified and supported early on (including their parents and communities). The MCH/MAMI clinic was considered an essential service in the hospital. MAMI allowed clinicians to deal with the mother and infant together and to counsel mothers on how to best take care of their infants at home (detailed counselling encouraged them to look after their infants, they were more interested, asked more questions and followed up on what to do; e.g., if they could not access medication). Other clinics had a high burden of patients and minimal time to engage with these types of patients. In the MCH/MAMI clinic they saw a limited number of patients per day (18) and had more time to counsel the patients and answer their questions. "MAMI enables us to do what is required and provides comprehensive care at the clinic. There is no more the need to go to various other departments for input." Participants constructed the potential value of the intervention for their work: Grade 5
5. Are you (or other key individual(s)) able and willing to get others involved in the Care Pathway? Are you actively engaged in making the Care Pathway work in your setting?	The Chair of Paediatrics (MAMI manager) was very involved and available for consultation in case of issues. Regular audits were performed; e.g., if patients did not attend. The MCH/MAMI clinic had permanent additional staff, who were fixed (not rotating like the residents in paediatrics): a feeding nurse (senior nurse) who had been trained on providing guidance, another clinical nurse monitored vitals, and triage. A nutritionist was based at the PCM clinic and could be involved in MAMI if needed (there was no nutritionist in the MCH/MAMI clinic). Key individuals drove the intervention forward: Grade 5
6. Do you believe and agree that being involved is right, and that by accepting the Care Pathway as part of your work you contribute to its implementation?	The feeding nurse was fixed to the MCH/MAMI clinic and solely assigned to these tasks (less clinical, provide guidance on infant feeding) and will continue with this in future. MAMI was considered a good idea and she accepted that this was a focus of her work. Participants agreed that the intervention was part of their work: Grade 5
7. Do you have the capacity and are you willing to organise yourself and your colleagues and collectively contribute to the work involved for implementing the Care Pathway?	The hospital saw many older malnourished children who were born with LBW. Colleagues understood that dealing with their vulnerability early could reduce or prevent high numbers of cases after six months of age. Participants agreed to the intervention: Grade 4
8. Do you have the capacity and are you willing to collectively define the actions and procedures needed to keep the practice ongoing (invest your time and energy to keep it going)?	Because the MCH/MAMI clinic was established and paediatric residents rotated in the MCH/MAMI clinic, investing time and providing quality care was a requirement and doing things differently was not an option. Participants continued to support the intervention: Grade 3

9. Are you and colleagues able to carry out the tasks required to implement the Care Pathway (to operationalise its components in practice)? (Interactional workability)	Colleagues worked as a team and were adequately trained. However, their competence in the tasks depended on their level of experience (what stage of their residency they were at) and the completion of tasks was easier when a more senior resident was present. Sometimes staff were overburdened, especially if the mother had several challenges or concerns that needed attention. In these cases, early follow-up was given. The staff aimed to assess/counsel one mother–infant pair at a time. If there was more than one, they could ask the feeding nurse to counsel them. Participants performed the tasks required by the intervention: Grade 4
10. Do you maintain trust in the intervention and in each other's work and expertise in implementing the Care Pathway? (Relational integration)	Colleagues were well trained, supported and supervised and therefore the quality of the services being monitored closely was (expected to be) high. Challenges were discussed with the feeding nurse in monthly sessions. Participants maintained their trust in the intervention and in each other: Grade 4
11. Is the work required for implementing the Care Pathway distributed to participants with the right mix of skills and training? Did it impact on the division of labour, resources, power, responsibilities between colleagues (tasks and skill sharing)? Was extensive training needed before implementing the Care Pathway? (Skill set workability)	A whole-day training workshop was used to discuss growth charts, train participants on feeding counselling and support using mannequins, and provide participants with scenarios to respond to. Every six months they had learning sessions on MAMI-related topics for all the paediatric residents. Sometimes family medicine residents were invited when they expressed an interest in the MCH/MAMI clinic. There were around 30 paediatric residents and 25–30 family medicine residents who were not fixed to the MCH/MAMI clinic but who could get involved if they were interested. The work of the intervention was appropriately allocated to participants: Grade 4
12. Is the implementation of the Care Pathway adequately supported by the advisor/manager? (Contextual integration)	The manager was motivating and supported them on why the MCH/MAMI clinic was important (they constantly got boosters about its importance) and how to implement practices. The staff asked questions or provided inputs to support cases, particularly for the more challenging ones. Red flag patients (problem cases) were discussed, and an investigation could be opened: for example, if infants were not gaining weight, an abnormal finding, a disability or maternal mental health issue was identified. Red flag cases were referred for early follow-up to specialist care. The lead paediatrician was the main person leading the clinic, but supervisors from other units were also involved and agreed on the clinic's importance. The intervention was adequately supported by its host organisation: Grade 5
13. Do you have access to information on the quality of care and outcomes of the Care Pathway (monitoring and evaluation information)?	The hospital had a paperless data system and there was a separate data collection system (using REDCap) for capturing data on MAMI implementation. The MCH/MAMI clinic data were managed by the MAMI manager for research purposes and evaluated on a regular basis (weekly or every two to three weeks, depending on the number of patients). Weekly meetings investigated 'red flag' patients and care in general, involving the feeding nurse. However, data on the quality of care (performance) were not readily accessible. Participants accessed information about the effects of the intervention: Grade 3

