Exploring Implementation Strategies to Improve Pediatric Treatment Guideline Implementation: Understanding Factors, Co-designing Strategies, and Identifying Change Mechanisms

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Abstract

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Background: While substantial progress has been made towards reducing child mortality, millions of preventable child deaths continue to occur every year. Clinical treatment guidelines that describe evidence-based interventions are available, however adherence to them remains suboptimal. This dissertation explores implementation strategies to support guideline adherence among health workers providing care in hospital settings in Kenya and other low- and middle-income countries (LMICs).

Methods: This dissertation utilized several methods to identify factors impacting guideline implementation, co-design a strategy to improve adherence, and identify the mechanisms that generate changes in guideline adherence. In Chapter 1, a qualitative study was conducted to understand the barriers and facilitators of clinical treatment guideline adherence among health workers at two hospitals in Kenya. Interviews and focus group discussions were conducted, transcripts were coded with a codebook organized around the Theoretical Domains Framework

(TDF), and analysis identified themes. In Chapter 2, we utilized a complex mixed method design to build upon the understanding gained in Chapter 1 and co-design an implementation strategy that would support health workers in applying clinical treatment guidelines at one hospital in Kenya. Through a multi-stage process of group decision making and iterative design, the Team Approach to Malnutrition Services (TeAMS) Toolkit was developed. Following a 10-week pilot of this strategy, a mixed methods evaluation of usability, feasibility, and impacts on task completion and teamwork was conducted. A survey included measurement of the System Usability Score, Feasibility of Implementation Measure as well as task analysis, and teamwork perceptions; with interviews and focus group discussions exploring these concepts in detail. In Chapter 3, a realist literature synthesis was conducted to develop and refine a program theory that explains the mechanisms through which participatory design processes and guideline implementation tools support guideline adherence in LMICs. After clarifying the scope through development of an initial program theory, we conducted a search for evidence and appraised the relevance, richness, and rigor of the identified studies. After extracting data, analysis of the evidence informed the refinement of the program theory.

Results: In Chapter 1, 35 participants took part in qualitative data collection and we found that TDF domains with greatest influence on the thematic findings were environmental context and resources, social influences, beliefs about consequences, and beliefs about capabilities. Health workers reported some deviations were intentional (ex. when guidelines were deemed inadequate for a clinical scenario) and other times they were unintentional (ex. when complex patient presentations make guidelines adherence difficult). Health workers were knowledgeable about guidelines and felt strongly that adherence to them was beneficial, however they also faced barriers to implementing them. Challenges related to environmental context were pervasive, including shortages of staff, supplies, and infrastructure. While health workers described frequent

interdisciplinary consultation within their teams, strict professional roles and team dynamics sometimes delayed diagnosis and treatment.

In Chapter 2, we involved 34 participants in a co-design process to develop and pilot test the TeAMS Toolkit. First, health workers decided that the challenge they would address was that reliance on nutritionists to handle critical tasks sometimes delays guideline adherent care for children with severe malnutrition. They then came to consensus on a strategy that would clarify team member roles in providing care to children with malnutrition and summarize information from guidelines to support performance of those roles. The TeAMS Toolkit was developed to meet these requirements, with iterations based on feedback from health workers. After launching and piloting, we found the TeAMS Toolkit to have good usability (median 77.5, IQR 67.5-87.5). Participants described the Toolkit as easy to use and a helpful reference to look to when delivering care. While there were no significant changes identified in quantitative measures of perceived competence or frequency of task completion, qualitative findings described non-nutritionists feeling able to take on feeding tasks utilizing the Toolkit content to guide them. Participants descried improved collaboration and multidisciplinary teamwork to ensure timely care, which aligned with significant changes ($p<0.05$) on two out of six measures of teamwork perceptions.

In Chapter 3, an initial program theory was developed that included ten context-strategy-mechanism-outcome (CSMO) configurations. Our search identified 10,883 records, and after de-duplication title and abstract screening of 8,697 records was completed. The full text of 112 articles were reviewed and data was extracted from 27 included studies. The extracted data was analyzed and synthesized to refine the initial program theory, resulting in a refined theory with eight CSMO configurations. This theory explicates how participatory processes can contribute to improved health worker engagement, acceptability of guideline implementation tools, group consensus

regarding operationalization plans, and teamwork perceptions. In addition, it describes how specific types of guideline implementation tools (descriptions of roles, teamwork skills, job aids, documentation tools) may impact guideline adherence through mechanisms including improved role clarity, visible reminders, gains in competence, and improved efficiency.

Conclusion: This dissertation contributes to deepening our understanding of how and why implementation strategies can support guideline adherence in LMICs. Our findings highlight how team collaboration and professional roles impact guideline adherence and describe an implementation strategy that addresses these drivers to improve guideline adherence. We plan to build on this work with further refinement and scale-up of the TeAMS Toolkit. Moreover, the refined program theory we developed can be utilized to guide the selection and design of implementation strategies, ensuring better alignment to context and the best chance of improving guideline adherence.

Table of Contents

List of Figures

List of Tables

Dedication

For my parents, who engrained in me a love of children (Mom)

and a desire to engineer better solutions (Dad).

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In addition to my committee members, so many individuals have contributed to the work presented in this dissertation. Dr. Benson Singa is a principal investigator of the studies presented in Chapter 1 and 2, leading our team in Kenya and supporting this work throughout the process. Additional team members on the Chapter 1 study included: Shawon Riffat Ara, Mary Masheti, Chrisantus Oduol, Phlona Amam, Molline Timbwa, Martin Kamui, and Johnstone Thitiri. The TeAMS Toolkit Pilot study, presented in Chapter 2 was successful due to the diligence of our research team. Dr. Beth Kolko offered her expertise in Human Centered Design, offering helpful suggestions and guidance as we developed our design activities and evaluations. Our study coordinator, Geoffrey

Okoth Olieng'o, and Catherine Achieng, who supported the qualitative data collection and analysis, along with Chrisantus Oduol, Phlona Amam, Priscah Lihanda, and Megan Lewis contributed extensive time and effort into achieving the aims of this study. Finally, the work in Chapter 3 depended on the contribution of Dr. Kyla Woodward, who reviewed thousands of titles and abstracts. Beyond being skilled and effective team members, it was a joy to work with all of these individuals.

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I am so appreciative of the support and camaraderie I received from various communities at the University of Washington. My PhD in Nursing Science cohort has been on this ride together, from getting to know each other in Zoom rooms in 2020, to supporting each other through moves to Seattle, coursework, exams, and life. I'm so glad to have had you by my side in this journey. The T32 seminar group and the Working in Implementation Science (WISE) group have also contributed constructive feedback and support that have make this dissertation better. And the Global Women, Adolescent, and Child Health Research Center gave me and this study a place to sit – both literally and figuratively – and I have felt welcomed into this community.

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much joy. I have treasured the time with you for holidays, beach vacations, and birthday adventures over these years. The extended family also has given me support and encouragement. So many friends, near and far, new and old, have been constant supports throughout this journey. I am so appreciative of the phone calls, coffee dates, and visits that have kept me sane through this PhD journey.

There are so many others I could add here. I truly believe that everyone I have encountered along my path has led me to this point. To everyone, mentioned and not – Thank you!

Introduction

This dissertation is both a representation and a culmination of my career so far. Since I was a child myself, I have been drawn to a career in pediatric health care. The mere thought of the millions of preventable child deaths that occur every year [1] and the ones that I have seen first-hand are what drive me to continue this work. Moreover, I have never been content to go along with an inefficient process, and whether it involved figuring out Excel formulas or creating job aids for myself and colleagues, I've been thinking about implementation tools long before I started my PhD studies, or even became a nurse.

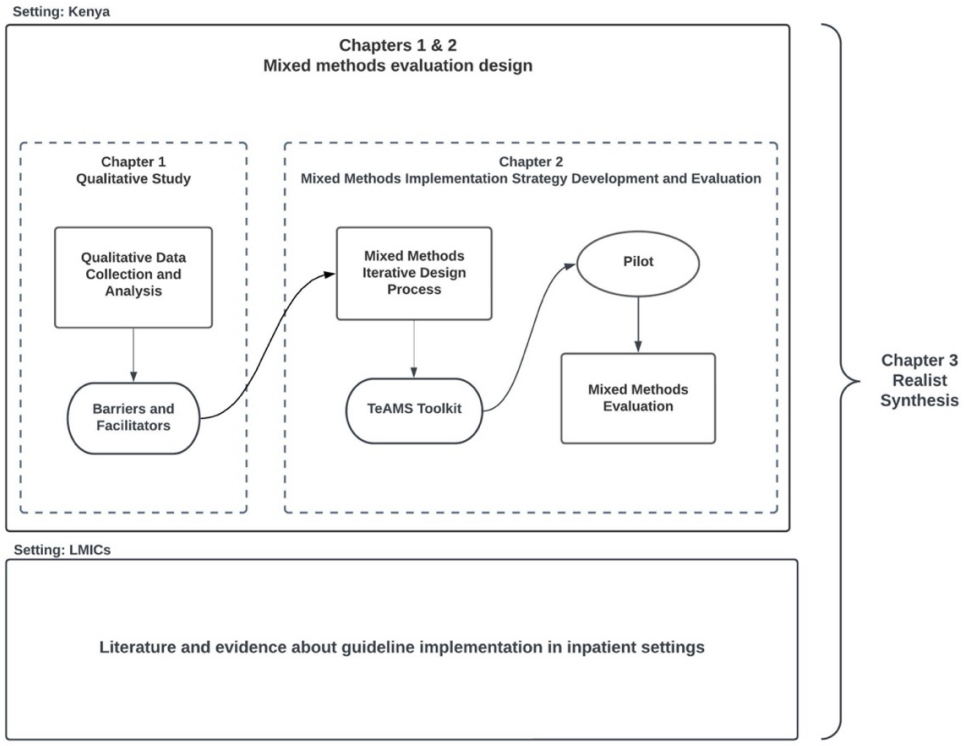
As a nurse, clinical practice guidelines provided clarity and reassured me that my actions were appropriate for my patients. When I began teaching nursing in Malawi, I was thankful for the national guidelines, such as Emergency Triage Assessment and Treatment [2], and the World Health Organization (WHO) Pocket Book of Hospital Care for Children [3], to tailor lessons to what would be expected of my students in practice. During that time, I came across Kenya's Basic Pediatric Protocols [4], which served as an additional resource that often provided more relevant information than textbooks designed for students in the United States. When I moved into a role that included shepherding quality improvement efforts in the pediatric ward at a hospital in Malawi, I began to understand the immense challenge that health workers and hospital-level leaders face when working to operationalize guidelines. My experience in that role eventually led me to the field of Implementation Science and this PhD dissertation.

I was not alone in my experiences. Across a wide range of conditions and settings, including pediatric hospital wards in Kenya, translation of guidelines into practice is sub-optimal [5,6]. Globally, poor uptake of guidelines has been attributed to factors related to the context, the guideline itself, and implementation approaches [7]. Many researchers and practitioners have reported on efforts to implement guidelines, with results consolidated in several systematic reviews

[8–11]. These indicate that while earlier (pre-2014) efforts to implement guidelines often focused on dissemination through health worker education and material distribution, most recent efforts have utilized multifaceted strategies that included a broader range of approaches, such as providing feedback on compliance, developing and distributing printed materials, and making changes to information/communication technology. They also explain that after guidelines are developed there is often inadequate funding to support guideline implementation, highlighting the added importance of identifying efficient implementation strategies [8].

This dissertation explores approaches to effectively implement guidelines for inpatient care in hospital settings in low- and middle-income countries (LMICs). It utilizes mixed method designs and realist literature synthesis to identify factors impacting guideline implementation, co-design a strategy to improve adherence, and identify the mechanisms that generate changes in guideline adherence (Figure 1).

Figure 0.1: Dissertation Study Design



In Chapter 1, I describe a qualitative study that identified barriers and facilitators of adherence to pediatric treatment guidelines for hospitalized children with pneumonia, diarrhea, or malnutrition. This study was conducted at two district hospitals in Kenya. Chapter 2 builds upon those findings, reporting the co-design of a tailored implementation strategy, the Team Approach to Malnutrition Services (TeAMS) Toolkit, that aimed to improve guideline adherence. The strategy was pilot tested and a mixed method evaluation assessed its usability and feasibility. Finally, Chapter 3 presents a realist literature synthesis which gathers evidence from across LMICs to identify the causal mechanisms that explain how and why this implementation strategy, consisting of participatory process and guideline implementation tools, would be effective in improving guideline adherence, and presents the findings in a refined program theory.

Together, this dissertation offers a deep understanding of how pediatric treatment guidelines are implemented, the impact of guideline tools developed through a participatory design process, and the generative mechanisms at work under the surface. The findings are transferable to many hospital settings in Kenya and beyond that face similar contextual conditions.

Chapter 1: Barriers and facilitators of providing guideline-adherent care to hospitalized children in Kenya: A qualitative study.

Background

Over the past three decades, child health interventions in Kenya have successfully reduced the under-five child mortality rate from 101 per 1000 in 1990 to 41 per 1000 in 2022, however, 60,000 child deaths still occur annually, many of which are preventable [1]. Many deaths in the post-neonatal period are caused by pneumonia, diarrhea, and malaria – all conditions with effective and relatively low-cost treatments [12]. Along with improvements in prevention of disease and access to care, accelerating improvements in quality of care are needed to achieve the Sustainable Development Goal target of eliminating preventable child deaths [13,14].

Clinical treatment guidelines synthesize evidence and summarize recommendations for assessment, diagnosis, and treatment. Comprehensive World Health Organization (WHO) guidelines for pediatric care of hospitalized children have been in place for over 15 years and provide recommendations for treatment of the primary causes of childhood death, including malnutrition, pneumonia, and diarrhea [3]. These recommendations have been adapted in Kenya and disseminated nationally within the Ministry of Health Basic Pediatric Protocols [15]. While the Basic Pediatric Protocols are the primary guideline for care of hospitalized children in Kenya, they are used in conjunction with several other national guidelines, including the Integrated Management of Childhood Illnesses (IMCI) which focuses on outpatient care with indications for referral and guidelines for specific conditions such as the Integrated Management of Acute Malnutrition (IMAM) [16]. All of these guidelines have been updated over time, with new versions released every 3-6 years. An analysis of patient records from 27 Kenyan hospitals demonstrated that providing care according to guidelines was associated with lower in-hospital mortality, highlighting the importance of pediatric guidelines as an evidence-based intervention in these settings [17]. However, adherence

to guideline-recommended care remains suboptimal, even among providers who have received training [5,6,18]. In fact, an analysis of health records from 522 acutely ill children in Kenya observed that care that was fully adherent to pediatric treatment guidelines for only 21%, 2%, and 37% of children with pneumonia, diarrhea, and severe malnutrition, respectively [19].

The purpose of this study was to identify and describe determinants of health worker adherence to pediatric guidelines for hospitalized children with pneumonia, diarrhea, or severe acute malnutrition (SAM) at two facilities in Kenya. Understanding the point-of-view of health workers and subsequently engaging them in generating ideas for overcoming challenges is critical to provide health workers the support they need to consistently deliver guideline-adherent care.

Methods

Study Design

We aimed to describe facilitators of and barriers to adherence to pediatric treatment guidelines for pneumonia, diarrhea, and severe malnutrition, including features of the guidelines themselves that drive their compatibility with use. We collected qualitative data cross-sectionally through focus-group discussions (FGDs) and in-depth interviews (IDIs) with health workers. Determinants of targeted guideline adherent behaviors were identified through thematic analysis of transcripts.

Conceptual Framework

Data collection and analysis was guided by the Theoretical Domains Framework (TDF). The TDF was developed in 2004 with the goal of making psychological behavior change theories more accessible to health services researchers and practitioners [20]. This descriptive framework of the determinants of behavior change draws from 33 theories, including many explanatory middle-range theories [20,21]. The refined version of the TDF offers a taxonomy of 14 domains, with 84 constructs nested within them [21]. These domains are each aligned to one component of the Capability,

Opportunity, Motivation - Behavior (COM-B) model, which proposes that capability, opportunity, and motivation are all necessary for a behavior to occur [22]. The TDF has been utilized frequently to identify determinants of guideline use across a variety of settings [23–26].

Population and Setting

This study was conducted at two public hospitals in Kenya. Mbagathi County Referral Hospital is located in an urban area in Nairobi and has a 46-bed pediatric ward accommodating 2,000 admissions per year [27]. Migori County Referral Hospital houses a 26-bed pediatric ward and is located in a town of approximately 100,000 people in a rural county of Western Kenya.

Pediatric wards in both facilities are staffed by doctors, clinical officers, nurses, and nutritionists. Health workers involved in providing clinical care to children hospitalized for pneumonia, diarrhea or severe acute malnutrition were eligible to participate. All health workers in these facilities are trained and are aware of treatment guidelines. A purposive maximum variation approach to sampling was employed to ensure that each cadre and those with varying years of practice were represented in FGDs and IDIs.

Data Collection

FGDs and IDIs were conducted with health workers at the two study facilities in August 2021 (Migori) and October 2021 (Mbagathi). Semi-structured, TDF-informed question guides were pilot tested with Kenya Medical Research Institute (KEMRI) staff to determine comprehensibility of the questions (Appendix 1A). Administrators at each facility granted approval prior to study initiation and participants provided written informed consent prior to participating. The study default was to conduct FGDs, with IDIs conducted based upon the preferences of facility administrators, necessary COVID-19 precautions, or if less than three individuals were available within a certain cadre. A trained Kenyan social scientist led the FGDs and IDIs, completed a debrief form to record

key messages and reflections, and transcribed audio recordings of each session. Ethics approval was obtained from the KEMRI Scientific Ethics and Review Unit (SERU/CCR/0208/4207) and the University of Washington Institutional Review Board (STUDY00008138).

Data Analysis

Thematic analysis was conducted according to the phases described by Braun and Clarke [28]. A codebook was developed a priori and included domains and constructs from the TDF, [29] patient characteristics, and guideline characteristics (Appendix 1B). The codebook included all 14 TDF domains as top-level codes and 20 (24%) constructs deemed most relevant to the research question as sub-codes. Content related to other constructs was coded using the domain only. All transcripts were coded using qualitative data analysis software (ATLAS.ti 8). Two researchers individually coded two transcripts, discussed discrepancies, and refined the codebook for greater clarity. Remaining transcripts were coded by one researcher and then reviewed and validated by the second researcher using an Excel-based coding validation tracker. Disagreements were discussed at consensus meetings, with further refinements to the codebook as needed. If agreement could not be reached, a third researcher acted as a tie breaker. This approach to consensus coding has been utilized in several studies, including others conducted in Kenya [30,31]. Coders wrote case memos for each transcript, summarizing findings and providing supporting quotes. Data (transcripts and case memos) were then analyzed for themes and preliminary findings were discussed with research members based at each facility to further refine the themes. Each theme was aligned to one or more TDF domains.

Results

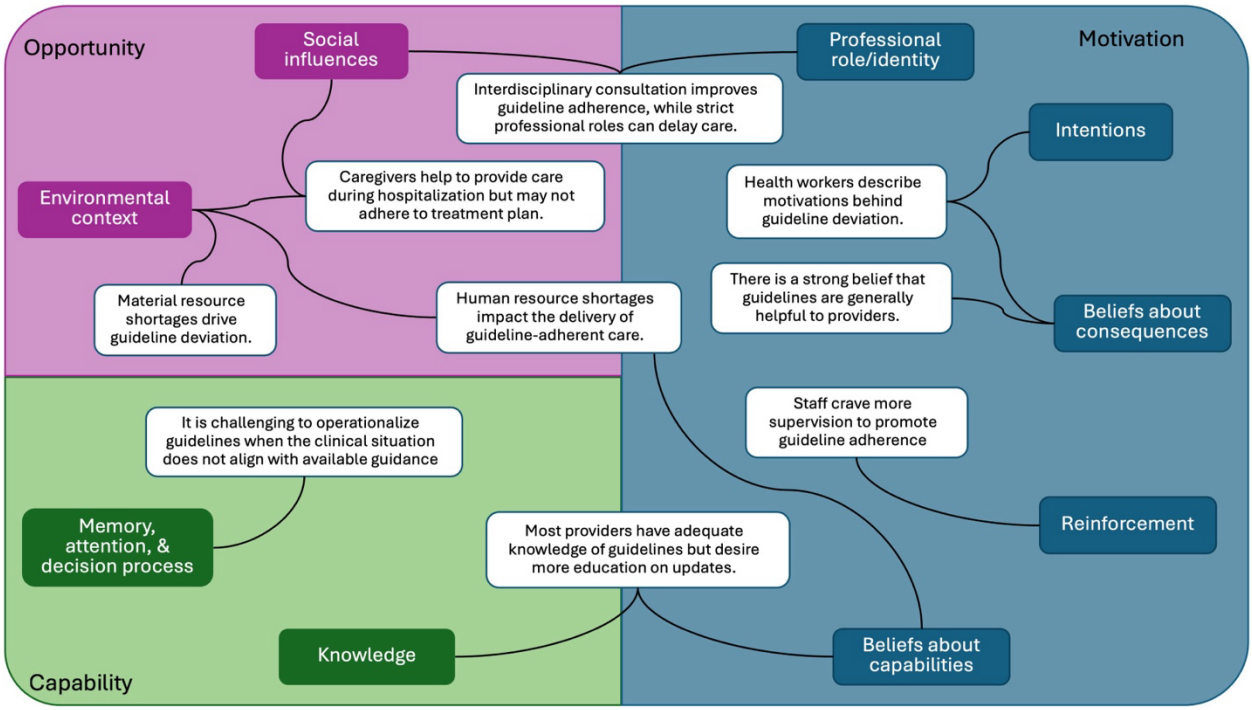
A total of 35 participants took part in three FGDs (19 participants) and 16 IDIs (Table 1). Participant cadres included nurses (69%), nutritionists (14%), medical doctors (11%), and clinical officers (6%),

and reflects overall staff distributions at the facilities (Table 1.1). Nine themes emerged that pointed to a network of factors driving adherence to and deviation from treatment guidelines. Each theme reflected one or more TDF domains, and four domains influenced the formation of more than one theme: environmental context and resources, social influences, beliefs about consequences, and beliefs about capabilities. (Figure 1.1)

Table 1.1: Participant Characteristics

	Facility A	**Facility B**
Total participants	14	21
Type of Data Collection		
FGD	5 (1 FGD)	14 (2 FGDs)
IDI	9	7
Cadre		
Clinical Officer	0	2
Medical Doctor	2	2
Nurse	10	14
Nutritionist	2	3

Figure 1.1: Themes aligned to COM-B components and TDF domains.



Most providers have adequate knowledge of guidelines but desire more continuing education following guideline updates

Many staff, of all cadres, were aware of available pediatric guidelines and had knowledge of specific clinical recommendations within them. Most participants identified the Basic Pediatric Protocols and IMCI as the primary guidelines in use, with some also referring to IMAM, Emergency Triage Assessment and Treatment (ETAT), and online WHO guidelines. While health workers frequently shared that they were not sufficiently trained on guidelines, they often demonstrated guideline-specific knowledge. Staff who had newly arrived in the departments, either through rotation from other departments or for internships, were characterized as having particularly low knowledge of pediatric guidelines.

Most participants reported that they had previously attended trainings on pediatric guidelines; however, many training experiences were not recent and, as a result, focused on outdated guideline

versions. Many staff were not confident that they would hear about updates to guidelines and were unsure if they were currently using the latest version of guidelines. Participants reported that opportunities to attend trainings on guideline updates are available to only a few staff members, and the content typically is not disseminated to all staff.

> "The in charges are the ones who will go for the training … And you see sometimes people really take it negatively, 'Isn't it you who went for training? Come, you implement." (Facility A, Nutritionist, IDI1)

Continuing medical education (CME) sessions held at the facility were often cited as an avenue for ongoing guideline training. These weekly meetings at the facility and/or department level offer a venue for information dissemination, however attendance is not typically mandatory and varies across cadres. Incentives to attend, such as refreshments, were suggested to improve attendance. Due to scheduling, it can be difficult to reach all staff with these sessions.

> "When you feel like you want to share something and because of the timetable you see you only have some few people. So, if you have something, for you to pass it to everybody, you can't. You have to repeat it several times because not everybody is there every time." (Facility B, Clinical Officer, IDI2)

Participants recognized that training, whether through CMEs or longer formats, was not sufficient to build confidence with guidelines. Ongoing support, such as senior review and discussion during ward rounds, assessments of information retention, and access to job aids were suggested to supplement formal training opportunities.

There is a strong belief that guidelines are generally helpful to providers

Participants unanimously indicated that guideline adherence was the expectation in their facility and believed that guideline adherence was associated with shorter inpatient stays, improved survival, fewer complications, less misuse of medications, personal satisfaction that they have provided good care, and reduced blame on individual providers if patients experienced poor

outcomes. In addition, guidelines allowed health workers to speak in "one language" (Facility A, Nurses, IDI5 and IDI6) supporting teamwork and easing patient handovers.

> "If you follow the guideline strictly you are likely to avoid those deaths that are preventable." (Facility B, Nutritionist, IDI7)

> "So when you hand over management, you know that it will continue and someone else will continue using the guidelines." (Facility A Nurse FGD1)

Staff often highlighted the simplicity of the algorithms and step-by-step guidance in the Basic Pediatric Protocols as a design feature that makes guideline adherence easier.

> "They give you steps, so you know where to go, so you don't strain a lot in the absence of a doctor's prescription. You can be able to just follow … you can decide and then later say I did this and that." (Facility B, Nurse, FGD1)

> "I mean you don't need to think, it is 5 in the morning, you are sleepy, you just open… the patient has cough and difficulty in breathing, do they have grunting, da da da yes, severe pneumonia yes, Xpen gentamycin, I mean it is so stupefied. If you gave it to a nurse, a CO, an intern, even for real when you give it to a watchman." (Facility A, Doctor, IDI4)

Human resource shortages and provider burnout impact the delivery of guideline-adherent care.

Participants identified gaps in staffing as a primary barrier to guideline adherence. One participant stated it is "number one, the biggest challenge." (Facility A, Doctor, IDI4). Shortages of health workers impact care delivery in several ways – making it challenging to complete all guideline-recommended care, limiting time for professional development, and leading to overarching feelings that overwhelm and impact health worker motivation.

Participants described that health worker shortages have a particularly negative impact on guideline recommendations that require frequent monitoring, care outside of the routine drug distribution schedule, and during nights and weekends when there are fewer staff on duty.

> "The guideline says that the patient should be monitored maybe after 20 minutes… and you are one staff and you are having like 50 [patients], you can't monitor that patient." (Facility B, Nurse, FGD1)

> “We try as staffs to cover up for the gap but … your time will end before you implement…You are concentrating on giving drugs only because you are overwhelmed. And before you remember maybe it is two o’clock and that child has gone without even ORS, without even ReSoMal, you are concentrating in completing drug distribution to all patients." (Facility A, Nurse Supervisor, IDI7)

> “There are leaner teams at night, you know fewer people at night, fewer people over the weekend, so when you have a large inflow of patients it is just difficult to follow the guidelines.” (Facility A, Doctor, IDI3)

They highlighted the challenges of completing tasks such as follow-up on fluid administration for children diagnosed with dehydration and feeding of children with SAM.

> “Sometimes you may wish to feed the baby and you find yourself alone or two then it becomes a challenge, you can’t give the feeds as per the guidelines” (Facility A, Nurse, FGD1)

> “You can prescribe very nicely what you are supposed to prescribe in an inpatient, but if you are understaffed, … let’s say you put first fluid … it is supposed to run for an hour, after that you are supposed to put another fluid. So they will get the fluid but I am not really sure about that duration that you have prescribed. So the thing is that you can have the guidelines but again the situation in the ground, are you truly properly staffed for this monitoring of these children? … Most of the time you put up the therapy you kind of forget. It is not an excuse it is just what it is.” (Facility B, Doctor, IDI3)

Health workers reported feeling overwhelmed, with little time to refer to guidelines. Feeling overworked due to staff shortages contributed significantly to health workers feeling unappreciated and left them little bandwidth to prioritize guideline adherence.

> “Overworking… so we are not able to look or refer to the guideline, sometimes you can even have the guidelines, but you cannot even have the time to refer to the protocols.” (Facility A, Nurse, IDI8)

> “We feel demoralized. We are not appreciated in any way, we do a lot of work, donkey work, you are tasked with a big number of patients, no one cares about your wellbeing psychologically, physically. The moment you are leaving duty now going to rest at home, you are tired and people are still expecting more from you.” (Facility B, Nurse, FGD2)

Material resource shortages drive guideline deviation.

Respondents reported that materials required for guideline adherence are inconsistently available. Resource shortages included medications, therapeutic foods, medical supplies, and basic necessities such as clean drinking water. When resources are not available, health workers ask the patient's caregiver to supply the missing resources, send patients to other facilities, offer treatments that deviate from guidelines, or improvise in other ways. Some participants even reported purchasing materials for their patients with their own money. Participants reported that they believe waiting for resources may be detrimental to the patient, so in some cases it is better to proceed with treatments that are not adherent to the guideline. They suggested that the guideline should include the ideal treatment plan, but also give alternative plans for common shortages.

> "I can say sometimes a drug is prescribed and the relative is not able to buy a drug that [we] don't have, so you keep using the first line drug that is available even if the baby is not improving." (Facility B, Nurse, FGD1)

> "Some medications, especially second line and third line, it is very difficult to find them in the hospital. So you have to tell the caregiver to buy them outside. So some they don't have the money so I give the prescription and they are unable to buy….and therefore we are unable to use the guideline. [Interviewer: So what do you normally do?] What we normally do [laughs] if there is maybe a patient with his own medication, maybe they have bought excess, you can borrow from that patient. When this other patient is able to buy, they will buy and then you will return to the other person….Or you do like Good Samaritan, you buy for them." (Facility A, Nutritionist, IDI2)

Participants reported that shortages of clean drinking water were particularly challenging. Water is a critical resource for all patients, but especially for those diagnosed with dehydration, SAM, or a combination of the two. The primary treatments for these patients are oral solutions and formulas [Oral Rehydration Solution (ORS), Rehydration Solution for Malnutrition (ReSoMal), F-75, etc] that are procured in powdered form and must be mixed with clean water.

> "Now it is usually hard…. 'Mum, please go buy a bottle of water we reconstitute the ORS then we give it to you.' 'I don't have money to buy the water.' So, it is either you give her [money] or you put [intravenous] fluids. So, in a way what is documented and what is actually done is

> a different thing. Because there is no way you are going to leave that baby there not giving fluid because she doesn't have money for water.... A 500mls of water, that is 30 shillings. In essence the hospital is supposed to provide water but ... the kitchen hours they have their specific time in distributing that water. So there is no harm going to leave a dehydrated child to wait until midday to get the water?" (Facility B, Doctor, IDI3)

There are also times when health workers are left with no alternatives for an out-of-stock resource and can take no action, even when they know the outcome will be poor. For example, when the blood bank does not have any blood available for a child who has severe anemia and giving other fluids is contraindicated.

> "I have seen children... come with severe dehydration, malaria, severe anemia, no blood, there is nothing you can do for those children.... Are you going to give fluids? You cannot give fluids in severe anemia. The blood is not available in the facility, now such children you just let them... you let nature take its course." (Facility B, Doctor, IDI5)

Health workers describe motivations behind guideline deviation.

Participants in both settings said that failure to use guidelines might be less an issue of knowledge, and more due to specific misalignments between health worker beliefs and the guidelines. These beliefs were often driven by the health worker's positive or negative perception of treatments based on their clinical experience or hesitation about utilizing standard guidance.

A participant noted seeing patients who were made comatose for several days after receiving intravenous diazepam for convulsions, therefore they avoided this guideline-adherent treatment in favor of other options, such as phenobarbitone. Meanwhile, the use of second-line antibiotics rather the first-line guideline recommended drug was often driven by a desire to help patients improve faster. Health worker perceptions were that second line regimens worked better, faster, and led to fewer readmissions. As a result, providers may move to the second line drug sooner than indicated when they see that the child is not improving.

> "Yes in this protocol sometimes the way a baby presents with severe pneumonia, as much as the baby is coming in severe pneumonia but you can see this baby is very sick, you even think of just starting second line you don't even think of first line." (Facility A, Nurse, IDI6)

> "And also, again there is this thing of, out of experience maybe, the protocol is saying you give this and then with your knowledge you say, no I think this one will work more faster than this. Like maybe let's say the doctor wants you to give maybe Xpen [benzylpenicillin] and actually you are saying that this one won't work, let's go to the second drug. And so you find when you have given this it actually works much better than the first one." (Facility A, Nurse, FGD1)

Some participants had concerns about relying too heavily on the guidelines; putting so much emphasis on them that ingenuity in diagnosis is restricted and recognition of less common diseases is delayed. In addition, a negative perception of "loving to read" or referring to guidelines frequently in front of patients was conveyed. (Facility A, Nutritionist, IDI1)

> "It can limit your ability to think outside the box yeah I think that would be the primary disadvantage… You can easily mismanage a patient by using that protocol because they have not presented with the required symptoms or maybe they are presenting with similar disease." (Facility A, Doctor, IDI4)

It is challenging to operationalize guidelines when the clinical situation does not align with available guidance.

Health workers described several examples in which the clinical scenario did not align with available guidelines, leaving them uncertain in how to proceed. These complex clinical presentations often included presence of comorbidities, history of prior care seeking, and/or family preferences. In these cases, health workers typically consulted senior staff to determine how to proceed, but they would prefer additional content in the guidelines to address these more complex scenarios.

