Should the rehabilitation phase of treatment for children with severe malnutrition (marasmus or kwashiorkor) take place within communities or as inpatients?

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The World Health Organization has produced guidelines for the management of common illnesses in hospitals with limited resources. This series reviews the scientific evidence behind WHO's recommendations. The WHO guidelines, and more reviews are available at:
http://www.who.int/child-adolescent-health/publications/CHILD_HEALTH/PB.htm

This review addresses the question: *Should the rehabilitation phase of treatment for children with severe malnutrition (marasmus or kwashiorkor) take place within communities, or as inpatients?*

The WHO Pocketbook of Hospital Care for Children defines severe malnutrition as the presence of oedema of both feet, or severe wasting (<70% weight-for-height/length or <-3SDa), or clinical signs of severe malnutrition. It advises admission of all children with severe malnutrition. The timing of discharge has to take into account the benefit of further inpatient care versus nosocomial infections, loss of earnings and available community support. Continued care as an outpatient to complete rehabilitation and prevention of relapse will be required.(Pocketbook chapter 7.4.7, page 184).

In a recent joint statement with the World Food Program, the United Nations and WHO, ('Community Based Management of Severe Acute Malnutrition'), defines malnutrition as a Mid Upper Arm Circumference of less than 110mm in children aged 6-59 months. It advises active case finding in the community, admission to hospital of only those children with complications, and community management with ready to use food (RTUF). This shift has its strongest evidence in the setting of field operations in complex emergencies where lack of resources has made inpatient treatment impractical, and the approach has been adopted in non-emergency settings.

This review intends to present the evidence as to whether the rehabilitation phase for children with severe malnutrition (marasmus or kwashiorkor) should take place within communities, or in settings where children are inpatients.

INTRODUCTION

Once severely malnourished children have been treated for acute problems in the stabilization phase of treatment, they require a longer phase of rehabilitation to enable catch up growth. Treatment in this phase includes frequent intake of energy and nutrient dense food, and education for the mother or carer. There has been discussion over the last 30 years as to the best setting for rehabilitation. Inpatient rehabilitation is costly, carries risks of cross infection, and is disruptive to families. Rehabilitation in ambulatory settings seems economically more sustainable, but the clinical effectiveness of such programs compared with inpatient treatment has not been established.

The following categories have been used in the past to describe care settings [1], and will be utilised in this review to make clear the interventions employed in different studies.

1. Inpatient hospital treatment

2. Residential rehabilitation centres where children live as inpatients. Their mothers or carers accompany them, assist in food preparation, and receive education.

3. Day stay rehabilitation centres, where children spend 6-8 hours per day and take several meals, for most days each week. Mothers or carers often attend, and education activities occur.

4. Ambulatory treatment, which may include supplements for home, and education for mothers or carers.

METHODS

The following search strategies were employed:

Cochrane library, 'nutrition disorder' AND 'child' – no relevant reviews

Pub med database, 'nutrition disorders AND (hospital OR ambulatory care OR home care services) AND humans AND (infant OR child), and restricting to systematic reviews - 31 articles found, 5 relevant.

Same search using the clinical filters 'therapy' and 'specific' - 75 articles found, 6 relevant. Same search using the clinical filters 'therapy' and 'broad' 472 further articles, and 10 further relevant articles were found.

Pub med database 'RTUF' using clinical filters 'therapy' and 'broad' found 1 further relevant article.

Titles were read to select articles pertaining to malnutrition in developing countries. The abstracts of these were then read, and articles not dealing with the rehabilitation phase of treatment were excluded. The remaining relevant articles were retrieved. If abstracts were not available, the complete article was sourced. One economic analysis (type 2b), three randomized controlled trials (type 1b), one systematically allocated trial (type 2b), and one large observational study (?type) were identified.

