Outpatient treatment of severe acute malnutrition: response to treatment with a reduced schedule of therapeutic food distribution$^{1,2}$

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ABSTRACT

Background: Community-based management of severe acute malnutrition (SAM) has been shown to be safe and cost-effective, but program coverage remains low. Treatment models that maintain high levels of clinical effectiveness but allow for increased coverage are still needed. A reduced schedule of follow-up, in which children receive clinical follow-up and therapeutic foods on a monthly rather than weekly basis, may be one alternative.

Objective: We aimed to describe the safety and feasibility of a monthly distribution of ready-to-use therapeutic food (RUTF) in the treatment of uncomplicated SAM, in terms of clinical response to treatment and household RUTF use.

Design: We conducted a nonrandomized pilot intervention study in which 115 children eligible for outpatient treatment of SAM were provided a monthly ration of RUTF. Anthropometric measurements were taken weekly for 4 wk to monitor treatment response. Unannounced household spot checks were conducted over 4 wk to assess household use of RUTF and storage practices.

Results: Adequate weight and midupper arm circumference (MUAC) gains were found throughout the 4-wk follow-up period. Observed mean $\pm$ SD weight gain from admission was 9.8 $\pm$ 6.8 g $\cdot$ kg$^{-1}$ $\cdot$ d$^{-1}$ in week 1 and 4.2 $\pm$ 2.1 g $\cdot$ kg$^{-1}$ $\cdot$ d$^{-1}$ by week 4. Unplanned household spot checks found an average surplus of RUTF sachets compared with the number expected based on the date of distribution and recommended dosing throughout the 4 wk of follow-up. The frequency at which more than the recommended dose was used (i.e., deviation of >2 sachets between available and expected stocks) was 4% and 22% of households visited in week 1 and week 4, respectively.

Conclusion: Adequate treatment response and RUTF use in the outpatient treatment of SAM was maintained over 4 wk of follow-up with a monthly schedule of RUTF distribution. This study was registered at clinicaltrials.gov as NCT02994212. 


Keywords: ready-to-use therapeutic food, RUTF, severe acute malnutrition, SAM, community-based management of acute malnutrition, CMAM, treatment response, household utilization of severe acute malnutrition (SAM)$^8$ (1). Today’s community-based model represents a historic shift away from exclusive inpatient care in the clinical management of SAM, wherein the majority of children with SAM presenting without clinical complications and sufficient appetite benefit from outpatient care, and inpatient management is reserved for stabilization of complicated cases. Outpatient care, including either weekly or biweekly clinical follow-up at a health facility, was made possible in part by the development of ready-to-use therapeutic foods (RUTFs). RUTFs are energy-dense pastes that provide all of the macro- and micronutrients needed for recovery from SAM, and they can be safely administered at home. The shift to outpatient care places increased responsibility on caregivers to supervise therapeutic feeding at home, but adequate weight gain, high recovery (i.e., >80%), and low mortality (i.e., 1–5%) have nevertheless been achieved across various settings (2–7).

Although community-based management of SAM can be cost-effective (8–10), program coverage remains exceedingly low: globally, only 7–13% of children with SAM received treatment in 2012 (11). New treatment models that maintain high levels of clinical effectiveness but allow for increased coverage are still needed. A reduced schedule of follow-up, in which children receive clinical follow-up and RUTF on a monthly rather than weekly or biweekly basis, may be one alternative. A monthly schedule of follow-up has the potential to reduce the burden on caregivers associated with frequent visits to a health facility, reduce program costs through improved efficiency associated with larger patient volumes, and offer greater operational flexibility to provide treatment in contexts in which security or geography do not allow frequent visits. Such changes could be

INTRODUCTION

Since 2007, the community-based management of acute malnutrition has become the standard of care for the management
expected to reduce barriers to program uptake and make more resources available, allowing programs to reach more children in need. A reduced schedule of follow-up, however, could influence individual response to treatment. Between monthly visits, adequate nutritional recovery would largely depend on caregivers’ abilities to manage a larger household RUTF stock and adhere to treatment instructions over a longer period.

