

Substandard discharge rules in current severe acute malnutrition management protocols: An overlooked source of ineffectiveness for programmes?

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Location: *State of Rajasthan, India*

What we know: In practice national, programme and research protocols for severe acute malnutrition (SAM) treatment vary from World Health Organization (WHO) recommendations on admission and discharge criteria.

What this article adds: The impact of various community-based management of acute malnutrition (CMAM) discharge criteria was simulated in a single cohort of 7,398 uncomplicated SAM children treated in a pilot eight-week stay programme in 2016. Nine discharge rules were simulated. The cure rate for each was compared to discharge when WHO recommendations are stringently applied, and the proportion of children still acutely malnourished (according to standard case definition) among those 'cured' was determined. Cure rates over eight weeks of treatment ranged from less than 50% to more than 90%. A varying and substantial proportion of children discharged as cured were still classified as having moderate acute malnutrition (MAM) or SAM. Discharging a child as cured using weight-for-height z-score (WHZ) or mid-upper arm circumference (MUAC) regardless of admission criteria greatly impacts on cure rate. Discharge using MUAC alone for both MUAC and WHZ admissions also increases apparent cure rate at the expense of discharging more MAM and SAM children as cured. As a theoretical simulation, external validity is limited. However, these findings raise significant concerns regarding variable discharge criteria. This may increase the risk of relapse and poor health outcomes and needs urgent review. An upgrade of protocols to ensure at least consistency between discharge and admission criteria is urgently required.

Background

Severe acute malnutrition (SAM) in children aged 6-59 months is defined in anthropometric terms as weight-for-height z score ≤ -3 Z-score (WHZ), or mid-upper arm circumference (MUAC) < 115 mm, or presence of bilateral oedema. Since 2013 the World Health Organization (WHO) has recommended that children with SAM should only be discharged from treatment when their WHZ or weight-for-length z-score (WLZ) is ≥ -2 or mid-upper arm circumference is ≥ 125 mm (MUAC ≥ 125 mm) and they have had no oedema for at least two weeks. The anthropometric indicator used to identify SAM should determine nutritional recovery. For example, a child admitted using MUAC is discharged based on MUAC. WHO does not specify what criteria should be applied for discharging children who meet both MUAC and WHZ/WLZ on admission; i.e.; whether either can be applied or both should be met. The most stringent interpretation is that a child meeting both criteria on admission should meet both criteria for discharge (see Box 1).

Currently implemented national CMAM protocols, as well as several simplifications being researched/implemented¹ (such as those incorporating MUAC/oedema-only programming), deviate from stringent WHO recommendations for discharge in various ways. The most common deviations are a lower number of visits to ascertain discharge cut-off reached; the use of the target weight rule (calculating a target weight for discharge based on height on admission, rather than current height and recalculated WHZ/WLZ); and inconsistent use of the same indicator at admission and discharge. Such deviations are likely to influence the proportion of SAM children considered as cured within a given period (nutritional recovery). Strictly speaking, this means a proportion of children are still moderately or severely malnourished at

¹ A range of simplified/combined/expanded protocols is being researched or implemented in programmes in various contexts. (See editorial for overview and articles in this edition of *Field Exchange* for examples of research and programming.) There are no current WHO recommendations on simplified approaches.

Box 1 Stringent application of WHO recommendations for discharge from community-based management of acute malnutrition (CMAM) programmes

Child admitted with WHZ < -3 only (A1): Reach WHZ ≥ -2 and no oedema for two consecutive visits*

Child admitted with MUAC < 115 mm only (A2): Reach MUAC ≥ 125 mm and no oedema for two consecutive visits

Child admitted with WHZ < -3 and MUAC < 115 mm (A3): Reach MUAC ≥ 125 mm and WHZ ≥ -2 and no oedema for two consecutive visits

*It could be argued that observing reach of discharge criteria for at least two weeks implies that the criteria should be observed at three consecutive weekly visits. To our knowledge, however, no national protocol follows this recommendation.

discharge. A recent review of relapse from SAM management suggests that relapse risk is a larger issue than previously thought and is significantly affected by the anthropometric status reached at discharge (Stobaugh, 2018). Heterogeneity in protocols is also a matter of concern for those interested in investigating the effectiveness of real-life CMAM programmes across the world and influencing contextual factors.

This article investigates the potential impact of the variability in the discharge criteria of various CMAM protocols on apparent cured rates and on the proportion of children discharged as cured while still acutely malnourished.