RESULTS

One study compared the cost effectiveness of different methods of care delivery for malnourished children in Dhaka, Bangladesh, and reported the clinical data, cost analysis, and follow up in three separate papers [2, 3, 4]. (Type 1b trial, type 2b economic evaluation). 437 children aged 12-60 months were randomised to three treatment options – inpatient nutritional rehabilitation centre, day care facility where they attended 6 days per week, or to domiciliary care in the home after one week of day care treatment, where they received weekly and then fortnightly visits from experienced health workers. Previous studies had indicated home care may be inappropriate for children under 1 year of age. Treatment continued until 80% of National Centre for Health Statistics expected weight for height was achieved. No food supplements were supplied for home. Children were excluded from the study if they had a critical, metabolic or congenital illness, or lived over 10km from the hospital. Children whose parents requested a change of group, who needed more than an initial 7 days of daily care, and children who died, were excluded from analysis – a total of 24% of patients were thus excluded after randomisation. Cost analysis was very detailed, and disaggregated into institution and parent costs.

The study found statistically significant differences between the domiciliary, day care and inpatient groups with regard to institution costs (US$29, US$59, US$156, p<0.0001), and between the domiciliary and other groups with regard to time taken to reach 80% of National Centre for Health Statistics expected weight for height (at home 35 days, day care 23 days, inpatient 18 days, p<0.001), rate of oedema loss (at home 19 days, day care 13 days, inpatient 11 days, p<0.001), rate of weight gain (4, 6, 11 g/kg of body weight/day, p<0.001), and cost to parents (at home 6363 taka, day care 2517 taka, inpatient 1552 taka, p<0.0001). There was no difference in mortality rates between the 3 groups (all groups <5%). The conclusion was drawn that the interventions were clinically equal and that there was no detriment to domiciliary group children in taking longer to reach 80% of expected weight for height.

The authors combined institutional and parental costs to calculate that domiciliary care was 1.6 times more cost effective as day care, and 4.1 times more cost effective than inpatient care. However, it would be clearer to say home care was more cost effective for the health service, but not for the parents. Most discontinuations occurred in the day care group, and a survey of parents at the end of the study found most preferring the domiciliary care option. Fortnightly follow up occurred for 12months. 23% of children were lost to follow up, significantly more from inpatient group than the other two. Follow up revealed high morbidity (mean 7 episodes of diarrhoea for the year), low mortality (2.3%), continued weight gain (mean weight for height 91% National Centre for Health Statistics expected value), and persistent stunting of height. Except for less cough and fever being reported in the domiciliary care group (p 0.03), there were no differences at follow up between intervention groups.

The authors of one randomised controlled trial aimed to demonstrate the effect of rehabilitation under optimal inpatient conditions. They studied 81 malnourished children in Jamaica [5], and compared full rehabilitation in hospital (to 95-100% National Centre for Health Statistics weight for length - average stay 40 days), with a short hospital stay followed by ambulatory rehabilitation (average hospital stay 18 days). Both groups received 6 months of standard community health service care following discharge, with the short stay group also being supplied with a daily high energy supplement at home for three months, and then ceasing rehabilitation regardless of clinical parameters. Results were expressed as standard deviation units from the National Centre for Health Statistics expected value for age. Children were followed up every 6 months after discharge from hospital for three years. Weight for age from the time of discharge from hospital until 2 years of follow-up was greater in the long stay group (mean -2.49, standard error 0.12 at discharge, mean -1.2 standard error 0.2 at two years) than the short stay group (mean -3.38, standard error 0.16 at discharge, mean -1.9 standard error 0.2 at two years). The short stay group did not achieve the weight for age of the long stay group at any of the follow up points, despite the three months of supplementation. Length for age from 12 months- 3 -until 30 months of follow up was significantly greater in the long-stay group (mean -1.8,standard error 0.2 at 12 months, mean -0.8standard error 0.2 at 30 months) than in the short stay group (mean -2.6, standard error 0.3 at 12months, mean -1.4, standard error 0.2 at 30months). By the end of 36 months of follow there were no differences between groups, and the weight and height of children in both groups approached that expected in their home community.