While the guidelines largely cover management of individual conditions, health workers noted that many of their patients have comorbidities that make treatment decisions more complex. One suggestion was to specify with a "disclaimer" when comorbidities would change the recommendations within a guideline.

> "So I believe they consider a normal child without any comorbidities. So as the health professional you have to treat this child as a whole, [the guidelines] are not treating the child

as a whole, they are focusing on one thing, the disease, they are not focusing on the whole" (Facility B, Doctor, IDI3)

"The [patient] with multiple diagnoses [is a challenge], so it is you to determine which [condition] is severe and address it first" (Facility A, Nutritionist, IDI2)

Care seeking prior to presentation at the facility was found to complicate treatment decisions, especially when the prior care was poorly documented, did not adhere to guidelines, or involved traditional healers. In some cases, earlier care included second line drugs, so health workers had to decide whether to continue those or revert to the first-line drugs recommended by the guidelines.

"You get a patient who has been mismanaged from the community. By the time they come, clearly they have been given treatment that is not for the condition. So now you start running up and down....it really makes it difficult for you now to start saving the life because of a guideline that was not followed." (Facility A, Nutritionist, IDI1)

Interdisciplinary consultation can improve guideline adherence and the sense of support among staff, while strict professional roles can delay care.

Health workers described their teams as generally supportive of each other. An openness to consult one another and share knowledge made guideline adherence easier.

"So many times you will find where someone is stuck someone else is stepping in, not just say the doctors, even the nurses will step in to assist where we see there is an issue, I think it is pretty good." (Facility A, Doctor, IDI3)

"Teamwork for us makes the dream work, teamwork such that it is not very hard for a nurse to even, you know there are places where nurse cannot say anything because she is a nurse but sometimes you find a nurse who comes and tells you, "hey Doc, I feel that patient is very sick, I feel we should refer" maybe I didn't think about it, maybe you thought it was not so bad." (Facility A, Doctor, IDI4)

"We have the medical officer interns, you know maybe sometimes they will not follow the guidelines they consult even nurses, even the doctor, or even the nutritionist. Yes, so that teamwork helps to follow the guideline." (Facility B, Nurse, IDI4)

The support and confidence health workers feel when they can consult others is noticeably absent during times with lower staffing – nights and weekends. While some nurses felt free to consult

by phone during times when a clinician or doctor was not within the facility, others were hesitant to make these calls.

> "The challenge comes in when maybe you are alone especially during night duty. No doctor is around you are just alone and this patient has just changed condition, so you have to do something," (Facility B, Nurse, FGD2)

Several health workers specifically mentioned challenges offering care to children with SAM when a nutritionist is unavailable to consult. While guidelines include treatment plans for children with SAM, some health workers felt that a nutritionist was required to initiate treatment and offered minimal monitoring overnight. While present at both facilities, it was more apparent at Facility A.

> "Now you will need a nutritionist to be there, to get the real classification on nutrition status of this child." (Facility A, Nurse, IDI6)

> "We don't have nutritionists at night so we usually leave it with the mothers in case there are mothers who require like assistance we tell the nurses so that they tell the nurse on duty to look at them" (Facility A, Nutritionist, IDI2)

This resulted in nutritionists feeling that other staff did not prioritize assessing and treating nutritional concerns; instead leaving them to handle everything related to nutrition. This can delay initiation and monitoring of critical guideline-adherent treatments for children with SAM.

> "From my experience malnutrition is like, I think forgotten or what, like the clinician don't really believe in it. Even if you ask for the nutrition status they are looking for a nutritionist, they don't consider it important and yet it is very important." (Facility A, Nutritionist, IDI2)

Staff crave more supervision to promote guideline adherence.

Health workers in our study recognized the benefits of supervision as a way to motivate staff and address challenges; however, they reported that supervision was needed more frequently. Supervision was described as a powerful motivator to improve use of guidelines.

> "We initiate, then they come up and check on your progress. Yeah, so you become a better person, yeah, with the spot check" (Facility A, Nurse, FGD1)

> "[Supervision] helps to keep the health workers on their toes to do the right thing." (Facility A, Nurse, IDI5)

Supervision also offered an opportunity for front-line staff to make leaders aware of resource shortages, training needs, and other challenges.

> "Supervision is very important because you see most of the health care workers, in case of a problem or an issue arising, we will not all of us walk to the office, most health care workers will depend on maybe the ward in-charge [or] the facility in-charge to do that. So they may be having a lot of concerns and they are just quiet. So during supervision there is that avenue for airing the challenges," (Facility B, Nurse, FGD2)

> "Supervision needs to be done frequently, for once it is done frequently it makes the staff more updated in their work and then it also helps the management to see the gaps that is there for example like they notice that there are two staff that needs orientation at that particular time." (Facility B, Nurse, IDI1)

Participants reported that external supervision was very rare, but there was supervision from department and facility level supervisors that occurred in several ways. A nutrition supervisor spoke of counter-checking treatment plans for every patient, especially when students were present; however, depending on staffing at each facility, this level of review was not always possible. In addition to spot checks of patient treatment plans, ward rounds often functioned as an opportunity to review care plans and discuss adherence to guidelines.

> "We have meetings, we correct each other in the CMEs… And that is why we do ward rounds … we scrutinize … and if there is a mistake, we do correct it" (Facility A, Nurse, IDI9)

The way supervision was implemented was a concern for some participants. When conducted at busy times of day, supervision could lead to delays in patient care while the staff participated. Meanwhile, health workers did not like when supervisors appeared unannounced and reviewed patient files without interacting with them. Furthermore, when concerns are raised during supervision activities but never addressed, health workers are left feeling that supervision does not help.

Caregivers help to provide care during hospitalization but may not adhere to treatment plans.

Families of children play a critical role in the provision of guideline adherent care, not only at home, but during their hospitalization. Participants recognize that:

> "We are supposed to be there but … we rely on our caregivers, so that they can help us because of this [staffing] shortage." (Facility A, Nurse, FGD1)

Guidelines for SAM and diarrhea have very specific oral treatments schedules, with frequent provision of formula or fluids throughout the day and night, and adjustments in response to clinical changes or additional loose stools. The caregiver provides many aspects of care, including oral feeding, offering fluids including ORS, and maintaining hygiene. After instruction on the treatment plan, some caregivers can follow the instructions and are empowered to remind the health workers when treatments are needed, improving guideline adherent care for their child. However, other caregivers may not provide care or seek assistance as planned.

> "You see because of understaffing, you may not be there to help [the mothers] prepare, so they just know the time which also they don't keep, like at night they don't do it, if you don't reach there on time to wake them up they will not wake them up but I think that is our duty at night," (Facility B, Nurse, FGD2)

Health workers recognized that the caregivers are often facing a variety of stressors. While in the hospital, they get little sleep, typically doing their best to sleep in a chair at the bedside. This can makes maintaining a schedule of frequent care, including every 2-3 hours throughout the night, difficult for them to maintain. One solution suggested was to encourage a supportive environment among the caregivers in the pediatric wards, with the mothers who follow instructions strictly reminding the ones who tend to forget.

Family financial resources can also be a barrier to guideline adherent care. The cost of a recommended hospitalization may be prohibitive for some families. And even when hospitalization

is accepted, there may be additional costs of treatments or supplies that a caregiver must gather funds for, delaying guideline adherent care.

Finally, when caregivers have unaddressed concerns about guideline-recommended treatments, they may stop them. One participant described the belief by some families that both oxygen and NG tubes were associated with death.

> "So, you communicate to the parent that this child is this and I want to give some oxygen. That one is associated with death. So, you can put your oxygen, you leave, the mother removes.... So sometimes that coordination management between the caretakers and the parents is a still a miss. Some do comply but others it is still a problem despite counseling. (Facility B, Doctor, IDI3)

Other families may obtain traditional medicine treatments and provide them to the child secretively during hospitalization, or discharge against medical advice to seek traditional care. This is sometimes due to a belief that diseases were caused by spiritual powers and clinical treatments will not be effective.

Discussion

This study presents and describes determinants of pediatric guideline adherence at two hospitals in Kenya. Over 15 years after the initial Basic Paediatric Protocols booklet was introduced, our study extends knowledge of drivers of adherence [32–34]. We applied the TDF comprehensively, to inform data collection and analysis, and found four TDF domains as most influencing on guideline adherent behaviors. Our findings align with those from other settings: three of these domains (environmental resources, social influences, and beliefs about consequences) were commonly reported in a systematic review of studies using the TDF to understand guideline adherence [35].

We found that training alone is not sufficient for increasing guideline adherence. Some health workers in our study were aware that updates to guidelines were occurring, but these updated guidelines did not reach all staff, indicating that current dissemination approaches are insufficient.

Evidence from a national referral hospital in Nairobi similarly found CMEs were not effective in changing care patterns, however the study reported more extensive teamwork and communication challenges that we observed [36]. Innovations that make it easier for health workers to access and understand updated guidelines could improve adherence, such as printing of hard copies, posting in online guideline repositories, and sharing via commonly used communication tools (WhatsApp). In addition to access, health workers need support to understand and implement the guidelines, particularly as updated guideline versions are released. Given variation in baseline knowledge and prior training on the guidelines, strategies that incorporate personalized learning methods may be well-suited to guideline training [37]. These could be targeted to provide brief training on the changes in a new version to those who demonstrate existing knowledge, while providing more comprehensive training to those who are not familiar with earlier versions. A recent study of an adaptive e-learning strategy for newborn care in Tanzania found good initial efficacy, but needed further strategy development to optimize sustained learning and refresher training [38].

Study participants sought guidelines that are quick and easy to use yet also include sufficient detail to guide them in more complex cases. In Lao PDR, the simplicity and easy accessibility of the WHO pediatric guidelines filled a void for health workers, driving use of the guidelines [24]. Multilayered formats give users the option of reviewing additional details about guideline recommendations and were preferred to standard narrative descriptions in a study of physicians in four countries (one LMIC) [39]. While these methods are typically delivered electronically, this can also be operationalized when developing written guidelines, such as in a short and long format used in Brazil [40]. In a participatory design process to develop summaries of recommendations to accompany a guideline, participants felt that rationales for recommendations were especially important when implementation would require a practice change [41]. There has been a proliferation

of guidelines, leading to duplication and contradictions in their recommendations [42]. To ease implementation, guideline developers should ensure the various national guidelines fit together.

Participants in our study noted that many clinical guidelines cover diseases and conditions individually, yet over one third of children admitted across settings have more than one diagnosis [19]. This demonstrates the need for guidelines to address the complexities that arise from comorbidity using strategies such as cross-refencing between guidelines and developing guidelines for common clusters of diagnoses [43,44]. While including this additional information could increase guideline complexity, ensuring use of best practices in presenting the content may maintain ease of use. For example, The Guideline Language and Format Instrument offers a tool to operationalize effective communication of content with action items to encourage language that is simple, clear, and persuasive, and a format that includes standardized components and optimal presentation [45].

In our study, both human and material resource shortages drove guideline deviation. Better alignment is needed between the resources available and the guideline recommendations and may be achieved through a combination of advocating for additional resources while also adapting guidelines to ensure implementability. In oncology, resource-stratified guidelines have been developed that support prioritization and tailoring of international guidelines by local policy makers [46]. It is particularly important to align the health worker time required to complete care and monitoring tasks at the recommended frequency with the available human resources. Others have reported that guideline recommendations quickly pile up to far exceed available time of staff [47]. Our study findings indicate that when these are not aligned, there is a greater impact on adherence to high-frequency or unscheduled tasks than on lower frequency tasks that occur during routinized activities (medication rounds). The role of these routines in determining what tasks are or are not completed has previously been described in newborn settings in Kenya [48,49].

In our study, participants frequently equated teamwork with the ability to consult others. While consultation is required in complex cases, use of guidelines should allow health workers to feel competent providing care with less consultation. Building on this culture of interprofessional consultation by enhancing other aspects of teamwork could improve guideline adherence. For example, improving handovers at the beginning of a night shift can prevent patient deterioration and improve team communication, and may make staff feel more supported and prepared to offer care without other team members physically present [50]. Our participants also described strict roles and responsibilities, especially related to care for children with SAM. Working as a team to clarify roles and ensuring that health workers feel competent to provide all urgently needed care would improve guideline adherence and health outcomes.

Our study had several limitations. We interviewed participants at two public referral hospitals that are involved in ongoing research activities related to pediatric care, including large observational and clinical trials. Therefore, these findings may not reflect experience of health workers at other levels or types of hospitals. The two research team members who completed the coding of transcripts have experience working in pediatric clinical settings in the USA, Malawi, and Bangladesh, but not in Kenya. The research teams at both sites reviewed and offered feedback on preliminary themes, which informed refinement.

Conclusions

This study advances our understanding of the barriers and facilitators to implementation of pediatric clinical guidelines in the hospital setting in Kenya. We found that health workers have a good amount of knowledge about guidelines and are able to consult with their colleagues to gain addition support, but need to be informed as guidelines are updated. Shortages in resources create operational challenges to deliver guideline-adherent care and lead to staff burnout. These findings can help us to identify opportunities to improve the guidelines themselves and promote

implementation strategies to support their implementation, such as increased supervision, provision of job aids, and support for enhanced team coordination.

Chapter 2: Participatory design and pilot test of the Team Approach to Malnutrition Services (TeAMS) Toolkit: A mixed methods study of implementation, usability, and feasibility

Background

In 2022, 60,000 children died before their fifth birthday in Kenya, many from conditions for which effective treatments exist [1]. In a study of children who died in western Kenya, malnutrition was the most common underlying cause of death in HIV-uninfected children and was present in the causal chain of over 50% of HIV-infected children [51]. Moreover, hospitalized children with severe malnutrition are six times more likely to die than well-nourished children [52].

In Kenya, two national guidelines detail treatment for hospitalized children with acute malnutrition, Integrated Management of Acute Malnutrition (IMAM) and the Basic Pediatric Protocols [4,53]. These have each been in place for more than 15 years, with revised editions every few years. They are based on World Health Organization (WHO) clinical recommendations that are estimated to reduce case fatality of severe acute malnutrition (SAM) by 41% [54]. Although providing care according to these guidelines is associated with lower in-hospital mortality in Kenya [17], adherence to the guidelines remains suboptimal [5,6].

Many strategies have been developed and implemented to promote the use of evidence-based guidelines in low-resource settings, with varying levels of success [11,55]. Multicomponent strategies for improving guideline implementation have been effective in research study settings, but are often too resource-intensive for national health systems to adopt for long-term implementation [33,56]. Guidelines are dynamic and ever-changing, thus new implementation strategies that can sustainably engage facility-level staff as drivers of implementation are urgently needed.

Implementation strategies are most effective and sustainable when they address contextual systems barriers and priorities of local decision-makers [57–59]. Human-centered design methods

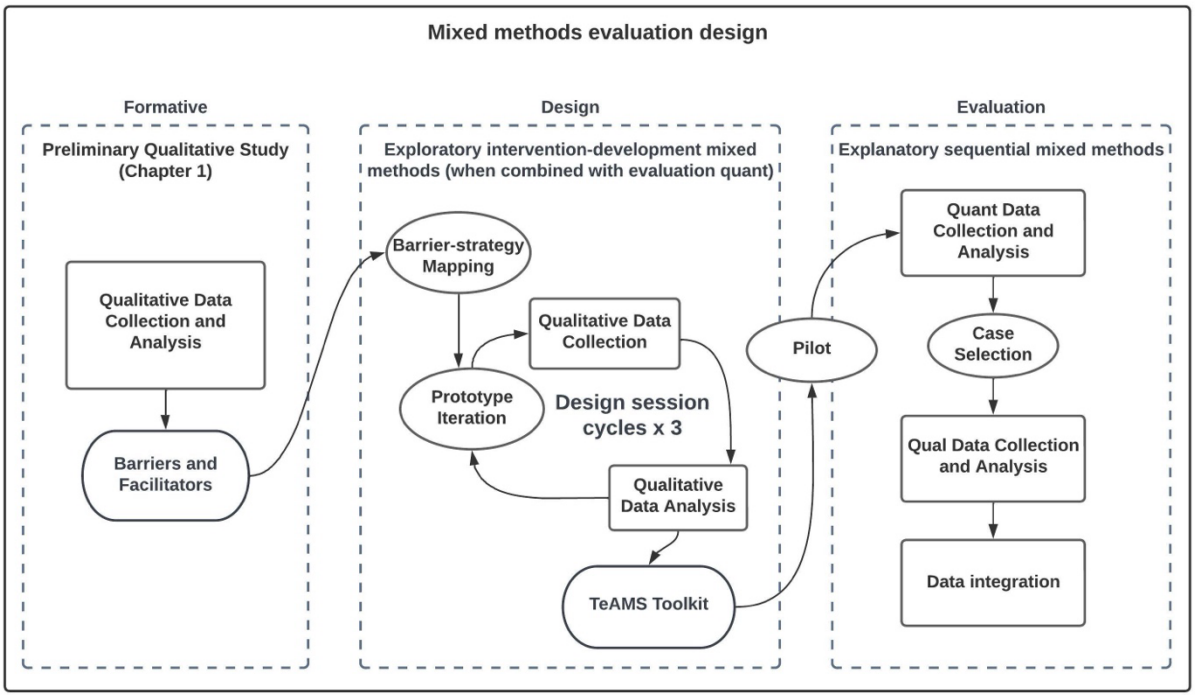
are well matched to the task of tailoring implementation strategies to specific health care settings [60,61]. This chapter presents finding from the design process and pilot study evaluation of the Team Approach to Malnutrition Services (TeAMS) Toolkit. Through a participatory design process, we developed the TeAMS Toolkit, a tailored implementation strategy to improve adherence to clinical guidelines for treatment of SAM. After piloting the TeAMS Toolkit, we conducted a mixed methods study to evaluate the implementation process, usability, feasibility, and impact of the TeAMS Toolkit on health workers' perceptions of teamwork, roles, and competence.

Methods

Study Design

A complex mixed-methods evaluation design was used to progress through formative research (previously described in Chapter 1), intervention design, and evaluation (Figure 2.1)[62,63]. The design process and quantitative evaluation are an intervention development variant of the exploratory sequential mixed methods design, as the qualitative design process informed the design of the TeAMS Toolkit, which was then assessed quantitatively [62]. When considered independently, the usability and feasibility evaluation followed an explanatory sequential mixed methods approach. Specifically, we used feedback about frequency of use of the Toolkit from the quantitative survey to inform selection of participants for the qualitative interview.

Figure 2.1: Study Design



Setting and Population

This study was conducted at a county referral hospital located in a town of approximately 100,000 residents within a mostly rural county in western Kenya. Pediatric patients seeking care are attended to in a Maternal-Child Health (MCH) clinic on weekdays or in the Casualty department during nights and weekend, where decisions to admit are made. If indicated, children aged one month to 12 years are admitted to the Pediatric Ward. In a cohort study conducted between 2016 and 2019, the mortality rate during hospital admission was 16.8% at this facility, much higher than other facilities in Kenya and concentrated among children with malnutrition [52]. This indicates that inpatient services could be optimized to improve outcomes, especially for children with malnutrition.

Health workers and supervisors involved in providing care to children presenting with acute malnutrition and meeting inclusion criteria were eligible to participate (Table 2.1). Inclusion criteria for each study activity differed in the timing and duration of experience in this clinical area. A member

of the study team met with department leaders to identify all eligible health workers. All participants provided written informed consent prior to initiating each data collection activity.

Table 2.1: Inclusion and Exclusion Criteria

<table>
<tr><th>Study Activity</th><th colspan="2">Inclusion Criteria</th><th>Exclusion Criteria</th></tr>
<tr><td>Barrier-strategy mapping workshop</td><td colspan="2">Health workers or clinical supervisors involved in providing clinical care to children hospitalized for pneumonia, diarrhea or severe acute malnutrition</td><td>Unwilling to consent</td></tr>
<tr><td>Design feedback session</td><td rowspan="3">18 years or older
Medical doctor, clinical officer, nurse, or nutritionist at study facility.
Able and willing to provide informed consent for participation</td><td>Involved in providing clinical care to children presenting with acute malnutrition for at least 3 months in the past year.</td><td>On leave during the study activity.
Unwilling to consent</td></tr>
<tr><td>Pre-pilot survey</td><td>Involved in providing clinical care to children presenting with acute malnutrition at the time of the survey.</td><td>On leave during the study activity.
Unwilling to consent</td></tr>
<tr><td>Post-pilot survey and Evaluation Interview/FGD</td><td>Involved in providing clinical care to children presenting with acute malnutrition for at least 6 weeks during the Toolkit Pilot.</td><td>On leave during the study activity.
Unwilling to consent</td></tr>
</table>

This study was approved by the Kenya Medical Research Institute Scientific Ethics and Review Unit (SERU/CCR/0208/4207 and SERU/CCR/0293/4644) and the University of Washington Institutional Review Board (STUDY00008138 and STUDY00017108 (Exempt)). Additional required approvals were obtained from Kenya's National Commission for Scientific, Technology, and Innovation (NACOSTI), the county Director of Medical Services, and the facility Medical Superintendent.

Data Collection and Analysis

Barrier-strategy mapping workshop

In August 2022, health workers were engaged in a participatory process to select a specific modifiable challenge related to adherence to national guidelines and an implementation strategy to

pilot that could address that challenge. Nominal Group Technique (NGT), a method that allows all participants an opportunity to share their ideas and ensures broader discussions when power asymmetries might otherwise leave some group members out, was used throughout [64]. First, findings from the qualitative analysis of barriers and facilitators (Chapter 1) were presented to participants, and modifiable barriers described in those findings were ranked by each participant on (1) the likelihood it could be overcome with few additional resources and (2) the impact of quality of care if the challenge were overcome. For the highest ranked challenge, a menu of theory-informed implementation strategies was presented, drawing from both the Behavior Change Wheel and Implementation Mapping approaches to designing interventions [58,65,66]. Participants then brainstormed specific strategy ideas, shared them, and ranked ideas on three criteria (a) potential for impact, (2) feasibility, and (3) acceptability. Following a discussion, a final ranking of which idea should be piloted was done and consensus reached. Detailed meeting notes were recorded by a study team member during the workshop and analyzed along with ranking data to identify preferences and rationales.

Participant surveys

All eligible individuals were invited to complete baseline surveys prior to initiation of design activities in March 2023, with additional invitations to newly eligible health workers prior to pilot implementation. Surveys included demographics, work experience, training history, and a task analysis of eight specific tasks related to care of children with SAM. We adapted a previously published method of task analysis [67]. For each task, participants reported how competent they felt (beginner, competent, expert), how frequently they performed it (daily, weekly, monthly, rarely, never), and if it was part of their formal roles and responsibilities. Finally, six items about team structure and mutual support were adapted from the TeamSTEPPS Teamwork Perceptions Questionnaire [68,69].

Following the pilot, all eligible individuals were invited to complete a post-pilot survey. This included all the same items as the baseline survey. In addition, it included the System Usability Scale (SUS), a ten item measure of Toolkit usability with minor adaptations to the wording to increase clarity [70]. The SUS has been used extensively in implementation science, health services, and other research across many settings, including Kenya [71–74]. Three items from the Feasibility of Implementation Measure (FIM) were included to measure feasibility of continuing to use the Toolkit [75].

Surveys were piloted and reviewed for interpretability by research staff with experience working in paediatric care at the study site. Questionnaires were self-administered on paper and checked for completeness by research staff. Survey data were entered into REDCap, a secure, web-based electronic data capture platform hosted at the University of Washington [76,77]. For quality control, 10% of entered responses were cross-checked against original paper forms.

Survey results were exported and analyzed in R Studio (R 4.4.1). Analysis of baseline data included counts and proportions of demographic details and task analysis and team perception findings. Endline analysis included individual item and composite mean scores of usability and feasibility measures. Changes in task analysis and team perceptions between paired responses were visualized and tested for significance with a permutation test (10,000 repetitions) [78,79].

Design Process

We used an iterative and user-centered approach to tailor the TeAMS Toolkit to the specific needs of the staff. Initial design of the TeAMS Toolkit was based on the strategy idea from the Barrier-Strategy Mapping Workshop and a review of the baseline survey data. Three cycles of rapid prototyping were conducted to develop the TeAMS Toolkit, with five to seven individual design feedback sessions with participants during each cycle. Rapid prototyping involves the sharing of a rough model of a strategy or tool to test ideas and gather feedback, before refining and repeating the

process [80]. During each cycle, activities were designed to gather input from staff on prototypes of sections of the TeAMS Toolkit (Table 2.2). Feedback gathered in design sessions sometimes varied across participants. In August 2023, a consensus meeting was held with department leaders from all cadres to make decisions about the direction to take in the final TeAMS Toolkit. Following this meeting, final modifications were made to the prototype.

Table 2.2: Design Feedback Session Activities

Cycle #	Cycle 1	Cycle 2	Cycle 3
Date	May 2023	June 2023	July 2023
Activities	- Discussion of tasks difficult without nutritionist - Review current role perception - Prioritize content for inclusion by placing cards on a matrix	- Review prototypes for display of roles and responsibilities. - Discuss documentation options	- Cognitive walkthrough[81] of feeding chart prototype - Discuss delivery options (electronic, posters, etc) - Discuss approaches for overcoming resource challenges

Design sessions were audio recorded and photographs captured content created during the session. The facilitator reported detailed feedback using a template designed to align with activities. A second study team member validated each report against the audio recording. Individual reports for each cycle were compiled into a unified report and proposed prototype changes ware entered on an Excel-based Modification Log for tracking.

Pilot Implementation

The TeAMS Toolkit was launched at a facility-wide continuing medical education (CME) event. Upon distribution of the Toolkit, a ten-week pilot period began in September 2023. Research team members were made available for brief department-level presentations about the Toolkit, however interactions were kept to a minimum in order to test feasibility of delivery with little research team involvement. During the pilot, a weekly progress report was completed by the study team. This report

documented research team interactions with facility staff, commodity availability, feedback offered by participants, and research staff observations.

Interviews and Focus Group Discussions

Following the pilot, interviews and focus group discussions (FGDs) were conducted with participants to gain an in-depth understanding of successes and challenges they experienced and their perception of the feasibility of the Toolkit for long-term use. A semi-structured question guide was developed to explore the implementation process and their use of each element of the TeAMS Toolkit during the pilot, including inquiry into the reasoning behind their impressions of the Toolkit. The decision to conduct an FGD or IDI depended upon the preferences of facility administrators, staff schedules, and separation of supervisors from staff they supervise. Participants were selected purposively to engage participants across cadres and departments. In addition, post-pilot surveys were reviewed and a participant who reported rarely using the Toolkit was purposively selected for participation. The participants are all health care workers proficient in English and the study activities were administered in English.

A trained Kenyan researcher conducted the interviews and FGD in December 2023. They were audio recorded and transcribed. A second researcher reviewed all transcriptions to ensure consistency with audio. Coding and analysis was performed in Dedoose [82]. In addition to interview and FGD transcripts, responses to two open-ended questions on the post-pilot survey were included in the qualitative analysis. A codebook was developed with deductive codes created for Toolkit Sections, Behavioral Drivers (Capability, Opportunity, and Motivation), aspects of usability, and key outcome categories. Child codes were added inductively to capture themes arising in the data. Two coders independently coded one transcript, reviewed discrepancies, and reached consensus. The codebook was refined based on this discussion. Remaining transcripts were coded by one

researcher, validated by a second researcher who documented any disagreement with coding, and consensus reached through discussion.

Data Integration

Data were integrated in two ways: *connecting* through the selection of participants for qualitative data collection conducted to ensure variation in responses to specific quantitative responses and *merging* by developing a qualitative coding scheme that aligned to quantitative measures [83]. During the analysis phase, a weaving narrative was developed by assessing and describing concordance, divergence, or expansion between quantitative and qualitative findings [83]. In addition, joint displays were developed to present findings [84].

Results

Participants

Thirty-four participants took part in study activities, with only one eligible staff member declining to participate. They represented each of the cadres responsible for clinical care and about half were based in the Pediatric Ward, where inpatient care is delivered to children with SAM (Table 2.3). Each study activity included between six and 29 participants from this group (Table 2.4). Some participants joined or left the department during the study period, so not all participants were eligible for every activity.

Table 2.3: Participant Characteristics

	Total (N=34)	Medical Doctor (N=4)	Clinical Officer (N=7)	Nurse (N=15)	Nutritionist (N=8)
Sex					
Female	22 (64.7%)	2 (50.0%)	3 (42.9%)	11 (73.3%)	6 (75.0%)
Male	12 (35.3%)	2 (50.0%)	4 (57.1%)	4 (26.7%)	2 (25.0%)
Age					
Median [IQR]	35 [30, 38]	35 [31.5, 35]	35 [34.5, 37]	37 [33, 44]	28 [26.75, 29]
Missing	1 (2.9%)	1 (25.0%)	0 (0%)	0 (0%)	0 (0%)
Education Level					
Diploma	22 (64.7%)	0 (0%)	5 (71.4%)	10 (66.7%)	7 (87.5%)
Higher diploma	3 (8.8%)	0 (0%)	1 (14.3%)	2 (13.3%)	0 (0%)
Bachelors	8 (23.5%)	3 (75.0%)	1 (14.3%)	3 (20.0%)	1 (12.5%)
Masters	1 (2.9%)	1 (25.0%)	0 (0%)	0 (0%)	0 (0%)
Department					
Paeds Ward	16 (47.1%)	4 (100%)	0 (0%)	9 (60.0%)	3 (37.5%)
MCH	9 (26.5%)	0 (0%)	2 (28.6%)	4 (26.7%)	3 (37.5%)
Casualty	5 (14.7%)	0 (0%)	3 (42.9%)	2 (13.3%)	0 (0%)
Other	4 (11.8%)	0 (0%)	2 (28.6%)	0 (0%)	2 (25.0%)

Table 2.4: Participants by Study Activity and Cadre

	Total (N=34)	Medical Doctor (N=4)	Clinical Officer (N=7)	Nurse (N=15)	Nutritionist (N=8)
Barrier-Strategy Mapping Worksop	7	1	1	4	1
Surveys					
Pre and Post	19	2	4	9	4
Pre Only	4	1	0	0	3
Post Only	10	0	3	6	1
None	1	1	0	0	0
Design Session	14	2	4	6	2
Consensus Meeting	6	2	1	2	1
FGD or IDI	12	2	2	6	2

Barrier-Strategy Mapping Workshop

Seven participants attended the workshop and contributed to the rankings and idea generation. After ranking and discussion they reached consensus to address the challenge: *Health workers rely on nutritionists to handle many tasks related to nutrition, delaying guideline adherent care for children with SAM*. They then developed six ideas to overcome this challenge, and after initial ranking and discussion two ideas were merged. After the final vote on which idea to pilot (Table 2.5), the chosen idea for the pilot was: *Summarize and merge information from the existing guidelines and agree as a team how this care will be delivered*.

Table 2.5: Strategy Idea Rankings

Idea	Final Score
Develop a standard feedback summary for trainings	0
Everyone else (doctors, COs, nurses) to assist in giving nutrition care	5
Develop a summary of key information from IMAM and other guidelines – merge and agree for nutrition.	19
On-job training on assessment and treatment initiation (including local feed preparation). Use practice scenarios and include evaluation.	12
Have quality improvement team (to do on job trainings, mentorship, ward rounds, weekly CME)	6

Scoring: Each participant ranked their top 3 ideas. #1 = 3 points, #2 = 2 points, and #3 = 1 point

Pre-Pilot Surveys

Baseline surveys were completed by 24 participants total. Twenty were completed prior to the start of the design sessions and were included in the analysis which informed Toolkit design. Four additional participants who became eligible before the pilot started are not included in this analysis but did contribute to the pre-post analyses presented later. While the majority of staff from all cadres had received some training on the Basic Paediatric Protocols, only half of clinical officers and one nurse (14%) reported any training on the IMAM guideline. Task analysis findings showed that participants felt competent in assessing malnutrition and frequently performed this task, however

choosing and initiating feeding plans and preparing formulas were less commonly performed (Table 2.7).

Table 2.6: Pre-pilot Task Analysis Results

Task	**Perceived competence** (% Competent or Expert)	**Frequency** (% Daily/Weekly)	**Part of formal role** (% yes)
Assessing the severity of malnutrition in a child	95%	100%	100%
Assessing the severity of malnutrition in an infant	95%	100%	90%
Choosing the correct feeding plan for a patient with malnutrition	80%	80%	75%
Initiating the feeding plan for a patient with malnutrition	80%	75%	70%
Monitoring the feeding plan for a patient with malnutrition.	85%	90%	75%
Teaching the caregiver of a patient with malnutrition how to follow the feeding plan	85%	95%	85%
Preparing therapeutic formulas using sachets	60%	50%	55%
Preparing therapeutic formulas using local ingredients	35%	25%	40%

Design Process

Eighteen design sessions were held with 14 unique participants. There were six, five, and seven participants in Cycles 1, 2, and 3, respectively. The input gathered during these sessions informed decisions about the content and features to include in the TeAMS Toolkit.

To develop content on roles and responsibilities of team members, in Cycle 1 we guided participants through a scenario to gather input about current roles perceptions and discuss the challenges that arise when a nutritionist is not present. This informed the development of four different displays of roles and responsibilities: a replication of a chart from IMAM, an admission workflow, a table of the Ten Steps of Malnutrition Care aligned to primary and backup cadres responsible, and a daily schedule of tasks. These four prototypes were shared in Cycle 2 and

additional clarifications were offered for refinement and the usefulness of each option was discussed. The first three displays were refined and included in the Roles and Responsibilities section of the Toolkit.

