Received: 13 January 2022 | Accepted: 3 August 2022

DOI: 10.1111/jhn.13083

ORIGINAL ARTICLE

JHND Journal of Human Nutrition and Dietetics | BDA The Association of UK Dietitians

Nutritional follow-up in children after discharge: Organisation in a tertiary care centre

Marissa Kooij[1] | **Emma Koster**[1] | **Renate Eveleens**[2] | **Koen Joosten**[1]

[1]Erasmus Medical Centre Sophia Children's Hospital, Rotterdam, The Netherlands

[2]Amsterdam University Medical Centre, Amsterdam, The Netherlands

Correspondence

Marissa Kooij, Erasmus Medical Centre Sophia Children's Hospital, Wytemaweg 80, 3015 CN Rotterdam, The Netherlands.
Email: m.kooij@erasmusmc.nl

Abstract

Background: Aiming to improve the standard of care for patients with a nutritional intervention, we evaluated how nutritional follow-up (FU) is organised at discharge and after 6 months.

Methods: From 16 November 2020 until 20 December 2020, we retrospectively included patients admitted for > 1 day to the general ward of a tertiary hospital. Medical charts were reviewed for demographics, anthropometric measurements and nutritional interventions (e.g., tube, parenteral nutrition). Involved healthcare provider (HCP), dietitian and speech and language therapist (SLT) were scored. Nutritional care FU was categorised as in a primary, secondary or tertiary care setting.

Results: We included 206 (52.4% male) patients, with a median length of stay of 4 (3–8) days. Prehospitalisation 58 (28.2%) patients had a nutritional intervention compared to 74 (35.9%) patients at discharge. In total, 80 (38.8%) patients received nutritional care FU by a total of 114 HCP, and approximately half (53.5%) were dietitians. FU was mostly conducted by a dietitian in the tertiary care (78.7%) and by an SLT in the primary care (54.5%). For 15 (20.3%) patients, the discharge letter included complete reports of nutritional interventions. At 6 months FU, 26.6% of the children still had a nutritional intervention. Mean weight standard deviation score increased significantly between discharge from the hospital and 6 months FU.

Conclusions: A considerable amount of paediatric patients received a nutritional intervention pre- and post-hospitalisation. Nutritional care is organised around a multitude of different HCP; however, not all cases are multidisciplinary. Nutritional care was scarcely reported correctly in the discharge letter.

KEYWORDS

children, discharge letter, nutritional intervention, organisation, tubefeeding, weight

Key points

- The present study evaluated how nutritional follow-up (FU) was organised at discharge and after 6 months.
- More children received a nutritional intervention post-hospitalisation than pre-hospitalisation.
- Nutritional FU was conducted by multiple healthcare providers (HCP) of which more than half were dieticians.
- The nutritional plan was poorly reported in the discharge letter with only one fifth containing complete reports.

INTRODUCTION

An imbalance between nutrient requirements and intake in children, which results in deficits in macronutrients and micronutrients, can be defined as paediatric malnutrition. Malnutrition can lead to growth and developmental impairment.[1,2] At admission, paediatric patients are often malnourished, ranging from 7.0% to 39.7%, or at risk of becoming malnourished.[3–7] Malnutrition at admission increases the length of stay, and thus the hospitalisation costs, and also decreases quality of life.[5–7] To identify children at risk for malnutrition upon admission screening tools such as the Screening Tool for Risk on Nutritional Status and Growth (STRONGkids) have been designed. It has been reported that a STRONGkids high risk classification is associated with a longer hospital stay and lower weight for height standard deviation score (SDS).[8]

To prevent and treat malnutrition and to prevent the adverse consequences of malnourishment a variety of nutritional interventions can be given, such as energy- and protein-enriched and disease-specific formulas. This is parallel to disease-specific treatment. In addition to disease-specific follow-up (FU), adequate FU of nutritional status can offer opportunities to optimise growth, nutritional status and recovery after discharge. A previous study of hospitalised critically ill children reported complete recovery of nutritional status 6 months after discharge in almost all subjects.[9] However, that study did not outline the means of nutritional FU and whether nutritional interventions were continued after discharge.

Aiming to further improve the standard nutritional care and FU for patients with a nutritional intervention or in need for nutritional FU, we evaluated how nutritional FU is organised in a tertiary care hospital. We were especially interested in children discharged with a nutritional intervention and the responsible healthcare provider (HCP) involved in nutritional care. Second, we evaluated the nutritional FU 6 months after discharge.

METHODS

Study design

We conducted a retrospective cohort study at the Erasmus Medical Centre Sophia Children's Hospital Rotterdam which is a tertiary care centre. We collected data from the electronic patient system of children who were discharged from the general ward between 16 November 2020 and 20 December 2020 and up to 6 months FU. The International Review Board reviewed our study and approved of our study protocol (MEC-2020-0949). The need for patient consent was waived.