Task shifting has been shown to be effective in clinical settings other than childhood malnutrition, such as in HIV care and treatment (12). However, there is limited experience in how increased responsibility placed on caregivers and a reduced schedule of follow-up would influence individual treatment responses in the context of SAM treatment. To inform the safety and feasibility of a reduced monthly schedule of follow-up in the treatment of uncomplicated SAM, we conducted a non-randomized pilot intervention study to assess the response to treatment and household use of RUTF in a series of children with SAM under a monthly schedule of RUTF distribution.

METHODS

Study site and subjects

The study was carried out in the Madarounfa Health District of the Maradi region of south-central Niger along the Nigerian border. The area is rural and largely representative of the Sahel region, where subsistence agriculture and animal husbandry are the primary livelihoods (13). Acute childhood malnutrition is endemic, with seasonal peaks from May until October because of food shortages and infectious illnesses. The study period (July to November) specifically coincided with a period of decreasing food shortages and infectious illnesses. The study period (July to November) specifically coincided with a period of decreasing food security before the annual harvest and an increased risk of malaria during the rainy season in this setting. In collaboration with the Ministry of Health of Niger, Médecins Sans Frontières (MSF) has supported pediatric care in the Madarounfa Health District since 2001. In 2014, the MSF-supported therapeutic feeding program treated >13,000 children with SAM, with 94% recovery, 2% default, <1% nonresponse, and 3% mortality.

Study enrollment was conducted at 2 outpatient nutritional treatment sites. Study inclusion criteria included the following: 1) being eligible for new admission to treatment of uncomplicated SAM, and 2) being resident within 15 km of the study health center. In accordance with the national protocol, a child was eligible for outpatient SAM treatment if he or she was aged between 6 and 59 mo; had a weight-for-height z score (WHZ) < −3 according to the 2006 WHO Growth Standards (14) and/or a midupper arm circumference (MUAC) < 115 mm; had sufficient appetite according to a test feeding of RUTF; and was free of clinical complications requiring hospitalization, including severe edema (15).

Study exclusion criteria included any child who had previously defaulted from previous SAM treatment (i.e., missed 2 consecutive weekly visits), was considered a relapse (i.e., readmitted within 3 mo of previous discharge), or was not accompanied by a parent or legal guardian ≥ 18 y of age.

Parents or legal guardians were provided information regarding the study objectives and procedures and provided written informed consent for their child’s participation before the start of any study activities. The study was approved by the Comité Consultatif National d’Éthique, Niger, and the Comité de Protection des Personnes, Ile-de-France XI.

Standard care

All children received standard care for outpatient treatment of uncomplicated SAM, as per MSF and government of Niger guidelines. At the time of admission, children received RUTF (14 sachets/wk for those who weighed < 8 kg, and 21 sachets/wk for those who weighed ≥ 8 kg in the routine nutrition program) and routine medicines (i.e., vitamin A, amoxicillin, and anthelmintic treatment, and, if appropriate, measles vaccination and antimalarial treatment) to treat and prevent complications.

Follow-up in the outpatient nutritional program was conducted on a weekly basis at the health center. At each visit, a physical exam and anthropometric assessment were conducted. Anthropometric measurements [weight to the nearest 100 g, length (for children < 24 mo of age) or standing height (for children ≥ 24 mo of age)] to the nearest 0.1 cm, and MUAC to the nearest 0.1 cm) were assessed with the use of standard techniques (16).

Nutritional recovery was determined at or after 3 wk if a child had a WHZ ≥ −2 in 2 consecutive visits and a MUAC ≥ 115 mm, no acute complication or edema for ≥ 7 d, and completed all antibiotic and antimalaria treatment at the time of discharge. Children were transferred to the hospital in the event of any clinical complication requiring inpatient management or weight loss > 5% between 2 consecutive visits or lack of weight gain after 3 wk. Caregivers were instructed to return to the health center for any health concerns between scheduled study visits, and treatment was provided free of charge.