To determine what portions of the guidelines to focus on in the Toolkit, we considered the survey findings and a prioritization activity in Cycle 1. Twelve topics related to IMAM and teamwork were displayed on index cards and participants placed each one on a matrix to indicate (1) if additional access to that information is needed and (2) if having that information accessible would help improve patient outcomes. Placement in the bottom right of this matrix indicates higher priority. The topics that were highest priority were related to high-performing Teams, monitoring children with SAM, and documentation of feeding (Figure 2.2).

Figure 2.2: Prioritization Matrix Results

Content on determining feeding plans was tested with participants in Cycle 3 using a cognitive walkthrough. In this design activity, participants worked through a scenario that asked them to determine the feeding plan for a child who is diagnosed with SAM. Key clinical details (weight, presence of edema, etc.) were given and the TeAMS Toolkit prototype was provided as a reference. The facilitator tracked their completion of eight steps to complete this task, noting whether any steps were completed incorrectly (Figure 2.3). Refinements to instructions and training plans were made to address the specific usability challenges identified.

Figure 2.3: Cognitive Walkthrough Results

Sub-task	3A CO	3B Doctor	3C Nutrition	3D Doctor	3E Nurse	3F Nurse	3G Nurse
Go to correct Toolkit page (Stabilization Phase – Overview)	✓	✓	✓	✓	✓	✓	✓
Identify correct row in Patient Characteristics section (no/mild edema, 6-59 months)	✓	✓	✓	✓	✓	✓	✓
Follow row across to identify feeding prescription (F-75; 130ml/kg/day; Table 1/Column A)	✓	✓	~	✓	✓	~	✓
Go to Table 1	✓	✓	✓	✓	✓	✓	✓
Go to Column A: No/mild oedema	✓	✓	✓	✓	✓	✓	✓
Find 10.0-10.4kg row	✓	✓	✓	✓	✓	✓	✓
Locate correct 3 hourly volume (170 ml)	✓	~	✓	✓	✓	✗	✓
Locate mixing instruction (7 scoops + 175 ml water; then measure and discard extra)	~	~	✗	~	~	~	✓

Key: ✓ Completed correctly ~ Partially correct ✗ Incorrect

The consensus meeting at the conclusion of the design process addressed eight specific decisions, including the preferred frequency of feedings in the department, schedules for vital sign measurement, the where the documentation chart for feeding should be placed. For each decision, several options and the feedback gathered during the design process were presented, and the group

aimed to reach consensus through discussion. They reached consensus on some topics, such as that the documentation chart should be placed at the bedside, instead of in the patient file. However, on other topics, such as what health workers should feed patients in case commercial formula powders were not available, consensus was not able to be reached. This was due, in part, to hesitation about recommending a treatment that does not meet standards. Following this meeting, the Toolkit content was finalized.

Implementation Strategy and Pilot

The Team Approach to Malnutrition Services (TeAMS) Toolkit is a strategy to improve implementation of existing guidelines for nutrition care through two main functions (1) clarify the roles and expectations of staff and (2) merge and summarize key information from the Basic Pediatric Protocol and Integrated Management of Acute Malnutrition (IMAM) in a format that is accessible to health workers. The final TeAMS Toolkit (Appendix 2B) is a 30-page document with four sections: Teamwork, Team Member Roles and Responsibilities, Key Information from IMAM, and Monitoring and Documentation. Six posters replicated a portion of the Toolkit content covering roles and responsibilities (2) and feeding plans for infants and children with SAM (4). Teamwork content was drawn from the TeamSTEPPS 3.0 curriculum materials [85]. The Documentation section included a new Bedside Monitoring Chart, designed to be placed on the wall at the bedside and completed by all cadres to document feeds given. The underlying challenges of a shortage of nutritionists and frequent stock-outs of commodities often came up in discussions during the design process. While tackling these systemic challenges was beyond the scope of this project, to offer some response to this feedback we included an appendix containing talking points for advocacy efforts to overcome these challenges.

The Toolkit document was printed, bound, and placed in the Pediatric Ward nurse station, Pediatric Ward malnutrition room, MCH Clinic, and Casualty Department. Posters were hung on the

walls in the same locations. An electronic version of the Toolkit was provided to department leaders, who were encouraged to distribute it widely among staff. A hospital-wide launch event was held to celebrate the start of the pilot and offer an overview of the Toolkit to all staff. Study staff presented for 10-20 minutes at departmental CME sessions in Pediatrics, MCH, and Casualty. In total, research staff spent less than 90 minutes presenting in CMEs and 10.5 hours interacting with department leaders and other staff to guide implementation of the Toolkit.

During the ten-week pilot, commodity availability was tracked weekly. Powdered F75 formula mix was available throughout, while powdered F100 was available in eight weeks. Ready to use therapeutic food (RUTF) sachets were available in nine weeks while rehydration solution for malnutrition (ReSoMal) was not available at any time during the pilot. There was a staffing change in the hospital nutrition supervisor just after the design process concluded and upon launch of the Toolkit they communicated concerns about the chosen approach to documentation. Minor changes were made to address these concerns and new copies of the Toolkit (v1.1) were shared in week five.

Mixed Methods Evaluation

The pilot evaluation was conducted in November and December 2023. Post-pilot surveys were completed by 29 participants, of whom 19 had also completed pre-pilot surveys. Twelve participants took part in qualitative data collection - six in-depth interviews and one FGD with six participants.

Toolkit Use

Among participants who completed the post-pilot survey, most reported using the toolkit daily (31%) or weekly (35%). Nutritionists were the most likely to be daily users (Table 2.7), highlighting that improving accessibility of nutrition guidelines is helpful even to those who are already fulfilling this role. Qualitative responses identified the posters displaying feeding plans from IMAM as the element of the Toolkit that was most often used. Some participants reported that they did not have

access to an electronic copy of the Toolkit, indicating that additional attention to distribution of that resource was needed.

Table 2.7: Frequency of Toolkit Use by Cadre

	Medical Doctor (N=2)	Clinical Officer (N=7)	Nurse (N=15)	Nutritionist (N=5)	Overall (N=29)
Frequency of Toolkit Use					
Daily	1 (50.0%)	2 (28.6%)	3 (20.0%)	3 (60.0%)	9 (31.0%)
Weekly	1 (50.0%)	2 (28.6%)	6 (40.0%)	1 (20.0%)	10 (34.5%)
Monthly	0 (0%)	1 (14.3%)	5 (33.3%)	1 (20.0%)	7 (24.1%)
Rarely	0 (0%)	1 (14.3%)	1 (6.7%)	0 (0%)	2 (6.9%)
Never	0 (0%)	1 (14.3%)	0 (0%)	0 (0%)	1 (3.4%)

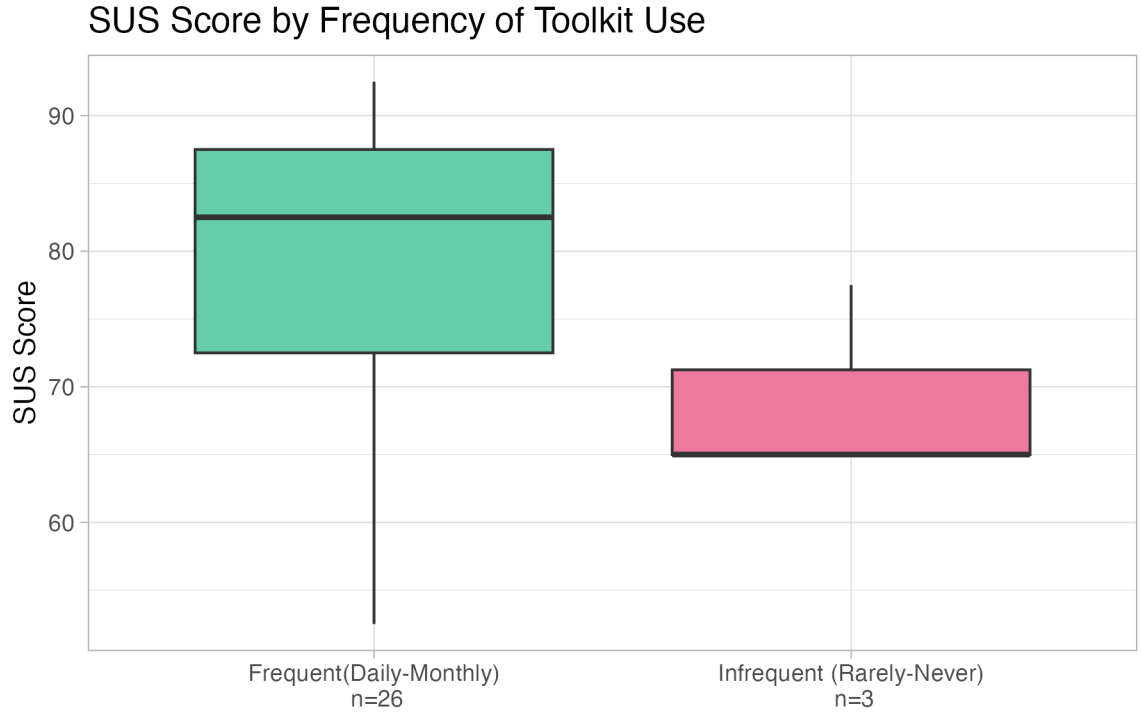
Usability

The median SUS among all respondents was 77.5 (IQR 67.5-87.5) on a 100 point scale, which is interpreted as acceptable usability [86]. There was variation in usability scores across cadres and frequency of toolkit use (Table 2.8, Figure 2.4). Among the frequent users of the toolkit, the benefits of having a reference to look at when determining or reviewing feeding plans was often highlighted. Only three individuals were infrequent users of the Toolkit, one nurse in Casualty and two Clinical Officers in MCH, and their SUS scores remained in the marginally acceptable range.

Table 2.8: System Usability by cadre

Cadre	**n=**	**SUS Median (IQR)**
Medical Doctor	2	88.75 (88.13, 89.38)
Nurse	15	80.17 (72.5, 87.50)
Clinical Officer	7	76.07 (65, 85)
Nutritionist	5	66.50 (62.5, 72.5)

Figure 2.4: Integrated Display - Usability by Frequency of Toolkit Use



Frequent Users:

"The toolkit has made it easy, you don't even have to go and sit down. You have it next to the patient, you just reference there and you are seeing if you are doing right or you are doing wrong and you intervene immediately. So at least in terms of easier accessibility to the right information, it has helped us fill that gap. " (Weekly, SUS=90, Doctor, Peds Ward, FGD1)

"I would say the charts worked well for me, because despite the high workload. I did not have an excuse for not initiating a child with SAM on the right management." (Monthly, SUS=82.5, Nurse, MCH, FGD1)

Infrequent Users:

"M: Did you refer to the summarized information on feeding plans in your professional work?
R: No
M : Please describe why you did not refer to this information.
R: I felt a bit of it is meant for the Nutritionist that we work with." (Rarely, SUS=65, CO, MCH, IDI5)

In addition, participants noted how the Toolkit simplified content from the existing guidelines and brought together the IMAM and Pediatric Protocol content, making it easier to use. One participant recounted that, although some health workers had concerns about discrepancies between the Toolkit and IMAM, upon review they recognized the content was the same.

> "Without those charts, you will leave the patient there, you go back to read in the other protocols. At the time, this patient may [think] you don't know what you are doing. You

> come, you are confused, 'Should I use the IMAM? Should I use the pediatric protocol?' Now with this, you just check there… without running, going back and forth." (Daily, SUS=62.5, Nutritionist, Peds Ward, IDI1)
>
> "Sometimes when you are given a booklet to read, the IMAM guideline booklet, it is a whole book. But this one is just a few leaflets and it is simplified for you to make a very straight forward sort of solution." (Daily, SUS=87.5, Doctor, Peds Ward, IDI6)

The SUS was designed to report a single dimension of usability, however others have identified two dimensions – usability and learnability [87]. Among our participants, the mean response across the 8 items within the usability dimension was 3.31 (scale 0-4), while scores on the two items addressing learnability were lower, with a mean of 2.26. Learnability was variable within qualitative responses, with some participants stating that the Toolkit was "self-explanatory" and others recommending additional training for staff to learn to use it. One participant offered an important insight about how their perception of the Toolkit evolved.

> "At first it looks a little complicated, but once you get the concept it is very easy and interesting." (Weekly, SUS=72.5, Nurse, MCH, Survey)

Participants mentioned a variety of learning methods that contributed to their understanding of the Toolkit content, including individual review of the Toolkit, discussions with groups of staff, and formalized CME sessions. In addition, some highlighted the value of having the Toolkit available to new staff before formal training opportunities can be organized.

> "There was a day, it was on Wednesday we had called the nutritionist. Ok, we did not understand the artificial feeding plus breast feeding. So, we had a nutritionist. We were around four medical practitioners. So, we were reviewing by the nutritionist, who was trying to tell us" (Nurse, Peds Ward, FGD1)
>
> "We have a reasonably good turnover of doctors including clinical officers and the Medical Officer interns…. Sometimes you would realize that you have a new team that you need to plan a CME. But in between that period before you plan for a CME, they still have some references they can use, to initiate the management for these SAM patients, so it has been a good thing. (Doctor, Peds Ward, FGD1)

Task Analysis

There were no significant changes between pre-pilot and post-pilot quantitative measures of perceived competence, frequency of completing tasks for malnourished children, or in what tasks participants said were part of their formal role. Although qualitative findings indicated that they did not regularly perform the tasks, many participants, including non-nutritionists, reported on surveys that many tasks were within their scope prior to initiation of the pilot: assessment of children (100%) selection of feeding plans (74%), monitoring patients (74%), and teaching caregivers (84%). Despite this, there were convincing qualitative reports that non-nutritionists were more likely to prescribe feeds, instead of waiting for a nutritionist following the introduction of the TeAMS Toolkit.

> "Because initially we used to wait for the Nutritionist to come. So, we will just do other things but the part of nutrition we wait for a Nutritionist. But now with the kit we can now get involved." (Nurse, Peds Ward, IDI2)

> "Mostly at night is when we get challenges as nurses… you are alone. Maybe you have so many admissions. So, the process…ok, you also don't know how to…in the initialize phase you don't know how to reconstitute the feeds. So, when the TeAMS came up, it helped us, and it is faster. You don't need to do so many calculations, you just look and see, and then you manage the patient. You know for the SAM children we are not supposed to give fluids, so because [in the past] we don't have the feeds, and the mother also does not have milk. It will force you to sustain with [intravenous] fluids. and the fluids are also not good, because they tend to have oedema. So, you pump a lot of fluids which is not supposed to be in the case of malnutrition. But nowadays at least with the TeAMS it has worked. We are able to start the feeds, so we don't have the risk of the heart being overloaded with fluids." (Nurse, Peds Ward, FGD1)

> "In MCH where nurses used to shy away from management of SAM, we are now able, we can manage using the TeAMS Toolkit." (Nurse, MCH, IDI4)

Some participants specifically identified that referring to the Toolkit made them feel more competent to carry out this task.

> "With the help of the TeAMS toolkit, you will find at night a nurse is giving feeds to the patient which was then a nutritional work…. Actually, if you ask them. They didn't know

what to do, but with the guide, the TeAMS Toolkit guide. They now understand it better, and they can do it." (Nutritionist, Peds Ward, IDI1)

"There was other staffs who were saying that calculating dosages is very hard, that is a job…a Nutritionist's job, but now with the summarized version, now everyone could calculate easily."(Nurse, Peds Ward, IDI2)

"Yes, I referred several times. Like one instance I remember I referred when the nutritionist was not around. A round was done, and they agreed that child was to be transitioned from F75 to F100. I referred to the Toolkit baseing on the weight, I was able to calculate the dosage of F100 that this child was supposed to receive." (Nurse, Peds Ward, FGD1)

Moreover, the Toolkit impacted how staff saw their own role and the role of others. During the design process, participants expressed concern about how nutritionists would respond to having their responsibility for feeding shared, which was addressed in the Toolkit by specifying that they remained the "primary" cadre responsible for feeding, but that others should act as "backup" if they are not immediately available. This approach to role clarification in a context where overlap between cadres was needed proved to be successful in ensuring other members of the team felt able to complete these tasks.

"Okay, initially, management of SAM was more of left for the nutritionist. So, after … attending the CME on the presentation of the Toolkit. It changed my perception and my interest towards it also changed. So again, it made it so simple that I wanted to go through and learn more. Because I learnt that I can also participate fully to save the children." (Nurse, MCH, FGD1)

"It's not that it's a role for the nutritionist – it's better done by the nutritionist. So that if the nutritionist is not there, out of the knowledge that we have, if it is something you can do, you do. But if it is something you cannot do, then you make the follow up with the higher cadres for proper management. But I like it that it is simple and easily understood." (Doctor, Peds Ward, FGD1)

Teamwork Perceptions

Among six measures of teamwork perceptions there were significant changes ($p<0.05$) in health workers' understanding of their own role and sharing information among team members (Table 2.9).

This was concordant with qualitative reports of improved collaboration and multidisciplinary approaches to ensure timely care.

> "I think the TeAMS toolkit is an improvement in terms of management. Because now the approach is different, it is not that we have a SAM baby, and the nurse as his role, and the medical officer has his role, and the nutritionist has his role. We are trying to be encouraged that most of the roles in the management cut across. So that we don't have to delay an intervention because one of us is not there." (Doctor, Peds Ward, FGD1)

> "There was increased multi-disciplinary approach or co-workers relationship because it was involving other cadres other than Nutritionist. [M: Okay, what do you think caused those changes?] Because of the TeAMS kit it brought in cooperation or togetherness of different cadres. So, they had to work as a team to manage clients." (Nurse Peds Ward, IDI2)

Table 2.9: Teamwork Perceptions

Question	Mean change (pre to post)	Permutation test p-value
The skills of staff overlap enough so that care for children with malnutrition can be shared amongst facility staff when necessary.	-0.0526	0.859
Staff within my unit share information that enables timely nutritional care for children and infants.	0.6316	0.047 **
Staff understand their individual roles and responsibilities related to care of children with malnutrition.	0.5263	0.033 **
Staff understand the roles and responsibilities of other health workers related to care of children with malnutrition.	0.3158	0.248
Staff assist fellow staff to provide nutritional care during periods of high workload.	0.4211	0.203
Staff request assistance from fellow staff to provide nutritional care when they feel overwhelmed.	0.1579	0.759

Note: Questions adapted from TeamSTEPPS Teamwork Perceptions Questionnaire [68]
** significant $p < 0.05$

Some participants felt that the engagement of staff during the design process supported the improved teamwork that they saw.

> "During the beginning of this study everybody was roped in. It was not something new whereby you start something and then in the middle you rope something, everybody knew about it. With that particular point … the people were receptive towards it and also it dissolved this mentality of I can't do this because it's this one's job. The main priority became this child with SAM." (Doctor, Peds Ward, IDI6)

Participants described improved communication, both verbal and written, supporting this multidisciplinary approach. Handovers across cadres and from shift-to-shift included more detail about nutrition needs. The Bedside Monitoring Chart offered a reference to use when handing over.

> "Because every cadre that is involved in the treatment of malnourished children knows the part that they should play. We have realized that there is need for us to talk as a team. So, we approach managing these children as a team for the best results. So, what came out is that we realized our part, and we realized also that we need to work as a team." (Clinical Officer, Other, FGD1)

> "The bedside monitoring chart will help us during handover. It helps because …you are handing over to the other person who has just arrived for the next shift, and you can't remember this baby's getting what feeds. You can refer on the chart. You can say "this baby came with SAM, initial plan, maybe the treatment which the baby's being given, types of feeds, the amount" (Nurse, Peds Ward, IDI3)

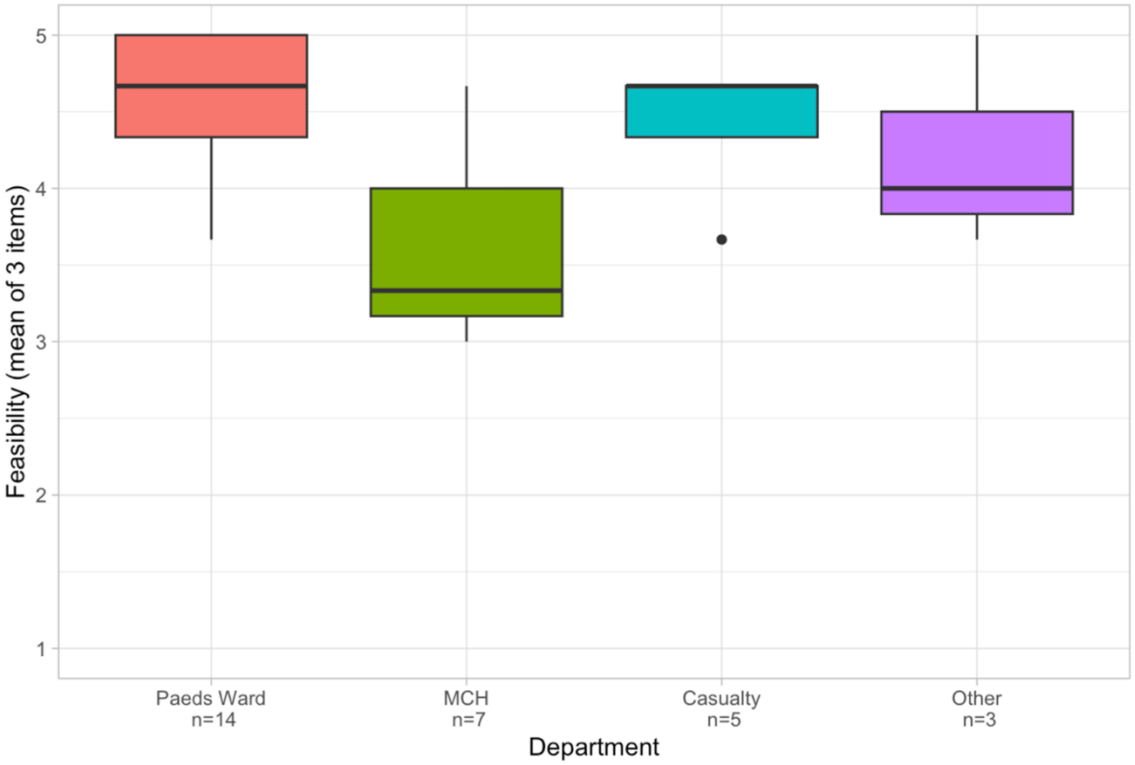
Finally, nutritionists also reported feeling more supported by their team. Easing the burden they felt when they were away from the hospital and knew there was nobody providing this care.

> "I am a nutritionist, and I know that someone is going to help me do that task and it is not me alone." (Nutritionist, Peds Ward, FGD1)

Feasibility

Overall, participants thought the Teams Toolkit would be feasible to continue using, based on quantitative Feasibility of Implementation Measure (median [IQR] 4.33 [4.0-4.66]; scale 1-5). Responses to three-items (the Toolkit seems implementable, is easy to use, and is possible to continue using) were averaged to obtain composite scores. The feasibility measure varied across departments, with those in the Pediatric Ward and Casualty reporting higher feasibility than those in MCH (Figure 2.5).

Figure 2.5: Feasibility by Department



Note: MCH = Maternal-Child Health Clinic

Participants reported that using the TeAMS Toolkit made their work more efficient, which may make them more likely to continue using the resources.

> "If this kit is going to be rolled out or we are going to use, we are going to save time in the management of patients. That will end up with good outcome of our patient." (Nurse, Peds Ward, IDI2)

> "The good thing about the toolkit, it has made it easier to administer these feeds, not only for nurses anybody now can do it. Yeah, be it an MO, be it a CO and all the interns are able to do that. Because we have the chart there. The chart has simplified everything that has to be done. So majorly am saying It has made work easier for the multidisciplinary team." (Nurse, Peds Ward, FGD1)

We also asked supervisors if they would be able to continue delivering the Toolkit. All responded that they could do this, and it would be beneficial. Some highlighted conditions that would support continued use, including ensuring availability of both printed and electronic copies, additional CMEs, and ensuring continued commodity availability.

> "Yes, it will be feasible for me to deliver the Toolkit in future, given that it is not a very bulky document and also it is easy to interact with, it's user friendly....having it in the digital format like easily shared within the smart phones would solve everything because it would make it easy to make it available to those that I supervise."(Doctor, Peds Ward, FGD1)

> "This Toolkit will be feasible if we continue lobbying for the availability of F75 and F100. Now, in situations where we have gone months without F75, F100 we will be back to zero whereby we have to wait for Nutritionist to make their locally available milk." (Doctor, Peds Ward, IDI6)

Discussion

We integrated methods from implementation science and human centered design to harness the knowledge of front-line health workers in the design of the TeAMS Toolkit. This engagement resulted in a Toolkit that was tailored to the context and needs of health workers. Participants felt that the Toolkit had a positive impact on the provision of timely care to malnourished children, by encouraging multidisciplinary collaboration and including a quick reference to support clinical decision making.

The methods used in the design process, drawn from human centered design, were instrumental to getting actionable feedback from health workers. Design methods are becoming commonplace in in efforts to support health care delivery globally but are not without challenges [61,88]. One commonly cited barrier is the time commitment required from front-line users [89,90]. We found that combining group and individual design activities allowed us to balance gathering adequate feedback with less participant time. We wanted to engage participants as much as possible, however with their busy schedules it was important to carefully prioritize the questions and activities we presented to them. Our choice to do individual design sessions allowed for shorter meetings and more opportunity for contributions from people who may be reserved in group settings. When blending these individual sessions with group activities, it worked well to include group meetings at both the beginning, to set the direction of the activities, and the end to work out final decisions – with the individual sessions in the middle.

In this setting, health workers are well aware of the existence of two guidelines that include management of SAM, but do not all have access to them. The Basic Pediatric Protocol covers many conditions and is very simple; but the four pages on SAM are not enough to make health workers feel competent. On the other hand, the IMAM guideline was very long and detailed, but seen as only for nutritionists. The TeAMS Toolkit functioned as a middle ground, consolidating key information from IMAM and helping to ensure that all staff were on the same page. This is in line with the findings of a study of guideline use in three African countries, which identified that formatting of guidelines is a greater determinant of their use that is the quality of content [91]. A multicomponent strategy in Papua New Guinea, including posters, reminder checklists, and training, resulted in large increases in the percentage of energy requirements met and in velocity of weight gain among children with SAM, even in a setting where special formulas were unavailable [92]. This demonstrates that providing user-friendly tools to support guideline implementation is an important piece of getting these into practice.

Teamwork and organizational culture have been identified as important drivers of quality of care for children with severe malnutrition [93]. Meanwhile, the study of teamwork in implementation research has shown that positive team environments (trust, cohesions, psychological safety) and ongoing communication within teams can support implementation outcomes[94]. The TeAMS Toolkit study deepened our understanding of how to support multi-disciplinary teamwork and sharing of roles to improve guideline implementation for malnutrition. While nutritionists offer a critical service, there are very few of them employed, so relying solely on them will delay critical feeding care. A recent improvement project in Mozambique supported nurses to improve inpatient pediatric nutrition care, and was successful in increasing nutritional assessments by nurses [95]. However, the authors noted that their limited engagement of doctors and nutritionists likely hindered progress in improving treatment outcomes. Role overlap enables different cadres of health workers

to share tasks when needed. While some who support strict division of labor see this role overlap as an indicator of inefficiency [96], others identify how multiskilled staff with overlapping roles provide the flexibility needed to meet the demands of a busy clinical setting [97]. Especially in smaller facilities, this flexibility is needed to ensure urgent services are always available. The method we used to develop role clarity by defining primary and backup roles is promising and should undergo further study.

In the TeAMS Toolkit pilot study, these two aspects of the toolkit – clarifying roles and providing user-friendly summaries of clinical guidelines – were synergistic. The guideline content was a reference for staff as they took on tasks that were new to them. Either one of these strategies alone would have been less effective and bundling them in multi-component implementation strategies should be considered.

Our study had several limitations. This pilot was conducted at one facility, so while the results may inform further studies, they are not generalizable to other settings. Around the time of the Toolkit launch, formula powders became more consistently available than during the design phase and tins of formula powder and an electric hot water kettle were made available for use by nurses when the nutritionist was away. These changes may have been attributed in part to discussions raised by the Toolkit design process and/or a new hospital nutrition supervisor joining the staff, but likely contributed to the positive outcomes we saw. Future studies could explore methods to scale up this implementation strategy to additional facilities and study clinical outcomes in addition to the process measures we included here.

Conclusions

We have described an iterative design process used to design a guideline implementation tool for use by health workers in Kenya to improve adherence to pediatric malnutrition treatment guidelines. The TeAMS Toolkit is a document and set of posters that includes content on teamwork, roles and

responsibilities, summaries of the guideline, and a documentation tool. Following a ten-week pilot, health workers reported high usability of the Toolkit and significant improvements in measures of teamwork perceptions. Many participants described increased engagement of non-nutritionists in feeding malnourished children. These findings demonstrate the potential of incorporating teamwork and role clarification into strategies for guideline implementation.

Chapter 3: Exploring change mechanisms of implementation strategies for provision of guideline-adherent care by health workers in inpatient settings: A realist literature synthesis

Background

Clinical practice guidelines compile evidence-based recommendations for use by health workers and can be produced and distributed by international organizations, national governments and associations, and local facilities. Many of the guidelines in low- and middle-income countries (LMICs) are based on those developed by the World Health Organization [98]. Guidelines have been credited with improving quality and safety in health care, by speeding the translation of evidence into practice and reducing variation [99]. While there has been a proliferation of these guidelines around the world, the implementation of them has lagged behind, leading some to question their value [42,100]. Implementation strategies that support the incorporation of guidelines into practice must be used to improve the adherence to guidelines and produce the intended improvements in care [101,102].

Guideline implementation tools are resources that accompany a guideline and facilitate its implementation into practice [103]. They include decision-support aids, training materials, guidance for monitoring, and more. Health workers report that when recommendations are formatted into tools that make information easier to use in practice, it contributes to their use [91]. A Cochrane review of guideline implementation tools found that they produced a 13.5% increase in guideline adherence, which is promising despite the fact that this was based on a small number of studies conducted in high-income countries and with measurement after only four weeks [104].

In the Team Approach to Malnutrition Services (TeAMS) Toolkit Pilot Study a participatory design process was used to develop guideline implementation tools that would support health worker adherence to existing guidelines for inpatient care of malnourished children (Chapter 2). The Toolkit

was designed to meet the needs of health workers at a county hospital in western Kenya and included four types of tools: descriptions of health worker roles and responsibilities, content on teamwork skills, job aids that simplify treatment algorithms, and a new documentation chart. We theorized that this strategy would generate improved guideline adherence through several mechanisms, including that user-friendly guideline implementation tools would improve role clarity and increase competence of health workers.

Realist research methods offer an approach to identifying and understanding the causal mechanisms that influence whether implementation strategies work, for whom, and why. Realist methods seeks to explain what context conditions, when combined with a particular intervention, will trigger the mechanisms that generate an outcome [105]. These explanations are described in the form of context-mechanism-outcome (CMO) configurations which are hypothesized and testable units of theory [106]. We also include the implementation strategy (S) within the configuration, making it a CSMO configuration, as has been described by others [107]. Realist synthesis is an approach which utilizes existing evidence to develop and refine a program theory. Unearthing the mechanisms of implementation strategies in a way that remains linked to the dynamics of the context offers an avenue to overcome the frequently cited challenge that scaling up implementation produces disparate results across contexts [108].

In this realist literature synthesis, we aimed to refine a program theory that explains the mechanisms through which a participatory design process used to develop guideline implementation tools contributes to guideline adherence. With evidence from reports of implementing guidelines in hospital settings in LMICs the refined program theory can inform the future development and scale-up of the TeAMS Toolkit and other guideline implementation strategies.

Methods

This literature synthesis utilized a five-step process described by Mukumbang and colleagues [109] that was adapted from methods described by earlier researchers [110,111]. The steps in this method are not firmly linear, particularly in steps two through four where an iterative process is expected to identify the most relevant literature. The review protocol was registered on the International Prospective Register of Systematic Reviews (PROSPERO, CRD42023474744).

Step 1: Clarify Scope

The goal of this review was to refine an initial program theory (IPT) developed in conjunction with a pilot study of an implementation strategy to support pediatric treatment guideline adherence among health workers in a hospital setting in Kenya (Chapter 2). This IPT began as a Theory of Change diagram that was developed during the design phase of the TeAMS Toolkit Pilot study. This theory was expanded to delineate more detailed CSMO configurations that explain the hypothesized generative mechanisms at play [112]. Several rounds of review and discussion by the research team led to refinements of the IPT.

Step 2: Search for evidence

The search strategy was designed to identify reports of strategies to implement or optimize use of clinical practice guidelines by health workers in inpatient settings in LMICs. Portions of the search strategy were informed by published search strategies for LMICs [113,114] and implementation strategies for guidelines [101,102], with terms added to address constructs within the IPT. We included a broad range of evidence types, including peer-reviewed research articles and reports of quality improvement (QI) activities. Reference lists of literature reviews on relevant topics were screened to identify records not identified in our search. Reports published from January 1, 2010

through December 31, 2023 were included and LMICs were defined by World Bank classifications during that time [115].