Inclusion and exclusion criteria

Inclusion criteria were (1) patients aged 0–18 years; (2) admitted to the general ward during the study period; and (3) length of hospital stay (LOS) longer than 24 h. In case of readmission, data were only included for the first admission episode. Exclusion criteria for evaluation were (1) premature neonates (birth at < 37 weeks of gestational age) who had not reached corrected term age and (2) death during admission. Patients were excluded for the 6-month FU period if they died within 6 months after discharge and/or did not receive clinical or outpatient FU in our hospital.

Data collection

Medical charts were reviewed regarding gender, age, LOS, diagnostic category and paediatric intensive care unit (PICU) admission before admission to the general ward. Age groups were defined as neonates (until 28 days of age), infants (28 days until 1 year of age) and children (older than 1 year). The STRONGkids score was noted if measured within 24 h after admission with a score of 0 indicating low risk, 1–3 indicating medium risk, and 4 and 5 indicating high risk for malnutrition.[8] Anthropometric measurements, including weight and height, were obtained from medical charts before admission (up to 1 year before admission), upon admission, discharge and up to 6 months after discharge. Measurements were converted to SDS using the Dutch TNO growth charts for patients older than 7 days and the Fenton growth chart was used for neonates younger than 7 days.[10,11] The Dutch TNO growth charts were corrected for prematurity until patients reached 2 years of age. Corrected growth charts were also used for patients with Down's syndrome. Acute malnutrition was defined as ≤ 2 SDS weight for age in patients < 1 years old and ≤ 2 SDS weight for height in patients ≥ 1 years old. Chronic malnutrition was defined as height SDS ≤ 2 for all ages.

Readmissions after discharge (admission longer than 24 h) and duration of nutritional FU in Sophia Children's Hospital were recorded.

To investigate the organisation of nutritional FU, data were collected on involved HCP; dietitian and/or speech language therapist (SLT) and/or paediatrician. FU by an SLT was only scored if it concerned nutritional problems. The referral of nutritional care was defined as a primary, secondary or tertiary care setting. These data were collected from medical charts and discharge letters from the involved medical doctor during hospital stay. FU by a paediatrician was scored both on disease specific FU and FU related to nutritional care, growth and/or malnutrition. When FU was not performed in our hospital, discharge letters were screened concerning recommendations about FU for nutritional care and growth-related problems. Data were collected both on nutritional intervention upon admission and discharge

specified in administration route, that is oral, enteral, parenteral and type of nutrition, that is energy- and protein-enriched diet and disease-specific diet, both with and without supplements and standard supplements. Supplements were defined as modules, formulas, sip feeding and tube feeding. Additionally, discharge letters were screened on reporting nutritional care at discharge (i.e., intervention, type of nutrition, special diets).

Data were collected up to 6 months after discharge on anthropometric measurements, nutritional interventions, involved HCP and care setting regarding nutritional care in the Sophia Children's Hospital (patients were not included if FU was exclusively conducted in another hospital).

Outcome measures

The primary outcome measure was the organisation of nutritional FU after discharge up to 6 months FU. The FU was outlined as number and type of involved HCP and care setting. Moreover, nutritional interventions, absolute numbers and type and route, were analysed during the study period.

Secondary outcome measures were nutritional intervention at discharge, dietitian or SLT consulted during hospitalisation and dietitian, SLT or paediatrician involved during FU in six predefined subgroups. These subgroups are (1) patients with a reported STRONGkids score within 24 h after admission; (2) LOS subdivided in hospitalisation shorter than 4 days and longer than 4 days; (3) age groups; (4) PICU admission during admission; (5) diagnostic categories; and (6) malnutrition at admission. Finally, weight change before admission, during admission and 6 months after discharge were recorded.

Statistical analysis

Statistical analyses was performed using SPSS, version 25 (IBM Corp.). Categorical variables were summarised as frequencies and percentages. Continuous variables were reported as medians and interquartile ranges or means and SD. Descriptive statistics were mostly used. Normality of data was tested using the Kolmogorov–Smirnov test. Continuous variables were compared using a paired samples *t* test. Categorical variables were compared using a chi-squared test or Fisher's exact test. $p < 0.05$ were considered statistically significant. If multiple comparisons were made, a Bonferroni correction was used.

RESULTS

Baseline characteristics

From 16 November 2020 until 20 December 2020, 602 patients admitted to the paediatric general ward were screened for eligibility. LOS was shorter than 24 h in 379 patients, 12 patients were readmitted, four patients had not reached corrected at term age and one patient died; therefore, they were excluded. In total, 206 patients were included in the analysis.

Table 1 shows the baseline characteristics of the included patients. On admission acute malnutrition was present in 5.9% of the children < 1 year and 7.3% > 1 year. Chronic malnutrition was present in 13.6% of the patients (8.7% < 1 year and 91.3% > 1 year). In 161 patients, with a measured weight and height, acute and chronic malnutrition was present in 34 patients (21.1%). In 105 patients, STRONGkids score was measured and showed a low risk in 60 patients (57%), medium risk in 43 patients (41%) and high risk in two patients (2%).