Methods

The impact of various discharge criteria was simulated in a single cohort of SAM children. A standard cohort was used rather than comparing the results of multiple programmes applying different discharge strategies to avoid confounding factors, such as severity of nutritional status, type of SAM diagnosis at admission, adherence to treatment protocols, and quality of implementation of protocols by health staff.

The cohort consisted of 7,398 uncomplicated SAM children who had been screened for SAM in the community (using MUAC only) and who were referred for admission to treatment (using MUAC and/or WHZ) in a CMAM pilot programme implemented in 2016 by the State of Rajasthan with the technical support of Action Contre la Faim (ACF) India. All beneficiaries received standard outpatient care for eight weeks, independent of their intermediary nutrition status (i.e., no discharge criteria were applied before week eight). Anthropometric measurements were taken weekly up to week eight for all children, with very little loss to follow-up. In some centres, treatment continued after eight weeks, but the decision was made to report on reach to discharge at eight weeks across the board, as until that point there was very little loss to follow up.

Nine discharge rules were applied to the dataset, informed by existing national protocols and recently piloted simplified or combined protocols that use MUAC only/MUAC thresholds² for admission of acutely malnourished children (Table 1). The number of children considered as cured under each of these discharge rules was simulated. This cure rate was compared to the cure rate if WHO recommended discharge criteria were stringently applied. Finally, under each discharge rule, the proportions of children who are still MAM, SAM or non-acutely malnourished according to widely accepted case definitions (UNHCR/WFP, 2011) were assessed. For example, a child admitted with WHZ <-3 and discharged using MUAC only may still have a WHZ <-3 or <-2. Similarly, a child admitted with MUAC<115mm and discharged using WHZ only may still have a MUAC<125mm. A child admitted with WHZ<-3 may be discharged as cured based on reaching WHZ<-2 while still having a MUAC<125mm or even

MUAC<115mm. These 'cured' cases would all be still classified as severely or moderately acutely

Table 1 Discharge rules applied to the same SAM cohort dataset³

Simulated discharge rule no.	Targeted populations of SAM children	Discharge criteria	Interpretation	Existing protocols (known to ACF) and simulated protocols incorporating these discharge criteria
1	A1: MUAC <115 mm A2: WHZ <-3 A3: MUAC <115 mm AND WHZ <-3	A1: MUAC ≥125 mm, for 2 visits A2: WHZ ≥-2, for 2 visits A3: MUAC ≥125 mm AND WHZ ≥-2, for 2 visits	Corresponds to the stringent WHO recommendations for discharge	Protocols implemented in some ACF-supported programmes or pilots in Asia, such as Indonesia and India (in the absence of national protocols)
2	As rule 1	A1, A2, A3: As rule 1, for 1 visit	Only required to meet discharge criteria at one visit	Simulated protocol
3	As rule 1	A1 and A2: as rule 1 A3: MUAC ≥125 mm, for 2 visits	Only MUAC discharge criterion is required for SAM children with both anthropometric diagnosis at admission, over 2 visits	National protocols in Burkina Faso and Afghanistan
4	As rule 1	A1, A2, A3: As rule 3, for 1 visit	Only MUAC discharge criterion is required for SAM children with both anthropometric diagnosis at admission, over 1 visit	Simulated protocol
5	As rule 1	A1, A2, A3: MUAC ≥125 mm OR WHZ >-2 for all, 1 visit	MUAC or WHZ are recommended for discharge for all No recommendation to use the same indicator for admission and discharge	National protocols in Chad, Central Africa Republic (CAR), Cameroon, Mali, Democratic Republic of Congo (DRC) and others
6	As rule 1	A1, A2, A3: MUAC ≥125 mm OR target weight, 1 visit	MUAC or reach of target weight (for discharge rule 6) are recommended for discharge for all No recommendation to use the same indicator for admission and discharge	National protocols in Chad, CAR, Cameroon, Mali, DRC and others
7	As rule 1	A1, A2, A3: MUAC ≥115mm and a minimum duration of treatment (6 weeks), 1 visit	MUAC ≥115mm and a minimum duration of treatment for all admissions	National protocol in Nepal
8	A1: MUAC <115 mm A2: WHZ <-3 & MUAC <125mm A3: MUAC <115 mm AND WHZ <-3	A1, A2, A3: MUAC ≥125 mm, 2 visits	MUAC threshold applied for admission using WHZ and only MUAC criterion used for discharge, over 2 visits.	Simplified protocol using MUAC threshold programming applied to WHZ admissions
9	As rule 8	A1, A2, A3: MUAC ≥ 125mm, 1 visit	MUAC threshold applied for admission using WHZ and only MUAC criterion used for discharge, over 1 visit	Simplified protocol using MUAC threshold programming applied to WHZ admissions

malnourished as per standard and internationally acknowledged SAM or MAM case definitions.