A set of 11 articles expected to be found by the search was developed and used to test and refine the search strategy, first in PubMed and then following translation to three additional databases (CINAHL, EBSCO Global Health, and SciELO). Using the refined search strategy (Appendix 3A) searches were conducted on February 27, 2024. With support from a research librarian, the references from the EBSCO Global Health database were deduplicated using a process that uses combinations of fields other than digital object identifiers (DOIs) to locate duplicates [116]. The deduplicated EBSCO GH results along with the full results from other databases were imported to Covidence and underwent automated deduplication.

Step 3: Appraise studies and extract data

Appraisal of the identified studies was conducted in an iterative process guided by three criteria – relevance, richness, and rigor [117]. Relevance is considered in relation to both the review topic and to the goal of theory development, while richness, encompasses contextual thickness (detailed description of the context or intervention) and conceptual richness (theoretical explanation of how the intervention worked) [118]. Due to the variety of data types included in realist reviews, determining standard criteria to determine rigor is difficult, as traditional hierarchies of evidence are not appropriate. During full text review, trustworthiness of the evidence (credibility of the source, appropriate use of methods, and potential for bias) and the coherence of theory presented in the evidence was appraised.

First, screening of titles and abstracts was conducted to determine relevance to the review topic. After confirming that the study was conducted in an LMIC and addressed guideline implementation by health workers, the item was scored on three dimensions - Clinical Topic, Implementation Strategy, and Implementation Outcome – according to the criteria below (Table 3.1). These individual

scores were documented, and the study was advanced to full-text review if the aggregate score was four or greater. Title and abstract screening began with two reviewers, with regular consensus meetings to resolve discrepancies and clarify screening criteria. After 25% of the records were screened by both reviewers, there was substantial agreement between the reviewers (k=0.78) and the remainder were reviewed by a single reviewer. Throughout this process, records not in English were translated using Google Translate.

Full text review followed, and encompassed assessment of the richness and rigor of the report along with relevance specifically regarding the goal of refining the IPT. An iterative process was used to prioritize records for completion of full-text review, using the screening scores as a guide [119]. Thirty full-text articles were appraised by two reviewers, with consensus discussions conducted to clarify criteria, and the remainder by a single reviewer. Each item was given an overall appraisal rating based on review of the full text, using a rating scale adapted from Hunter et al (Table 3.2) [120].

Table 3.10: Title/Abstract Screening Score

Dimension	**2**	**1**	**0**
Clinical Area	Inpatient Nutritional Support (SAM, Newborn feeding, etc)	Inpatient Hospital Care (including surgical and emergency; but not outpatient clinics located at hospitals)	Not Inpatient Hospital Care
Implementation Strategy	Co-design process discussed OR Strategy addresses - Teamwork, role clarity, Job aids (display of guidelines), and/or Documentation tools	Other Implementation Strategy	No Implementation Strategy
Implementation Outcome	Implementation Outcomes reported (acceptability, reach, adoption, fidelity, uptake, cost, sustainability, and/or similar outcomes)	Only Clinical Outcomes reported	No Outcome reported

Table 3.11: Full-text Appraisal Rating Scale

Rating	Criteria
High	Papers in this category make several contributions towards theory development and have a good amount of detail. Regardless of the overall quality of the study, the extracts that have been used to build program theory are of sufficient quality to support the inferences.
Moderate	Papers in this category make one or two contributions towards theory development and have a fair amount of detail. Regardless of the overall quality of the study, extracts that have been used to build program theory are of sufficient quality to support the inferences.
Low	Although relevant in respect to the program intervention (implementation strategies for guideline adherence) papers in this category make little contribution to theory development and/or have results that lack credibility raising uncertainty as to whether extracts from the study are of sufficient quality to use in the program theory building or refinement. These papers may also lack enough detail to make them useful to the study.
None	Although relevant in respect to the program intervention (implementation strategies for guideline adherence) papers in this category make no contribution to theory development.

Data were extracted from each item with an appraisal rating of high. The extracted elements (Appendix 3B) include information about the context, guideline, implementation strategy, and outcomes. Implementation strategy details were extracted based on guidance for naming, defining, and specifying these activities [121]. Moreover, detailed descriptions of findings relevant to the CSMO configurations in the IPT were extracted from the full text.

Step 4: Synthesize evidence and draw conclusions

The extracted data was then synthesized and analyzed to test the hypotheses in the IPT. First, combinations of CSMO elements identified in the evidence were used to distinguish areas where the evidence confirms or refutes the theory. In addition, constructs missing from the IPT were identified to inform expansion of the theory. To further develop an understanding of the generative mechanisms, explanatory models were formed through retroductive theorizing [122]. The CSMO configurations, supporting evidence, and thought process leading to each main proposition in the refined program theory was described in detail [123].

Step 5: Disseminate, implement, and evaluate

This realist synthesis produced a refined program theory that explicates contexts, implementation strategies, and mechanisms that impact the provision of guideline-adherent care. The resulting program theory can guide the design, implementation, and evaluation of efforts to improve quality of hospital care through guideline implementation. Dissemination will therefore aim to reach both researchers and practitioners, with results shared through presentations at local and international scientific meetings, international peer-reviewed journals, and through briefs to other stakeholders. The refined theory should not be considered static but should be used and critiqued to continue to refine the causal explanation it provides. This step will commence following publication of the theory and is not discussed in the manuscript results.

Results

Step 1: Clarify scope

Following refinement and review among the research team, the IPT was finalized (Table 3.3). It includes 10 CSMO configurations grouped by the two aspects of the TeAMS Toolkit Pilot study, the participatory design process and the TeAMS Toolkit that was piloted, which included sections devoted to roles and responsibilities, teamwork skills, job aids for nutrition care, and a bedside documentation form. To reflect the dynamic and intertwined nature of how implementation strategies might work, the CSMO configurations in the IPT converge in some areas, with multiple context and strategy combinations potentially triggering the same mechanism, while in other areas they diverge, with the same strategy leading to different mechanisms depending on the context.

Table 3.12: Initial Program Theory

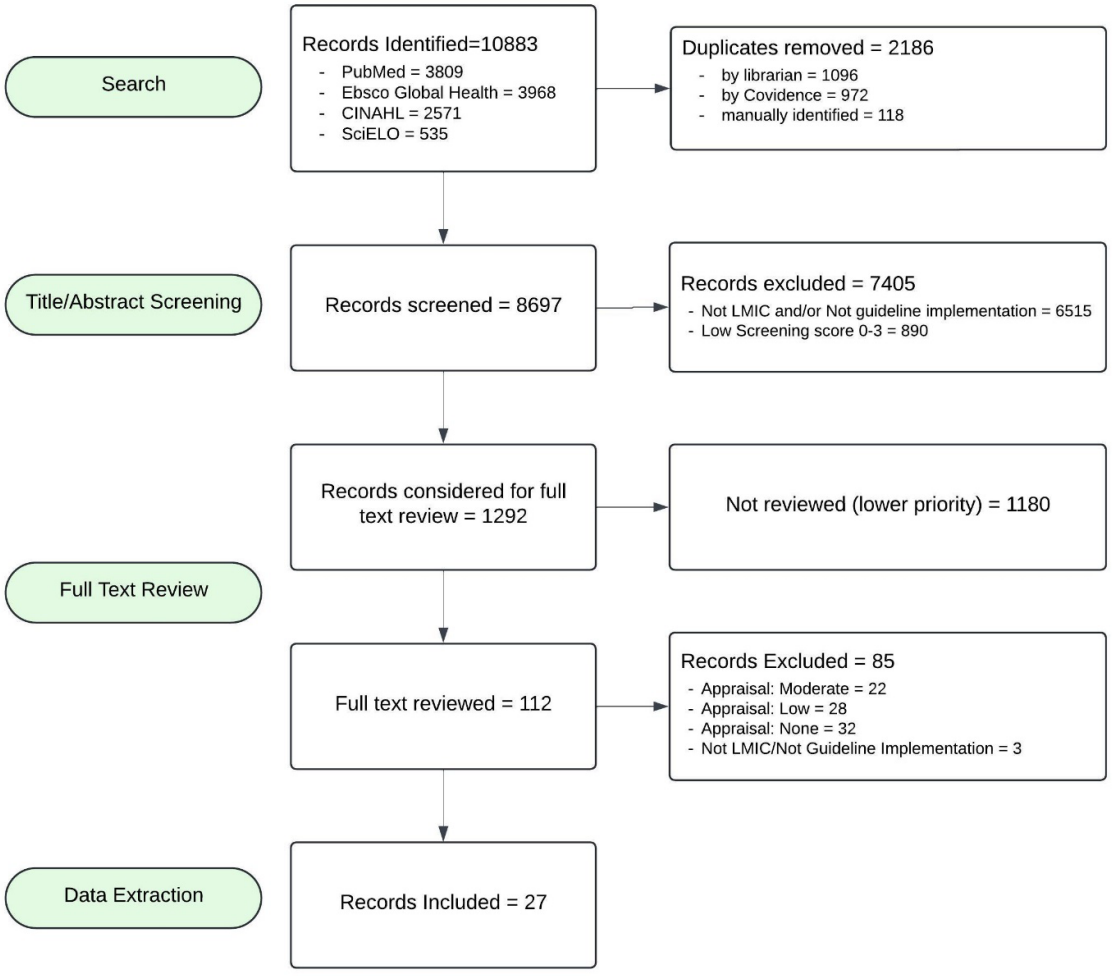
CSMO #	In the **context** of…	An implementation **strategy** including…	Will trigger the **mechanism**…	Resulting in the **outcome**…
Design Process				
1	Health workers feel incompetent in providing guideline recommended care. Informational resources (guidelines, job aids, knowledgeable colleagues, etc) are not available or accessible.	Health workers are engaged in the design process.	There is individual buy-in to use the tools. Perceived importance and relevance of tool	Health workers will be more likely to use the toolkit
2	Sub-optimal implementation of guidelines. Length and complexity of guideline are barriers to guideline implementation.	Health worker feedback is used to refine the content and features of tools to support guideline implementation. Usability problems are addressed during design process.	Health workers will perceive the tools as acceptable and feasible to use.	Health workers will be more likely to use the toolkit
3	Guidelines contain discrepancies and/or recommendations that are not feasible within the facility	Design process generates discussions and group decision-making, with clearly documented roles and outcomes.	Team consensus is established and health workers perceive the treatment plan as clear	Enhanced individual health worker intention and self-efficacy to deliver care according to the unified plan.
4	Facility staff members are trainers for existing guidelines. Guidelines contain discrepancies and/or recommendations that are not feasible within the facility		Trainers are committed to the original guideline and resistant to consideration of adaptations	Staff members will not form consensus around a plan that differs from existing guidelines.
5	Divisions, silos, and/or hierarchies exist between team members/cadres.		There is an enhanced team identity and improved teamwork attitudes.	Health workers will be more likely to collaborate effectively to provide guideline adherent care.

CSMO #	In the **context** of…	An implementation **strategy** including…	Will trigger the **mechanism**…	Resulting in the **outcome**…
TeAMS Toolkit Components				
6	Staff shortages exist and task sharing/overlap is needed.	There is a clear description of roles and responsibilities of health workers to deliver guideline adherent care, including a timeframe or urgency of completion	Health workers know that they are expected to complete these tasks (improved role clarity)	Adherence to guidelines will be improved.
7	Facility leaders reinforce roles and responsibilities. No additional staffing is available. or other efficiencies.		Health workers are externally motivated to deliver care. Health workers feel overburdened and unsupported.	Adherence to guidelines will be improved in the short-term. Health workers will be unable to maintain improvements in guideline adherence long-term and are less open to future efforts to share roles.
8	Existing guidelines are not easily accessible to health workers during care delivery Length and complexity of guideline are barriers to guideline implementation	Treatment plan/decision support information is summarized and made easily available to health workers (through posters or other job aids).	Health workers feel more competent in making treatment decisions due to information that is more accessible and in a format that is easier to understand and use.	Adherence to guidelines will be improved.
9	Divisions, silos, and/or hierarchies exist between team members/cadres.	Guidance on four teamwork skills (Communication, Team Leadership, Situation Monitoring, and Mutual Support) is provided to health workers.	There are improved teamwork skills among staff.	Health workers will be more likely to collaborate effectively to provide guideline adherent care.
10	Each cadre documents care in a different location (nutritionists on multichart, nurses on treatment chart, etc).	A unified chart at the bedside is implemented, including information about the feeding prescription and documentation of each feeding.	This visible chart makes it quicker and easier for staff of all cadres to see what care is expected for a specific patient, if it has been completed, and document when it is done. It removes barriers/time needed to access patient files and serves as a reminder.	The likelihood that feedings are provided as recommended and missed feeds are recognized for follow-up is increased.

Steps 2 and 3: Search for evidence, appraise studies, and extract data

Our search for evidence in four databases identified 10,883 records, which was reduced to 8,697 through deduplication (Figure 3.1). The title and abstract review excluded 7,405 records, 6,515 that were either not in an LMIC or not related to guideline implementation and 890 with a low screening score. Due to the large number of studies remaining, they were prioritized based on the components of the screening score and the full texts of 112 articles were reviewed and data was extracted from 27 with an appraisal rating of high.

Figure 3.6: Search Flow Diagram



Step 4: Synthesize evidence and draw conclusions

Most of the included studies were conducted in Sub-Saharan Africa, including three in Kenya (Table 3.4). The guidelines being implemented included those for severe acute malnutrition (SAM, 6), intrapartum care (5), safe surgery (4), and other conditions. These guidelines were most often created by the WHO (15) or national health ministries (7), with many of these national guidelines based upon WHO recommendations.

Table 3.13: Study Regions

Region	# of studies
Sub-Saharan Africa	17
Asia and Oceana	7
Latin America and Caribbean	6
Eastern Europe	1

* some records reported multiple sites, therefore total >27

Participatory Process

Five CSMO configurations in the IPT describe our theory of how the participatory process to design guideline implementation tools and strategies contributes to the adoption of those tools – a precursor to guideline adherence. The included studies described engagement of health workers in a variety of participatory processes, some highly influenced by human-centered design (HCD) methods [124–126] while others occurred within the context of QI [127–129] and evidence based practice activities [130,131]. We chose to adopt this broad conceptualization because the critical features of this strategy were the engagement of health workers and offering a forum for group decision-making processes, which are not unique to HCD-inspired processes.

Health Worker Engagement. We hypothesized that, if health workers feel incompetent and do not have access to other information sources, involving them in a design process to develop guideline tools would generate buy-in and make them more likely to use tools developed. Evidence

of this strategy-mechanism link was extensive in these studies, with many commenting on the ownership, buy-in, and motivation generated by the activities [124,126,127,132–136]. One study of a mobile guideline app development process highlighted the limited accessibility of decision support tools as an important driver of interest in using the new tool [126]. Still others pointed to a lack of involvement among staff in the design of strategies as a barrier that hindered their buy-in and use of the tools, which also aligns with the CSMO [42,137].

Fewer of the studies mention the context features included in this CSMO and within the TeAMS Toolkit Pilot while several health workers described participation in the design activities boosting their excitement about the Toolkit, others said that a brief survey was adequate for them to feel engaged, and some who did not participate in the design process felt strongly about the importance of the Toolkit. Synthesizing this evidence indicates that when there is strong perceived need due to a lack of access, incompetence, or other factors individuals may buy-in to the use of a tool without any additional strategies to engage them. Meanwhile, several studies identified that the lack of a perceived need or benefit from the tool was a barrier to success [135–138]. While they may not overcome every skeptic, strategies that actively engage individuals who do not immediately perceive a need in a process that both demonstrates the need and involves them in developing relevant tools may generate buy-in. It is actually in this context, as opposed to when a strong need is clear, that participatory engagement is more likely to trigger buy-in.

It also become clear that participatory engagement was not the only pathway to buy-in among health workers. In an initiative to promote hand hygiene across 50 private hospitals in South Africa, buy-in among staff was developed, but not through the pathway in this CSMO, as washing hands is not a task hindered by incompetence and there was little engagement of front-line staff in the design of the initiative [128]. Instead, in this and other studies, prioritization among high-level leaders (county, national, system) and/or low-level leaders (department, hospital) played an important role

in generating buy-in among health workers [124,127,128,137]. This prioritization by leadership is synergistic with participatory engagement in generating buy-in to and eventual use of the guideline implementation tools.

User-testing of tools. Guidelines and their accompanying implementation tools are developed with the intent to make care recommendations clear, however health workers often find that these tools do not achieve that goal. A review of guideline development and implementation in Uganda identified that there was no systematic method of pre-testing national guidelines with target users [42]. We hypothesized that when implementation of guidelines is suboptimal and the length and complexity of the guideline are barriers, a strategy that addresses usability problems and refines the tool based on feedback from target users will improve acceptability and feasibility of the tools. This configuration was strongly supported by evidence from the literature and the TeAMS Toolkit Pilot [124–126,133,139–141]. Others suggested that this would have improved implementation had it been included in their strategies [138,142]. A study of reproductive health guideline use in Ghana demonstrated the benefits of modifying guideline tools based on user feedback.

> *"These [locally-adapted] guidelines were all modifications of the existing national or international protocols, and were modified to either suit the level of care provision or convert them into 'easier to refer to' charts. Compared to the safe motherhood protocol, 88% of respondents found the modified guidelines easier to use."[141, p5]*

Group discussion and decision-making. Three CSMOs in the IPT relate to the role of participatory group discissions and decision-making in generating both agreed-upon treatment plans and a collaborative team that works together to act on those plans. We hypothesized that this strategy would be function through several mechanisms and in the context of guidelines that are seen as not feasible or contain discrepancies and where divisions or hierarchies separate health workers.

Several studies identified specific features of group processes that made them more effective. Some highlighting that including specific stakeholders (e.g. hospital management representatives) was a facilitator, [127,134] while others mentioned that meetings were ineffective when key staff did not attend [137]. Participants in a study that structured meetings around the Plan-Do-Study-Act (PDSA) cycle found that these meetings were different from what they had experienced in the past, with more active engagement as opposed to passive reporting [127].

We hypothesized that group decision-making could overcome challenges with feasibility, as well as discrepancies in guidelines. There is evidence from several countries, including Kenya, and various conditions, including SAM, that discrepancies exist between guidelines and even within the same guideline [42,124,133]. Group decision making is able to help teams come to agreement on a unified plan of action, achieving a common goal among health workers [124,127,130,131,133,134,136,140,143]. When feasibility of the guideline was an important challenge, group processes that worked through how treatments would be operationalized were highlighted [133]. In addition to contexts of discrepancies and poor feasibility, this unified treatment plans came about from group processes when the challenge was related to the lack of a guideline [130,131] and lack of communication between hospital departments [143].

Additional evidence described the ability of these group discussions to contribute to positive team perceptions, as presented in another CSMO. A study of the use of partographs in India described coordination between doctors and nurses developing through engagement in QI teams [132]. In Tanzania, the Surgical Safety Checklist was introduced at 40 hospitals through a strategy of first providing training on leadership, QI, and teamwork skills to a multidisciplinary team from each hospital, before an additional technical training to the same group on the guideline [144]. These teams were able to initiate use of the checklist within their facilities, with utilization in over 90% of

cases. The TeAMS Toolkit study supported this portion of the theory, with participants aligning the improved team collaboration they observed with the design process that engaged them early on.

There is also support for this CSMO in the examples of poor teamwork that are attributed to a lack of consensus-building among health workers [129,137,138]. A potential barrier to this strategy generating enhanced team perceptions is the size of the facility and number of staff engaged. In large facilities, group decision-making processes may involve a smaller proportion of the staff, making these activities less effective in generating a strong team identity on their own, compared to when they take place in small facilities [144].

In the literature, several additional mechanisms were reported related to team functioning. Findings included that as teams continued to engage, both trust and teamwork skills were developed among their users [127]. Separately it was found that the most active facility-level teams were more able to overcome barriers as they arose [143] and that the use of checklists led to increased team communication, further improving team functioning [129]. Together, these point to a self-reinforcing cycle at work in these teams.

During the TeAMS Toolkit Pilot, some challenges in reaching consensus appeared to be driven by individuals who had been trained as trainers on the guidelines. We included a CSMO in our IPT describing a hypothesized mechanism for this observation. Within the final TeAMS Toolkit evaluation this challenge was not brought up by participants and we did not identify any other evidence supporting this configuration. Regardless of their position as trainers, it has been noted that individuals resisting change can hinder implementation overall, but not specifically through the mechanism of resistance to adaptation in consensus-building processes [137].

Guideline Implementation Tools

Roles and Responsibilities. To prevent delays in feeding, the TeAMS Toolkit contained content related to roles and responsibilities that provided role clarity while also allowing for role overlap

between cadres. This approach was successful in generating an expectation among non-nutritionists that they contribute to feeding children with SAM when waiting for a nutritionist would delay care. We did not identify any other reports of tools that specifically addressed role clarity where overlap in roles is needed, however we believe this is an underrecognized and understudied phenomenon and so will retain this CSMO configuration in our refined theory. We did identify other strategies that improved role clarity more generally and contribute to understanding how role perceptions impact adherence to guidelines. In South Africa, as part of broader ongoing efforts to improve care for children with SAM, the national Department of Health highlighted a clear and simple message to all clinicians, that within 30 minutes of arrival these children must be started on antibiotics, fed, and kept warm [134]. This directive set a very simple expectation and included a timeframe for action. In China, the development of a new procedure for nurses to offer nutritional assessment and treatment to patients with cancer-treatment related oral mucositis created role clarity and there was improvement in completion of these tasks when audited [130].

Two studies that introduced new roles designed to support breastfeeding mothers within hospitals also provide important lessons. Following the introduction of a full time nurse to support breastfeeding in Malawi, other nurses stopped completing the tasks of breastfeeding education and assessing weight-for-length, and while there were no significant changes in patient outcomes, they appeared to worsen [145]. This demonstrates a need for approaches to role clarification that maintaining overlap in roles. In Kenya, a breastfeeding peer supporter role was introduced and it was noted that the documentation tool they used contributed to clarifying the expectations of the role for the these individuals and other members of the care team [146]. This points to a link between documentation expectations and role clarity that was also described in the TeAMS Toolkit study.

While many of the included studies used multi-component implementation strategies that included monitoring or supervision, these were not tied to reinforcing specific roles and

responsibilities but tended to look at implementation of the guideline more generally, leaving no strong evidence for CSMO #7.

Teamwork Skills. The TeAMS Toolkit contained a brief section with information about four teamwork skills – communication, team leadership, situation monitoring, and mutual support. While our evaluation did reveal improvement in some measures of team performance, participants primarily attributed these to the team engagement in the design process and the overarching focus on teamwork, not on learning skills from the content. Across the literature, there were several studies that highlighted the importance of developing teamwork skills, however interventions often featured multidisciplinary training sessions [137,144]. Two additional studies described how teamwork skills were developed through group meetings, without formal training on these topics [127,135]. These findings point to the importance of learning teamwork skills, and the varied approaches to achieving that goal. Including this as content in a tool may provide a visible display of teamwork as a priority and provide basic knowledge to health workers; however having opportunities to put those skills in to practice in necessary to develop them.

Job Aid Posters. Posters, charts and other job aids are instrumental in helping health workers operationalize guidelines. There was extensive evidence supporting the hypothesized CSMO configuration. Several studies found a link between this strategy and an outcome of improved guideline use, without identifying a clear mechanism [124,131,144,146]. Others highlighted that job aid posters worked by making the information clear and easily accessible, allowing health worker to build their knowledge and access the information when needed to feel competent in their treatment decisions [42,125,126,134,141,142]. Alone or in addition, posters on the wall acted as a reminder to health workers [125,134,135,139,147]. These finding align with the outcomes in the TeAMS Toolkit pilot, where participants highly valued the job aid component of the Toolkit and identified both of these mechanisms.

There was some evidence that these tools were more likely to generate positive outcomes in the context of staff who do not feel competent. In a study that introduced the Safe Childbirth Checklist in tertiary hospital in Sri Lanka there was moderate uptake of the guideline (used in 46% of patients with 71% of items completed), which was attributed in part to the high perceived competence at baseline among health workers at this tertiary maternity hospital [129]. Others pointed to the particular usefulness of the tools among health workers with low competence, such as those without formal training on the guideline [138] or who have recently joined a department [134].

Documentation Tools. We hypothesized that challenges arising from documentation that is completed by different cadres in different locations of patient records were described in a variety of settings [139,146,147]. Some reported that this led to lack of clarity about treatment plans because different diagnoses were documented in different areas of the patient record [146,147]. A study of partograph use in India identified that when these documentation tools were made available at the patient bedside it facilitated documentation in the moment and improved efficiency of completing documentation [132]. Others highlighted how making a documentation tool easy to find, whether at the bedside or in a conspicuous place in the patient record made it easier for others to review and monitor progress [135,139,142]. These findings align with the TeAMS Toolkit study results that a bedside feeding chart allowed for quick reviews of progress and improved communication during patient handovers.

An interesting analogue to a bedside documentation chart was described in a study of Safe Surgical Checklist implementation, where a large chart for documenting surgical counts was drawn on the wall tiles in permanent marker and a dry-erase marker used document them during each case [135]. The authors described the benefit of this approach in that it "allowed everyone to see the count and remain engaged with the process" [135, p6]. Some documentation tools have also contributed to instigating improved multidisciplinary communication [129].

Among health workers, documentation is often seen as an additional task that has little benefit to the patient. In several studies, documentation tools to support guideline adherence were introduced that duplicated documentation required in other areas of the patient record [142,146]. This duplication can reduce potential efficiency gains and generate resistance from health workers [142]. Therefore, it is critical to design documentation tools that are complementary to existing documentation practices.

Theory Refinement

Based on this analysis, we refined the program theory in several ways. In addition to updating the CSMO configurations to reflect our findings, the terminology was changed to address a "participatory process" and "guideline implementation tools", instead of specific language about the TeAMS Toolkit. The refined program theory is presented in Table 3.5. This refined theory is comprised of eight CSMO configurations that describe the mechanisms through which participatory processes and guideline implementation tools may generate improved health worker adherence to clinical practice guidelines.

Table 3.14: Refined Program Theory

CSMO #	Context	Strategy	Mechanism	Outcome
Participatory Process				
1	Health workers do not perceive a strong need for guideline implementation tools. This may be due to high perceived competence, existing access to information, etc.	Health workers are engaged in a participatory process that demonstrates a need and develops guideline implementation tools.	There is individual buy-in to use the tools. There is increased perceived importance and relevance of the tools	Health workers will be more likely to use guideline implementation tools.
2	Length and complexity of the guideline are barriers to guideline implementation.	User-testing of guideline implementation tools is conducted, and refinements are made to address usability problems.	Health workers perceive the tools as acceptable and feasible to use.	Health workers will be more likely to use guideline implementation tools.
3	Guidelines contain discrepancies and/or recommendations that are not feasible within the facility	Health workers are engaged in group discussions and decision-making to develop a plan, which is reflected in guideline implementation tools.	Team consensus is established and health workers perceive the treatment plan as clear.	Enhanced individual health worker intention and self-efficacy to deliver care according to the unified plan.
4	Divisions, silos, or hierarchies exist between team members/cadres.	Group discussion and decision-making activities include training in and/or modeling of effective teamwork skills.	There is an enhanced team identity and improved teamwork attitudes.	Health workers will be more likely to collaborate effectively to provide guideline adherent care.
Guideline Implementation Tools				
5	Staff shortages exist. Task sharing with role overlap is needed.	Health workers roles and responsibilities are clarified, including a backup individual/cadre responsible for all time-critical tasks.	Role clarity is improved, with clear expectations of who can complete tasks.	Health worker adherence to guidelines is improved.
6	Divisions, silos, or hierarchies exist between team members/cadres. Health workers have an opportunity to practice teamwork skills.	Guidance on four teamwork skills (Communication, Team Leadership, Situation Monitoring, and Mutual Support) is provided to health workers.	There is improved knowledge of teamwork skills among staff.	Health workers will be more likely to collaborate effectively to provide guideline adherent care.

CSMO #	Context	Strategy	Mechanism	Outcome
7	Health workers do not feel competent to provide guideline recommended care. Existing guidelines are not easily accessible and perceived as long and complex.	Job aids (posters or other decision-support tools) simplify and improve access to guideline content.	Health workers feel more competent in making treatment decisions due to information that is more accessible and in a format that is easier to understand and use. Highly visible job aids serve as a reminder to health workers.	Health worker adherence to guidelines is improved.
8	Each cadre documents care in a different location in the patient record.	A documentation tool is provided that aligns with guideline recommend care and (1) unifies documentation by different cadres, (2) is placed in a visible location, (3) avoids duplication of documentation, and (4) is easy to use.	It is quicker and easier for health workers identify patient care needs, document completion, and monitor patient progress. Highly visible documentation tool serves as a reminder.	Timely adherence to guideline recommended care and early recognition of missed care or patient deterioration.

Discussion

In this realist literature synthesis, we aimed to identify the causal mechanisms at work in an implementation strategy that used a participatory design process to develop guideline implementation tools. We then tested that theory against evidence from other guideline implementation efforts in LMICs. The resulting refined program theory incorporates eight CSMO configurations related to both the participatory design process and the resultant guideline implementation tools.

While the use theories to guide implementation science research has become commonplace, researchers are less frequently engaged in the process of developing and refining those theories. When we view theories as approximations instead of finished products, we can use our research to develop, refine, and expand them, contributing to knowledge development [148]. This study allowed us to build upon the work of our pilot study and the broader literature, to understand the mechanisms at work when participatory design processes are used to develop guideline implementation tools. There is considerable debate around how to balance context and generalizability in implementation research [149]. Realist theory development helps find that balance and can be used to inform researchers and practitioners as they choose which implementation strategies to use in a particular context.

Teamwork skills are needed to implement guidelines as effectively as possible, so strategies to improve adherence to guidelines will benefit from attention to the development of teamwork skills among health workers. Our findings identified synergies between the participatory processes and guideline implementation tools promoting teamwork. Developing teamwork skills within hospitals depends not only on acquiring knowledge but on having the opportunity to practice these skills [150]. Participatory processes that bring people together can create those opportunities [151]. The benefits of these participatory activities can therefore expand beyond the specific objectives of the activity;

they have the potential to enhance capacity for effective teamwork and promote an organizational culture that values teamwork.

Several guidelines and tools identified in this review incorporate implementation strategies highlighted in our theory and should be seen as examples to emulate. The WHO Safe Childbirth Checklist details key actions that should be taken around the time of delivery and was published in 2015 after field testing and refinement [136]. An accompanying Implementation Guide walks through a process to engage, launch, and support implementation of this tool, addressing many of the components of our theory [152]. One key feature is that it provides encouragement to customize the tool and recommendations for how to do that. This is different from many guidelines which, whether intended by guideline developers or not, are seen as regulations that must be implemented as planned.

This study had several limitations. Program theories are not intended to be all-encompassing, therefore we focused on the areas addressed by our pilot study [153]. Implementation strategies that include ongoing monitoring of guideline adherence, through internal supervision, external monitoring, coaching, audit and feedback, or other approaches are likely to support guideline implementation but are not addressed in this theory. The included studies often employed multicomponent implementation strategies, making it difficult to disentangle the strategies and identify CSMO configurations. We attempted to link the CSMO elements based on qualitative responses and authors' analyses in discussion sections, however these other strategies likely contributed to the outcomes observed in those studies. Moreover, several areas of the registered protocol were changed due to pragmatic concerns – including having a second reviewer for only a portion of title/abstracts and full text reviews, and stricter prioritization the records that would undergo full text-review. We feel that these changes did not significantly impact findings due to high

inter-rater reliability in screening and the achievement of theoretical saturation in the synthesis of evidence.

Conclusions

This realist literature synthesis refines a program theory describing how and why strategies incorporating participatory processes and guideline implementation tools work at hospitals in LMICs. The refined theory highlights the contribution of participatory processes to improved teamwork and the value of user-tested job aids to support guideline implementation. This refined theory can be utilized to guide implementation efforts that are intended to support guideline adherence, with the hopes of supporting selection and design of implementation strategies that align to context and trigger the generative mechanisms that produce results.

Conclusion

"There is always a well-known solution to every human problem – neat, plausible, and wrong."

– H. L. Mencken [154]

Much of the research in the health sciences field comes from a positivist paradigm that seeks to find *the* generalizable answer to a research question. While the promise of a silver bullet is enticing, as H.L. Mencken said in 1920, these simple answers tend to be wrong. Instead, research can be an endeavor to understand what's working, what's not, and why that is. The context and structures of society are ever-changing, so the work must continue to build on and refine this understanding. And most importantly, find ways to use the knowledge gained to keep making progress toward improvement.

In this dissertation, I was able to incorporate my new-found realist-informed view to build a deeper understanding of implementation strategies to support guideline implementation in LMICs. In Chapter 1, I describe the barriers and facilitators health workers experience when implementing pediatric treatment guidelines at two hospitals in Kenya. Chapter 2 built on this understanding to develop an implementation strategy to address one of the barriers identified. We used a participatory approach to co-design the TeAMS Toolkit and, following an initial pilot, health workers reported good usability of the tool. In addition, there were promising results related to improved teamwork perceptions and prompt treatment initiation by nurses. Finally, Chapter 3 describes a realist literature synthesis that took a program theory of the TeAMS Toolkit and tested it in the wider literature to refine the explanations of how and why this implementation strategy may work.