For the 6-month FU period, 18 patients were excluded, 13 patients received no FU and five patients died. One hundred and 88 patients (91.3%) received FU in our hospital after discharge. FU periods differed between patients. For the FU period, data were available until 1 month after discharge in 18 patients (9.6%), up to 2 months in 10 patients (5.3%), up to 3 months in 21 patients (11.2%), up to 4 months (6.4%) in 12 patients, up to 5 months in 16 patients (8.5%) and up to 6 months in 111 patients (59.0%). After 6 months, 164 patients (79.6%) were still in FU, either disease-specific or nutritional. During the 6-month FU period, 34 patients (18.1%) were readmitted once, 14 patients (7.4%) twice, four patients (2.1%) three times and three patients (1.6%) four times.

Nutritional care prehospitalisation and during hospitalisation

Prehospitalisation 58 patients (28.2%) had a nutritional intervention: 39 medical patients (67.2%) and 19 surgical patients (32.8%) (Figure 1). In 50 of the 58 patients (86.2%), a dietitian was already involved and, in 12 patients (20.7%), a SLT was involved. During hospitalisation, another 20 patients received a nutritional intervention. In four patients (6.9%), the nutritional intervention at admission was completed before or at discharge. During admission, a dietitian and/or SLT was involved in 70 patients (34.0%) of whom 35 patients already had involvement before admission and 35 patients were new patients.

FU after discharge

At discharge, 74 patients (35.9%) had a nutritional intervention (Figure 1); 38 patients of these patients (51.4%) received partial of complete enteral nutrition tube feeding), of whom 17 patients (44.7%) had a gastrostomy tube. Five patients (6.8%) received (partial) home parenteral nutrition. The administration route for the intervention was oral in 31 patients (41.9%).

TABLE 1 Baseline characteristics

Characteristics	Number of patients	Results
Male, *n* (%)	206	108 (52.4)
Age at inclusion, median years (IQR)	206	4.5 (1.0–12.2)
Age groups	206	
Neonate < 28 days, *n* (%)		14 (6.8)
Infants ≥ 28 days and ≤ 1 year, *n* (%)		38 (18.4)
Children > 1 year, *n* (%) (%)		154 (74.8)
LOS, median days (IQR)	206	4.0 (3-8)
Malnutrition at admission[b]		
Weight SDS (< 1 year), *n* (%)	51	3 (5.9)
Weight to height SDS (> 1 year), *n* (%)	124	9 (7.3)
Height SDS, *n* (%)	169	23 (13.6)
STRONGkids, *n* (%)	105	
Low risk		60 (57.1)
Medium risk		43 (41)
High risk		2 (1.9)
Diagnostic group, *n* (%)	206	
Surgical		117 (56.8)
Orthopaedic		25 (12.1)
Abdominal		22 (10.7)
Cardiac		20 (9.7)
Neurologic		20 (9.7)
Urologic		16 (7.8)
Trauma		7 (3.4)
ENT		4 (1.9)
Other		3 (1.5)
Medical		89 (43.2)
Neurologic		20 (9.7)
Gastrointestinal/urologic		19 (9.2)
Other		16 (7.8)
Respiratory		9 (4.4)
Inflammatory/auto-immune		8 (3.9)
Oncologic		8 (3.9)
Infection (non-cardiac/ respiratory/gastro-intestinal)		5 (2.4)
Cardiac		4 (1.9)
Admitted to PICU during hospitalisation, *n* (%)	206	
No admission		143 (69.4)
Elective admission		35 (17.0)
Non-elective admission		28 (13.6)

Abbreviations: ENT, ear, nose and throat; HC, head circumference; LOS, length of stay; PICU, paediatric intensive care unit; SDS, standard deviation score; STRONGkids, Screening Tool for Risk on Nutritional Status and Growth.

[a]≤ 7 days Fenton growth chart, > 7 days TNO growth chart.

[b]Malnutrition was defined as SDS ≤ −2.

In 38 patients (51.4%), the nutritional intervention consisted of a disease-specific diet of whom 30 patients used disease-specific supplements (modules, formulas, sip feeding and tube feeding). In 16 patients (21.6%) energy- and protein-enriched supplements were prescribed. In the other 20 patients (27%), either standard supplements or energy- and protein-enriched diet advice was administered.

From the 74 patients with a nutritional intervention at discharge, four patients did not receive nutritional FU because the clinician judged this was not needed. Another 10 patients who did not receive a nutritional intervention at discharge received FU for nutritional care anyway. The reason for FU in these patients was growth in two patients, monitoring intake in one patient, training oral feeding in two patients, growth and training oral feeding in two patients, obesity in one patient, and probable onset of disease-related feeding problems in two patients. Overall, a total of 80 patients received nutritional FU.