Observations were excluded that had missing anthropometry or implausible z-scores at admission (WHZ<-6 or WHZ >5), implausible height growth (negative, or >7 cm), or MUAC gain (>3cm) during the two-month treatment period. All analyses were performed using STATA 13 software (StataCorp, USA).

Results

Among the 7,398 uncomplicated SAM children in the cohort, 29.4% of children met admission

MUAC criteria only (A1); 28.6% met WHZ only (A2); and 42% met both criteria (A3). There were no oedematous cases in this cohort. Forty-two observations were excluded from analysis because of missing anthropometry at admission; 384 were excluded because of implausible z-scores at admission; and 523 were excluded for implausible height or MUAC gains during treat-

² Several simplified protocols allow admission using MUAC only or may admit using MUAC and/or WHZ criteria, but all WHZ-identified children must fall under a MUAC threshold (e.g., <125 mm).

³ Actual protocols cited in the table are available on request.

Table 2 Apparent cured rates and proportion (%) of children still MAM or SAM among those cured with each discharge rule

Discharge rules	Proportion (%) of admitted children discharged as cured under discharge rules	Proportion (%) of discharged cured children still classified as MAM or SAM according to standard case definition
Simulation in a cohort of 6,449 SAM children, admitted according to WHO recommendations (A1: MUAC <115 mm A2: WHZ <-3 A3: MUAC <115 mm AND WHZ <-3). For discharge details see Table 1	Rule 1	35.0
	Rule 2	51.6
	Rule 3	41.3
	Rule 4	60.1
	Rule 5	86.1
	Rule 6	88.9
	Rule 7	92.9
Simulation in a cohort of 6,351* SAM children with MUAC <125mm, admitted according to simplified protocols examined (A1: MUAC <115mm A2: WHZ<-3 & MUAC <125mm A3: MUAC <115mm AND WHZ<-3). For discharge details see Table 1	Rule 8	43.1
	Rule 9	64.6

*Ninety-eight children had WHZ<-3 but MUAC ≥125mm, hence did not meet the inclusion criteria for the protocol and were excluded from the analysis.

ment period, leaving 6,449 SAM children for analysis. Ninety-eight children had WHZ<-3 but MUAC ≥125mm, hence did not meet the inclusion criteria for the simplified protocol simulation; these were excluded from the simplified protocol analysis (n=6,351).

The simulations find huge variations in the apparent cured rates over eight weeks of treatment depending on the discharge rules applied, ranging from less than 50% up to more than 90% cured rates. A varying and substantial proportion of children discharged as cured per the various protocols were, in fact, still MAM or SAM according to standard case definitions (Table 2). Figures 1 and 2 show the observed increase in apparent cured rates when discharge rules become less stringent, and the related increase in the number of children discharged as cured while still MAM or SAM.

Nearly one quarter (24%) of children discharged as cured according to WHO discharge criteria were still MAM or SAM when compared to the standard case definition. This is because, even when the WHO criteria are stringently applied, a child admitted and

discharged under MUAC criteria may still have a WHZ <-2 and is therefore considered malnourished. Similarly, a child admitted and discharged meeting full WHZ criteria may still have a MUAC <125mm.

Most importantly, these simulations reveal the very large impact of the recommendation for discharge used in most African national protocols, which consider a child as cured according to WHZ or MUAC, regardless of the admission criteria used. We translated this in our simulations as considering the children as cured whenever one of these criteria is first reached (for discharge rules 5 and 6). Under such rules, a very high proportion of children admitted with MUAC<115mm are discharged as cured according to reach of WHZ≥-2 or target weight, while their MUAC is still below

125 or even 115 mm. Similarly, a very high proportion of children admitted with WHZ<-3 are discharged as cured according to reach of MUAC≥125mm while their WHZ is still below -2 or -3. This is clearly reflected in Rule 5 simulation, a protocol which leads to an impressive apparent cured rate of 86.1% observed after eight weeks of treatment (versus 35% when stringent WHO discharge criteria are applied). However, more than 90% of these children identified as cured still meet MAM or SAM case definitions (Table 2 and Figure 1). Among these children, 60.5% are still MAM and 31.1% are still SAM.