Future directions

Dissemination of these findings has already begun at the hospital, county, and national level in Kenya. There is a strong desire from front-line health workers and local leaders to refine and scale

up the TeAMS Toolkit to additional hospitals. To better understand the impact of the Toolkit, future studies will seek to measure clinical outcomes for patients with malnutrition, ideally through routine reporting systems. This can be a challenge, as critical process indicators related to feeding are inconsistently recorded in routine documentation. Designing a study that can accomplish this is necessary to determine if there is a positive impact on patients and justify additional investment in the TeAMS Toolkit. In addition, as the development of the TeAMS Toolkit proceeds, it will be critical to work with the national guideline development teams. Ideally, the types of user-tested implementation tools included in the Toolkit would be provided alongside the guideline itself. If done well, this would ensure sustainability as guideline updates occur.

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Appendices

Appendix 1A – Question Guide

Appendix 1B – Qualitative Codebook

Appendix 2A – TeAMS Toolkit

Appendix 3A – Search Strategy

Appendix 3B – Data Extraction Template

Appendix 1A – Question Guide

Focus Group Discussion/In-depth Interview Guide
Healthcare workers

Version 1.1

Introductory script

Thank you for taking the time to participate in this interview today. I am (interviewer name), and I will be facilitating this interview.

First, I would like to share some background information about the project. This study focuses on exploring the factors that influence use of national, institutional, or WHO paediatric treatment guidelines for pneumonia, diarrhea, and severe acute malnutrition (SAM). The purpose of the study is to learn from health workers about their experiences with using specific paediatric treatment guidelines as well as to understand the factors that make it easier or harder to use guidelines.

You are invited to participate in this focus group discussion/in-depth interview because you provide clinical services to children hospitalized with pneumonia, diarrhea and SAM in this facility. If you agree to participate in the interview, we will ask you questions about your experiences using paediatric treatment guidelines in your institution. This information will help us gain insights into how to improve paediatric treatment guidelines and opportunities to increase correct use of guidelines within paediatric care.

Participating in this interview is voluntary and this conversation is completely confidential. Your name or the name of your organization will not be shared in any way. With your permission, I would like to audio record this conversation for transcription purposes. Only designated research team members will have access to the recording and transcription. We will ensure secure storage of them. Please refrain from using names or other details that might reveal the identity of any individuals in your organization.

Please take a moment to review the informed consent form and, once you have finished reading it and if you agree with its contents, you can sign the form. I'll wait a few minutes to give each of you a chance to read the form and decide if you would like to participate.

Interview Guide

Sl.	Questions
1	Please tell me a bit about your daily roles and responsibilities as a health care provider.
2	What guidelines do providers in your facility use to provide clinical care to acutely ill, hospitalized children? Probe: • What about for pneumonia, diarrhea and SAM specifically? • Are these national guidelines? Facility guidelines? WHO guidelines?
3	What training have you received about these guidelines? Probes: • When did you first receive these trainings? • How often do you receive these trainings about guidelines? • Do you think these trainings adequately prepared you to apply these guidelines? Why or why not?
4	Now I would like to ask some questions specifically about guidelines for pneumonia, diarrhea, and SAM. In general, do you think providers at your facility tend to strictly follow these guidelines? Please explain. Probes: • If no, do providers think there is a better option than the existing guidelines?
5	How important do you think it is for providers to strictly follow these guidelines in the management of acutely ill children?

	Probes: • What do you think are the advantages of strictly following these guidelines? • When specifically might it be important to strictly follow the guidelines? Can you provide an example from your own work?
6	Do you find yourself strictly following guidelines in your own work? Why or why not?
7	Can you think of any disadvantages of strictly following these guidelines? If yes, could you please elaborate? Probes • When might it be important not to follow the guidelines? • Could you narrate an example from your own work?
8	How challenging do you think it is to follow the guidelines for managing pneumonia, diarrhea or SAM in hospitalized children? Please explain. Probes: • Please tell me more. Why do you think providers in your facility, at times, do not use guidelines? • When providers do not use guidelines, how do you think they are making clinical decisions?
9	Do you think patient outcomes vary based on whether guidelines are followed strictly or not? Please provide an example. Probe: • To clarify, do you think interventions focused on improving guideline adherence in your facility would improve patient outcomes?

10	In your experience, what influence does supervision of healthcare providers have on guideline use? Probes: • Do supervisors refer to guidelines when they provide clinical feedback or advice? • Do supervisors encourage providers to consult guidelines for pneumonia, diarrhea, and SAM patients? • Do supervisors take any actions if providers do not follow guidelines for managing patients?
11	Is there anything about the environment or organization of a health facility that makes it harder to follow guidelines?
12	Is there anything about the environment or organization of a health facility that makes it easier to follow guidelines? Probes: • Do you receive any specific support in following the guidelines? Support might include supervision, job aids, workplace norms, support from colleagues, and so forth. • Would you appreciate a specific type of support in the future? Please provide an example.
13.	Is there anything about the workplace culture that makes it harder to follow guidelines? By workplace culture I mean the social norms and operating procedures that guide the interactions between health workers here. Probes: • Do you face any specific challenges around supervision, workplace norms, organizational management, etc.?
14	Likewise, is there anything about the workplace culture that makes it easier to follow guidelines?
15.	Have you found it challenging to follow guidelines with certain patient presentations? Probes

	• Have you observed any specific challenges in applying guidelines for different diagnoses and severities, for example: severe vs. non-severe pneumonia, acute watery diarrhea vs chronic diarrhea or dysentery, SAM with complications vs without? • Do you think guideline adherence differs if a patient has received prior care and is returning to the facility? If the paediatric patient has multiple diagnoses? •
16.	Have you found it challenging to follow guidelines with certain patient presentations? Probe • Have you observed any specific challenges applying guidelines if the patient came from a specific socio-economic background?
17	Have you come across any guidelines that were particularly helpful in your clinical decision making? Please explain. Probes • What about these guidelines makes them particularly useful, in your opinion? (If examples are needed: were the guidelines well organized? Were they clear? Were they relevant to complex cases as well as simplistic cases?)
18.	Have you come across any guidelines that were particularly unhelpful in your clinical decision making? Please explain Probes • Why do you think that these guidelines were not helpful? (If examples are needed: were the guidelines not well organized? Were they not clear? Were they not as relevant to complex cases as they are to simplistic cases?) • Have you ever observed conflicting recommendations within a guideline? How do you make clinical decisions in such circumstances? • What particular changes would you suggest that could make the guidelines more useful for providers like yourself?

19	What ideas do you have for improving use of pediatric clinical guidelines in your setting? Probes • Would these recommendations differ if we are talking about diagnosis guidelines as opposed to treatment guidelines, or vice versa? • [If the participant recommends training]: What strategies for improving guideline use do you think might be effective above and beyond training?
20.	Is there anything else that you think is important for me to know about paediatric treatment guidelines regarding diagnosis or treatment? Your feedback will be very helpful for understanding how to improve the design and implementation of guidelines in Kenya, and more broadly. Thank you so much for your time, I really appreciate it. We look forward to sharing a short summary of this research with hospital staff in about 3-5 months time.

Appendix 1B – Qualitative Codebook

Appendix 1B - Qualitative Codebook

Code	Parent Code	Description
Behavioral_regulation		Behavioral RegulationAnything aimed at managing or changing objectively observed or measured actions Inclusion Criteria:Include statements regarding how health workers are planning for change/action to improve guideline adherence. Include statements related to changing facility norms to improve guideline adherence. Exclusion Criteria:Exclude statements regarding intentions. Code these statements as 'Intentions.' Note intention is about the decision to perform a behavior, whereas behavioral regulation is about actions individuals take to try to change their behavior.
Capability	Capability	Beliefs about capability Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use. Inclusion Criteria:Include statements that reflects respondents' belief and confidence about their personal ability of applying pediatric guidelines in clinical settings. Exclusion criteria: Exclude statements that reflect belief about ability to apply guidelines based on organizational or environmental factors.
Capability_behavior	Capability	Beliefs about capability: Perceived behavioral control Individual's perception of the difficulty of enacting a behaviorInclusion Criteria:Include statements regarding perception about how difficult it is for them to apply pediatric guidelines
Capability_efficacy	Capability	Beliefs about capability: self-efficacy Individual's belief in his or her capacity to execute behaviors necessary to produce specific performance attainments Inclusion Criteria:Include statements regarding perception of self-efficacy to complete the necessary actions required to follow the guidelines Exclusion Criteria:TBD
Capability_empowerment	Capability	Beliefs about capability: empowerment The progression of choice, influence, and control an individual can exercise over events in their lives Inclusion Criteria:Include statements regarding respondents' belief about having choice, influence, and control to apply guidelines at workplace. Exclusion Criteria:TBD
Caregiver		CaregiverInclusion criteria: Include statements indicating child's caregiver related factors that affect guideline adherence.Exclusion Criteria: TBD
Consequence	Consequence	Beliefs about consequences Acceptance of the truth, reality, or validity about outcomes of a behavior in a given situation Inclusion criteria: Include statements that reflect beliefs about outcomes depending on adherence and non-adherence to pediatric guidelines at the patient-, health worker-, or facility-level. Capture perceived advantage and disadvantage of guideline adherence. Exclusion criteria: Exclude statements about reinforcements, which specify an arranged system of incentives or punishment to encourage guideline adherence.
Consequence_antic_benefit	Consequence	Beliefs about consequences: Anticipated benefit The sense of potential for a positive outcome in the future that influences their decision makingInclusion Criteria:Include statements regarding anticipated positive clinical and professional outcomes as a consequence of following or not following the guideline.Exclusion Criteria:TBD.
Consequence_antic_regret	Consequence	Beliefs about consequences: anticipated regret The sense of potential regret an individual may feel in the future that influences their decision making Inclusion Criteria:Include statements regarding anticipated clinical and professional outcome as a consequence of following or not following the guideline. Exclusion Criteria:TBD.
Consequence_consequence	Consequence	Beliefs about consequences: consequences Result or effect of a behavior Inclusion Criteria:Include statements regarding previous clinical and professional outcome (experienced or observed) as a consequence of following or not following the guideline. Exclusion Criteria:TBD.
Diarrhea		Diarrhea Inclusion criteria:Include statements that are specific about facilitators/barriers to diarrhea guideline adherence
Emotion		Emotion A complex reaction pattern, involving experiential, behavioral, and physiological elements, by which the individual attempts to deal with a personally significant matter or event Inclusion criteria: Include statements mentioning provider's mental health, burn-out and emotional inability to handle complex and stressful situations as factor for guideline non-adherence. Exclusion criteria: TBD
Environment	Environment	Environmental context Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behavior Inclusion criteria: Include statements about society, environment, organization, resource, supervisor, peer, and caregiver related factors of guideline adherence and non-adherence. Exclusion criteria: Exclude statements about characteristics of acutely ill child and pediatric guidelines as factors for guideline adherence and non-adherence.
Environment_organization	Environment	Environmental context: Organizational culture/climate Any aspect related to the organizations working culture or climate Inclusion criteria: Include statements about organizational norms and cultures that make it easier or harder to follow guidelines. Also, include general statements about the culture of supervisor and peer support in following guideline recommendations. Exclusion criteria: Specific examples of support provided by supervisors or peers should be coded as Social_influences_support.
Environment_resources	Environment	Environment_resourcesAvailability of human and material resources Inclusion criteria: Include statements about material and human resources that make it easier or harder to follow guidelines. Resources may include staff number and pattern, availability or access to instruments, medications, guidelines in printed or other form. Exclusion criteria: Exclude statements related to patient/family access to resources for items that are not expected to be provided by the health system (e.g. transport, long term food), these should be coded Patient_ses
Environment_systems	Environment	Environmental context: Systems and processesProcedures according to which something is done.Inclusion Criteria: Include statements regarding formal and informal structures, systems, procedures, and processes involved in the delivery of care to hospitalized children. Include group norms related to these systems, procedures, and processes.Exclusion criteria: TBD
Goals	Goals	Goals Mental representations of outcomes or end states that an individual wants to achieve Inclusion Criteria: Include statements about how guideline adherence specifically, or providing good patient care more generally, is perceived as a goal and how they think it can be achieved Exclusion Criteria:TBD
Goals_priority	Goals	Goals: PriorityOrder of importance or urgency of goalsInclusion Criteria:Include statements about any competing interests that might be prioritized over and interfere with following guidelines. This may include both prioritization of outcomes and goals related ot the use of the guideline, as well as staff prioritization of tasks while providing care.Exclusion Criteria:TBD.

Appendix 1B - Qualitative Codebook

Code	Parent Code	Description
Guideline	Guideline	Guideline related factors Characteristics of the guidelines Inclusion criteria: Include statements about criteria of the guidelines driving adherence. Exclusion criteria: Exclude statements about guideline knowledge and training related issues.
Guideline_clarity	Guideline	Guideline related factors: Clarity of recommendationGuideline recommendations that are easy to understand, unambiguous, and contain sufficient information. Inclusion criteria: Include statements that express the presence or lack of clarity of guideline recommendations. This may include statements of information being present or missing, discussion of conflicting recommendation within and between different guidelines, or the clarity of instructions in the guideline such as "step-by-step" instructions. Exclusion Criteria:TBD.Examples:"Like in pediatric protocol even themselves... they give you steps, so you know where to go so you don't strain a lot in the absence of a doctor's prescription you can be able to just follow and may be you can use a dosage maybe the child is convulsing, the doctor is not there to prescribe you can decide and then later say I did this and that.""You know when you have this guideline, this one says this and this one says this you now don't know which one to use.""I think they are very easy, simple to follow. First of all they are very few pages and to the point, you just open a page and it's just telling you how to, this child this age, this is how to do it, these are the symptoms this is how to do it."
Guideline_complex	Guideline	Guideline related factors: Complexity of guidelineComplexity of guideline instructions and/or inclusion of alternatives and nuance in guideline impact ability to adhere to them.Inclusion criteria: Include statements that discuss complexity of guideline recommendations, e.g., many stems of recommendation for one condition, inclusion of alternative options, dealing with complex clinical conditions.Exclusion Criteria:TBD.Examples:"So would like a guideline that also suggests for you other ways in case whatever has been suggested to be used is not readily available in most facilities?R: Yes, options, the alternatives. Maybe you find this procedure maybe you don't have all that but now what are some of the alternatives that we can have. Like there are guidelines that we are having that don't give alternatives, they just stick to what was written but things are different in every setting. So my suggestion is when they give us procedures for an ideal scenario they should also think through those unideal scenarios in facilities like dispensary or level one where there is no much resources."
Intentions		IntentionsA conscious decision to perform a behavior or a resolve to act in a certain wayInclusion Criteria:Inclusion Criteria:Include statements about respondent's conscious personal intention or choice of adhering or not adhering to guideline that could be a result of previous experience or belief about the 'better' treatment. Also include statements reflecting their perceptions of the intentions of other HCWs.Exclusion criteria: Exclude statements about guideline adherence or non-adherence related to organizational norms or supervisor's direction.
Knowledge		KnowledgeAn awareness of the existence of something Inclusion criteria: Include statements that mention what the respondent know about the existence, types and contents of pediatric guideline for pneumonia, diarrhea, and SAM. Exclusion criteria: Exclude statements that describe staff's experience and skills on applying the guidelines
Memory		Memory, attention, and decision processes The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives Inclusion criteria: Include statements that are about factors of guideline adherence/non-adherence related decision-making process due to individual's memory and attention issues. Exclusion criteria: Exclude statements related to occupational settings or environmental factors related to guideline adherence/non-adherence. Exclude or double code guideline complexity related factor associated with memory, attention and decision process, for example, unclear or complex recommendations difficult to remember or follow.
Optimism	Optimism	Optimism The confidence that things will happen for the best or that desired goals will be attainedInclusion Criteria: Include statements expressing optimism or lack thereof about guideline implementation and adherence. Exclusion: Exclude statements about patient or professional consequences.
Optimism_optimism	Optimism	Optimism: optimism Hopefulness and confidence about the future or the successful outcome of something Inclusion Criteria: Include statements expressing optimism about guideline implementation and adherence. Example: "Guidelines can be successfully used here."
Optimism_pessimism	Optimism	Optimism: pessimism A lack of hope or confidence in the futureInclusion Criteria: Include statements expressing pessimism about guideline implementation and adherence. Example "This would never work here"
Patient	Patient	Patient Characteristics Characteristics of the acutely ill children Inclusion criteria: Include statements that mention child's age, sex, socio-economic condition, previous illness, nutritional status, comorbidities, previous hospitalization or other medical/non-medical careseeking, and disease severity as factors for guideline adherence and non-adherence. Exclusion criteria: Exclude statements related to interactions with caregiver or caregiver expectation driving guideline adherence.
Patient_age	Patient	Patient Characteristics: Age Child's age Inclusion criteria:Include statements indicating child's age as a factor that influences guideline adherence Exclusion Criteria:TBD
Patient_careseeking	Patient	Patient Characteristics: Previous care seeking Previous care seeking history for the same illness episode Inclusion criteria:Include statements indicating child's care seeking history for the same illness episode as a factor that influences guideline adherence. Exclusion Criteria:TBD.
Patient_comorbidity	Patient	Patient Characteristics: Comorbidities Child's current comorbidities Inclusion criteria: Include statements indicating child's current comorbidities as a factor that influences guideline adherence. Exclusion Criteria: TBD.
Patient_hospitalization	Patient	Patient Characteristics: Previous Hospitalization Child's previous hospitalization history for the same illness episode Inclusion criteria: Include statements indicating child's previous hospitalization history for the same illness episode as a factor that influences guideline adherence. Exclusion Criteria:TBD.
Patient_illness	Patient	Patient Characteristics: Previous illness Child's previous illness history Inclusion criteria:Include statements indicating child's previous illness history as a factor that influences guideline adherence. Exclusion Criteria: TBD
Patient_nutrition	Patient	Patient Characteristics: Nutritional status Child's nutritional status at admission Inclusion criteria:Include statements indicating child's nutritional status at admission as a factor that influences guideline adherence. Exclusion Criteria:TBD.
Patient_perception	Patient	Patient Characteristics: Health worker's perceptionHealth worker's perception about chances of survivalInclusion Criteria: Include statements about how health workers' perception about child's prognosis influence guideline adherence. Exclusion Criteria: TBD

Appendix 1B - Qualitative Codebook

Code	Parent Code	Description
Patient_ses	Patient	Patient Characteristics: Socio-economic condition Child's socio-economic condition Inclusion criteria:Include statements indicating child's socio-economic condition as a factor that influences guideline adherence. Exclusion Criteria:TBD.
Patient_severity	Patient	Patient Characteristics: Disease severity Child's disease severity assessed by physician at the current facility Inclusion criteria: Include statements indicating child's disease severity assessed at the current facility as a factor that influences guideline adherence. Exclusion Criteria:TBD.
Patient_sex	Patient	Patient: Sex Child's sex Inclusion criteria:Include statements indicating child's sex as a factor that influences guideline adherence. Exclusion Criteria:TBD.
Pneumonia		Pneumonia Inclusion criteria:Include statements that are specific about facilitators/barriers to pneumonia guideline and adherence
Quote		Good Quote Inclusion criteria:Include statements that seem fit to include in the result section of the manuscript as quotes
Reinforcement	Reinforcement	Reinforcement Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus Inclusion Criteria:Include statements regarding the presence or lack of incentives or punishments as factor for guideline adherence or non-adherence. Exclusion criteria: Exclude statements about consequences of guideline adherence that are not part of an arranged contingency. Exclude statements about the reinforcement of skills gained through training, this should be coded as skills_development
Reinforcement_incentives	Reinforcement	Reinforcement: Incentives Any stimulus that encourages a desired response Inclusion Criteria:Include statements on the presence or absence of motivators (i.e., incentives) for applying guidelines correctly Exclusion Criteria:TBD.
Reinforcement_punishment	Reinforcement	Reinforcement: Punishment Any penalty as a consequence of an undesirable action or outcome Inclusion Criteria:Include statements regarding the presence or absence of supervision and punishment for not following guidelines Exclusion Criteria:TBD.
Review_audio		Review audioInclusion criteria: Include statements where there are questions about the accuracy of the transcription and a review of the audio recording is needed
Role	Role	Professional/Social role and identity A coherent set of behaviors and displayed personal qualities of an individual in a social or work setting Inclusion Criteria:Include statements about the 'identity and role of the provider' shaping perception and practice of adhering to guidelines at workplace. Also include statements that mention 'identity and role of the provider' as an influencing factor for confidence and competence on applying guidelines in practice. Include statements regarding health workers' roles and responsibilities in providing care. Exclusion criteria: Exclude statements about confidence or skills to apply guidelines in work settings that are not tied to professional identity/role by the respondent.
Role_commitment	Role	Professional/Social role and identity: Organizational commitment Dedication and connection employees have with their organization Inclusion Criteria: Include statements about health worker's commitment to the organization influencing guideline adherence. Exclusion criteria: TBD
Role_leadership	Role	Professional/Social role and identity: Leadership Act of leading a group or organization to accomplish group or organizational goals Inclusion Criteria: Include statements that indicates the role of leadership and supervisors in health worker's guideline adherence Exclusion criteria: Exclude statements that focus on the supervisor's delivery of reinforcements, these should be coded as Reinforcement
Sam		Severe Acute Malnutrition Inclusion criteria:Include statements that are specific about facilitators/barriers to SAM guideline and adherence
Skills	Skills	SkillsAn ability or proficiency acquired through practice Inclusion criteria: Include statements about provider's skills and competence for applying the guideline including trainings that they received. Exclusion criteria: TBD
Skills_ability	Skills	Skills: Ability Having the means or skills to complete a task Inclusion criteria: Include statements about the health worker's personal ability to apply guidelines in clinical practice. Exclusion criteria: TBD
Skills_develop	Skills	Skills: Skills developmentProcess of identifying, developing, and honing skillsInclusion criteria: Include statements about trainingsreceived on pediatric guidelines. Also include statements that indicate trainings or a lack thereof as a factor for guideline adherence and non-adherence. Forms of skills development may include initial and follow-up training, on-job training, continuing medical education (CME), or any other method of capacity development.Exclusion criteria: TBD
Skills_practice	Skills	Skills: Practice Repetition of an act, behavior, or series of activities to improve a performance or develop a skill Inclusion criteria: Include statements about competence to apply guidelines acquired through practice and experience Exclusion criteria: TBD
Social_influences	Social Influences	Social influences Interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviors Inclusion Criteria:Include statements about guideline adherence related behavior influenced by the attitude and practice to learn from the actions of peers and supervisors. Also, include statements that reflect respondent's actions related to following guidelines based on perceived expectations of the child's caregiver or society in general. Exclusion criteria: TBD
Social_influences_modelling	Social Influences	Social influences: modelling The process in which one or more individuals serve as examples for another individual to copy Inclusion Criteria:Include statements regarding learning how to deliver guideline adherent care from supervisors and other health workers via modelling. Exclusion Criteria:TBD.
Social_influences_social_pre	Social Influences	Social influences: Social pressure Direct or indirect influence on people by individuals or groups Inclusion Criteria:Include statements that reflect respondent's actions related to following guidelines based on perceived expectations of the child's caregiver or society outside the workplace. Exclusion Criteria:TBD.
Social_influences_support	Social Influences	Social influences: social support The provision of assistance to others, typically in order to help them cope with stressors Inclusion Criteria:Include statements that reflect specific examples of support from peers, supervisors, and caregiver or lack thereof affecting guideline adherence Exclusion Criteria: Exclude general statements of a supportive/unsupportive work environment, these should be coded as Environment_organization
Unclear		UnclearInclusion criteria:Include statements that require discussion for coding decision and/or may require new code generation

Appendix 2A – TeAMS Toolkit

TeAMS Toolkit

Team **A**pproach to **M**alnutrition **S**ervices

v1.1 October 2023

Resources to support team-based care for hospitalized children with severe acute malnutrition.

Designed with and for health care workers at:

Migori County Referral Hospital

With research support from:

KENYA MEDICAL RESEARCH INSTITUTE KEMRI

UNIVERSITY of WASHINGTON

Version 1.1, October 2023

**v1.1 contains updates to the Bedside Monitoring Chart only*

Table of Contents

Introduction

The Team Approach to Malnutrition Services (TeAMS) Toolkit was developed and tailored for Migori County Referral Hospital through a co-design effort in collaboration with the University of Washington and the Kenya Medical Research Institute. The goal of this effort was to develop a resource that responds to challenges faced by health care workers to promote adherence to national paediatric treatment guidelines and promote improved nutritional recovery of patients with acute malnutrition.

Statement of Need

In Kenya, the under-five mortality rate in 2021 was 37 per 1,000 live births,[1] with an estimated 54,000 under-five deaths.[2] Despite remarkable reductions in child mortality, malnutrition remains a primary contributor. Additionally, children admitted to a hospital with severe wasting are at high risk for in-hospital and post-discharge mortality.[3] This Toolkit is designed to supplement existing national guidelines - the Basic Paediatric Protocols (BPP, 5th Edition Nov. 2022) and the Integrated Management of Acute Malnutrition (IMAM, 2021). It provides additional resources to assist healthcare workers as they implement these guidelines for the management of acute malnutrition.

Using this Toolkit

This toolkit is designed to support staff in two main ways: (1) offering guidance on teamwork and clarifying team member roles and (2) consolidating recommendations from national guidelines so that health workers have easier access to the information they need to fulfil those roles. This is accomplished in four sections:

- **Teamwork Skills** – General guidance on skills including communication, team leadership, and mutual support.
- **Team Member Roles and Responsibilities** – Specific information about the roles of team members
- **Key Information from IMAM** – Detailed information about the treatment plans for children in each phase of treatment, with a focus on feeding.
- **Monitoring and Documentation** – Guidance on the frequency of monitoring children admitted with SAM and on using the Bedside Monitoring Chart for SAM.

Abbreviations and Acronyms

BPP	Basic Paediatric Protocols
CO	Clinical Officer
IMAM	Integrated Management of Acute Malnutrition
MCH	Maternal-Child Health
MO	Medical Officer
MUAC	Mid-upper arm circumference
OTP	Outpatient Therapeutic Programme
ReSoMal	Rehydration Solution for Malnutrition
SAM	Severe acute malnutrition
TeAMS	Team Approach to Malnutrition Services
WHZ	Weight-for-height z-score

[1] The World Bank, UN Inter-agency Group for Child Mortality Estimation. Mortality rate, under-5 (per 1,000 live births) - Kenya. The World Bank. Accessed April 1, 2023. https://data.worldbank.org/indicator/SH.DYN.MORT?locations=KE

[2] The World Bank. Number of under-five deaths - Kenya. The World Bank. Accessed April 1, 2023. https://data.worldbank.org/indicator/SH.DTH.MORT?locations=KE

[3] Diallo AH, Shahid ASMSB, Khan AF, et al. Childhood mortality during and after acute illness in Africa and south Asia: a prospective cohort study. *The Lancet Global Health*. 2022;10(5):e673-e684. doi:10.1016/S2214-109X(22)00118-8

Teamwork

Providing high quality care to our patients requires working together as a team. In addition, working in a supportive team creates a better environment for all of us. This section outlines four key skills that can help us strengthen team-based communication. This communication is particularly important when multiple health workers are sharing roles, as outlined in later sections of this Toolkit.

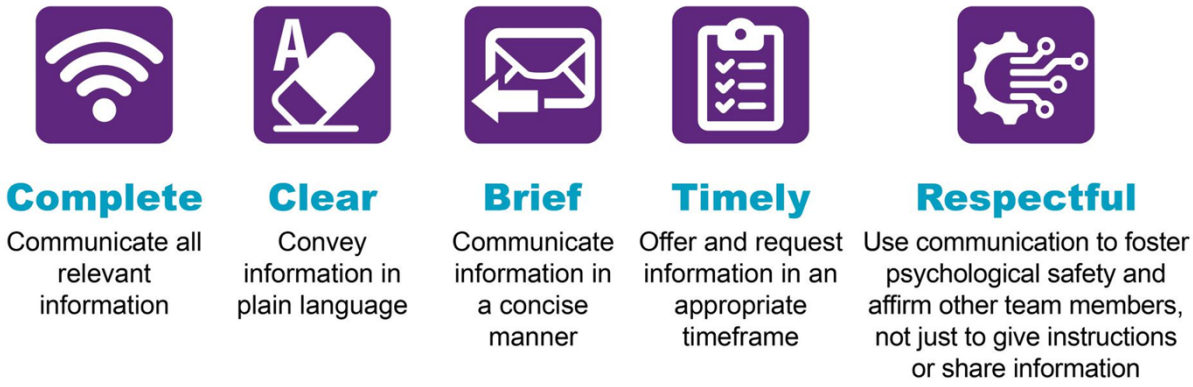
Content and images in this section are drawn from the TeamSTEPPS training program. TeamSTEPPS is an evidence-based framework to optimize team performance in health care settings and is built around four key skills: Communication, Team Leadership, Situation Monitoring, and Mutual Support.

Want to learn more? Addition resources are available on the TeamSTEPPS website.

https://www.ahrq.gov/teamstepps

Teamwork Skill #1: Communication

Effective communication includes verbal, non-verbal, and written forms and is critical for good teamwork. Five features of effective communication are displayed below.



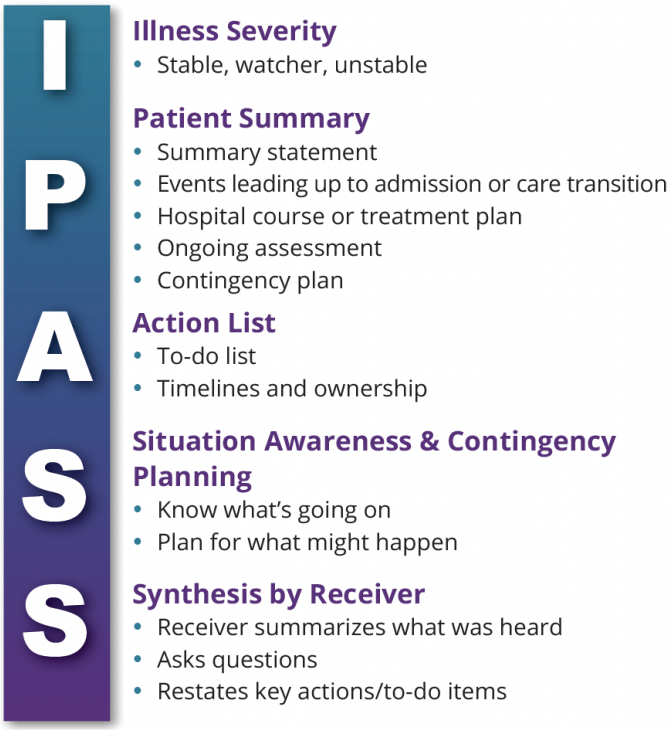
Handovers

Patient handover is an important communication tool. Effective communication between team members during handover will ensure the best possible care for the patient.

I-PASS is one approach to ensuring that handover includes the most important elements of care.

Specific item to review during handover for children with SAM are:

- Feeding progress and documentation
- Availability of formula/RUTF
- Caregiver support needs



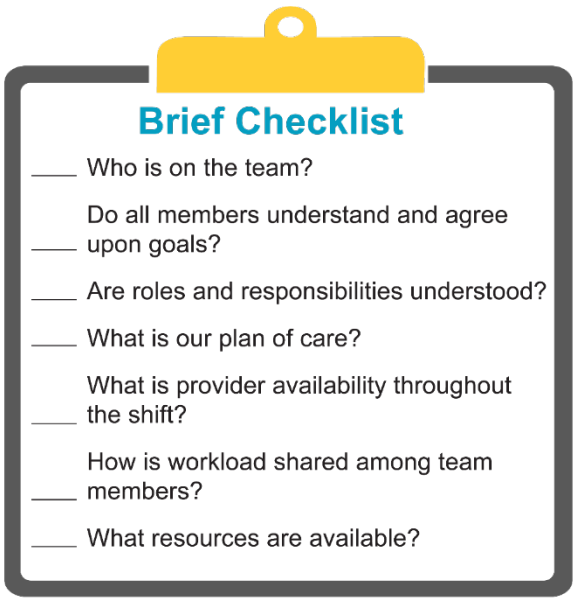
Teamwork Skill #2: Team Leadership

Teams are sets of people communicating, coordinating, and collaborating—in this case, to provide optimal care to patients. They can be formal or informal and the team membership may change from day to day. They include health workers as well as other workers in the hospital. Patients and family caregivers are always a part of the team.

Effective team leaders establish and maintain shared mental models needed to ensure optimal patient care. Regularly reviewing information in team meetings, as well as having informal conversations with team members, helps maintain shared mental models and foster effective teamwork.

One type of meeting that can be helpful to share the plan for the day and coordinate team members is a "brief." This is a type of short check-in meeting with staff present for a shift and can help establish communication norms for the rest of the day. See the checklist on the right with some topics to cover in this type of meeting.

Formal team leaders also have an important role in communicating information to those outside the department. This can take the form of regular reports or advocacy related to a specific challenge the team is facing. See "Appendix A: Advocating to Overcome Challenges" for more details.



Teamwork Skill #3: Situation Monitoring

Situation monitoring ensures new or changing information is identified for communication and decision making. It includes awareness of the status of the patient, the status of other team members, and progress towards the goal.

Team members can help maximize situational awareness if they:

- Share information with the team
- Request information from others
- Direct information to specific team members
- Include patient or family in communication
- Maintain documentation
- Know and understand where to focus attention
- Know and understand the plan
- Inform team members when the plan has changed

Teamwork Skill #4: Mutual Support

Also called “backup behaviour,” mutual support involves team members assisting one another, providing and receiving feedback on performance, and advocating assertively when patient safety is threatened. Team resilience can be strengthened by simply asking other team members, “I have 10 minutes, how can I help?”