Two hundred and three (98.5%) patients received disease-specific FU by a paediatrician. In the 80 patients receiving nutritional FU, 114 HCPs were involved. A dietitian was involved in 61 (76.3%) patients, a SLT in 22 (27.5%) patients and a paediatrician in 31 (38.8%) patients (Table 2). Furthermore, multiple combinations of HCP were possible, with the most frequent nutritional FU consisting of a dietitian and paediatrician ($n = 9$; 11.3%) and a dietitian, SLT and paediatrician ($n = 7$; 8.8%). In five patients, a paediatrician and SLT (6.3%) conducted the FU and, in six patients, a dietitian and SLT (7.5%).

FU by a dietitian was predominantly received in the tertiary care setting (78.7%), either in the Sophia Children's Hospital or in a tertiary care hospital elsewhere (Table 2). However, SLT mostly organised their FU in the primary care setting (54.5%) and paediatricians divided their dietary care equally between secondary and tertiary care setting (45.2% vs. 51.6%).

In 15 patients (20.3%), the discharge letter mentioned the correct nutritional intervention including administration route, specific diet and/or formula and quantities (Table 3). In 16 patients (21.6%) with an intervention at discharge, there was no mention of a nutritional

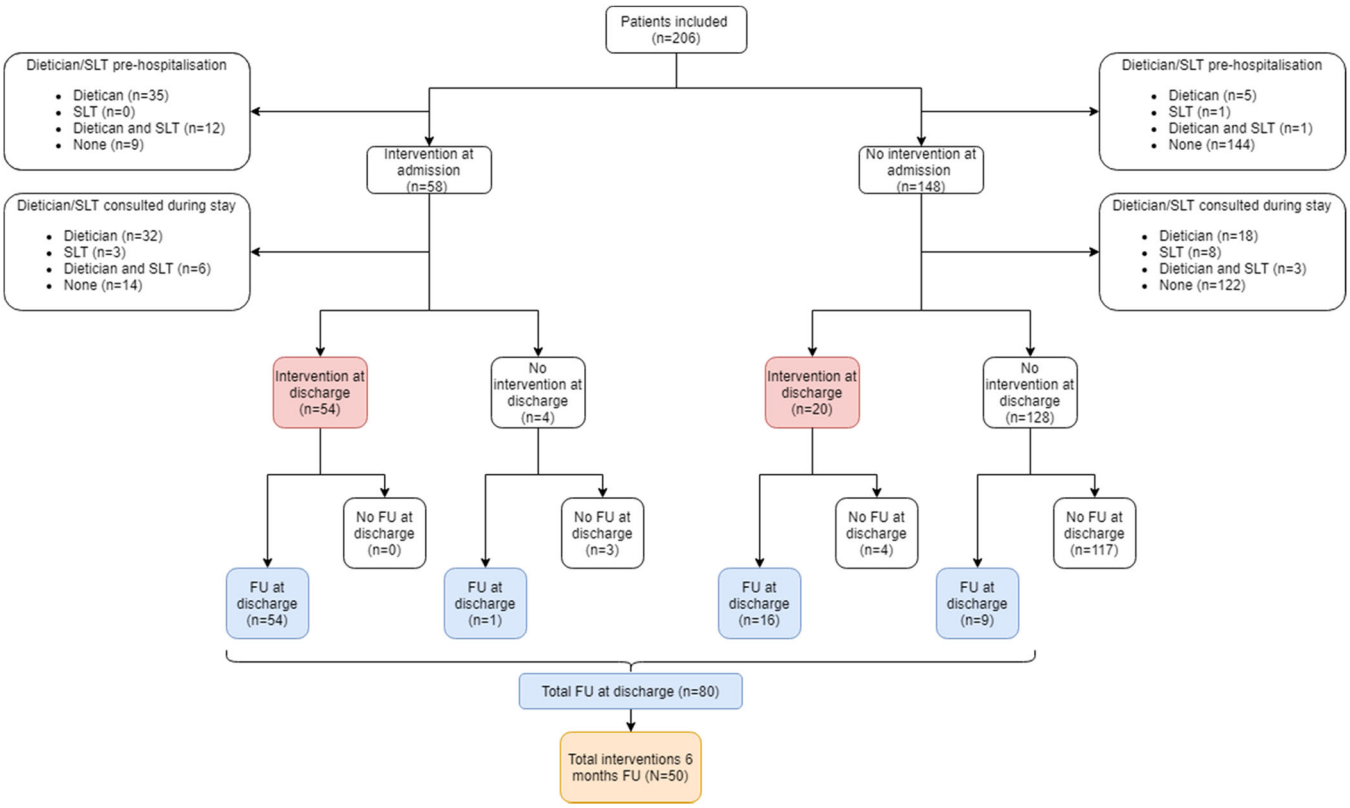

FIGURE 1 Flow chart of nutritional care at admission until discharge Intervention is classified as a nutritional intervention. In total, 74 children had an dietary intervention at discharge and 80 children received nutritional follow-up after discharge. FU, follow-up; SLT, speech and language therapist.