14. Do you collectively agree on the quality of care and the effects of the Care Pathway because of formal monitoring?	Data on quality of individual care were accessible, but data on quality of services were not. Participants collectively assessed the intervention as worthwhile: Grade 1
15. Do you individually think the Care Pathway is worthwhile?	The paediatric resident saw the impact of the care given; e.g., by identifying infants needing specific support and being able to pick up cases for timely referral. Data from REDCap showed how many babies were preterm or malnourished, and how many mothers were depressed, and allowed for monitoring over time. Data also indicated how many mother–infant pairs were not returning for follow-up. The quality of services was not monitored. Participants individually assessed the intervention as worthwhile: Grade 3
16. Can you make changes to the intervention as an individual or a group in response to the appraisal?	aking changes in the quality of individual care was possible; making changes in service quality was not possible. Antenatal care, nutritional support in pregnancy and lactation support should be added to the clinic to better cover the needs. Participants modified their work in response to their appraisal of the intervention: Grade 3

* The findings were informed by normalisation process theory (13, 14) (see Annex 3: Methods and limitations), adapted to the MAMI Care Pathway approach, to understand the path followed towards adoption, including enablers and barriers, and the likelihood of the Care Pathway becoming routine in practice. The quotes are from the participatory discussions with the paediatric resident.

Annex 8. Appraising readiness for scale

Table Annex 8a. Appraising challenges to scale-up, spread and sustainability of the MAMI Care Pathway approach at Indus Hospital in Pakistan, 2021–2023

Domain 1: The condition (including risk factors)	Addresses a) how well the **condition** "small and nutritionally at-risk infants and their mothers" is characterised, understood and predictable, and b) how care is being affected by socio-cultural factors and comorbidities.
1a. Is the condition "small and nutritionally at-risk infants and their mothers" well-characterised, well-understood and predictable?	Medical staff were well equipped and skilled (trained) to understand the condition, and therefore to detect (e.g., used growth charts based on WHZ, MUAC tapes) and classify the severity. More challenging were the multiple steps/components of the assessment and the care.
1b. Are socio-cultural factors and comorbidities relevant for the condition "small and nutritionally at-risk infants and their mother"?	Probably more than half of malnutrition (vulnerability) in infants is caused by social factors, e.g., poverty. Clinicians were used to detecting common social factors that interact with the condition; they were used to assessing these (e.g., demography or infant care aspects). However, for "small and nutritionally at-risk infants and their mothers", factors were assessed in much more depth, which was more challenging. For example, questions related to family planning or mental health were influenced by socio-cultural factors and were not easy to talk about, and more time and effort was required from the examiner to explore these. An experienced clinician can handle these questions better than a junior clinician. Paediatricians were not used to dealing with issues related to the mother. Therefore, referral to services may be needed, but this brings in other challenges, but it is not impossible since most services are available at the hospital.
Domain 2: The technology	Addresses whether **the methods (technologies)** of the MAMI Care Pathway used for detecting, classifying, and supporting "small and nutritionally at-risk infants and their mothers" are a) newly introduced, b) need new knowledge, c) need continued support, and d) need specific adaptations.
2a. What are the key features of the methods (technologies) used to assess, classify and support "small and nutritionally at-risk infants and their mothers"? Are methods known? Do they exist?	Clinicians were familiar with the assessment and classification tools and knew how to use them. The hospital used a digitised information system that was in the process of being updated to include the MAMI assessment and treatment information. The updated system would make it easy to insert and appraise assessment data (e.g., height and weight, plotting weight on the growth curves). As such, the adapted 2021 MAMI Care Pathway package materials could be integrated into the care system of the hospital.
2b. Is new knowledge generated or made visible when applying the methods to assess, classify and support "small and nutritionally at-risk infants and their mothers"? Has it the potential to detect changes in health and nutrition status?	Screening and assessing nutritional status of infants u6m initially used weight-for-length z-score. WAZ or MUAC was not done and had to be initiated. Also, assessing and addressing maternal risk factors was new. Initially, it was not thought feasible to assess maternal mental health, anaemia and malnutrition (because they were not trained on this), but once introduced and trained, the clinicians have developed the skills to assess and counsel mothers.