Helping others with tasks builds a strong, trusting team. Effective teams place all offers and requests for assistance in the context of patient safety. Team members foster a climate where it is expected that assistance will be actively **sought** and **offered**. Assistance is **sought from** and **provided to** patients and family caregivers.

The Ten Steps of Inpatient Care chart in this Toolkit is based on the concept of mutual support. It includes Primary and Back-up responsibilities to guide assisting one another with tasks.

Team Member Roles and Responsibilities

Understanding our own role and the roles of other team members can help our team function well. In a small team, we may need to share roles to make sure the patient does not need to wait for treatments.

Team member roles and responsibilities are displayed in three different ways in this Toolkit.

- First, the IMAM guideline describes the roles of staff related to caring for children with malnutrition.
- The Admission Workflow chart describes the steps in admitting a child with SAM and which team member is usually responsible for each step.
- The Ten Steps of Inpatient Care chart lists the 10 steps and includes both the primary team member(s) responsible and who can be a “back-up” if the primary is unavailable. In addition, it highlights which steps are urgent, so all team members can prioritize these critical steps.

Roles and Responsibilities

As specified by IMAM 2021, p. 16

Clinician/Doctor	Nurse/Nutritionist
- Conducts initial medical assessments (triage, history-taking, examinations, investigations, and treatment) of SAM children with complications. - Work in collaboration with nutritionists, nurses, and other healthcare workers in managing the child and required intervention. - Monitor child’s recovery progress. - Conduct daily ward rounds to establish whether the child is responding to drugs and feeds and makes adjustments based on his/her progress. - Assesses children who fail to respond to treatment or present diagnostic difficulty and manage complications. - Take action to transfer children to the OTP (if recovering) or to critical care (if their condition is worsening).	- Performs triage and admits SAM children with medical complications to inpatient care. - Registers children using the registration numbers given at the OTP and enters his/her information into the registration book and the critical care pathway. - Collaborate with the clinician to review children in the inpatient care daily. - Administer and document all medications, including ReSoMal. - Call the child’s OTP to inform the staff of his/her arrival and discuss any details not recorded on the transfer form upon transfer from inpatient care. - Ensure that all 10 steps for the inpatient management of children with SAM are followed. - Ensure that inpatient care procedures are followed, including taking vital signs as stipulated in the protocol.

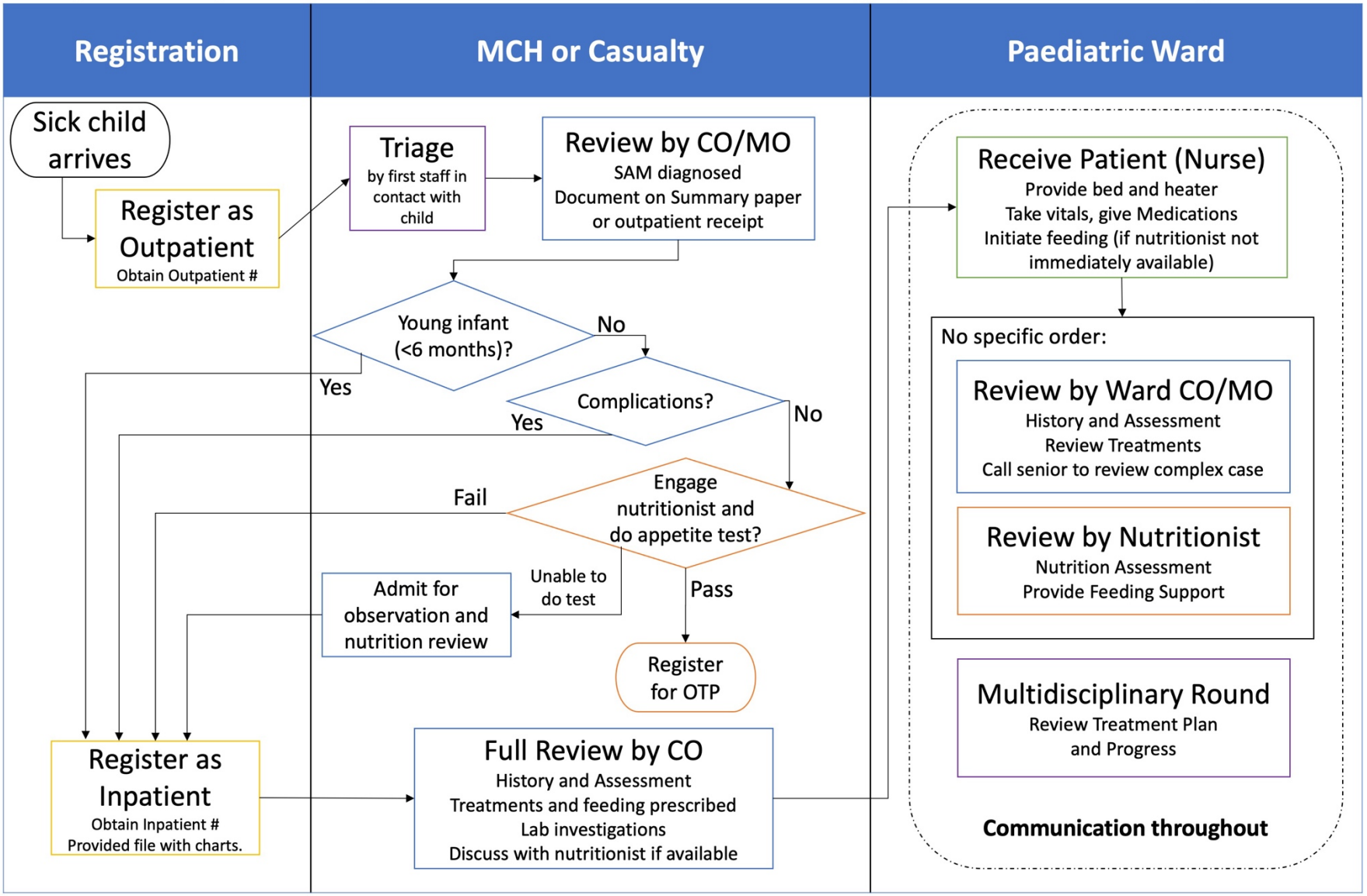
OTP = Outpatient Therapeutic Programme
ReSoMal = Rehydration Solution for Malnutrition

Admission Workflow

Admission of a child with SAM

TeAMS Toolkit
Team Approach to Malnutrition Services
v1.0 August 2023

This diagram outlines the process of admitting a child with Severe Acute Malnutrition. Roles indicated are a guide; other team members should offer support as needed.



Ten Steps of Inpatient Care

The roles listed here are a guide. All team members can help to provide care or alert other staff when support is needed.

10 Steps	Task Description [1 and 2]	Team Member(s) Responsible [3 and 4]		Urgent To be done immediately	Comments
		Primary	Back-up		
Triage	Assess for emergency signs and identify SAM	First person in contact with child	CO/MO (MCH/Casualty)		Alert senior if complex case[3]
Step 1	Assess and treat hypoglycaemia	Nutritionist or anyone noticing lethargy in child	CO/MO, Nurse		Prevent by ensuring feeding starts within 30 minutes.
Step 2	Assess and treat hypothermia	Nurse	CO/MO, Nutritionist		
Step 3	Assess and treat dehydration	Clinical Officer	Medical Officer, Nurse, Nutritionist		
Step 4	Correct electrolyte imbalance	Nutritionist	CO/MO		Commercial formulas contain needed electrolytes.
Step 5	Treat infections	CO (prescribe) Nurse (administer)	Medical Officer		
Step 6	Check and correct micronutrient deficiencies	Nutritionist	Clinical Officer, Medical Officer		Commercial formulas contain needed micronutrients.
Step 7	Start cautious feeding (prescribe and begin feeding)	Nutritionist	Clinical Officer (prescribe/initiate) Nurse (initiate/monitor)		Directly observe first several feeds and alert senior if vomiting everything
Step 8	Monitor catch-up growth (ensure appetite and weight are monitored and start catch-up feeding)	Nutritionist	Nurse (take weight) CO/MO (review)		
Step 9	Assure sensory stimulation (provide a caring and stimulating environment for the child)	Nutritionist, Nurse	CO/MO		Instruct caregiver on activities.
Step 10	Prepare for follow up (start educating the family so they help in the acute treatment and are ready for discharge)	Nutritionist	Nurse, CO/MO		

Sources 1: Basic Paediatric Protocol (2022); 2: Integrated Management of Acute Malnutrition (2021); 3: TeAMS Toolkit study data (Pre-pilot survey and Cycle 1 design sessions); 4: Study team knowledge of study site

Key Information from IMAM

The following section includes key information needed to offer treatment for children with Severe Acute Malnutrition, based on the IMAM guideline. These resources provide information on critical topics needed to initiate and adjust treatment for children with SAM, focusing on feeding.

This information includes guidance for:

1. Reconstituting Formulas
2. Feeding and nutrition plans, considerations, and goals for the three phases of treatment (Stabilization, Transition, and Rehabilitation).

3. Feeding of infants 2-6 months old
    a. Feeding plans for children with and without the prospect of breastfeeding
    b. Supplemental Suckling technique

Reconstituting Formulas

Important!

Always mix formula using full scoops of powder and the amount of water specified. This ensures the correct concentration.
After mixing, measure the exact amount of formula needed for the patient.

F-75

1 scoop + 25ml water = 27.5ml F-75

Volume needed (ml)	Scoops	Water (ml)
1 – 27	1	25
28 – 55	2	50
56 – 82	3	75
83 – 110	4	100
111 – 137	5	125
137 – 165	6	150
166 – 192	7	175
193 – 220	8	200
221 – 247	9	225
248 – 275	10	250

F-100

1 scoop + 25ml water = 28.5ml F-100

Volume needed (ml)	Scoops	Water (ml)
1 – 28	1	25
29 – 57	2	50
58 – 85	3	75
86 – 114	4	100
115 – 142	5	125
143 – 171	6	150
172 – 199	7	175
200 – 228	8	200
229 – 256	9	225
257 – 285	10	250
286 – 313	11	275
314 – 342	12	300
343 – 370	13	325
371 – 399	14	350
400 – 427	15	375

Storage

One mixed, formula must be used:

- within 2 hours (room temperature)
- within 12 hours (stored in fridge)

This will prevent dangerous bacterial growth.

Diluted F-100

F-100 + 30% extra water

Volume needed (ml)	F-100 Scoops	Water (ml)
1 – 36	1	32
37 – 72	2	65
73 – 108	3	98
109 – 144	4	130

Stabilization Phase

Feeding Prescription:

**If severe dehydration, provide initial treatment for dehydration before starting feeding.

Patient Characteristics		Feeding Prescription		
Oedema	**Age**	**Type**	**Volume**	**More detail**
No/Mild Oedema	< 6 months	Diluted F100 OR Expressed breast milk OR infant formula	130ml/kg/day	Breastfeed first, then give feed. See Table 4
	6-59 months	F75	130ml/kg/day	Table 1: Column A
Severe oedema (+++ includes face)	<6 months AND 6-59 months	F75	100ml/kg/day	Table 1: Column B

Considerations

- Breastfed children should be offered breastmilk for 20 minutes. Thirty minutes to 1 hour later, give the therapeutic feed. Do supplemental suckling to provide formula while stimulating milk production. (IMAM 2021 p. 64) See Infants section for detail.
- If the child is unable to feed orally or is taking less than 75% of the prescribed diet per day, insert nasogastric tube (NGT) for feeding. Each day, try feeding orally before using NGT. (IMAM 2021 p. 40)
- If there is deterioration during the stabilization phase, reduce the diet to 50% of the recommended intake until all signs and symptoms disappear and then gradually increase the amount given. (IMAM 2021 p. 49) Signs of deterioration: respiratory distress, worsening oedema, jugular vein engorgement (BPP 2022 p 45)

Nutrition Goals

- Reduce oedema
- Restore appetite
- Prevent osmotic diarrhoea
- Maintain weight – Weight gain is **not** the goal during stabilization. Weight may decrease in children with oedema or increase if severe dehydration.

Criteria to advance to Transition Phase (IMAM 2021 p.45)

- Appetite returned – Taking all prescribed feed orally (nasogastric tube removed)
- Severe Oedema reduced (From severe to moderate or mild)
- Treatment for complications commenced and child recovering

Table 1: Stabilization Phase – 6-59 months (and <6 months with Severe Oedema)

	Column A: No or moderate oedema				Column B: Severe oedema, even face			
Type	**F75** (130ml/kg/day) [1]				**F75** (100ml/kg/day) [2]			
Weight (kg)	**Total feeds / 24hrs** (ml per day)	**3 hourly feed volume** (ml per feed)	**Mixing from F-75 powder** [3]		**Total feeds / 24hrs** (ml per day)	**3 hourly feed volume** (ml per feed)	**Mixing from F-75 powder** [3]	
			Scoops	**Water** (ml)			**Scoops**	**Water** (ml)
3.5-3.9	520	65	3	75	400	50	2	50
4.0-4.4	560	70	3	75	440	55	2	50
4.5-4.9	640	80	3	75	480	60	3	75
5.0-5.4	720	90	4	100	520	65	3	75
5.5-5.9	800	100	4	100	600	75	3	75
6.0-6.4	840	105	4	100	640	80	3	75
6.5-6.9	880	110	4	100	680	85	4	100
7.0-7.4	960	120	5	125	720	90	4	100
7.5-7.9	1000	125	5	125	800	100	4	100
8.0-8.4	1080	135	5	125	840	105	4	100
8.5-8.9	1160	145	6	150	880	110	4	100
9.0-9.4	1200	150	6	150	920	115	5	125
9.5-9.9	1280	160	6	150	1000	125	5	125
10.0-10.4	1360	170	7	175	1040	130	5	125
10.5-10.9	1400	175	7	175	1080	135	5	125
11.0-11.4	1480	185	7	175	1120	140	6	150
11.5-11.9	1520	190	7	175	1200	150	6	150
12.0-12.9	1640	205	8	200	1280	160	6	150
13.0-13.9	1840	230	9	225	1360	170	7	175
14.0-14.9	2000	250	10	250	1480	185	7	175

1: 3 hourly feeding volume obtained from IMAM 2021 Table 2.7, with added rows for 0.5 kg intervals for 6-12 kgs. 24 hourly volumes calculated from this.
2: Feeding volumes adapted from BPP 2022 pg 45, adjusted to fit weight ranges.
3: Mix the amount indicated (based on full scoops), then measure the prescribed volume for the child and discard the extra. Source: Instruction on F-75 Tin: 1 scoop + 25 ml water = 27.5ml F-75.

Transition Phase

Feeding Prescription:

Patient Characteristics		Feeding Prescription		
Age	**Breastfeeding**	**Type**	**Volume per day**	**More detail**
< 6 months	Breastfeeding	Diluted F100 OR Expressed breast milk OR infant formula	130ml/kg/day	Table 4: Part A
	No prospect of breastfeeding	Diluted F100 OR infant formula	~175ml/kg/day	Table 4: Part B
6-59 months	n/a	RUTF	1/3 packet/kg/day (75% of this meets Transition goal)	See Table 2.
		F100	130ml/kg/day	

Considerations (IMAM 2021, p 45-46)

- Transition phase is usually 2-3 days, during this time F75 is replaced by RUTF or F100, or a combination of the two.
- Most children will be discharged home on RUTF, so RUTF is used for transition.
    - Initially alternate F100 and RUTF. This may be alternated every 3 hours, or by giving F100 during the day and RUTF at night. If RUTF is tolerated, change to only RUTF for the remainder of Transition phase.
    - Give the mother the full day's amount of RUTF. She should offer small portions of RUTF frequently, with water offered during and after the RUTF.
    - Staff should monitor RUTF intake at least 5 times a day. If the child is not taking 75% of the RUTF, give F100 to make up the deficit. See "Transition Phase – Calculating Intake of RUTF and F100" in the Toolkit for examples.
    - If RUTF is refused, give F100 and offer RUTF again the next day.
- If the child is not expected to be discharged home on RUTF, use F100 for Transition
    - Days 1-2: Feeding plan is the same as Stabilization Phase, replacing F75 with F100. The schedule may be changed to 6 feeds per day.
- If there is deterioration during the transition phase, return to the Stabilization Phase.

Nutrition goals (IMAM 2021 p.45)

- Increase calorie intake from 100kcal/kg/day to 130kcal/kg/day, while avoiding fluid overload or refeeding syndrome.
- Begin slowly gaining weight (about 6g/kg/day).

Criteria to advance to Rehabilitation Phase

- Good appetite: taking all F100 or at least 75% of RUTF

<u>Transition Phase</u> – Calculating Intake of RUTF and F100

During Transition phase, F100 and RUTF may be alternated. In addition, F100 is used to top up if the child is not taking enough RUTF. The equivalents to the right are used to calculate intake. Below are two examples for how to determine if the child is meeting the needed intake, and how to respond if they are not.

RUTF to F100 equivalents (IMAM 2021 p.47 footnote)	
RUTF (fraction of packet)	**F100** (ml, rounded to nearest 5ml)
1/8	60
1/4	125
1/2	250
3/4	375
1	500

<u>Example 1 – Alternating F100 and RUTF</u>

Age: 1 y 5 mo Admission Wt.: 8.1 kg

Table 2 (Transition Phase) says:

Type	**RUTF** (500kcal packs) [1]		**F100** (130ml/kg/day) [2]	
Weight (kg)	**Daily ration** (packets)	**75% of daily ration**	**Total feeds / 24hrs** (ml)	**8 feeds/day** (ml per feed)
8.0-8.4	3	2.25	1080	135

At 10am, the decision is made to start Transition Phase. The mother is given 3 packs of RUTF. She is instructed to give 135ml of F100, and then alternate giving a portion of RUTF (with water) or the F100 at each 3 hourly feeding time.

Throughout the day and night, the feeding is well documented. Indicating the following:

11am – F100 135 ml
2pm – RUTF
5pm – RUTF
8pm – F100 135ml
11pm – RUTF (1 pack finished)
2am – no feeding
5 am – RUTF
8am – RUTF (2 packs finished)

Total:
2 packs RUTF
270 ml F100

During review the next day, you need to decide if they took enough to meet the calorie goal? There are two options for how to determine this:

Use the 75% RUTF goal (convert F100 volume to RUTF packs)	**Use the F100 daily total** (convert RUTF packs to F100 volume)
This child needs to take 2.25 packs of RUTF per day to meet the Transition Phase calorie goal (75% of daily ration). They took 2 packs of RUTF. The child also took 270 ml of F100, this is equivalent to a little more than ½ pack of RUTF. In total, this is about 2.5 packs of RUTF, so they met the goal and do not need more.	This child needs about 1080 ml/day of F100 to meet their calorie goal. 2 packs of RUTF are equivalent to 1000 ml of F100 (500 x 2). They also took 270ml of F100. They consumed the equivalent of 1270 ml of F100. This is more than the goal, so they do not need more.

Example 2 – Taking RUTF

Age: 3 y 2 mo Admission Wt.: 10.5 kg

Table 2 (Transition Phase) says:

Type	**RUTF** (500kcal packs) [1]		**F100** (130ml/kg/day) [2]	
Weight (kg)	**Daily ration** (packets)	**75% of daily ration**	**Total feeds / 24hrs** (ml)	**8 feeds/day** (ml per feed)
10.5-10.9	4	3	1400	175

It is the second day of Transition Phase. Yesterday the child tolerated alternating F100 and RUTF, so today they will advance to taking only RUTF. At 10am, the mother is given 4 packs of RUTF. She is told to give small portions of RUTF (with water) throughout the day and night.

Throughout the day and night, the feeding is well documented. Indicating the following:

11am – RUTF
2pm – RUTF
5pm – RUTF
8pm – RUTF (1 pack finished)
11pm – RUTF
2am – no feeding
5 am – RUTF (2 packs finished)
8am – RUTF

Total: 2.75 packs RUTF

During review the next day, you need to decide if they took enough to meet the calorie goal?

Use the 75% RUTF goal
This child needs to take 3 packs of RUTF per day to meet the Transition Phase calorie goal (75% of daily ration). They took 2.75 packs of RUTF. This is 0.25 packs less than the goal. Based on the chart 0.25 (1/4) pack of RUTF = 125ml F100. Give the child a top up of 125ml F100. Continue with the RUTF feeding plan, encouraging the mother to give a little bit more each feed.

Table 2: Transition Phase - 6-59 months

Type	**RUTF** (500kcal packs) [1]		**F100** (130ml/kg/day) [2]						
Weight (kg)	**Daily ration** (packets)	**75% of daily ration**	**Total feeds / 24hrs** (ml)	**8 feeds/day 3-hourly** (ml per feed)	**8 feeds/day: Mixing F-100** [3]		**6 feeds/day 4-hourly** (ml per feed)	**6 feeds/day: Mixing F-100** [3]	
					Scoops	**Water** (ml)		**Scoops**	**Water** (ml)
3.5-3.9	1.25	0.94	520	65	3	75	80	3	75
4.0-4.4	1.5	1.13	560	70	3	75	90	4	100
4.5-4.9	1.5	1.13	640	80	3	75	100	4	100
5.0-5.4	2	1.5	720	90	4	100	110	4	100
5.5-5.9	2	1.5	800	100	4	100	125	5	125
6.0-6.4	2	1.5	840	105	4	100	135	5	125
6.5-6.9	2.5	1.88	880	110	4	100	145	6	150
7.0-7.4	2.5	1.88	960	120	5	125	155	6	150
7.5-7.9	2.5	1.88	1000	125	5	125	165	6	150
8.0-8.4	3	2.25	1080	135	5	125	180	7	175
8.5-8.9	3	2.25	1160	145	6	150	190	7	175
9.0-9.4	3	2.25	1200	150	6	150	200	8	200
9.5-9.9	3.5	2.63	1280	160	6	150	210	8	200
10.0-10.4	3.5	2.63	1360	170	6	150	220	8	200
10.5-10.9	4	3	1400	175	7	175	230	9	225
11.0-11.4	4	3	1480	185	7	175	245	9	225
11.5-11.9	4	3	1520	190	7	175	255	9	225
12.0-12.9	4	3	1640	205	8	200	270	10	250
13.0-13.9	4.5	3.38	1840	230	9	225	290	11	275
14.0-14.9	5	3.75	2000	250	9	225	310	11	275

1: Adapted from IMAM 2021 Table 2.11 and BPP 2022 pg 45. Some rations increased from source tables so that 75% of ration ≈ 130kcal/kg/day

2: 3 hourly feeding volume obtained from IMAM 2021 Table 2.10, with added rows for 0.5 kg intervals for 6-12 kgs. 24 hourly volumes calculated from 3 hourly volumes. Some volumes changed from source tables so that daily intake ≈ 130ml/kg/day

3: Mix the amount indicated (based on full scoops), then measure the prescribed volume for the child and discard the extra. Source: Instruction on F-100 Tin: 1 scoop + 25 ml water = 28.5ml F-100

Rehabilitation Phase

Feeding Prescription:

Patient Characteristics		Feeding Prescription		
Age	**Breastfeeding**	**Type**	**Volume per day**	**More detail**
< 6 months	Breastfeeding	Diluted F100 OR Expressed breast milk OR infant formula	130ml/kg/day	Table 4: Part A
	No prospect of breastfeeding	Diluted F100 OR infant formula	~260ml/kg/day	Table 4: Part B
6-59 months	n/a	RUTF (preferred)	Increased	Table 3.
		F100	Gradually increase to about 200ml/kg/day	

Considerations (IMAM 2021, p 49)

- RUTF is preferred in order to prepare the child for discharge home.
- If taking F100:
    - Increase the volume of each feed by 10 ml until some feed is uneaten. This is expected at about 200ml/kg/day.
    - Monitor closely for signs of fluid overload while increasing feeding volume.
- If the child remains hungry after completing a feed, more can be offered.
- 6-59 months: Gradually introduce other foods, RUTF can be mixed into uji.
- If there is deterioration during the rehabilitation phase of treatment, the child should be returned to the stabilization phase.

Nutrition goals

- Catch up growth (weight gain ~10g/kg/day) and correcting micronutrient deficiency

Criteria for Discharge

- If medical complications no longer require inpatient management and they are taking RUTF, transfer to Outpatient Treatment Programme.
- If Weight-for-height is > - 3 or MUAC is >11.5cm and no oedema for 2 weeks, they may be discharged as “cured” and referred for Supplemental Feeding Programme .

Table 3: Rehabilitation Phase - 6-59 months

Type	**RUTF** (500kcal packs) [1]	**F100** (increase slowly to approximately 200 ml/kg/day) [2]						
Weight (kg)	**Daily ration** (packets)	**Total feeds / 24hrs** (ml)	**6 feeds/day ~4-hourly** (ml per feed)	**6 feeds/day: Mixing F-100** [3]		**5 feeds/day** (ml per feed)	**5 feeds/day: Mixing F-100** [3]	
				Scoops	**Water** (ml)		**Scoops**	**Water** (ml)
3.5-3.9	1.25	720	120	5	125	150	6	150
4.0-4.4	1.5	840	140	5	125	170	6	150
4.5-4.9	1.75	900	150	6	150	190	7	175
5.0-5.4	2	1080	180	7	175	210	8	200
5.5-5.9	2	1140	190	7	175	225	8	200
6.0-6.4	2.5	1260	210	8	200	250	9	225
6.5-6.9	2.5	1320	220	8	200	270	10	250
7.0-7.4	2.5	1440	240	9	225	290	11	275
7.5-7.9	3	1530	255	9	225	310	11	275
8.0-8.4	3	1620	270	10	250	330	12	300
8.5-8.9	3	1740	290	11	275	350	13	325
9.0-9.4	3.5	1800	300	11	275	370	13	325
9.5-9.9	3.5	1950	325	12	300	390	14	350
10.0-10.4	3.5	2100	350	13	325	410	15	375
10.5-10.9	4	2160	360	13	325	430	16	400
11.0-11.4	4	2250	375	14	350	450	16	400
11.5-11.9	4.5	2340	390	14	350	470	17	425
12.0-12.9	4.5	2520	420	15	375	490	18	450
13.0-13.9	4.5	2700	450	16	400	530	19	475
14.0-14.9	5	2880	480	17	425	575	21	525

1: Adapted from IMAM 2021 Table 2.11 and BPP 2022 pg 45. Some rations changed from source tables so that ration ≈ 175kcal/kg/day

2: Adapted from IMAM 2021 Table 2.13, with added rows for 0.5 kg intervals for 6-12 kgs. Some volumes changed from source tables so that daily intake ≈ 200ml/kg/day

3: Mix the amount indicated (based on full scoops), then measure the prescribed volume for the child and discard the extra. Source: Instruction on F-100 Tin: 1 scoop + 25 ml water = 28.5ml F-100

Infants less than 6 months

Feeding Plan

Formula: Diluted F-100 (preferred), expressed breast milk, or standard infant formula
If severe oedema: F75 is used in stabilization. Never use full-strength F100.

Feeding plans depend on the possibility of breastfeeding.

If breastfeeding is possible: (IMAM 2021 p 64-66)
Goal: Assess breastfeeding and support the mother to ensure adequate milk supply. Supplement the breast milk until a return to exclusive breastfeeding is possible.

Plan: At least 8 times a day, breastfeed for 20 minutes, wait 30 min – 1 hour, then supplement with Dilute F100 (Table 4 Part A). Give this amount using the Supplementary Sucking method. Offer additional breastfeeding if the child cries or seems to want more.

There are no phases. Weight gain on the same supplementation amount is a sign of increasing breast milk supply. Changes to the feeding volume are based on weight assessment.

Supporting mothers
Infants who are malnourished are weak and often do not suckle strongly enough to stimulate adequate production of breast milk. The mother often thinks she has insufficient breast milk and is apprehensive about her ability to adequately feed her child. Breast milk supply is demand-led, the more the baby breastfeeds, the more breast milk the mother will produce. All team members should offer encouragement to mothers and help them build confidence.

If the child:	**Then:**
Loses weight over three days yet seems hungry and is taking all the F100 Diluted	Add 5mls to each feed
Continues to gain weight but does not finish all the supplemental milk	Continue, this is a sign of increased breastmilk production
Gains at least 20g per day (irrespective of his/her weight)	Decrease the quantity of F100 Diluted to half of the maintenance amount.
After decreasing F100 to half:	
Weight gain is maintained (at least 10g per day)	Stop supplemental suckling completely. Monitor for a few more days, then discharge if continued weight gain.
Weight gain is not maintained	Increase the amount given to 75% of the maintenance amount. After two to three days, reduce it again if weight gain is maintained.

If breastfeeding is NOT possible: (IMAM 2021 p 69-70)
Goal: Support nutritional recovery. Engage social worker and ensure plans to meet ongoing nutritional needs are in place before discharge.

Plan: Progression through Phases (Stabilization, Transition, Rehabilitation) with increasing volumes of Dilute F100 (Table 4 Part B). Criteria for progression are the same as in older children.

Supplementary Suckling (IMAM 2021 p 66-67)

Prepare the tube:

- Use a n.8 or n.5 NG tube. If there are side pores, cut off the tip so there is only one opening.
- Align the tip of the tube with the tip of the nipple. If needed, use a piece of tape to secure the tube.
- Place the other end in a cup with the formula.
- As the baby suckles the nipple and tube together, the tube acts as a straw and they will take in the formula.

Image credit: UpToDate

Cup Placement

- The level of the cup determines if the milk flows faster or slower. Low = slow; High = fast
- Initial feedings and for weak infants: place the cup 5-10 cm below the nipple
- Stronger infants: place the cup up to 30 cm below the nipple
- Never place the cup higher than the nipple.

Notes:

- After feeding is completed, flush clean water through the tube using a syringe.
- For the first feeds, the health worker may need to help the mother hold the cup. With encouragement, most mothers are able to learn to use the technique independently.
- It may take one or two days for the infant to get used to the tube and the taste of the mixture of milks, but it is important to persevere.

Table 4: Infants < 6 months – Diluted F100

Part A: Breastfeeding is possible: Breastfeed for 20 minutes before each feed and do Supplemental Suckling. This is critical to increase milk supply!

Weight (kg)	**Stabilization Phase**		**Progression is based on weight monitoring**
	Total feeds / 24hrs (ml)	**3 hourly feed volume** (ml)	
<=1.2	160	20	Losing weight for 3 days and acts hungry → Increase each feed by 5ml Gaining weight, but won't finish formula → Sign of increased breastmilk production, continue Gains 20g/day → Ween off formula (see details on overview page)
1.3-1.5	200	25	
1.6-1.8	240	30	
1.9-2.1	280	35	
2.2-2.4	320	40	
2.5-2.7	360	45	
2.8-2.9	400	50	
3.0-3.4	440	55	
3.5-3.9	480	60	
4.0-4.4	560	70	

Making Diluted F-100

F-100 + 30% extra water

Volume needed (ml)	**F-100 Scoops**	**Water (ml)**
1 – 35	1	32
40 – 70	2	65
75 – 105	3	98
110 – 145	4	130

Mix water and powder, and then measure the volume needed.

Part B: Breastfeeding is not possible

Weight (kg)	**Stabilization Phase** 130ml/kg/day		**Transition Phase** increase by 1/3; ~175ml/kg/day		**Rehabilitation Phase** double starting amount, 260ml/kg/day	
	Total feeds / 24hrs (ml)	**3 hourly feed volume** (ml)	**Total feeds / 24hrs** (ml)	**3 hourly feed volume** (ml)	**Total feeds / 24hrs** (ml)	**3 hourly feed volume** (ml)
<=1.2	160	20	200	25	280	35
1.3-1.5	200	25	240	30	360	45
1.6-1.8	240	30	280	35	440	55
1.9-2.1	280	35	360	45	520	65
2.2-2.4	320	40	400	50	600	75
2.5-2.7	360	45	440	55	680	85
2.8-2.9	400	50	520	65	760	95
3.0-3.4	440	55	560	70	840	105
3.5-3.9	480	60	640	80	960	120
4.0-4.4	560	70	720	90	1120	140

Source: Guidance on ml/kg/day from IMAM 2021 pg 64-65 and 69-70. Feed volumes calculated to reach this daily recommendation (IMAM tables not used as they exceed this recommendation.)

Monitoring and Documentation

Once admitted, children with SAM need frequent treatment and monitoring during the first several days to ensure that their condition is improving. Monitoring become less intensive as they advance through the phases of inpatient treatment for SAM.

Assessment, Monitoring, and Treatment Frequency

	Stabilization Phase	**Transition Phase**	**Rehabilitation Phase**
Assessment and Review	Full assessment Weight and oedema Daily review of treatment plan	Full assessment Weight and oedema Daily review of treatment plan	Full assessment Weight and oedema Daily review of treatment plan
Vital Sign monitoring** (Temp, HR, RR)	6 times a day	4 times a day	3 times a day *more frequent while increasing fluid intake
Feeding (including monitoring of feeding)	8 times a day (3 hourly day and night)	6 or 8 times a day	5 or 6 times a day (Infants: 8 times a day)
Output (vomiting and stool)	Discuss with caregiver and document during each contact.		
Other	Medications Caregiver education (Stimulation, Feeding) Prepare for discharge		

** Monitor vital signs every 30 minutes if any emergency sign or severe complication is present - including shock, severe dehydration, hypoglycaemia, and severe anaemia. More frequent monitoring may also be needed if there are other complications or comorbidities.

Full assessment includes: Cough, liver size, respirations, dehydration status

Additional monitoring:

- MUAC – every 7 days
- Length/Height – every 21 days

Documentation

Documentation is a critical form of team communication. For children with SAM, it is especially important that weight, feeding intake, and output (vomit/stool) are well documented. Their progression through the phases of inpatient treatment depends on accurate and well-organized documentation.