Although the impact is not as large, an increase in the percentage of MAM and SAM children among those discharged as cured is observed when the only deviation was using MUAC ≥125mm alone for SAM children admitted meeting both WHZ and MUAC criteria (A3, discharge rule 3). When this discharge cut-off is reached only once (as with discharge rule 4), a 60% cure rate after eight weeks of treatment is observed, with 41.5% still acutely malnourished among those discharged as cured (35% MAM and 6.5% SAM). When compared with the results obtained with stringent WHO discharge criteria, reaching MUAC cut-off for one visit only induces a fivefold increase in the proportion of children erroneously discharged as cured while still SAM, which translates into a ninefold increase in the corresponding number of children affected.

Results for simplified protocols (discharge rules 8-9), are shown in Figure 2 and Table 2. Cure rates are higher with these rules than with stringent WHO discharge criteria due to the increased number of children who are classified as cured while still MAM or SAM, since the number of children cured and no longer acutely malnourished according to standard definition (i.e., with both MUAC ≥125 mm and WHZ ≥-2) is actually similar between discharge rule 1 and 8, as well as between discharge rules 2 and 9. Using MUAC ≥125mm at one visit for dis-

charge of all children (rule 9), a 64.6% cure rate is observed, with 30% MAM and 11.7% SAM among those cured. When compared with stringent WHO discharge criteria, this discharge rule induces a ninefold increase in the proportion of children erroneously discharged as cured while still SAM, which translates into a seventeenfold increase in the corresponding number of children affected.

Study limitations

Since the figures reported come from theoretical simulations of the application of simple discharge rules, performed on a single dataset, one should be cautious with their external validity. First, the cohort dataset used comes from a unique programme in Rajasthan, India, with many contextual specificities. This was an uncomplicated SAM management programme that was ideally staffed and supervised, with much effort made through home visits to improve the adherence of the families to treatment. Secondly, it can be argued that the a posteriori application of simple discharge rules to an observed anthropometric growth pattern oversimplifies not only the existing protocols, but also what is at stake in the health staff decision to discharge a child as cured, and thus should not be expected to translate into the same decisions in real-life programmes. Another limitation in the analysis is that the discharge criteria could only be applied until week eight, while most programmes implemented in real life have a maximum duration of treatment of 12 to 16 weeks. On that point, however, it should be noted that, while a longer duration of treatment would raise the numbers of discharged cured, it is unlikely to change the proportions of children who are still MAM or SAM among those classified as cured. Furthermore, discharge rules are often more nuanced than implied here and may suggest several options for use in different contexts, such as health centres or mobile clinics, be complemented by trainings or guidance to bring clarity to gap areas, or indeed integrate more deviations from the WHO stringent recommendations, such as minimal length of stay, a varying z-score cut-off to determine target weight, or use of simplified unisex tables to calculate z-scores.

There is also limited evidence to ascertain whether it is safe to discharge children from SAM treatment programmes according to different indicators. In 2013 WHO had identified as a research priority the need to evaluate the validity of MUAC values versus WHZ as discharge criteria and to determine appropriate cut-off values in relation to response to treatment, relapse and mortality (WHO, 2013). There is also a knowledge gap on relapse (Stobaugh, 2018). For now, WHO recommendations must be considered as the standard against which other simplified protocols should be evaluated among similar populations, based on similar judgment criteria.

Discussion

These results demonstrate long-overlooked impacts of discharge rules incorporated into national



A POSHAN Prahari (sentinel) assesses the appetite test of a child enrolled in the POSHAN program during a home visit, Rajasthan

Government of Rajasthan

protocols that deviate from the WHO 2013 recommendations. A varying and substantial proportion of children currently admitted as SAM and discharged as cured from CMAM programmes are still moderately or severely malnourished, according to standard case definitions. This affects apparent cured rates, with the greater the protocol 'deviation' generally increasing the proportion of MAM and SAM children classified as cured. Lowest bidder rules mean that protocols that use discharge criteria that most depart from WHO recommendations may paradoxically appear to be most effective in terms of cure rate and length of stay.

These findings may provide one plausible explanation for the perception that CMAM pro-

grammes are more effective in Africa than in Asia, whereby recent Asian programmes and pilots have tended to abide more strictly to WHO recommendations, in the absence of national protocols.