2c. What knowledge and/or technical support is required to assess, classify, support "small and nutritionally at-risk infants and their mothers"?	New knowledge was required for implementing the Care Pathway, and, as such, training became a continuous process, because residents rotated in the MCH/MAMI clinic and every year new residents arrived. Annual training sessions took place (like November this year). Also, if anything changed in the Care Pathway or was updated (e.g., introducing a digitised system for data analysis, such as REDCap, to have information readily available and accessible), specific training sessions took place.
2d. Are the methods used in the MAMI Care Pathway generic and standardised?	The Care Pathway approach could be replicated in new sites (satellite health centres of the hospital), but it would be too taxing to fully implement MAMI. Therefore, there is a plan to focus on three to four key aspects (e.g., breastfeeding support, feeding counselling, basic medical support) and, as such, develop a simplified approach, modified to having a 10-minute encounter based on 'look, assess, adopt'. It is expected that it will take time and effort to do this, because a solid programme will be needed that can be sold to the donors.
Domain 3: The value proposition	Explores whether the MAMI Care Pathway is considered a **valuable intervention, and for who** it has value: a) the care provider and/or b) the user?
3a. How do health workers perceive the value of the MAMI Care Pathway? Do they understand the value of the short-/mid-/long-term benefits?	The contribution of the MAMI Care Pathway to improving the health of infants showed a positive impact that was appreciated. Picking up issues early helped to reduce future complications, and the burden on the hospital care system. Rotation of residents in the MCH/MAMI clinic offered a good opportunity for them to be trained and to use the MCH/MAMI learning in future positions/ placements.
3b. How do the mothers (caregivers) perceive the value of the MAMI Care Pathway? Do they understand the need? Do they appreciate the care? Is the opportunity cost a barrier?	Mothers were initially satisfied with the care and attention, but many mothers did not come for follow-up visits because they felt the infant was okay or for other reasons (e.g., mothers were working, could not afford the transport, had to be accompanied). When mothers were in the clinic, they were happy and appreciative; after they left the clinic, other contextual factors come into play that may have interfered with care.
Domain 4: The adopter system	Explores whether the MAMI intervention has been **adopted (accepted) and by who:** a) health staff, b) mothers, c) the lay support system of the mother.
4a. Did important changes have to be made for health workers (staff in the health facility) to take on their role in the MAMI Care Pathway? Did new skills have to be learned, new staff appointed, new tasks be taken on?	No extra staff were hired, but new paediatric residents rotated in the MCH/MAMI clinic. Some reorganisation of tasks had to happen to enable coverage of the MCH/MAMI clinic activities, to ensure that enough clinicians were available to cover the clinic activities. At the start, the additional tasks and longer working hours created some resistance, but this mostly disappeared when the benefits of the clinic were understood. Also, other departments were affected as they were asked to integrate the MAMI Care Pathway (e.g., accepting referrals). Overall, it took four months to put all MAMI activities into place to start the clinic activities, and from the fifth month onwards data were being uploaded into REDCap.
4b. Were specific or new actions expected of the mother?	Before, mothers would go to the nursery to attend vaccination and then go home. With the MCH/MAMI clinic, mothers and infants at-risk received more attention and were asked to return for regular follow-up visits. Targeted counselling engaged them in a process to strengthen (or change) behaviours on feeding and care practices.