TABLE 2 Care setting follow-up per healthcare provider

	Primary care	Secondary care	Tertiary care Sophia	Tertiary care
Dietitian ($n = 61$), n (%)	2 (3.3)	11 (18.0)	41 (67.2)	7 (11.5)
SLT ($n = 22$), n (%)	12 (54.6)	5 (22.7)	5 (22.7)	0
Paediatrician ($n = 31$), n (%)	1[a] (3.2)	14 (45.2)	11 (35.5)	5 (16.1)

Notes: In 80 patients nutritional follow-up was conducted with a total of 113 healthcare providers involved. The table shows in which care setting follow-up was conducted per healthcare provider.

Abbreviation: SLT, speech and language therapist.

[a]General practitioner.

intervention in the discharge letter. In 43 patients (58.1%), no completely correct prescription of the nutritional plan was found.

FU after discharge

Six months after discharge, 50 of 188 patients (26.6%) still received a nutritional intervention. In seven patients with a nutritional intervention at admission, there were no FU data, in 22 patients the intervention was discontinued and, in five patients, a nutritional intervention was started after discharge. In patients where the intervention was stopped, 11 patients (50.0%) received enteral nutrition and 11 patients (50.0%) received oral nutrition. Twenty-one patients (42.0%) received partial or complete enteral nutrition at 6 months FU, 17 patients had a gastrostomy tube and four patients a nasogastric tube. In the 21 patients with a nasogastric tube at discharge, four patients had no FU, four patients still had a nasogastric tube at 6 months FU and, in 13 patients, the nasogastric tube was discontinued. In the group where the nasogastric tube was discontinued, one patient received a gastrostomy tube and one patient transitioned to parenteral nutrition. One of the five patients with (partial) home parenteral nutrition at discharge was weaned off parenteral nutrition 6 months after discharge.

TABLE 3 Nutritional information in discharge letter

	n = 74
Correct mention, *n* (%)	15 (20.3)
Partly correct mention, *n* (%)	
Administration route missing	4 (5.4)
Specific diet/formula missing	3 (4.1)
Quantities missing	4 (5.4)
Quantities and specific diet/formula missing, correct route	9 (12.1)
Quantities and route missing, correct formula/diet	1 (1.4)
Mention of intervention, no specification	22 (29.7)
No mention of a nutritional intervention, *n* (%)	16 (21.6)

Notes: Nutritional information reported in het discharge letter. Correct mention included administration route (i.e. oral, enteral, parenteral), specific mention of diet/formula (i.e. ketogenic diet, fibre enriched) and quantities.

Nutritional care in predefined subgroups

Table 4 shows subgroups of our population in relation to nutritional care. More nutritional interventions at discharge, increased involvement of dietitians and SLT, and higher nutritional FU rates were found in children with a higher STRONGkids score, in malnourished children, in children with a longer LOS and in children within the medical diagnostic group. The results were statistically significant, except for increased involvement of a dietitian and/or SLT in medium- and high-risk STRONGkids score children.

Weight course during admission and after discharge

In 111 children (53.9%), weight was measured at admission and at discharge. The mean SDS for weight

TABLE 4 Nutritional care in predefined subgroups

	Number of patients	Intervention at discharge	HCP during hospitalisation[c]	FU HCP
STRONGkids, *n* (%)	105	$p < 0.001$		$p = 0.002$
Low risk (*n* = 60)		11 (18.3)*	14 (23.3)	14 (23.3)*
Medium and high risk (*n* = 45)		24 (53.3)	18 (40.0)	24 (53.3)
PICU admission, *n* (%)	206			
Yes (*n* = 63)		21 (33.3)	23 (36.5)	21 (33.3)
No (*n* = 143)		53 (37.1)	47 (32.9)	59 (41.3)
Acute malnutrition at admission, *n* (%)[a]	175	$p = 0.03$	$p = 0.03$	$p = 0.01$
Yes (*n* = 12)		8 (66.7)	8 (66.7)	9 (75.0)
No (*n* = 163)		55 (33.7)	53 (32.5)	61 (37.4)
LOS, *n* (%)	206	$p < 0.001$	$p < 0.001$	$p = 0.01$
≤ 4 days (*n* = 105)		25 (23.8)*	19 (18.1)*	32 (30.5)
> 4 days (*n* = 101)		49 (48.5)	51 (50.5)	48 (47.5)
Age groups, *n* (%)[b]	206			
Neonates (*n* = 14)		5 (35.7)	9 (64.3)	6 (42.9)
Infants (*n* = 38)		11 (28.9)	9 (23.7)	14 (36.8)
Older children (*n* = 154)		58 (37.7)	52 (33.8)	60 (39.0)
Diagnostic category, *n* (%)	206	$p < 0.001$	$p < 0.001$	$p < 0.001$
Surgical (*n* = 117)		23 (19.7)*	26 (22.2)*	27 (23.1)*
Medical (*n* = 89)		51 (57.3)	44 (49.4)	53 (59.6)

Abbreviations: FU, follow-up; HCP, healthcare professional; LOS, length of stay; PICU, paediatric intensive care unit; SLT, speech and language therapist.

[a]Malnutrition was defined as SDS ≤ −2 on weight standard deviation score, height standard deviation score or weight for height standard deviation score.