Study procedures

At admission, study nurses collected background information from participating caregivers, including maternal age and educational status, child feeding practices and vaccination history, and household socioeconomic status, with the use of standardized questionnaires.

For study participants, a 4-wk supply of RUTF (56 sachets/4 wk for those weighing < 8 kg and 84 sachets/4 wk for those weighing ≥ 8 kg) was provided on admission. Sachets distributed in the monthly ration were individually marked by unique identifiers to distinguish study and nonstudy sachets, which could coexist within a single household as a result of interhousehold sharing. A plastic bucket was provided to facilitate transport and storage at home. Oral instructions were given for recommended storage conditions and appropriate use at home, advising caregivers to keep RUTF in the provided bucket or another cool, dry place away from direct sunlight.

At the end of each admission visit, participants were accompanied to their home to record the location of their residence. Participants returned to the health center on a weekly basis for a minimum of 4 wk for physical exams and anthropometric assessments, but no additional RUTF or instructions were provided during those visits. Although treatment programs eventually adopting a reduced RUTF distribution schedule may not have required weekly clinical follow-up, weekly follow-up was ensured in this pilot study as a safety precaution in light of this new distribution model. In addition, after baseline consent, unannounced spot checks were made weekly by research members at the participant’s home. Information on availability of the marked RUTF sachets and conditions of at-home RUTF storage was collected with the use of standardized observation checklists.
A primary objective of the study was to assess the safety of a monthly distribution of RUTF, for which the risk was thought to be most acute early in treatment, when weight gain and energy needs were greatest. Therefore, study follow-up ceased after 4 wk. Participants not yet eligible for discharge as per program guidelines after 4 wk returned to the standard weekly distribution of RUTF rations until discharge and in accordance with national guidelines.

Statistical analysis

To estimate the proportion of caregivers adherent to the recommendations of the monthly RUTF ration at 4 wk with a precision of ±10%, assuming a 50% risk, \( \alpha = 0.05 \), and 15% loss to follow-up, the minimum sample size was 114 caregivers and children. Participant characteristics, including maternal characteristics and child anthropometric status, were summarized with the use of means ± SDs for continuous measures and proportions for discrete measures. Response to treatment in recovered children was summarized with the use of mean ± SD weight gain (grams per kilograms per day) and MUAC gain (millimeters per day) from admission until program discharge ±4 wk from admission, as well as the count and proportion of children with >5% weight loss or the development or worsening of nutritional edema.

RUTF use was assessed with weekly spot-check data as the deviance between the number of marked RUTF sachets available and the number of sachets expected, based on the time since admission and prescribed dose of RUTF per child.

All data were double-entered into EpiData 3.1. SAS statistical software version 9.3 was used for analysis.

RESULTS

Between July and November 2014, 115 caregivers and their children with uncomplicated SAM were included in the study (Table 1). Caregivers were a mean of 29.6 ± 8.0 y of age. Ten percent of caregivers had ever attended school, and more than one-half (54.8%) had previous experience in nutritional programs. The mean ± SD age of children was 18.4 ± 8.6 mo. More than one-half of the children were enrolled with a WHZ < −3, and approximately one-third had a MUAC < 115 mm.