When documentation is well organized, it is easy for team members to find the information they need and review how the patient is progressing. To support this, a new Bedside Monitoring Chart is provided in this Toolkit, along with examples of how it can be completed. This Bedside Monitoring Chart will supplement the Paediatric Treatment Chart and other documentation tools already in use.

A summary of key assessments and where to document them is provided here.

Item	**Where to Document**
Vital Signs	Vital Signs Chart
Weight	Bedside Monitoring Chart
Oedema	Bedside Monitoring Chart
Feeding Plan	Bedside Monitoring Chart, also note in inpatient file.
Feeding (time, amount taken, route)	Bedside Monitoring Chart
Output (stool and vomit)	Bedside Monitoring Chart
Assessment	Clinician notes
Medications	Paediatric Treatment Chart

The Bedside Monitoring Chart for SAM should be:

- started upon admission for every child diagnosed with SAM (if no printed copies are available, use a blank paper to create one – see Example 2)
- placed on the wall at the bedside – using a clipboard or plastic pocket when possible.
- filled in by any team members when reviewing patients. Caregivers may also be instructed to add information, which can be reviewed and confirmed by staff.
- reviewed for completeness during handover.
- moved to the patient file as soon as the decision to discharge is made.

When the plan changes or a new ration of RUTF is provided, it is helpful to indicate the time of day when this change was made. See Examples.

Bedside Monitoring Chart for SAM with medical complications

Name					IP #			Age			
Date Of Admission			Diagnosis			Admission Wt: kg			MUAC:		
	Day	1	2	3	4	5	6	7	8	9	10
	Date										
Assess	Weight										
	Oedema										
Feeding Plan		Initial Plan	continue □	continue □	continue □	continue □	continue □	continue □	continue □	continue □	continue □
	Treatment Phase										
	Type										
	Amount/24 hours										
	Frequency (# /day)										
	Amount per feed										
	Scoops:Water (ml)										
	NGT										
	Other (Breastfeeding, ReSoMal, etc)										
Feeding and Output	12 midnight 1 am										
	2 am 3 am										
	4 am 5 am										
	6am 7am										
	8 am 9 am										
	10 am 11 am										
	12 noon 1 pm										
	2 pm 3 pm										
	4 pm 5 pm										
	6 pm 7 pm										
	8 pm 9 pm										
	10 pm 11 pm										

Oedema: 0 none, + mild(feet/ankles), ++ (both feet plus lower legs, hands, or arms), +++ severe(generalized, including face)

Feeding (indicate volume): ✓ = Feeding completed; ~ = Partially Completed; NG = via NGT; BF = Breastfed; X = Missed
If Missed or <80% taken, add reason: R = Refused; A = Absent; N = No formula

Output: V = Vomit (estimate volume)
Stool: S = Solid (Firm or Soft); L = Loose; W = Watery

Example 1: Child 6-59 months

Bedside Monitoring Chart for SAM with medical complications

TeAMS Toolkit v1.1 Oct 2023

Name: John Onyango | IP #: | Age: 1y 5m

Date Of Admission: 2/8/2023 | Diagnosis: SAM | Admission Wt: 8.1 kg | MUAC: 105 mm

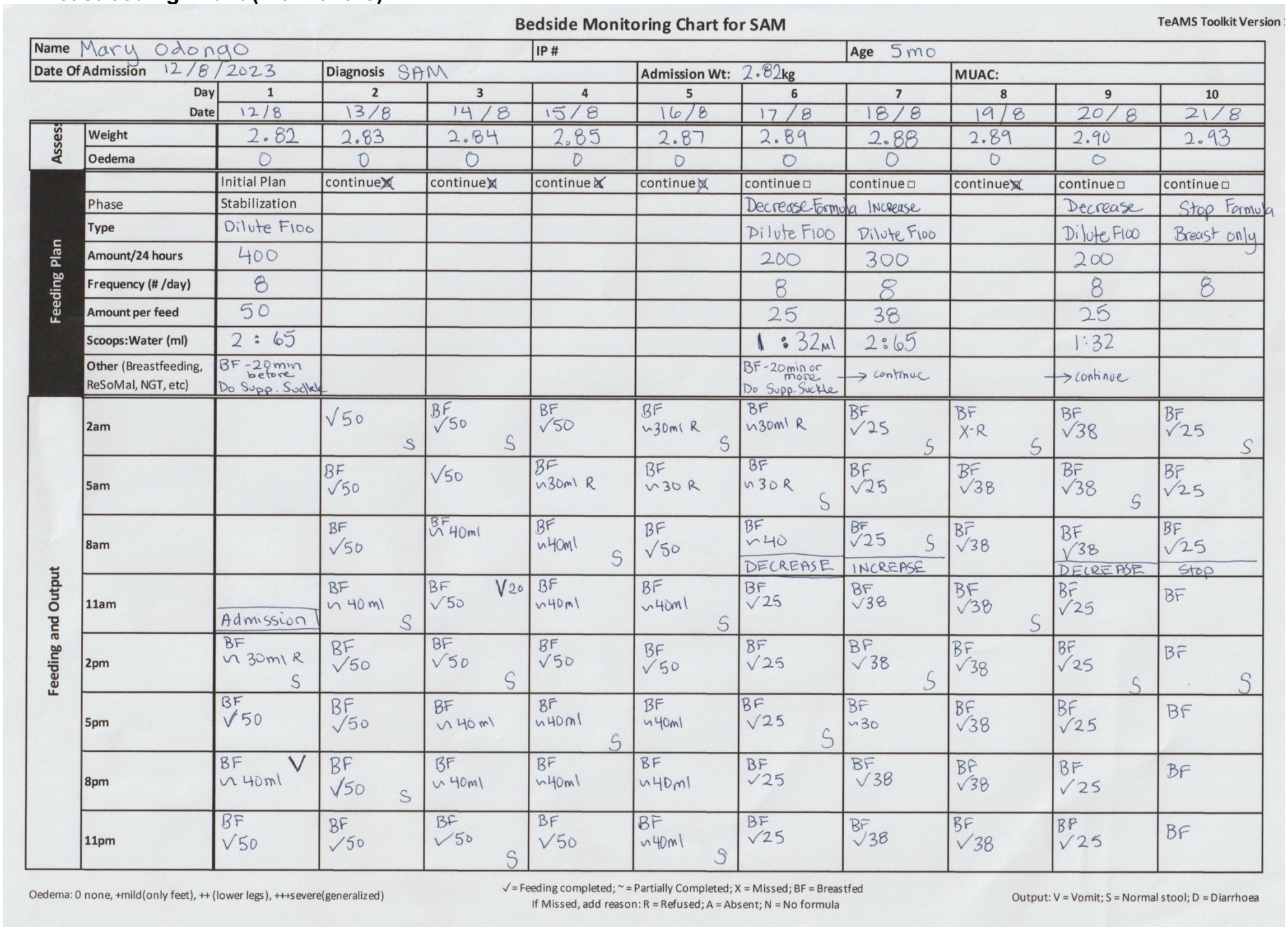
		Day	1	2	3	4	5	6	7	8	9	10
		Date	2/8	3/8	4/8	5/8	6/8	7/8	8/8	9/8	10/8	11/8
Assess	Weight		8.1	8.0	8.2	8.3	8.4	8.5	8.7	8.8	8.9	8.9
	Oedema		++	+	0	0	0	0	0	0	0	0
Feeding Plan			Initial Plan	continue ~~x~~	continue □	continue ~~x~~	continue □	continue □	continue ~~x~~	continue □	continue ~~x~~	continue □
	Treatment Phase		Stabilization		Stabilization		Transition	Transition		Rehabilitation		Discharge
	Type		F75		F75		F100	F100 / RUTF		RUTF		to OTP
	Amount/24 hours		1080ml		1080ml		1080	3 packs Goal 2.25		3 packs		on RUTF
	Frequency (# /day)		12		8		8	8		6		
	Amount per feed		90ml		135ml		135	135				
	Scoops:Water (ml)		4:100		5:125		5:125					
	NGT		3pm - Insert NGT									
	Other (Breastfeeding, ReSoMal, etc)			Try oral				Alternate F100 and RUTF			add uji 2x/day	
Feeding and Output	12 midnight / 1 am			NG 90 S	✓90							
	2 am / 3 am			NG 90	✓90	✓135	✓135	✓135	X	X	X	
	4 am / 5 am			NG 90	✓90	✓135	✓135	∿120	✓RUTF - 2 pack done	✓135	✓	✓
	6am / 7am			NG 90 V40	✓90	S			L		S	
	8 am / 9 am		Admission ∿70ml - R	NG 90	✓90	✓135	✓135 CHANGE TO F100	✓135 ADD RUTF	✓135 new ration	✓ RUTF - 2 packs done REHABILITATION	✓ - 3 packs done	✓ + uji 3packs done
	10 am / 11 am		∿80	✓90 - oral	✓90 CHANGE	✓135	✓135	✓RUTF	✓RUTF	✓	new ration	
	12 noon / 1 pm		∿60 R L	∿85	TO 8/day			S		S	✓ + uji	
	2 pm / 3 pm		∿65 R	✓90 S	∿120	✓135	∿115 L	✓135	✓135ml			
	4 pm / 5 pm		NG 90	✓90 NGT removed	✓135	✓135 S	∿125	✓RUTF - 1 pack done	✓RUTF - 1 pack done	✓ - 1 pack done	✓ 1 pack done	
	6 pm / 7 pm		NG 90	✓90					S	✓	S	
	8 pm / 9 pm		NG 90	✓90	✓135	✓135	✓135 S	✓135ml	✓135ml	✓ - 2 packs done	✓	
	10 pm / 11 pm		X-A	✓90	✓135	✓135	✓135	✓RUTF	✓RUTF		✓ 2 packs done	

Oedema: 0 none, + mild(feet/ankles), ++ (both feet plus lower legs, hands, or arms), +++ severe(generalized, including face)

Feeding (indicate volume): ✓ = Feeding completed; ~ = Partially Completed; NG = via NGT; BF = Breastfed; X = Missed
If Missed or <80% taken, add reason: R = Refused; A = Absent; N = No formula

Output: V = Vomit (estimate volume)
Stool: S = Solid (Firm or Soft); L = Loose; W = Watery

Example 2: Breastfeeding Infant (2-6 months)



Bedside Monitoring Chart for SAM

TeAMS Toolkit Version

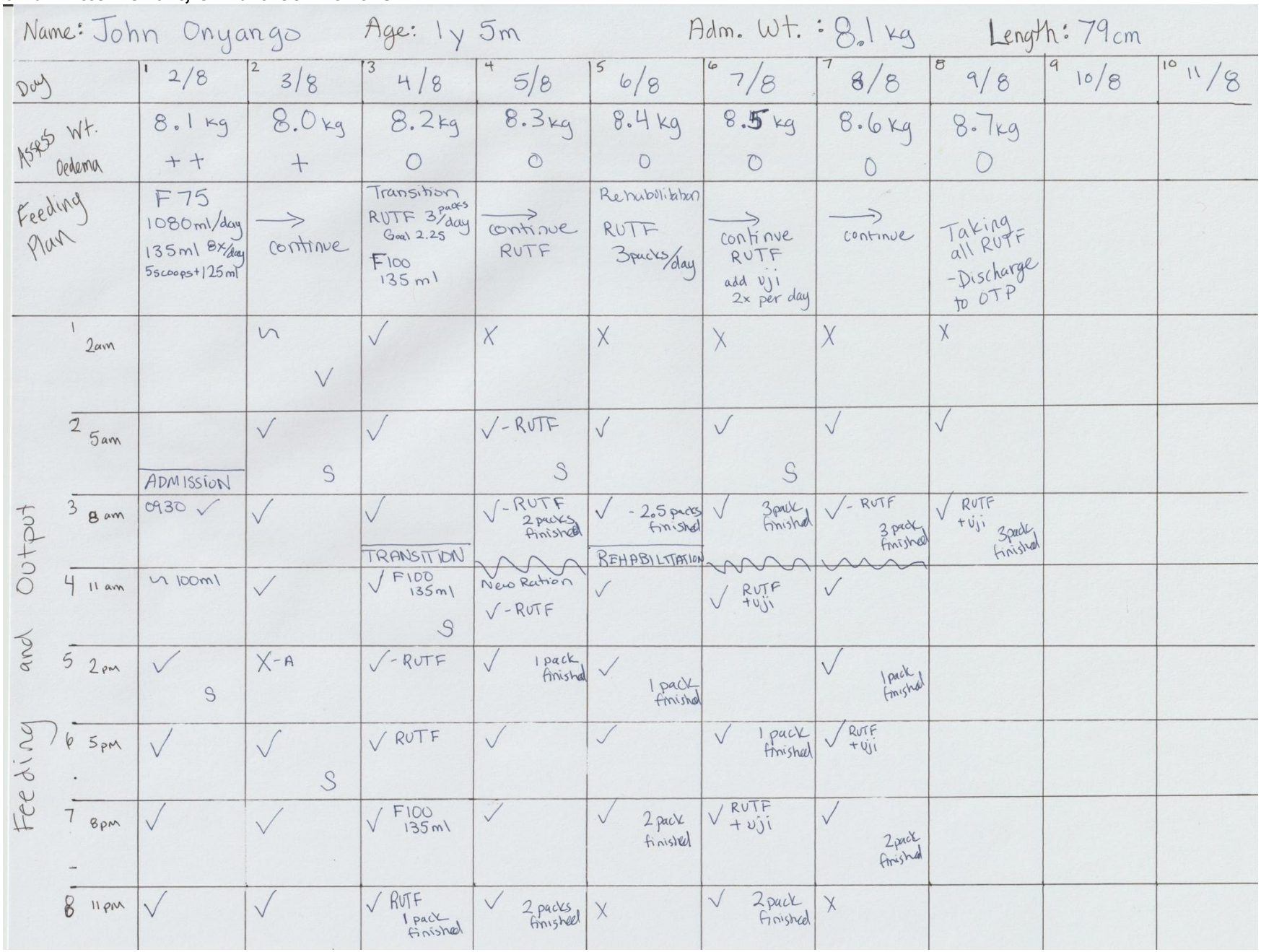
Name	Mary Odongo			IP #			Age	5mo			
Date Of Admission	12/8/2023	Diagnosis	SAM		Admission Wt:	2.82kg		MUAC:			
	Day	1	2	3	4	5	6	7	8	9	10
	Date	12/8	13/8	14/8	15/8	16/8	17/8	18/8	19/8	20/8	21/8
Assess	Weight	2.82	2.83	2.84	2.85	2.87	2.89	2.88	2.89	2.90	2.93
	Oedema	0	0	0	0	0	0	0	0	0	
Feeding Plan		Initial Plan	continue☒	continue☒	continue☒	continue☒	continue☐	continue☐	continue☒	continue☐	continue☐
	Phase	Stabilization					Decrease Formula Increase			Decrease	Stop Formula
	Type	Dilute F100					Dilute F100	Dilute F100		Dilute F100	Breast only
	Amount/24 hours	400					200	300		200	
	Frequency (# /day)	8					8	8		8	8
	Amount per feed	50					25	38		25	
	Scoops:Water (ml)	2 : 65					1 : 32ml	2:65		1:32	
	Other (Breastfeeding, ReSoMal, NGT, etc)	BF -20min before Do Supp. Suckle					BF -20min or more Do Supp. Suckle	→ continue		→ continue	
Feeding and Output	2am		BF √50 S	BF √50 S	BF √50	BF ~30ml R S	BF ~30ml R	BF √25 S	BF X-R S	BF √38	BF √25 S
	5am		BF √50	√50	BF ~30ml R	BF ~30 R	BF ~30 R S	BF √25	BF √38	BF √38 S	BF √25
	8am		BF √50	BF ~40ml	BF ~40ml S	BF √50	BF ~40 DECREASE	BF √25 S INCREASE	BF √38	BF √38 DECREASE	BF √25 Stop
	11am	Admission	BF ~40ml S	BF √50 V20	BF ~40ml	BF ~40ml S	BF √25	BF √38	BF √38 S	BF √25	BF
	2pm	BF ~30ml R S	BF √50	BF √50 S	BF √50	BF √50	BF √25	BF √38 S	BF √38	BF √25 S	BF S
	5pm	BF √50	BF √50	BF ~40ml	BF ~40ml S	BF ~40ml	BF √25 S	BF ~30	BF √38	BF √25	BF
	8pm	BF ~40ml V	BF √50 S	BF ~40ml	BF ~40ml	BF ~40ml	BF √25	BF √38	BF √38	BF √25	BF
	11pm	BF √50	BF √50	BF √50 S	BF √50	BF ~40ml S	BF √25	BF √38	BF √38	BF √25	BF

Oedema: 0 none, +mild(only feet), ++ (lower legs), +++severe(generalized)

✓= Feeding completed; ~ = Partially Completed; X = Missed; BF = Breastfed
If Missed, add reason: R = Refused; A = Absent; N = No formula

Output: V = Vomit; S = Normal stool; D = Diarrhoea

Example 3: Handwritten chart, child 6-59 months



Name: John Onyango Age: 1y 5m Adm. Wt.: 8.1 kg Length: 79cm

Day	1 2/8	2 3/8	3 4/8	4 5/8	5 6/8	6 7/8	7 8/8	8 9/8	9 10/8	10 11/8
Assess Wt. / Edema	8.1 kg ++	8.0 kg +	8.2 kg 0	8.3 kg 0	8.4 kg 0	8.5 kg 0	8.6 kg 0	8.7 kg 0		
Feeding Plan	F75 1080ml/day 135ml 8x/day 5 scoops+125ml	→ continue	Transition RUTF 3 packs/day Goal 2.25 F100 135 ml	→ continue RUTF	Rehabilitation RUTF 3packs/day	→ continue RUTF add uji 2x per day	→ continue	Taking all RUTF -Discharge to OTP		
Feeding and Output 1 2am		∽ V	✓	X	X	X	X	X		
2 5am	ADMISSION	✓ S	✓	✓ - RUTF S	✓	✓ S	✓	✓		
3 8 am	0930 ✓	✓	✓ TRANSITION	✓ - RUTF 2 packs finished	✓ - 2.5 packs finished REHABILITATION	✓ 3pack finished	✓ - RUTF 3 pack finished	✓ RUTF +uji 3pack finished		
4 11 am	∽ 100ml	✓	✓ F100 135ml S	Neo Ration ✓ - RUTF	✓	✓ RUTF +uji	✓			
5 2 pm	✓ S	X-A	✓ - RUTF	✓ 1 pack finished	✓ 1 pack finished		✓ 1 pack finished			
6 5pm	✓	✓ S	✓ RUTF	✓	✓	✓ 1 pack finished	✓ RUTF +uji			
7 8pm	✓	✓	✓ F100 135ml	✓	✓ 2 pack finished	✓ RUTF +uji	✓ 2pack finished			
8 11 pm	✓	✓	✓ RUTF 1 pack finished	✓ 2 packs finished	X	✓ 2pack finished	X			

References and Additional Resources

Two guidelines from the Ministry of Health in Kenya were the primary sources of information for this guideline:

- Integrated Management of Acute Malnutrition, 2nd Edition, 2021
    - Not available online. Contact the KEMRI-UW team for soft copy.
- Basic Paediatric Protocols, 5th Edition, November 2022
    - Available here: https://paediatrics.uonbi.ac.ke/sites/paediatrics.uonbi.ac.ke/files/2023-04/Basic%20Paediatric%20protocol%205th%20edition%20FOR%20PRINT%2031st%20Oct%202022.pdf

Additional content related to management of children with acute malnutrition from the World Health Organization (WHO):

- Primary guideline: Guideline: updates on the management of severe acute malnutrition in infants and children, 2013, https://www.who.int/publications/i/item/9789241506328
- Recent update that supplements the 2013 version: WHO guideline on the prevention and management of wasting and nutritional oedema (acute malnutrition) in infants and children under 5 years – v1.1 published July 2013, https://app.magicapp.org/#/guideline/7330
- Pocket book of hospital care for children, 2nd edition, 2013. https://www.who.int/publications/i/item/978-92-4-154837-3

Appendix A: Advocating to Overcome Challenges – Talking Points

Team Leaders often need to advocate to others outside the department. A persuasive message often includes the rationale, brief background information, a problem statement, and a call to action. Below are some talking points to consider including in these communications. They should be tailored for the audience and needs of the department.

When starting an advocacy conversation, start by providing an <u>overarching rationale</u>:

- Children admitted with severe wasting are very vulnerable. They are six times as likely to die during their admission.
- With treatment, most of these children can survive!
- [*Give a personal story of a positive outcome*]

When advocating about issues related to <u>nutritionist availability</u>, try adapting the following messages:

Background

- The care for a child with SAM is very intensive. It requires feeding and monitoring at least 3 hourly, and the caregivers often need a lot of support at the beginning.
- The nutritionists are a critical part of our team. They have special expertise in assessing nutritional needs and supporting caregivers.
- Nutritionists are especially important during the initial diagnosis process, when they perform an appetite test which determines the need for outpatient or inpatient care.

Problem statement

- Right now, it is very difficult to offer our patients the care they need on the weekend because the staff are not enough. There are rarely nutritionists available on the weekend.

Call to Action

- A top priority is improving access to a nutritionist over the weekend. Some options that could be considered are:
    - Hiring additional full-time nutritionists, with weekend rotation.
    - Locum nutritionists on the weekend.
    - An on-call nutritionist on the weekend, to review new admissions or respond to emerging problems.

When advocating about issues related to <u>commodity availability</u>, try adapting the following messages:

Background

- Children admitted with SAM must be fed every 3 hours, day and night, to prevent hypoglycaemia.
- They are also at high risk of infection, so the formulas they are given must be prepared carefully to avoid contamination.
- When the official commodities are in stock, it is quick and easy to prepare feeds for children with SAM

Problem statement

- The special commodities for children with SAM are frequently out of stock.
- When they are out of stock, we try to make an enriched milk, but this is very time consuming, so it can’t be done if a nutritionist is not available.

Call to Action

- Our top priority is to have your help in procuring the commodities for these children (F75, F100, RUTF, and ReSoMal).
    - If these commodities are not already on the essential medicines list, can you help get them added?
- If these commodities cannot be **consistently** procured, we would like your help in procuring the supplies for an enriched milk to use as an alternative.
    - Because this is time consuming to prepare, it can't be done every 3 hours when staffing is low. Procuring a refrigerator for the malnutrition room would allow for safe storage of the formula for 12 hours.

Appendix 3A – Search Strategy

			PubMed Search (feb 14 - PubMed v4)			CINAHL Complete (EBSCO Host)		
Dimension	Criteria	Terminology	#	Search	Results (Feb 14 2024)	#	String	#
Country	LMIC (World Bank 2021 data)	Country names	1	afghanistan[tw] OR afghanistan's[tw] OR afghanistani[tw] OR afghanistani's[tw] OR afghani[tw] OR afghani's[tw] OR afghan[tw] OR afghans[tw] OR (africa*[tw] NOT African-American*[tw]) OR albania[tw] OR albania's[tw] OR albanian[tw] OR albanians[tw] OR algeria[tw] OR algeria's[tw] OR algerian[tw] OR algerians[tw] OR angola[tw] OR angola's[tw] OR angolan[tw] OR angolans[tw] OR antigua*[tw] OR barbuda*[tw] OR argentin*[tw] OR armenia[tw] OR armenia'S[tw] OR armenian[tw] OR armenians[tw] OR azerbaijan*[tw] OR bangladesh*[tw] OR bengal*[tw] OR bangal*[tw] OR belarus*[tw] OR belorus*[tw] OR byelarus*[tw] OR byelorus*[tw] OR belize*[tw] OR benin*[tw] OR bhutan*[tw] OR bolivia[tw] OR bolivia's[tw] OR bolivian[tw] OR bolivians[tw] OR bosnia*[tw] OR herzegovin*[tw] OR botswan*[tw] OR batswan*[tw] OR brazil[tw] OR brazil's[tw] OR brazilian[tw] OR brazilians[tw] OR brasil[tw] OR brasil's[tw] OR brasilian[tw] OR brasilians[tw] OR bulgaria*[tw] OR burkina*[tw] OR burkinese*[tw] OR burundi*[tw] OR cabo-verde*[tw] OR cape-verde*[tw] OR cambodia[tw] OR cambodia's[tw] OR cambodian[tw] OR cambodians[tw] OR kampuchea*[tw] OR cameroon*[tw] OR cameroun*[tw] OR chad*[tw] OR chile[tw] OR chile's[tw] OR chilean[tw] OR chileans[tw] OR china[tw] OR china's[tw] OR chinese[tw] OR colombia[tw] OR colombia's[tw] OR colombian[tw] OR colombians[tw] OR comoro*[tw] OR comore*[tw] OR comorian* OR mayotte*[tw] OR congo*[tw] OR costa-rica[tw] OR costa-rica's[tw] OR costa-rican[tw] OR costa-ricans[tw] OR cote-d'ivoir*[tw] OR cote-d'ivoir*[tw] OR cote-divoir*[tw] OR cote-d-ivoir*[tw] OR ivory-coast*[tw] OR ivorian*[tw] OR croatia*[tw] OR cuba[tw] OR cuba's[tw] OR cuban[tw] OR cubans[tw] OR djibouti*[tw] OR	2758003	1	(afghanistan OR afghanistan's OR afghanistani OR afghanistani's OR afghani OR afghani's OR afghan OR afghans OR (africa* NOT African-American*) OR albania OR albania's OR albanian OR albanians OR algeria OR algeria's OR algerian OR algerians OR angola OR angola's OR angolan OR angolans OR antigua* OR barbuda* OR argentin* OR armenia OR armenia'S OR armenian OR armenians OR azerbaijan* OR bangladesh* OR bengal* OR bangal* OR belarus* OR belorus* OR byelarus* OR byelorus* OR belize* OR benin* OR bhutan* OR bolivia OR bolivia's OR bolivian OR bolivians OR bosnia* OR herzegovin* OR botswan* OR batswan* OR brazil OR brazil's OR brazilian OR brazilians OR brasil OR brasil's OR brasilian OR brasilians OR bulgaria* OR burkina* OR burkinese* OR burundi* OR cabo-verde* OR cape-verde* OR cambodia OR cambodia's OR cambodian OR cambodians OR kampuchea* OR cameroon* OR cameroun* OR chad* OR chile OR chile's OR chilean OR chileans OR china OR china's OR chinese OR colombia OR colombia's OR colombian OR colombians OR comoro* OR comore* OR comorian OR mayotte* OR congo* OR costa-rica OR costa-rica's OR costa-rican OR costa-ricans OR cote-d'ivoir* OR cote-d'ivoir* OR cote-divoir* OR cote-d-ivoir* OR ivory-coast* OR ivorian* OR croatia* OR cuba OR cuba's OR cuban OR cubans OR djibouti* OR french-somaliland* OR dominica* OR ecuador* OR egypt* OR united-arab-republic* OR el-salvador* OR guinea* OR equatoguinea* OR eritrea* OR eswatini* OR swaziland* OR swazi* OR swati* OR ethiopia* OR fiji* OR gabon* OR gambia* OR ((georgia OR georgian OR georgians) NOT (atlanta OR california OR florida)) OR ghana* OR grenada* OR grenadian* OR guatemala* OR guyana* OR guiana* OR guyanese* OR haiti* OR hispaniola* OR hondura* OR hungary* OR india* OR indonesia* OR iran* OR iraq* OR jamaica* OR jordan* OR kazakh* OR kenya* OR kiribati* OR karabati* OR korea* OR kosovo* OR kosova* OR kyrgyz* OR kirgiz* OR kirghiz* OR	750149
		Developing country (headings)		n/a		2	(MH "Developing Countries")	19996
		Developing country (terms)	2	developing-country[tw] OR developing-countries[tw] OR developing-nation[tw] OR developing-nations[tw] OR developing-population[tw] OR developing-populations[tw] OR developing-world[tw] OR less-developed-country[tw] OR less-developed-countries[tw] OR less-developed-nation[tw] OR less-developed-nations[tw] OR less-developed-world[tw] OR lesser-developed-country[tw] OR lesser-developed-countries[tw] OR lesser-developed-nation[tw] OR lesser-developed-nations[tw] OR lesser-developed-world[tw] OR under-developed-country[tw] OR under-developed-countries[tw] OR under-developed-nation[tw] OR under-developed-nations[tw] OR under-developed-world[tw] OR underdeveloped-country[tw] OR underdeveloped-countries[tw] OR underdeveloped-nation[tw] OR underdeveloped-nations[tw] OR underdeveloped-world[tw] OR global-south[tw] OR least-developed-countries[tw]	159,157	3	developing-country OR developing-countries OR developing-nation OR developing-nations OR developing-population OR developing-populations OR developing-world OR less-developed-country OR less-developed-countries OR less-developed-nation OR less-developed-nations OR less-developed-world OR lesser-developed-country OR lesser-developed-countries OR lesser-developed-nation OR lesser-developed-nations OR lesser-developed-world OR under-developed-country OR under-developed-countries OR under-developed-nation OR under-developed-nations OR under-developed-world OR underdeveloped-country OR underdeveloped-countries OR underdeveloped-nation OR underdeveloped-nations OR underdeveloped-world OR global-south OR least-developed-countries	35317

			PubMed Search (feb 14 - PubMed v4)			CINAHL Complete (EBSCO Host)		
Dimension	Criteria	Terminology	#	Search	Results (Feb 14 2024)	#	String	#
		LMIC and synonyms focused on economy	3	middle-income-country[tw] OR middle-income-countries[tw] OR middle-income-nation[tw] OR middle-income-nations[tw] OR low-income-country[tw] OR low-income-countries[tw] OR low-income-nation[tw] OR low-income-nations[tw] OR lower-income-country[tw] OR lower-income-countries[tw] OR lower-income-nation[tw] OR lower-income-nations[tw] OR underserved-country[tw] OR underserved-countries[tw] OR underserved-nation[tw] OR underserved-nations[tw] OR under-served-nation[tw] OR under-served-nations[tw] OR deprived-country[tw] OR deprived-countries[tw] OR lmic[tw] OR lmics[tw] OR third-world[tw] OR lami-country[tw] OR lami-countries[tw] OR poor-country[tw] OR poor-countries[tw] OR poor-nation[tw] OR poor-nations[tw] OR poor-world[tw] OR poorer-country[tw] OR poorer-countries[tw] OR poorer-nation[tw] OR poorer-nations[tw] OR poorer-world[tw] OR developing-economy[tw] OR developing-economies[tw] OR less-developed-economy[tw] OR less-developed-economies[tw] OR underdeveloped-economy[tw] OR underdeveloped-economies[tw] OR under-developed-economy[tw] OR under-developed-economies[tw] OR middle-income-economy[tw] OR middle-income-economies[tw] OR low-income-economy[tw] OR low-income-economies[tw] OR lower-income-economy[tw] OR lower-income-economies[tw] OR low-gdp[tw] OR low-gnp[tw] OR low-gross-domestic[tw] OR low-gross-national[tw] OR lower-gdp[tw] OR lower-gnp[tw] OR lower-gross-domestic[tw] OR lower-gross-national[tw] OR transitional-country[tw] OR transitional-countries[tw] OR emerging-economy[tw] OR emerging-economies[tw] OR emerging-nation[tw] OR emerging-nations[tw]	57388	4	middle-income-country OR middle-income-countries OR middle-income-nation OR middle-income-nations OR low-income-country OR low-income-countries OR low-income-nation OR low-income-nations OR lower-income-country OR lower-income-countries OR lower-income-nation OR lower-income-nations OR underserved-country OR underserved-countries OR underserved-nation OR underserved-nations OR under-served-nation OR under-served-nations OR deprived-country OR deprived-countries OR lmic OR lmics OR third-world OR lami-country OR lami-countries OR poor-country OR poor-countries OR poor-nation OR poor-nations OR poor-world OR poorer-country OR poorer-countries OR poorer-nation OR poorer-nations OR poorer-world OR developing-economy OR developing-economies OR less-developed-economy OR less-developed-economies OR underdeveloped-economy OR underdeveloped-economies OR under-developed-economy OR under-developed-economies OR middle-income-economy OR middle-income-economies OR low-income-economy OR low-income-economies OR lower-income-economy OR lower-income-economies OR low-gdp OR low-gnp OR low-gross-domestic OR low-gross-national OR lower-gdp OR lower-gnp OR lower-gross-domestic OR lower-gross-national OR transitional-country OR transitional-countries OR emerging-economy OR emerging-economies OR emerging-nation OR emerging-nations	21076
		Continents/ Regions with more LMICs	4	pacific-island*[tw] OR polynesia*[tw] OR melanesia*[tw] OR arab-countr*[tw] OR arabic-countr*[tw] OR middle-east*[tw] OR sahara* OR subsahara* OR magreb*[tw] OR maghrib*[tw] OR west-indies*[tw] OR caribbean*[tw] OR central-america[tw] OR central-america's[tw] OR central-american[tw] OR central-americans[tw] OR latin-america[tw] OR latin-america's[tw] OR latin-american[tw] OR latin-americans[tw] OR south-america[tw] OR south-america's[tw] OR south american[tw] OR south-americans[tw] OR asia-central[tw] OR central-asia[tw] OR central-asia's[tw] OR central-asian[tw] OR central-asians[tw] OR asia-northern[tw] OR north-asia[tw] OR north-asia's[tw] OR north-asian[tw] OR north-asians[tw] OR northern-asia[tw] OR northern-asia's[tw] OR northern-asian[tw] OR northern-asians[tw] OR asia-southeastern[tw] OR southeastern-asia[tw] OR southeastern-asia's[tw] OR southeastern-asian[tw] OR southeastern-asians[tw] OR south-eastern-asia[tw] OR south-eastern-asia's[tw] OR south-eastern-asian[tw] OR south-eastern-asians[tw] OR southeast-asia[tw] OR southeast-asia's[tw] OR southeast-asian[tw] OR southeast-asians[tw] OR south-east-asia[tw] OR south-east asia's[tw] OR south-east-asian[tw] OR south-east-asians[tw] OR asia-western[tw] OR west-asia[tw] OR west-asia's[tw] OR west-asian[tw] OR west-asians[tw] OR western-asia[tw] OR western-asia's[tw] OR western-asian[tw] OR western-asians[tw] OR europe-eastern[tw] OR east-europe[tw] OR east-europe's[tw] OR east-european[tw] OR east-europeans[tw] OR eastern-europe[tw] OR eastern-europe's[tw] OR eastern-european[tw] OR eastern-europeans[tw]	237,042	5	pacific-island* OR polynesia* OR melanesia* OR arab-countr* OR arabic-countr* OR middle-east* OR sahara* OR subsahara* OR magreb* OR maghrib* OR west-indies* OR caribbean* OR central-america OR central-america's OR central-american OR central-americans OR latin-america OR latin-america's OR latin-american OR latin-americans OR south-america OR south-america's OR south american OR south-americans OR asia-central OR central-asia OR central-asia's OR central-asian OR central-asians OR asia-northern OR north-asia OR north-asia's OR north-asian OR north-asians OR northern-asia OR northern-asia's OR northern-asian OR northern-asians OR asia-southeastern OR southeastern-asia OR southeastern-asia's OR southeastern-asian OR southeastern-asians OR south-eastern-asia OR south-eastern-asia's OR south-eastern-asian OR south-eastern-asians OR southeast-asia OR southeast-asia's OR southeast-asian OR southeast-asians OR south-east-asia OR south-east asia's OR south-east-asian OR south-east-asians OR asia-western OR west-asia OR west-asia's OR west-asian OR west-asians OR western-asia OR western-asia's OR western-asian OR western-asians OR europe-eastern OR east-europe OR east-europe's OR east-european OR east-europeans OR eastern-europe OR eastern-europe's OR eastern-european OR eastern-europeans	50020