[b]Neonates < 28 days; infants ≥ 28 days and ≤ 1 year; children > 1 year.

[c]Paediatrician not included, automatically involved during hospitalisation.

*Significant using the Bonferroni correction calculated, $p = 0.003$.

at admission was 0.05 (SD ± 1.6) and, at discharge, it was −0.2 (SD ± 1.5). For children with an intervention at admission, the mean SDS for weight at admission was −0.9 (SD ± 1.8) and, at discharge, was −0.6 (SD ± 1.6). Thirteen children (11.7%) had a weight SDS ≤ 2 at discharge. Fifty-four children (48.6%) lost weight during their admission with a median percentage of weight loss of −2.7% [interquartile range (IQR) = −5.5 to −1.4]. In 39 (72.2%) patients, weight loss was between 0% and 5% and, in 15 (27.8%) patients, weight loss was ≥ 5%. When dividing the 111 patients in a group in which a dietitian was involved or not during hospital stay, weight loss was present in 54.2% and 44.4%, respectively, of patients.

In Figure 2, the weight SDS during the study period is depicted in children with and without an intervention at admission.

DISCUSSION

In the present study, we aimed to investigate the organisation of nutritional FU in 206 children who were admitted to the general ward in a tertiary care hospital for more than 24 h. At discharge, a total of 74 patients (35.9%) and 80 patients (38.8%), respectively, received a nutritional intervention and nutritional FU. In these 80 patients, 114 HCP's were involved, with a multitude of combinations possible and in different care settings. In only 20.3% of the patients with a nutritional intervention at discharge, the correct intervention was mentioned in the discharge letter. During FU, the number of patients with a nutritional intervention had decreased (26.6%). Mean weight SDS increased significantly between discharge and 6 months after discharge, and also in children with a nutritional intervention.

Upon admission, 58 patients (28.2%) received a nutritional intervention that is much higher than previously described (11.8%).[7] During hospitalisation, a nutritional intervention was started in 20 patients which contained oral, enteral or parenteral feeding strategies. We found that longer LOS, higher STRONGkids score, medical diagnostic group and malnutrition upon admission were associated with more nutritional interventions, involvement of dietitian/SLT during stay and nutritional FU. One study also showed a significant difference between increasing STRONGkids risk groups and the percentage of interventions per risk group ($p < 0.05$).[12]

In the present study, 48.6% of the children lost weight during admission (median weight loss 2.7%; IQR = 1.4–5.5), which is in accordance with previous studies.[5,7] However, we did not find a difference in weight loss between patients consulted or not consulted by a dietitian (54.2% vs. 44.4%). This is in contrast to a Canadian study in which it was shown that the percentage of patients who lost weight was significantly higher in patients not visited by a dietitian.[5] We argue that the effect of a dietitian involved during hospitalisation on weight gain can hardly be concluded from a population with a median LOS of 4 days but has to be judged in patients with a longer hospital stay and in FU after discharge.

The percentage of children receiving a nutritional intervention at discharge (35.9%) is also higher compared to previous studies (ranging from 12.1% to 17.3%).[13,14] This difference might be explained by the present study being performed in a tertiary academic hospital. Furthermore, our higher rates of nutritional intervention could be a result of the previous studies using less broader definitions of nutritional interventions. Six months after discharge, the nutritional intervention rate

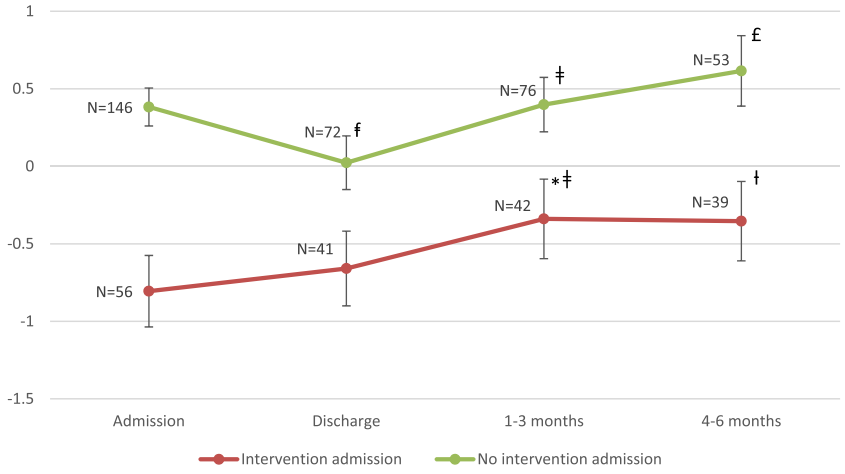

FIGURE 2 Mean standard deviation score for weight from admission until 6 months after discharge. Standard deviation score for weight from admission, at discharge, after 1–3 months after discharge and 4–6 months after discharge. All values are expressed as the mean ± SEM. [f]Value is statistically significant compared to admission, $p < 0.05$ ($n = 71$). *Value is statistically significant compared to admission, $p < 0.05$ ($n = 41$). [ǂ]Value is statistically significant when compared to admission, $p < 0.05$ (n = 37). [ǂ]Value is statistically significant compared to discharge, $p < 0.05$ ($n = 41$; $n = 31$). [£]Value is statistically significant compared to discharge, $p < 0.05$ ($n = 23$).

decreased to 26.6% and we noted a significant improvement overall of the weight SDS, implying the effect of nutritional intervention. Importantly, in 13 children, nasogastric tube feeding could be stopped and, in one child, parenteral nutrition could be stopped.