Follow-up in the nutritional program from admission to week 4 is shown in Table 2 and Supplemental Figure 1. Weight loss > 5% was infrequent, with 2 of 115 children (2%) receiving the monthly RUTF ration transferred to inpatient care for weight

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal</td>
<td></td>
</tr>
<tr>
<td>Caregiver participants, ( n )</td>
<td>115</td>
</tr>
<tr>
<td>Age, y</td>
<td>29.6 ± 8.0</td>
</tr>
<tr>
<td>Ever attended school (not including Quranic school)</td>
<td>12 (10.4)</td>
</tr>
<tr>
<td>Ever attended the nutritional program before</td>
<td>63 (54.8)</td>
</tr>
<tr>
<td>Child</td>
<td></td>
</tr>
<tr>
<td>Age, mo</td>
<td>18.4 ± 8.6</td>
</tr>
<tr>
<td>Sex, F</td>
<td>65 (56.5)</td>
</tr>
<tr>
<td>WHZ &lt; −3</td>
<td>59 (51.3)</td>
</tr>
<tr>
<td>MUAC &lt; 115</td>
<td>34 (29.6)</td>
</tr>
<tr>
<td>HAZ &lt; −3</td>
<td>48 (41.7)</td>
</tr>
<tr>
<td>Times previously admitted to nutritional program</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>65 (56.5)</td>
</tr>
<tr>
<td>1</td>
<td>32 (27.8)</td>
</tr>
<tr>
<td>≥ 2</td>
<td>18 (15.7)</td>
</tr>
</tbody>
</table>

1Values are means ± SDs or \( n \) (%). HAZ, height-for-age z score; MUAC, midupper arm circumference; WHZ, weight-for-height z score.

Table 3 shows the mean deviation between the number of marked RUTF sachets available and the number of sachets expected, based on the date of distribution and recommended doses. Among households visited in week 1, 68% of households were found with the correct RUTF use (i.e., a deviance of ±2 sachets between available and expected stocks), 4% of households having used more than expected and loss >5% during follow-up in week 3 (\( n = 1 \)) and week 4 (\( n = 1 \)). No child developed or increased nutritional edema, and none died. Response to treatment under the monthly schedule of RUTF distribution is shown in Table 3. Both adequate weight and MUAC gains were found during the 4 wk of follow-up. Observed mean ± SD weight gain from admission was 9.8 ± 6.8 g · kg\(^{-1}\) · d\(^{-1}\) in week 1, 7.4 ± 4.0 g · kg\(^{-1}\) · d\(^{-1}\) by week 2, 5.3 ± 2.7 g · kg\(^{-1}\) · d\(^{-1}\) by week 3, and 4.2 ± 2.1 g · kg\(^{-1}\) · d\(^{-1}\) by week 4. Observed mean ± SD MUAC gain from admission was 0.6 ± 0.6 mm/d by week 1, 0.5 ± 0.3 mm/d by week 2, 0.3 ± 0.2 mm/d by week 3, and 0.3 ± 0.2 mm/d by week 4.

All 115 households were visited by the study team ≥1 time during follow-up, with a mean ± SD 3.12 ± 0.66 visits/household over 4 wk. Household spot checks found a positive mean deviation over the 4 wk of follow-up, indicating a consistent average surplus of marked sachets compared with the number expected based on the date of distribution and recommended dosing (Figure 1). Among households visited in week 1, 68% of households were found with the correct RUTF use (i.e., a deviance of ±2 sachets between available and expected stocks), 4% of households having used more than expected and loss >5% during follow-up in week 3 (\( n = 1 \)) and week 4 (\( n = 1 \)). No child developed or increased nutritional edema, and none died. Response to treatment under the monthly schedule of RUTF distribution is shown in Table 3. Both adequate weight and MUAC gains were found during the 4 wk of follow-up. Observed mean ± SD weight gain from admission was 9.8 ± 6.8 g · kg\(^{-1}\) · d\(^{-1}\) in week 1, 7.4 ± 4.0 g · kg\(^{-1}\) · d\(^{-1}\) by week 2, 5.3 ± 2.7 g · kg\(^{-1}\) · d\(^{-1}\) by week 3, and 4.2 ± 2.1 g · kg\(^{-1}\) · d\(^{-1}\) by week 4. Observed mean ± SD MUAC gain from admission was 0.6 ± 0.6 mm/d by week 1, 0.5 ± 0.3 mm/d by week 2, 0.3 ± 0.2 mm/d by week 3, and 0.3 ± 0.2 mm/d by week 4.