4c. By offering MAMI, were other lay caregivers in the mother's network affected (e.g., family members, volunteers, community members), and were there new requirements or expectations for them? Is the wider network requested to get involved?	It is unknown if other family members were affected when applying the MAMI Care Pathway approach because this was never directly asked. However, the mother was accompanied by a family member when attending the clinic, including for the return visits, or she was replaced if she was working. The opportunity costs were, for example, time investment and payment for transport. On the other hand, some mothers brought other mothers and their infants if they noticed a problem, which showed that mothers networked with each other, were able to identify risks and to act upon this (often these infants indeed needed support). Also, relatives or in-laws could influence mothers or interfere with feeding and care practices (e.g., dilute formula milk to reduce the cost), who then ideally had to be included in behaviour change messaging.
Domain 5: The organisation	Addresses whether **the organisation** of the MAMI intervention required important changes and inputs in the given organisational context: a) capacity, b) readiness to adopt, c) easiness of adoption and funding decision, d) changes in teamwork, and e) tasks to be undertaken (the work).
5a. Did the organisational setup have the capacity to innovate, change and adapt ways of working, and did it have the resources for doing so?	The initiative of starting and maintaining the MCH/MAMI clinic was driven by the Chair of Paediatrics, who received approval and support from the senior hospital management to adopt the new approach, and who had relatively easy access to financial and human resources (so far).
5b. Was the organisational setup ready / open to innovate, change, adapt ways of working, did it and have the resources for doing so?	The Chair of Paediatrics championed the innovation as a need to fill a care gap and took responsibility for making the clinic operational, then acting as the MAMI manager.
5c. How easy will the adoption and funding decision for the MAMI Care Pathway be (resources, cost savings, new infrastructure to manage by MOH, non-governmental organisations or donor lead)?	All organisational steps were managed by the Chair of Paediatrics/ MAMI manager, receiving the support and trust from superiors and colleagues, and the financial resources through the hospital's charity system. It was mentioned that other colleagues face much bigger challenges in implementing their activities.
5d. What changes were needed in MOH, non-government organisation, health worker team organisation to adopt MAMI? Did team interactions and team routines change (new), align or conflict?	Staff (paediatric residents and nutrition nurse) were available through adapting the rotation system and trained to take on their specific tasks. Sustaining the new team routines was challenged by motivation because it needed to be sustained.
5e. What work is involved in implementing and improving the quality, and who will do it?	Important knowledge and efforts were invested to put operations in place, e.g. developing evidence-based guidelines, obtaining additional resources, sourcing additional tools, accessing counselling skills, and introducing REDCap for monitoring implementation and quality. To sustain quality of care, a more simplified implementation approach would be required, especially for the expansion to satellite sites, and then it would be necessary to learn how it 'survives' over time.
Domain 6: The wider context	Explores whether **financial and policy requirements** are in place nationally for rollout.

6a. Were financial and policy requirements for MAMI in place for programme rollout? a) the past context, b) the future context for expansion?	There was interest in expanding the learning to beyond the MCH/MAMI clinic or hospital premises and efforts were made and were continuing but needed to be regularised; e.g. involve clinicians in training, involve nutritionists/dieticians in managing infants u6m (as well as above six months), reach out to the Paediatric Association of Pakistan for their engagement, expand to two other main hospitals of Karachi with a high burden of undernutrition but no services, reach out to WHO for their involvement and learning. The MOH was committed to addressing malnutrition in children but there were disparities in service provision across provinces and risk stratification/gap analysis would be required to ensure that human resources and funding are provided according to the level of need.
Domain 7: Embedding and adaptation over time	Explores the feasibility of **embedding and adapting** the MAMI Care Pathway approach over time: the feasibility of a) continuing to adapt and evolve on the medium and long-term, and b) building organisational resilience.
7a. What is the feasibility of continuing embedding and adapting the MAMI Care Pathway approach (intervention modalities) over time (medium to long term)? Are you expecting certain barriers?	The current setup showed that there was good potential to adopt the MCH/MAMI clinic as a routine service. Challenges included further simplifying the approach, ensuring ongoing learning and implementation support, and solving financial challenges relating to staff, training, and medicines. Also, the whole approach was carried forward by one influential person.
7b. What is the degree of organisational resilience in regard to detecting and overcoming critical issues or barriers (barriers related to embedding, handling critical events, adapting to unforeseen eventualities?)	Having a (stricter) system of accountability for embedding MAMI into IMCI – supported by WHO – may increase the importance of MAMI and commitment for MAMI services.