The care setting where FU was conducted differed among HCPs. For dietitians, it was mostly concentrated in the tertiary care setting; for SLT, it was mostly concentrated in the primary care setting; and, for paediatricians, it was equally concentrated in the secondary and tertiary care setting. Interestingly, in only one-third of the children, nutritional FU was conducted by two or three HCPs, which might be necessary in all children with a nutritional intervention. At the very least, it is recommended that the standard care for tube-fed children is performed in a multidisciplinary team.[13] Furthermore, a comment by the ESPGHAN Committee on Nutrition suggests the implementation of a nutrition support team in paediatric units.[14] The team should be multidisciplinary consisting of paediatrician specialised in nutrition, a dietitian, a nurse and, if possible, a pharmacist. The goal of this team would be screening patients for nutritional risk, identifying children in need of nutritional support, providing nutritional management, and education and training of hospital staff. Barriers for adequate nutritional care are identified as lack of personnel or resources to carry out screening and measurements, lack of awareness (importance nutrition, limited education/training) and lack of a protocol managing undernutrition.[15] These barriers should be tackled by introducing more education during the nursing and medical curriculum about nutrition and create awareness through clinical lessons/presentations.

An astonishing result of our study was that, in only 20.3% of the patients with a nutritional intervention at discharge, the correct intervention was mentioned in the discharge letter, whereas, in 21.6% of the patients, there was no mention at all of an intervention in the discharge letter. This result calls for action and improvement. A Canadian study conducted in an adult diabetic population evaluated the content and quality of the discharge letter (to a primary physician) with and without using a discharge letter template.[16] The letters created using a template more frequently included risk factors, disease-specific management options and re-referral criteria. The use of similar templates could be an outcome for our population, first of all to increase the complete mention of the nutritional intervention at discharge and to set patient-specific nutritional goals. In addition, up-to-date information from a SLT or dietitian should be included.

Although a considerable percentage of our population lost weight after admission, weight SDS resorted after discharge. There was a significant difference in weight SDS between admission and directly at discharge compared to 1–3 months and 4–6 months after discharge, as well as in patients who already had a nutritional intervention at admission. This is in agreement with a previous study from our centre in which patients who were admitted to the intensive care had a restored weight SD score 6 months after discharge.[9] This emphasises the need for careful evaluation of the effect of nutritional therapy on growth after discharge and to set goals for nutritional treatment in relation with growth parameters.

Although the present study was performed in a relatively large sample and it was the first study to outline nutritional care in a tertiary care hospital in such an extensive manner, study limitations should also be addressed.

The retrospective study design makes our study prone to bias. To minimise the risk of bias, we screened the discharge letter, electronic patients files and old discharge/outpatient clinic letters for potential information. We missed anthropometric data on discharge in 53.9% of the patients, which is an example of missing data because of the retrospective character of the study. This could potentially lead to distorted data.

Furthermore, essential information about FU (before and after the study period) in another hospital could be missed because we had no access to these records.

In conclusion, a substantial number of patients, both prehospitalisation and with increasing numbers posthospitalisation, received a nutritional intervention, which indicates widespread usage in a tertiary care hospital. The nutritional FU consisted of a multitude of different types and combinations of HCPs who conducted FU in different care settings. In the discharge letter from the hospital, the nutritional plan and latest advice from a dietitian and/or SLT was poorly reported.

Future nutritional intervention studies at discharge are needed to demonstrate which nutritional support therapy enables the best improvement in clinical and health-related outcome, quality of life, and well-being of the child and parents/caregivers.

AUTHOR CONTRIBUTIONS

Development of project idea: Marissa Kooij, Emma Koster, Renate Eveleens and Koen Joosten. *Data collection*: Marissa Kooij. *Data analysis*: Marissa Kooij and Renate Eveleens. *Review and interpretation of data*: Marissa Kooij, Emma Koster and Koen Joosten. *Drafting of manuscript*: Marissa Kooij and Emma Koster. *Project supervision*: Koen Joosten.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

TRANSPARENCY DECLARATION

The lead author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported. The reporting of this work is compliant with STROBE guidelines. The lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained. The International Review Board

reviewed our study and approved of our study protocol (MEC-2020-0949).

PEER REVIEW

The peer review history for this article is available at https://publons.com/publon/10.1111/jhn.13083.