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| TABLE 2                                                                 |
|--------------------------|----------------|
| Follow-up in the nutritional program ≥4 wk\(^{1}\) | Week 1 | Week 2 | Week 3 | Week 4 |
| Undergoing follow-up     | 104 (90.4) | 80 (69.6) | 62 (53.9) | 31 (26.9) |
| Absent from scheduled visit | 5 (4.3) | 6 (5.2) | 10 (8.7) | 3 (2.6) |
| Discharged as recovered at this visit | 0 (0) | 22 (19.1) | 11 (9.6) | 36 (31.3) |
| Total discharged as recovered | 0 (0) | 22 (19.1) | 33 (28.7) | 69 (60.0) |
| Transferred to inpatient care at this visit | 6 (5.2) | 1 (0.9) | 3 (0.9) | 2 (1.7) |
| Weight loss > 5%          | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Development or worsening of nutritional edema | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Died                     | 0 (0) | 0 (0) | 0 (0) | 0 (0) |

\(^{1}\)Values are \( n \) (%). \( n = 115 \).
29% of households having used less than expected at the time of the visit. Among households visited in week 4, the frequency of correct use was 36% of households, with 22% having used more and 43% having used less than expected.

Household spot checks revealed high levels of compliance with adherence with suggested RUTF storage practices throughout the 4 wk of follow-up. Study personnel observed the monthly ration to be most often stored inside the home (range: 95.8–98.8% across weeks 1–4), with no stock stored in direct sunlight. Most participants (range: 85.0–91.1%) used the plastic bucket provided by the study for storage of the ration at home as instructed.

**TABLE 3**

Response to treatment over 4 wk of follow-up from admission

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Weight gain, g · kg⁻¹ · d⁻¹</td>
<td>Weight gain, g · kg⁻¹ · d⁻¹</td>
</tr>
<tr>
<td></td>
<td>MUAC gain, mm/d</td>
<td>MUAC gain, mm/d</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>106</td>
</tr>
<tr>
<td>Week 1</td>
<td>9.83 ± 6.81</td>
<td>0.61 ± 0.56</td>
</tr>
<tr>
<td></td>
<td>11.10 ± 7.71</td>
<td>0.57 ± 0.49</td>
</tr>
<tr>
<td>Week 2</td>
<td>7.39 ± 4.04</td>
<td>0.48 ± 0.33</td>
</tr>
<tr>
<td></td>
<td>6.97 ± 4.33</td>
<td>0.39 ± 0.31</td>
</tr>
<tr>
<td>Week 3</td>
<td>5.28 ± 2.66</td>
<td>0.33 ± 0.22</td>
</tr>
<tr>
<td></td>
<td>5.75 ± 3.11</td>
<td>0.35 ± 0.24</td>
</tr>
<tr>
<td>Week 4</td>
<td>4.20 ± 2.05</td>
<td>0.28 ± 0.19</td>
</tr>
<tr>
<td></td>
<td>5.03 ± 2.54</td>
<td>0.32 ± 0.20</td>
</tr>
</tbody>
</table>

1 Values are means ± SDs unless otherwise indicated. MUAC, midupper arm circumference; RUTF, ready-to-use therapeutic food.

2 From reference 17.

**FIGURE 1** Distribution of ready-to-use therapeutic food stocks available compared with those expected by week of follow-up: week 1 (A), week 2 (B), week 3 (C), and week 4 (D).
DISCUSSION

Among children receiving the monthly distribution of RUTF, both weight gain and MUAC gain were satisfactory. Anthropometric measurements, combined with household spot checks, suggested largely appropriate RUTF usage over the 4-wk follow-up period. Use of the monthly ration represented more often under- rather than overconsumption, based on the standard dosing recommendations, and sufficient to maintain an adequate response to treatment. Few children experienced weight loss, and no child developed or had worsening edema during 4 wk of follow-up. These results represent the first clinical experience with a monthly rather than weekly distribution of RUTF and suggest this modality to be both safe and feasible for outpatient management of uncomplicated SAM.