			PubMed Search (feb 14 - PubMed v4)			CINAHL Complete (EBSCO Host)		
Dimension	Criteria	Terminology	#	Search	Results (Feb 14 2024)	#	String	#
		Some additional terms	5	high-burden-countr*[tw] OR high-burden-nation*[tw] OR countdown-countr*[tw] OR countdown-nation*[tw] OR human-development-index[tw]	2572	6	high-burden-countr* OR high-burden-nation* OR countdown-countr* OR countdown-nation* OR human-development-index	765
		Combine	6	Combine (1-5 OR) Note - Terms not found: afghanistani's, afghani's, albania's, algeria's, bolivia's, burkinese*, cote-divoir*, lesothan*, lesothonian*, malay-federation, malaya-federation, malayan-federation, nauran, naurian's, navigator-island*, kittian*, togo's, lesser-developed-country, lesser-developed-nation, lesser-developed-world, under-developed-nation, north-asia's, northern-asia's, southeastern-asia's, south-eastern-asia's, south-eastern-asians, west-asia's, western-asia's, east-europe's, countdown-nation*, lower-income-nation, underserved-country, underserved-nation, under-served-nation, under-served-nations, deprived-country, poorer-country, poorer-nation, poorer-world, under-developed-economy, under-developed-economies, lower-income-economy, lower-gnp, lower-gross-national	2,919447 (1780922 in 2010-2023)	7	Combine terms with OR	792039
Guidelines			7	"Practice Guidelines as Topic"[MeSH Terms] OR "Clinical Protocols"[MeSH Terms] OR "Critical Pathways"[MeSH Terms] OR "Health Planning Guidelines"[MeSH Terms] OR "Checklist"[MeSH Terms]	337071	8	(MH "Practice Guidelines" OR MH "Protocols+")	130235
		Guideline - with some relation to adherence	8		119774	9	(MH "Guideline Adherence") OR ((guideline* OR protocol* OR checklist) N8 (use OR adhere* OR adopt* or implement* OR appl*))	65714
Implementation			9	Implement* or uptake "implement*"[All Fields] OR "uptake"[All Fields] OR "uptakes"[All Fields] OR "uptaking"[All Fields]	1203630	10	implement* or uptake	317387
			10	"Quality Improvement" [MeSH Terms] OR "Evidence-Based Medicine" [MeSH Terms]	110416	11	MH "Diffusion of Innovation+" OR MH "Quality Assurance" OR MH "Quality of Nursing Care" OR MH "Professional Practice, Evidence-Based+"	139690
			11	(7 OR 8) AND (9 OR 10) (429578) AND (1295605)	60478	12	(8 or 9) AND (10 OR 11) (177834 AND 437876)	43172
Clinical Area	Inpatient care		12	"ambulatory care"[MeSH Terms]	56762	13	MH "Outpatient Service" OR MH "Ambulatory Care Facilities+" OR MH "Outpaitents"	75918
			13	#4 NOT #5	60010	14	12 NOT 13	42238
			14	6 AND 13	6670	15	7 AND 14	4550
Publication Date	01Jan2010 to 31Dec2023		15	**(2010:2023[pdat])**	5510	16	PUBYEAR IS 2010:2023	4026
Most relevant and Initial Program Theory Terms	Nutrition Care	nutrition, feeding, malnutrition	16	Dietetics[MeSH Terms] OR "Child Nutrition Sciences"[MeSH Terms] OR "Nutrition Therapy"[MeSH Terms] OR "Malnutrition"[MeSH Terms] or "Wasting Syndrome"[MeSH Terms] or "Child Nutrition Disorders"[MeSH Terms] OR "Infant Nutrition Disorders"[MeSH Terms] OR feeding[tw] OR severe-acute-malnutrition[tw]	586265	17	(MH "Nutrition Disorders+" NOT MH "Obesity+") OR MH "Nutrition Services" OR MH "Dietetics" OR MH "Dietitians" OR MH "Nutritionists" OR MH "Feeding Methods+" OR feed* OR Severe-Acute-Malnutrition	177240

			PubMed Search (feb 14 - PubMed v4)			CINAHL Complete (EBSCO Host)		
Dimension	Criteria	Terminology	#	Search	Results (Feb 14 2024)	#	String	#
	Design	UCD, HCD, CBPR, collaborative, co-design, design, group decision making	17	"user-centered design" [MeSH Terms] OR "Community-Based Participatory Research"[Mesh terms] OR co-design OR collaborative OR human-centered-design OR group-decision OR "design process" OR "decision making, shared"[MeSH Terms] "group processes"[Mesh Terms] (translates to: "user-centered design"[MeSH Terms] OR "Community-Based Participatory Research"[MeSH Terms] OR "co-design"[All Fields] OR ("collaborate"[All Fields] OR "collaborated"[All Fields] OR "collaborates"[All Fields] OR "collaborating"[All Fields] OR "collaboration"[All Fields] OR "collaborations"[All Fields] OR "collaborative"[All Fields] OR "collaborative s"[All Fields] OR "collaboratively"[All Fields] OR "collaboratives"[All Fields] OR "collaborator"[All Fields] OR "collaborators"[All Fields]) OR ("universal design"[MeSH Terms] OR ("universal"[All Fields] AND "design"[All Fields]) OR "universal design"[All Fields] OR ("human"[All Fields] AND "centered"[All Fields] AND "design"[All Fields]) OR "human centered design"[All Fields]) OR "group-decision"[All Fields] OR "design process"[All Fields] OR "decision making, shared"[MeSH Terms] OR "group processes"[Mesh Terms]	402144	18	MH "Shared Governance+" OR MH "Decision-making, organizational" OR MH "Decision-making, shared" OR MH "Collaboration" OR user-centered-design OR human-centered-design OR co-design OR process N5 design* OR group n5 decision-making	68032
	Guideline featu	length, complex, availability, accessible, , discrepancy, clarity, job aid, poster, decision support	18	"guideline long"[tiab:~10] OR "guideline length"[tiab:~10] OR "guideline complex"[tiab:~10] OR "guideline complexity"[tiab:~10] OR "guideline clear"[tiab:~10] OR "guideline clarity"[tiab:~10] OR access[tw] OR accessible[tw] OR available[tw] OR availability[tw] OR discrepancy[tw] OR conflicting[tw] OR poster[tw] OR job-aid[tw] OR decision-support[tw] OR "decision support systems, clinical"[MeSH Terms] OR "Decision Support Techniques"[MeSH Terms]	2245770	19	MH "Decision Making, Clinical+" OR ((guideline* OR procedure* OR protocol* OR checklist*) N8 (long OR length OR complex* OR clear OR clarity OR access* OR availab* OR discrepancy OR conflicting)) OR poster OR job-aid OR decision-support OR MH "Information Resources+" OR "Decision Support Systems, Clinical"	670120
	Teamwork	teamwork, team identity, silos, hierarchy, consensus, Communication, Team Leadership, Situation Monitoring, and Mutual Support	19	"Patient Care Team"[Mesh Terms] OR teamwork[tw] OR team-identity[tw] OR silo[tw] or hierarchy[tw] or consensus[tw] or Communication[tw] or "Team Leadership"[tw] or "Situation Monitoring"[tw] or "Mutual Support"[tw]	786929	20	MH "Consensus" OR MH "Multidisciplinary Care Team+" OR MH "Organizational Development" OR MH "Teamwork" OR MH "Team building" OR MH "Group Dynamics+" OR teamwork OR team-identity OR silo or hierarchy or consensus or Communication or "Team Leadership" or "Situation Monitoring" or "Mutual Support"	353388
	Roles/Respons	role clarity, share roles, task sharing, task shifting, task overlap, responsibilities, reinforse, supervision, expectionation, overburden	20	"Role"[Mesh terms] OR "Task shifting"[Mesh Terms] OR "Work performance"[mesh terms] OR "Multitasking behavior"[Mesh Terms] or task-shifting[tw] OR task-sharing[tw] OR task-overlap[tw] OR delegat*[tw] OR role[tw] OR responsibility[tw] OR "reinforcement, psychology"[Mesh Terms] OR "Workload"[Mesh Terms] OR workload[tw] OR supervis*[tw] or reinforce*[tw] or expect*[tw]	4284725	21	MH "Supervisors or Supervision+" OR MH "Workload" OR MH "Role+" OR MH "Task shifting" OR MH "Task Performance and Analysis+" OR MH "Reinforcement (Psychology)OR task-sharing OR task-overlap OR supervis* OR reinforc* or expect*	420212
	Documentatio	multichart, treatment chart, bedside, documentation, monitoring, missed (care/feeds)	21	"reminder systems"[MeSH Terms] OR "Task Performance and Analysis" [Mesh Terms] OR "Medical Records"[Mesh Terms] OR "Hospital Records"[Mesh Terms] OR "Nursing Records"[Mesh Terms] OR document*[tw] or "treatment chart"[tw] OR "Monitoring, physiologic"[Mesh terms] or monitor*[tw] OR "missed care"[tw] OR Multichart	1931437	22	MH "Documentation+" OR document* or "treatment chart" OR MH "Monitoring, physiologic" or monitor* OR "missed care" OR Multichart	532457

			PubMed Search (feb 14 - PubMed v4)			CINAHL Complete (EBSCO Host)		
Dimension	Criteria	Terminology	#	Search	Results (Feb 14 2024)	#	String	#
	Mechanisms/C	buy-in, competence, usabilility, acceptability, feasibility, resistance, adaptation, motivation	22	"Motvation"[Mesh terms] OR "Clinical Competence"[Mesh Terms] OR competen*[tw] OR usab*[tw] OR acceptab*[tw] OR feasib*[tw] OR "resist change"[tiab:~10] OR "resistant change"[tiab:~10] OR adapt*[tw] or motivation[tw]	2061743	23	MH "Dissent and Disputes+" OR MH "Motivation" OR MH "Professional Competence+" OR usab* OR acceptab* OR feasib* OR (resist* N10 change) OR adapt* OR motivation	456336
	Other	trainer, shortage, staffing	23	trainer[tw] OR "staff shortage"[tiab:~10] OR understaff*[tw]	7425	24	MH "understaffing" OR trainer OR (staff* N8 shortage) OR understaff*	16388
			24	(16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23)	10074208	25	(17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24)	2167557
			24	15 AND 24	3809	26	16 AND 25	2571

		Global Health (EBSCO)			SciElo (via Web of Science)			
Dimension	Criteria	#	String	#	#	String	#	
Country	LMIC (World Bank 2021 data)	1	(afghanistan OR afghanistan's OR afghanistani OR afghanistani's OR afghani OR afghani's OR afghan OR afghans OR (africa* NOT African-American*) OR albania OR albania's OR albanian OR albanians OR algeria OR algeria's OR algerian OR algerians OR angola OR angola's OR angolan OR angolans OR antigua* OR barbuda* OR argentin* OR armenia OR armenia'S OR armenian OR armenians OR azerbaijan* OR bangladesh* OR bengal* OR bangal* OR belarus* OR belorus* OR byelarus* OR byelorus* OR belize* OR benin* OR bhutan* OR bolivia OR bolivia's OR bolivian OR bolivians OR bosnia* OR herzegovin* OR botswan* OR batswan* OR brazil OR brazil's OR brazilian OR brazilians OR brasil OR brasil's OR brasilian OR brasilians OR bulgaria* OR burkina* OR burkinese* OR burundi* OR cabo-verde* OR cape-verde* OR cambodia OR cambodia's OR cambodian OR cambodians OR kampuchea* OR cameroon* OR cameroun* OR chad* OR chile OR chile's OR chilean OR chileans OR china OR china's OR chinese OR colombia OR colombia's OR colombian OR colombians OR comoro* OR comore* OR comorian OR mayotte* OR congo* OR costa-rica OR costa-rica's OR costa-rican OR costa-ricans OR cote-d'ivoir* OR cote-d'ivoir* OR cote-divoir* OR cote-d-ivoir* OR ivory-coast* OR ivorian* OR croatia* OR cuba OR cuba's OR cuban OR cubans OR djibouti* OR french-somaliland* OR dominica* OR ecuador* OR egypt* OR united-arab-republic* OR el-salvador* OR guinea*	1871040	1	afghanistan OR afghanistan's OR afghanistani OR afghanistani's OR afghani OR afghani's OR afghan OR afghans OR (africa* NOT African-American*) OR albania OR albania's OR albanian OR albanians OR algeria OR algeria's OR algerian OR algerians OR angola OR angola's OR angolan OR angolans OR antigua* OR barbuda* OR argentin* OR armenia OR armenia'S OR armenian OR armenians OR azerbaijan* OR bangladesh* OR bengal* OR bangal* OR belarus* OR belorus* OR byelarus* OR byelorus* OR belize* OR benin* OR bhutan* OR bolivia OR bolivia's OR bolivian OR bolivians OR bosnia* OR herzegovin* OR botswan* OR batswan* OR brazil OR brazil's OR brazilian OR brazilians OR brasil OR brasil's OR brasilian OR brasilians OR bulgaria* OR burkina* OR burkinese* OR burundi* OR cabo-verde* OR cape-verde* OR cambodia OR cambodia's OR cambodian OR cambodians OR kampuchea* OR cameroon* OR cameroun* OR chad* OR chile OR chile's OR chilean OR chileans OR china OR china's OR chinese OR colombia OR colombia's OR colombian OR colombians OR comoro* OR comore* OR comorian OR mayotte* OR congo* OR costa-rica OR costa-rica's OR costa-rican OR costa-ricans OR cote-d'ivoir* OR cote-d'ivoir* OR cote-divoir* OR cote-d-ivoir* OR ivory-coast* OR ivorian* OR croatia* OR cuba OR cuba's OR cuban OR cubans OR djibouti* OR french-somaliland* OR dominica* OR ecuador* OR egypt* OR united-arab-republic* OR el-salvador* OR guinea*	361540	
		2	DE "Developing Countries" OR DE "Least Developed Countries"	144867		n/a		
		3	developing-country OR developing-countries OR developing-nation OR developing-nations OR developing-population OR developing-populations OR developing-world OR less-developed-country OR less-developed-countries OR less-developed-nation OR less-developed-nations OR less-developed-world OR lesser-developed-country OR lesser-developed-countries OR lesser-developed-nation OR lesser-developed-nations OR lesser-developed-world OR under-developed-country OR under-developed-countries OR under-developed-nation OR under-developed-nations OR under-developed-world OR underdeveloped-country OR underdeveloped-countries OR underdeveloped-nation OR underdeveloped-nations OR underdeveloped-world OR global-south OR least-developed-countries	64486	2	developing-country OR developing-countries OR developing-nation OR developing-nations OR developing-population OR developing-populations OR developing-world OR less-developed-country OR less-developed-countries OR less-developed-nation OR less-developed-nations OR less-developed-world OR lesser-developed-country OR lesser-developed-countries OR lesser-developed-nation OR lesser-developed-nations OR lesser-developed-world OR under-developed-country OR under-developed-countries OR under-developed-nation OR under-developed-nations OR under-developed-world OR underdeveloped-country OR underdeveloped-countries OR underdeveloped-nation OR underdeveloped-nations OR underdeveloped-world OR global-south OR least-developed-countries	6287	

		Global Health (EBSCO)			SciElo (via Web of Science)			
Dimension	Criteria	#	String	#	#	String	#	
		4	middle-income-country OR middle-income-countries OR middle-income-nation OR middle-income-nations OR low-income-country OR low-income-countries OR low-income-nation OR low-income-nations OR lower-income-country OR lower-income-countries OR lower-income-nation OR lower-income-nations OR underserved-country OR underserved-countries OR underserved-nation OR underserved-nations OR under-served-nation OR under-served-nations OR deprived-country OR deprived-countries OR lmic OR lmics OR third-world OR lami-country OR lami-countries OR poor-country OR poor-countries OR poor-nation OR poor-nations OR poor-world OR poorer-country OR poorer-countries OR poorer-nation OR poorer-nations OR poorer-world OR developing-economy OR developing-economies OR less-developed-economy OR less-developed-economies OR underdeveloped-economy OR underdeveloped-economies OR under-developed-economy OR under-developed-economies OR middle-income-economy OR middle-income-economies OR low-income-economy OR low-income-economies OR lower-income-economy OR lower-income-economies OR low-gdp OR low-gnp OR low-gross-domestic OR low-gross-national OR lower-gdp OR lower-gnp OR lower-gross-domestic OR lower-gross-national OR transitional-country OR transitional-countries OR emerging-economy OR emerging-economies OR emerging-nation OR	1142761	3	middle-income-country OR middle-income-countries OR middle-income-nation OR middle-income-nations OR low-income-country OR low-income-countries OR low-income-nation OR low-income-nations OR lower-income-country OR lower-income-countries OR lower-income-nation OR lower-income-nations OR underserved-country OR underserved-countries OR underserved-nation OR underserved-nations OR under-served-nation OR under-served-nations OR deprived-country OR deprived-countries OR lmic OR lmics OR third-world OR lami-country OR lami-countries OR poor-country OR poor-countries OR poor-nation OR poor-nations OR poor-world OR poorer-country OR poorer-countries OR poorer-nation OR poorer-nations OR poorer-world OR developing-economy OR developing-economies OR less-developed-economy OR less-developed-economies OR underdeveloped-economy OR underdeveloped-economies OR under-developed-economy OR under-developed-economies OR middle-income-economy OR middle-income-economies OR low-income-economy OR low-income-economies OR lower-income-economy OR lower-income-economies OR low-gdp OR low-gnp OR low-gross-domestic OR low-gross-national OR lower-gdp OR lower-gnp OR lower-gross-domestic OR lower-gross-national OR transitional-country OR transitional-countries OR emerging-economy OR emerging-economies OR emerging-nation OR	1927	
		5	pacific-island* OR polynesia* OR melanesia* OR arab-countr* OR arabic-countr* OR middle-east* OR sahara* OR subsahara* OR magreb* OR maghrib* OR west-indies* OR caribbean* OR central-america OR central-america's OR central-american OR central-americans OR latin-america OR latin-america's OR latin-american OR latin-americans OR south-america OR south-america's OR south american OR south-americans OR asia-central OR central-asia OR central-asia's OR central-asian OR central-asians OR asia-northern OR north-asia OR north-asia's OR north-asian OR north-asians OR northern-asia OR northern-asia's OR northern-asian OR northern-asians OR asia-southeastern OR southeastern-asia OR southeastern-asia's OR southeastern-asian OR southeastern-asians OR south-eastern-asia OR south-eastern-asia's OR south-eastern-asian OR south-eastern-asians OR southeast-asia OR southeast-asia's OR southeast-asian OR southeast-asians OR south-east-asia OR south-east asia's OR south-east-asian OR south-east-asians OR asia-western OR west-asia OR west-asia's OR west-asian OR west-asians OR western-asia OR western-asia's OR western-asian OR western-asians OR europe-eastern OR east-europe OR east-europe's OR east-european OR east-europeans OR eastern-europe OR eastern-europe's OR eastern-european OR eastern-europeans	779559	4	pacific-island* OR polynesia* OR melanesia* OR arab-countr* OR arabic-countr* OR middle-east* OR sahara* OR subsahara* OR magreb* OR maghrib* OR west-indies* OR caribbean* OR central-america OR central-america's OR central-american OR central-americans OR latin-america OR latin-america's OR latin-american OR latin-americans OR south-america OR south-america's OR south american OR south-americans OR asia-central OR central-asia OR central-asia's OR central-asian OR central-asians OR asia-northern OR north-asia OR north-asia's OR north-asian OR north-asians OR northern-asia OR northern-asia's OR northern-asian OR northern-asians OR asia-southeastern OR southeastern-asia OR southeastern-asia's OR southeastern-asian OR southeastern-asians OR south-eastern-asia OR south-eastern-asia's OR south-eastern-asian OR south-eastern-asians OR southeast-asia OR southeast-asia's OR southeast-asian OR southeast-asians OR south-east-asia OR south-east asia's OR south-east-asian OR south-east-asians OR asia-western OR west-asia OR west-asia's OR west-asian OR west-asians OR western-asia OR western-asia's OR western-asian OR western-asians OR europe-eastern OR east-europe OR east-europe's OR east-european OR east-europeans OR eastern-europe OR eastern-europe's OR eastern-european OR eastern-europeans	30316	

		Global Health (EBSCO)			SciElo (via Web of Science)			
Dimension	Criteria	#	String	#	#	String	#	
		6	high-burden-countr* OR high-burden-nation* OR countdown-countr* OR countdown-nation* OR AB human-development-index	1662	5	high-burden-countr* OR high-burden-nation* OR countdown-countr* OR countdown-nation* OR human-development-index	489	
		7	Combine terms with OR	1970290	6	Combine terms with OR	374822	
Guidelines		8	DE "guidelines" OR DE "checklists"	68010				
		9	(guideline* OR protocol* OR checklist) N8 (use OR adhere* OR adopt* or implement* OR appl*)	25331	7	(guideline* OR protocol* OR checklist) NEAR/8 (use OR adhere* OR adopt* or implement* OR appl*)	9072	
Implementation		10	implement* or uptake	224840	8	implement* or uptake	54744	
		11	DE "quality of care" OR DE "service quality" OR DE "implementation of research"	12219	9	quality-of-care OR quality-improvement OR diffusion-of-innovation OR evidence-based-practice	2630	
		12	(8 or 9) AND (10 OR 11) (84257 AND 233704)	17780	10	#7 AND (#8 OR #9)	2285	
Clinical Area	Inpatient care	13	DE "primary health care"	21807				
		14	12 NOT 13	16961				
		15	7 AND 14	7250	11	#6 AND #10	1095	
Publication Date	01Jan2010 to 31Dec2023	16	PUBYEAR IS 2010:2023	6583	12	PUBYEAR IS 2010:2023	982	
Most relevant and Initial Program Theory Terms	Nutrition Care	17	DE "dietetics" OR DE "nutritional intervention" OR DE "nutritional support" OR DE malnutrition OR DE "protein energy malnutrition" OR DE undernutrition OR severe-acute-malnutrition OR feeding	222,212	13	TS = (protein-energy-malnutrition OR undernutrition OR severe-acute-malnutrition OR feeding OR nutritionist OR dietetics OR (nutrition* NEAR/8 (therapy OR treatment OR support)))	25220	

		Global Health (EBSCO)			SciElo (via Web of Science)			
Dimension	Criteria	#	String	#	#	String	#	
	Design	18	DE "decision making" OR user-centered-design OR human-centered-design OR co-design OR (process N5 design*) OR (group n5 decision-making)	19895	14	user-centered-design OR human-centered-design OR co-design OR (process Near/8 design*) OR (group near/8 decision-making) OR collaborat*	13295	
	Guideline featu	19	DE "Decision Support systems" OR ((guideline* OR procedure* OR protocol* OR checklist*) N8 (long OR length OR complex* OR clear OR clarity OR access* OR availab* OR discrepancy OR conflicting)) OR poster OR job-aid OR decision-support OR DE posters	18492	15	((guideline* OR procedure* OR protocol* OR checklist*) Near/8 (long OR length OR complex* OR clear OR clarity OR access* OR availab* OR discrepancy OR conflicting)) OR poster* OR job-aid* OR decision-support	39061	
	Teamwork	20	DE teamwork OR DE teams OR DE "consensus" OR DE "work teams" OR teamwork OR team-identity OR silo or hierarchy or consensus or Communication or "Team Leadership" or "Situation Monitoring" or "Mutual Support"	109447	16	TS=(teamwork OR team-identity OR silo or hierarchy or consensus or Communication or "Team Leadership" or "Situation Monitoring" or "Mutual Support")	32275	
	Roles/Respons	21	DE "Roles" OR DE "task shifting" OR DE "work sharing" OR DE "work simplification" OR DE "supervisors" OR DE "supervision" OR task-overlap OR supervis* OR reinforc* or expect* OR workload OR role OR task-shift* OR task-shar*	568211	17	Role* OR task-overlap OR supervis* OR reinforc* or expect* OR workload OR task-shift* OR task-shar*	92887	
	Documentatio	22	DE "documentation" OR DE monitoring OR document* or "treatment chart" or monitor* OR "missed care" OR Multichart	327352	18	document* or "treatment chart" or monitor* OR "missed care" OR Multichart	65314	

		Global Health (EBSCO)			SciElo (via Web of Science)			
Dimension	Criteria	#	String	#	#	String	#	
	Mechanisms/C	23	DE motivation OR DE "professional competence" OR usab* OR acceptab* OR feasib* OR (resist* N10 change) OR adapt* OR motivation OR buy-in	225726	19	motivation OR competenc* OR usab* OR acceptab* OR feasib* OR (resist* Near/10 change) OR adapt* OR buy-in	68704	
	Other	24	DE "trainers" OR OR trainer OR (staff* N8 shortage) OR understaff*	2897	20	trainer* OR (staff* Near/8 shortage) OR understaff*	656	
		25	(17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23	1258307	21	(13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20)	279080	
		26	16 AND 25	3968	22	12 and 21	535	

Appendix 3B – Data Extraction Template

Data Extraction

General information

Study ID

Covidence author-year

Title

Title of paper / abstract / report that data are extracted from

Notes

Study Details

Methods

Aim of study

Study design

Categories adapted from: https://doi.org/10.3389/fpubh.2018.00032

1. Randomized controlled trial (including cluster RCTs, stepped wedge)
2. Quasi-experiments with control (Non-randomised experimental study, interrupted time series)
3. Quasi-experiments no control group (Pre-post/iTS with no control)
4. Observational - no active intervention (cross-sectional or longitudinal, case study, associations)
5. Systematic review
6. Economic evaluation
7. Text and opinion
8. Other

Clear above selection

Data Collection

Use N/A for literature review, commentary, etc. "Other" included just in case something else comes up.

1. Quantitative (###)
2. Qualitative (abc)
3. Mixed Methods
4. N/A
5. Other

Clear above selection

Additional notes about Study Design

Study Setting (Context)

Start year

End year

Country

Region

1. ☐ Kenya
2. ☐ Other Sub-Saharan Africa
3. ☐ Middle-East/North Africa
4. ☐ Latin America and Caribbean
5. ☐ Asia/Oceana
6. ☐ Eastern Europe

Clear above selection

Facility Type

1. ○ Public (Government)
2. ○ Private
3. ○ Mixed
4. ○ Unclear

Clear above selection

Facility Level

Choose primary relevant one/highest level if multiple.

1. ○ Academic Hospital
2. ○ Referral Hospital
3. ○ District/Other Hospital
4. ○ Clinic
5. ○ Community
6. ○ Other

Clear above selection

Number of Facilities

Context/Setting - Other notes

Guideline

Guideline Name

Source/Developer of Guideline

Source/Developer Type

1. ○ WHO
2. ○ International Organization
3. ○ National/State Government
4. ○ National/State Organization
5. ○ Local (hospital, etc)
6. ○ Other

Clear above selection

Guideline status

1. ○ New guideline
2. ○ Updated guideline (version change)
3. ○ Existing guideline (ongoing implementation)
4. ○ Other

Clear above selection

Guideline Topic

Population description

Condition(s) targeted

Implementation Strategy

Strategy name

(if provided)

Strategy components

Waltz 2015 - Clusters of ERIC Strategies

1. ☐ Train and educate stakeholders (training sessions and materials)
2. ☐ Support clinicians (reminders, revise prof. roles, new clinical team, facilitate clinical data to providers)
3. ☐ Provide interactive assistance (Technical assistance, facilitation, supervision)
4. ☐ Adapt and tailor to context
5. ☐ Change infrastructure
6. ☐ Use evaluative and iterative strategies (audit and feedback, QI/monitoring, identify barriers/facilitators)
7. ☐ Develop stakeholder interrelationships (champions, teams, leadership, local consensus)
8. ☐ Engage consumers (patients)
9. ☐ Utilize financial strategies

Clear above selection

Actor (Who is delivering the strategy)

1. ○ Academic/Research
2. ○ Implementing Agency/NGO
3. ○ Ministry of Health
4. ○ Hospital/Facility
5. ○ Other

Clear above selection

Action Target (Cadres)

1. ☐ Doctor
2. ☐ Nurses
3. ☐ Clinical Officers
4. ☐ Nutritionist/Dietician
5. ☐ Pharmacist
6. ☐ Other

Clear above selection

Action Target (additional description)

Description of Strategy Components

Specify the implementation strategy components. If more than 4, describe below.

	Action (describe)	Temporality	Dose	Intended outcome effected	Justification (theoretical, practical, empirical)
Component #1					
Component #2					
Component #3					
Component #4					

Additional Strategy Components

Describe any additional strategy components (if >4)

Were action targets (health workers) involved in the design of the strategy?

1. ○ Yes
2. ○ No
3. ○ Unclear

Clear above selection

Outcomes

Unit of analysis

1. Patient
2. Provider
3. Facility

Clear above selection

Patient-level outcomes

Total number of patient participants

Patient outcomes

List values for outcomes measured a the patient level.

	Outcome	Statistic (ie. mean, median, etc)	Intervention group (or post-test)	Control group (or pre-test)
Outcome 1				
Outcome 2				
Outcome 3				
Outcome 4				

Provider-level outcomes

Total number of provider participants

Provider outcomes

List values for outcomes measured a the patient level.

	Outcome	Statistic	Intervention group (or post-test)	Control group (or pre-test)
Outcome 1				
Outcome 2				
Outcome 3				
Outcome 4				

Facility-level outcomes

Total number of facilities included

Facility Outcomes

Facility level outcomes

	Outcome	Statistic	Intervention group (or post-test)	Control group (or pre-test)
Outcome 1				
Outcome 2				
Outcome 3				
Outcome 4				

Other Outcome Data

Describe other outcomes

Contributions to Initial Program Theory

Presence of CSMO components

Enter "1" if this item addresses each element of the CSMOs

	Context	Strategy	Mechanism (explicit)	Mechanism (implicit)	Outcome
#1 - design, buy-in					
#2 - feedback, refinement, acceptable					
#3 - discussion, consensus, self-efficacy					
#4 - trainers, resistance, no consensus					
#5 - divisions, discussion, team identity, collaboration					
#6 - staff shortage, role clarity, GL adherence					
#7 - reinforcement, motivation, GL adherence (short); overburden, not-maintained (long)					
#8 - GL not accessible, job aids/decision support, competence, adherence					
#9 - divisions, teamwork skills content, collaboration					
#10 - multiple documentation, unified chart, GL adherence					

GL adherence

Detailed descriptions of contributions to IPT. For each CSMO, describe relevant findings, highlighting both support or contradictions

#1 - design, buy-in

#2 - feedback, refinement, acceptable

#3 - discussion, consensus, self-efficacy

#4 - trainers, resistance, no consensus

#5 - divisions, discussion, team identity, collaboration

#6 - staff shortage, role clarity, GL adherence

#7 - reinforcement, motivation, GL adherence (short); overburden, not-maintained (long)

#8 - GL not accessible, job aids/decision support, competence, adherence

#9 - divisions, teamwork skills content, collaboration

#10 - multiple documentation, unified chart, GL adherence

Additional contributions not described by our CSMOs

Other

Questions, Thoughts

References to consider

#	DOI or full reference	Rationale
1		
2		
3		
4		
5		
6		
7		