REFERENCES

1. Becker P, Carney LN, Corkins MR, Monczka J, Smith E, Smith SE, et al. Consensus statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: indicators recommended for the identification and documentation of pediatric malnutrition (undernutrition). Nutr Clin Pract. 2015;30(1):147–61.
2. Mehta NM, Corkins MR, Lyman B, Malone A, Goday PS, Carney LN, et al. Defining pediatric malnutrition: a paradigm shift toward etiology-related definitions. JPEN J Parenter Enteral Nutr. 2013;37(4):460–81.
3. Mehta NM, Skillman HE, Irving SY, Coss-Bu JA, Vermilyea S, Farrington EA, et al. Guidelines for the provision and assessment of nutrition support therapy in the pediatric critically ill patient: Society of Critical Care Medicine and American Society for Parenteral and Enteral Nutrition. Pediatr Crit Care Med. 2017;18(7):675–715.
4. Werner D, Zimmer KP, Eckert GP, Laffolie J. Malnutrition in paediatrics: stationary screening & follow-up malnutrition in der pädiatrie: stationäres screening & follow-up. Klin Padiatr. 2020;232(1):20–8.
5. Bélanger V, McCarthy A, Marcil V, Marchand V, Boctor DL, Rashid M, et al. Assessment of malnutrition risk in canadian pediatric hospitals: a multicenter prospective cohort study. J Pediatr. 2019;205:160–7.
6. De Longueville C, Robert M, Debande M, Podlubnai S, Defourny S, Namane SA, et al. Evaluation of nutritional care of hospitalized children in a tertiary pediatric hospital. Clin Nutr ESPEN. 2018;25:157–62.
7. Hecht C, Weber M, Grote V, Daskalou E, Dell'era L, Flynn D, et al. Disease associated malnutrition correlates with length of hospital stay in children. Clin Nutr. 2015;34(1):53–9.
8. Hulst JM, Zwart H, Hop WC, Joosten KF. Dutch national survey to test the STRONGkids nutritional risk screening tool in hospitalized children. Clin Nutr. 2010;29(1):106–11.
9. Hulst J, Joosten K, Zimmermann L, Hop W, van Buuren S, Büller H, et al. Malnutrition in critically ill children: from admission to 6 months after discharge. Clin Nutr. 2004;23(2):223–32.
10. Fenton TR, Kim JH. A systematic review and meta-analysis to revise the Fenton growth chart for preterm infants. BMC Pediatr. 2013;13:59.
11. Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek. Dutch growth charts. 2010. Accessed December 21, 2021. Available from: https://www.tno.nl/groei
12. Gambra-Arzoz M, Alonso-Cadenas JA, Jiménez-Legido M, López-Giménez MR, Martín-Rivada Á, de Los Ángeles Martínez-Ibeas M, et al. Nutrition risk in hospitalized pediatric patients: higher complication rate and higher costs related to malnutrition. Nutr Clin Pract. 2020;35(1):157–63.
13. Edwards S, Davis AM, Bruce A, Mousa H, Lyman B, Cocjin J, et al. Caring for tube-fed children: a review of management, tube weaning, and emotional considerations. JPEN J Parenter Enteral Nutr. 2016;40(5):616–22.
14. Agostoni C, Axelson I, Colomb V, Goulet O, Koletzko B, Michaelsen KF, et al. The need for nutrition support teams in pediatric units: a commentary by the ESPGHAN committee on nutrition. J Pediatr Gastroenterol Nutr. 2005;41(1):8–11.
15. Huysentruyt K, Goyens P, Alliet P, Bontems P, Van Hautem H, Philippet P, et al. More training and awareness are needed to improve the recognition of undernutrition in hospitalised children. Acta Paediatr. 2015;104(8):801–7.
16. Doyle MA, Malcolm JC, Liu D, Maranger J, Ooi TC, Keely E. Using a structured discharge letter template to improve communication during the transition from a specialized outpatient diabetes clinic to a primary care physician. Can. J Diabetes. 2015;39(6):457–66.

AUTHOR BIOGRAPHIES

Marissa Kooij is a Pediatric Resident currently working at the Elisabeth-TweeSteeden Hospital in Tilburg. Her research interests include organisation of healthcare and nutritional status in children.

Emma Koster is a RD with a MSc in Health Sciences. She works as a pediatric dietitian at Sophia Children's Hospital. Her research interests include Clinical Dietetics and Nutritional Status.

Renate Eveleens is an Anesthesiology Resident currently working at the Amsterdam University Medical Center. Her research interests include enteral and parenteral nutrition on de (pediatric) ICU.

Koen Joosten is a Paediatric-Intensivist at ErasmusMC-Sophia Children's Hospital. Since 2019, he is a Professor of 'nutrition and metabolism of the sick child' at the ErasmusMC in Rotterdam, which comprises his research interests.

How to cite this article: Kooij M, Koster E, Eveleens R, Joosten K. Nutritional follow-up in children after discharge: Organisation in a tertiary care centre. J Hum Nutr Diet. 2022;1–9. https://doi.org/10.1111/jhn.13083