Adequate treatment response in the outpatient management of SAM relies in large part on appropriate therapeutic feeding at home. Experience has shown that adequate recovery from uncomplicated SAM can be achieved with weekly and biweekly follow-up and distributions of RUTF (18). A reduced schedule of follow-up, however, would require caregivers to manage large RUTF stocks and adhere to dosing instructions over a longer period of time, potentially challenging the outpatient response to treatment.

Despite the greater burden on caregivers, mean weight and MUAC gains in our study cohort compared favorably to minimum global program standards (19). Observed weight and MUAC gains were consistent with other community-based nutritional programs in which mean weight gain varied between 3.0 and 6.8 g · kg\(^{-1}\) · d\(^{-1}\) (20) and mean MUAC gain varied between 0.3 and 0.6 mm/d (21, 22) during recovery. Response to treatment was also similar to those recorded in children enrolled in a randomized trial in the same setting in which a weekly distribution of RUTF and standard medical care was provided (Table 3) (17). The favorable treatment responses noted in our study cohort thus suggest the clinical safety of a monthly RUTF distribution in the management of uncomplicated SAM.

Household use of ready-to-use products has been recognized as an important barrier to program effectiveness (23), but data on household use remains limited. Household spot-check data suggest that the majority of participants correctly used the monthly ration early in treatment, but this proportion decreased by the end of follow-up. Because weight gain did not appear to falter, incorrect use does not appear to be at the expense of recovery. Anecdotal reports suggest that households may decrease therapeutic feeding later in treatment once a child’s weight and clinical status is recovered. In 2010, our group found that 65–80% of households enrolled in a large-scale preventative program in Niger reported never sharing the provided ready-to-use supplement (24). In 2011, only 30–51% of households in Niger that were enrolled in a preventive program that provided supplemental foods to young children, household food rations, and/or cash reported not sharing the provided supplement (25). Considering the limitations of self-report, compliance may have been even lower. However, accompanying qualitative interviews with participants conducted by an independent study team confirmed the high value placed on RUTF by caregivers. The women perceived positive medical and nutritional impacts from the nutritional supplements on the target child, including an improvement in child health, as well as prevention of diseases and malnutrition (C Langendorf, Epicentre, personal communication, 2016).

Other reports describing the use of RUTFs are largely limited to the use of small-quantity formulations (≤20 g) provided in the prevention of malnutrition (26–30). The greater perceived risk associated with SAM, a life-threatening condition that requires vigilant attention and care, may be an important determinant of high compliance in our study in comparison with reports related to the small-quantity formulations used in the context of prevention. This, however, was not the case in Ethiopia, where RUTF provided in SAM treatment was still perceived to be a food or commodity for selling (31, 32).

In high-burden settings, the number of children with SAM who receive treatment may be constrained by limited human resources and infrastructure to provide facility-based clinical follow-up. Using a reduced frequency of follow-up in such contexts could allow more children to access care. A recent cost analysis of SAM treatment in Niger suggested that important economies of scale were possible, with per-child costs decreasing as patient volume increased because of fixed costs associated with personnel and infrastructure (33). The same cost analysis tool suggests that a monthly schedule of follow-up, which simply increases the number of children who receive outpatient treatment by 4-fold compared with a weekly schedule of follow-up, could reduce the cost per child treated by 52% ($166.39 compared with $79.53). Although many interrelated factors contribute to program coverage (e.g., physical access, opportunity costs, and awareness of the illness and available services), only some of these would be addressed by a reduced schedule of follow-up. The potential cost efficiencies, coupled with our findings supporting the safety and feasibility of monthly follow-up, however, suggest that this approach may be a promising model to increase program coverage and reduce costs in the treatment of uncomplicated SAM.