Table Annex 8b. Appraising the potential scalability of implementing the MAMI Care Pathway approach at Indus Hospital in Pakistan, 2021–2023, and suggested actions

Steps in the scale-up appraisal – questions		Suggestions for more information or action needed
1. Is input about the project being sought from a range of stakeholders (e.g., policy-makers, programme managers, providers, non-government organisations, beneficiaries)?	No	Support was sought from senior hospital managers and paediatric colleagues, but not from outside of the hospital. Links were established with the MAMI Global Network and MAMI Implementers Group.
Are individuals from the future implementing agency involved in the design and implementation of the pilot?	No	There was a desire to establish links with other health facilities and adapt the design to their level, but this has not yet happened.
Does the project have mechanisms for building ownership in the future implementing organisation?	No	There was a desire to link in-country with the MOH, United Nations organisations and implementing partners.
2. Does the innovation address a persistent health or service- delivery problem?	Yes	The identified health needs drove the efforts to start the MAMI clinic.
Is the innovation based on sound evidence and preferable to alternative approaches?	Yes	Implementation in the tertiary hospital environment, driven by the Chair of Paediatrics, underlined the need for, and benefits of, this evidence-based approach.
Given the financial and human resource requirements, is the innovation feasible in the local settings where it is to be implemented?	Yes	The tertiary hospital had sufficient resources to implement the innovation.
Is the innovation consistent with existing national health policies, plans and priorities?	Yes	The innovation was aligned with existing paediatric services; however, person-centred implementation is new or 'different'.
3. Is the project being designed in light of agreed-upon stakeholder expectations for where and to what extent interventions are to be scaled-up?	No	Scale-up was not an objective of implementing the MAMI Care Pathway approach.
4. Has the project identified and taken into consideration community, cultural and gender factors that might constrain or support implementation of the innovation?	No	They were very aware about the community and socio-cultural factors, but the hospital setting was constrained in regard to further addressing these outside the premisses.
Have the norms, values and operational culture of the implementing agency been taken into account in the design of the project?	Yes	Norms and values dictated what was feasible in the hospital setting.
Have the opportunities and constraints of the political, policy, health-sector and other institutional factors been considered in designing the project?	No	NA
5. Has the package of interventions been kept as simple as possible without jeopardising outcomes?	Yes	The existing package was contextualised and adapted/simplified or expanded. Further simplification was perceived as needed for future action.
6. Is the innovation being tested in the variety of socio-cultural and geographic settings where it will be scaled up?	No	NA

Is the innovation being tested in the types of service delivery points and institutional settings in which it will be scaled-up?	No	NA
7. Does the innovation tested require human and financial resources that can reasonably be expected to be available during scale-up?	No	NA
Will the financing of the innovation be sustainable?	No	NA
Does the health system currently have the capacity to implement the innovation? If not, are there plans to test ways to increase health systems capacity?	No	NA
8. Are appropriate steps being taken to assess and document health outcomes as well as the process of implementation?	Yes	Data were collected for research purposes and learning.
9. Is there provision for early and continuous engagement with donors and technical partners to build a broad base of financial support for scale-up?	No	The hospital was self-funded by zakat donations.
10. Are there plans to advocate for changes in policies, regulations and other health systems components needed to institutionalise the innovation?	No	No plans, but a desire to be in touch with WHO and the state MOH was expressed, but no progress has been made yet.
11. Does the project design include mechanisms to review progress and incorporate new learning into the implementation process?	Yes	Discussions and learning between clinicians are ongoing.
Is there a plan to share findings and insights from the pilot project during implementation?	Yes	Research was planned to consolidate learning.
12. Is there a shared understanding among key stakeholders about the importance of having adequate evidence related to the feasibility and outcomes of the innovation prior to scaling up?	Yes	Within the hospital system there was a shared understanding, but not beyond it. There was hope to expand to partner health facilities using the learning from the hospital context.

Designed by Scalegate
Copyeditor: MyBluePencil
Photo credits © The Indus Hospital, Karachi

2nd Floor, Marlborough House, 69 High Street, Kidlington, Oxfordshire OX5 2DN, UK
+44 (0)1865 372340 | office@ennonline.net | www.ennonline.net

Charity registration no: 1115156. Company registration no: 4889844