Another randomised trial compared rehabilitation in a malnutrition ward of a hospital (the level of care being between that of a hospital and nutritional rehabilitation centre) to rehabilitation in a community program (which was somewhere between a day-care rehabilitation program and ambulatory care) of 100 malnourished children in Niger [6]. Existing programs were used, and therefore reflected care as it was actually delivered in Niger at the time. The study found no statistically significant difference in mortality or in weight for height between the two groups after 6 months of follow up. However, the mortality rate in both groups was very high (41%in the hospital group, 33% in the ambulatory rehabilitation group), and the study was presumably underpowered to detect this clinically significant difference of 19.5% between the groups. Children lost to follow up were not included in the mortality analysis, the actual periods of rehabilitation were short, being about 12 days, and no measure given of when children were deemed to have completed rehabilitation. The study did find a significant difference in the cost of treatment, with hospital rehabilitation costing 120% more than ambulatory rehabilitation (p<0.001). (Type 2b economic analysis).

One study compared hospital rehabilitation with rehabilitation at home using RTUF [7]. 1178 children who presented to seven nutrition rehabilitation units (NRU) in Malawi were systematically allocated to receive either standard inpatient therapy (WHO guidelines, with rehabilitation stage commenced in NRU but often completed at home with cereal and legumes), or home therapy with all of the rehabilitation phase of treatment at home using RTUF. Eligible children had a WFH of >-2 SD, and children with severe oedema, anorexia and systemic infection were excluded. Weight for height Z score <-2 was more likely to be achieved in the RUTF (79%) than the standard

therapy group (46%, p<0.001). Relapse or death was less likely in the RTUF group compared with the standard therapy group (8.7% compared with 16.7%, p-<0.001). Lower rates of cough, fever, diarrhea over the first 14 days of treatment were reported in the RTUF group (p<0.001). The lack of formal randomization, due to poor acceptance of this in the community, necessitated prospective systematic allocation, designed to control for differences in presentation during different seasons. However, the RTUF group had higher initial weight for height z scores, and the authors postulate that mothers of moderately malnourished children may have only presented when the home RTUF option was being offered by the rehabilitation centres, as this would have been less disruptive to families.

A randomised controlled trial compared the efficacy F-100 with RTUF during the rehabilitation phase in a therapeutic feeding centre in Senegal [8]. Seventy malnourished children (weight for height z score <-2) in Senegal received either F-100 or RTUF ad libitum during the rehabilitation phase of management. Those in the RTUF group had a greater mean daily energy intake, consuming 808 kJ per kg per day, compared with 573 kJ per kg per day in the F-100 group (p<0.001). Average weight gain was greater in the RTUF group, who gained 15.6g/kg/day, compared with 10.1g/kg/day in the F-100 group (p<0.001). The more wasted children had the largest weight gains. The RTUF group had a shorter duration of rehabilitation of 13.4 days, compared with 17.3 days in the F-100 group (p<0.001). The study was not blinded due to the differences in appearance of the two food options.

A large observational study of a field operation in Malawi [9] involved nearly 3000 malnourished children treated with RTUF at home via 12 centres with three different staffing models, and reported the outcomes for severely and moderately malnourished children in terms of recovery (85% and 89% respectively), failure (3% and 4% respectively) or death (1% and 2% respectively). The authors assert that outcomes were acceptable based on comparison with Sphere guidelines and the Prudhon case fatality index, and thus home based therapy with RUTF yields acceptable results, with no differences in outcome with different staffing models.

SUMMARY

Full nutritional rehabilitation can occur in an inpatient setting, and in one study the benefits were measured in growth advantage for two years after the intervention (level A evidence). Compared with inpatient rehabilitation, ambulatory rehabilitation (without food supplied) costs less to the health service but costs more to parents (level B evidence). Ambulatory rehabilitation took 17 days longer to achieve equivalent growth indices to children treated as in-patients in one study, and did not achieve the same improvements in weight gain and growth measurements after 6 months in another (level A evidence). Rehabilitation with RTUF in the home setting was more likely to achieve recovery, and had lower rates of relapse, death and infection than rehabilitation partly in hospital and partly at home with local foods (level B evidence). Children given RTUF as inpatients during the rehabilitation phase consume more energy, gain more weight, and have shorter rehabilitation than those given F-100 (level A evidence). Large programs of home therapy have been developed, which can achieve large coverage of populations. In the absence of large randomised trials, the evidence for these being superior to inpatient management remains incomplete.. Current opinion would suggest that a combination of inpatient and outpatient programs should exist, the former for more complicated cases and the latter for improved access to treatment on a larger scale.

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