Our study had several strengths. First, we assessed household RUTF compliance by triangulating data from household spot checks with important clinical outcomes representing response to treatment. Doing so was, to our knowledge, a novel way to describe household RUTF use, as well as assess the safety and feasibility of an alternative RUTF distribution schedule. Second, although caregivers were aware of weekly spot checks, the home visits were conducted on unannounced days per times, lending credibility to the findings observed. Repeated spot checks, as used in this study, may be a more valid measure of compliance than self-report (34), which could be subject to social desirability and recall biases.

Limitations of the study include not being able to conduct in-home observations of RUTF use to determine individual intake. Directly observing household behaviors may have presented additional information on factors that influence compliance. However, more intrusive observations may have been less acceptable. Because of safety concerns, a monthly ration was distributed, but the children enrolled in the study continued weekly follow-up at the health facility. No guidance related to RUTF use or additional stock was provided during weekly facility visits to reduce any undue influence from the safety visits, but the study is not an exact representation of the model in question because of safety considerations. In addition, given one of the study’s objectives to assess the early safety of
the monthly RUTF distribution model, study follow-up did not continue after the initial 4 wk of treatment. The study thus does not provide a complete understanding of this approach in terms of overall recovery or length of stay. Finally, the generalizability of this work may be limited. Thirty-five percent of caregivers whose children were screened for eligibility chose not to participate; this occurred most often with adolescent caregivers who cited needing to inform the head of household before agreeing to any change in standard care. Study participants may therefore represent a subgroup in whom acceptability and adherence may be higher than in the general population. In addition, Niger has an important history of therapeutic feeding programs and RUTF, possibly providing the study population with a unique experience and various strategies to respond to the alternative RUTF distribution model. Findings may be different in settings in which there is less experience with therapeutic feeding programs and RUTF.

Future work should explore whether high household compliance can be achieved and maintained over longer periods in this context, with the goal of transferring effective household strategies to other settings. Understanding how caregivers manage appropriate use despite many potential barriers, including large household size, high food insecurity, and social pressure to share, may yield insights for the use of more flexible service delivery models elsewhere. Implementation of a reduced schedule of follow-up would also rely on caregivers to monitor recovering children at home for any clinical or anthropometric measure deterioration between monthly visits. Results are forthcoming from another pilot study in the same setting that assessed caregivers’ knowledge of clinical danger signs and accuracy in MUAC measurement for such surveillance. Previous research suggests that MUAC change can be a suitable indicator of weight change (35), and that mothers can measure MUAC to classify their children instead of having community health workers do so (36).

In conclusion, we found treatment response and RUTF use to be maintained over 4 wk when we used a reduced monthly schedule of RUTF distribution. The reduced monthly schedule of RUTF distribution shown here to be safe and feasible may make more cost-effective service delivery models possible. These results lend support to a new, more flexible and efficient model for the outpatient management of SAM. Implementation of any new model for the delivery of outpatient management of SAM will require appropriate training, follow-up, and community sensitization, but our findings provide promising evidence to encourage further evaluation of this approach to increase access to care and program coverage. Further randomized studies are ongoing to assess the impact of monthly compared with standard weekly follow-up on nutritional recovery, as well as overall length of stay and weight gain.

We thank Yazi Mai Aiki Abdoulaiz; our field research center coordinator, Aimé Makimere; and André Munger, Médecins Sans Frontières Operational Center Paris.

The authors’ responsibilities were as follows—SI, KEH, and RFG: reviewed the manuscript, decided to publish the manuscript, and read and approved the final manuscript. IA: assisted with the interpretation of data, critically reviewed the manuscript, decided to publish the manuscript, and read and approved the final manuscript. None of the authors reported a conflict of interest related to the study.

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