Findings are in line with the striking difference that can be observed between the very high cure rates reported by routine CMAM programmes that use protocols reflected in rules 5 (MUAC ≥ 125 mm or WHZ-2 for all, 1 visit) or rule 6 (MUAC ≥ 125 mm or target weight, 1 visit) that frequently report cure rates $>90\%$ (against a cure rate benchmark $>75\%$), and the much lower cure rates reported in studies using more stringent criteria. For instance, a recently published multi-centre trial in India reported

cure rates of 43-57% by 16 weeks of treatment, where cured status was defined as reaching WHZ ≥ -2 and absence of oedema of feet in children admitted with WHZ < -3 (Bhandari, 2016). The authors of this article reported that the use of height at enrolment to determine discharge increased the proportion of children who reached the cut-off for recovery, which they assumed could partly explain the apparently better results observed in Africa, where using admission height is common. These results are also consistent with what we have observed in 'real-life' ACF programmes and following national protocols incorporating discharge rules 6 and 7: secondary analysis by ACF of the actual nutritional status of children at discharge found proportions of global acute malnutrition above 40% among the children discharged as cured, most of which could be explained by the use of different discharge criteria (MUAC or WHZ) compared to admission criteria.

Although simplified protocols under research may provide an answer to a range of practical issues, these results show that the related discharge rules could lead to a large augmentation in the number of children discharged as cured while still MAM (with WHZ < -2) and, most concerning, still SAM (with WHZ < -3).

These observations reflect the need for urgent action to upgrade and standardise protocols on discharge criteria: most urgent is correction of inconsistent use of discharge criteria for different admission criteria; i.e. admissions under MUAC should be discharged using MUAC and children admitted under WHZ MUAC should be discharged according to WHZ.

Conclusions

Results presented here indicate that an overlooked, variable and often dramatic proportion of malnourished children are considered cured by CMAM programmes, mostly due to discharge rules set by national protocols that depart from 2013 WHO recommendations. In the absence of evidence to the contrary, this may increase the risk of relapse and poor health outcomes in the mid to long term and precludes us from achieving a valuable assessment of the effectiveness of real-life SAM management programmes around the world and influencing factors. In the short term, an upgrade of protocols to ensure at least consistency between discharge and admission criteria is urgently required to avoid the erroneous discharge of a very large number of children who are still acutely malnourished.

Considering these findings, we call for a global effort by stakeholders involved in the development of technical guidance, support of national guidance development and implementation of SAM management programmes to standardise protocols, investigate the rationale for deviations from WHO guidance in national protocols, and rigorously evaluate the effectiveness of current WHO recommendations in a range of contexts, according to defined health outcomes.

For more information, please contact Benjamin Guesdon at bguesdon@actioncontrelafaim.org

Figure 1 Impact of varying discharge rules from CMAM programmes (simulation, n=6,449)

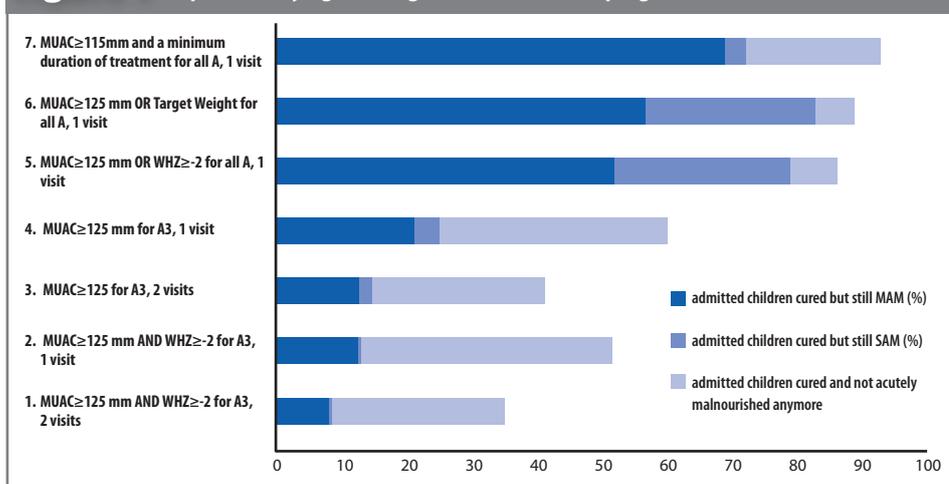


Figure 2 Impact of discharge rules such as those adopted by simplified protocols (simulation, n=6,351)

