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Nutrition

Anthropometric assessment: ESPGHAN quality of care survey from paediatric hospitals in 28 European countries

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Abstract

Objectives: Assessment of anthropometric data is essential for paediatric healthcare. We surveyed the implementation of European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) evidence-based guidelines and practical recommendations on nutritional care, particularly regarding anthropometric measurements.

Methods: Paediatric hospitals from 28 European countries provided pseudonymized data through online questionnaires on hospital characteristics and their standards of nutritional care. Practical tasks assessed an unbiased collection and reporting of anthropometric measurements in random patients' files and discharge letters.

Results: Of 114 hospitals (67% academic), 9% have no nutritionist/dietitian available, 18% do not provide standard policy to assess weight and height and

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15% lack training for nursing staff for accurate performance. A wall-mounted stadiometer to measure standing height and equipment for sitting weight is unavailable in 9% and 32%, respectively. Infant length is measured by one instead of two healthcare professionals and with a tape instead of a rigid length measuring board in 58% and 15% of hospitals, respectively.
The practical tasks reviewed 1414 random patients, thereof 446 younger than 2 years of age. Missing documentation occurred significantly more often for height versus weight and their percentiles in infants ≤2 years versus older children, and in general paediatric versus gastrointestinal patients, with no difference between academic and nonacademic hospitals. Review of documented anthropometric data in discharge letters disclosed that consultants significantly underestimated the deficits in their units compared to documented data.
Conclusions: The survey revealed significant gaps in performance and documentation of anthropometry in the participating hospitals. A resurvey will assess changes in quality of care over time.

KEYWORDS
anthropometry, children, guidelines, paediatric gastroenterology

1 | INTRODUCTION

Improving quality of care (QoC) is central to the initiatives of the European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN). These activities encompass the outputs of various committees, working groups and strategies related to education and public affairs. In 2020, the ESPGHAN Council initiated a QoC task force with the main goal to survey the adoption of diagnostic and management society guidelines in the fields of paediatric gastroenterology, hepatology and nutrition. When the survey identifies certain deficits, targeted education should further promote the translation of evidence-based recommendations into clinical practice and contribute to harmonize QoC in countries that span ESPGHAN membership. Of the topics suggested by the three main Committees (Gastroenterology, Hepatology and Nutrition), the QoC task force chose 'anthropometric assessment' as the first topic. The main challenge was to establish a survey concept that neither disclosed the identity of reporting persons nor their institutions/hospitals. The survey should be feasible, not too time-consuming for physicians and allow benchmarking with individual feedback.

Despite increasing awareness of nutrition as an integral part of patient care[1] and multiple worldwide initiatives to develop international and national references for 'optimal' childhood growth,[2,3] the acquisition and documentation of anthropometric data remains insufficient in hospitalized children.[4–7] Appropriate growth of a child or adolescent is a marker of overall health, dietary adequacy and well-being.[8–11] Therefore, every deviation from the norm should be recognized as a possible manifestation of an underlying disease.[11] Monitoring growth and development is essential to identify children at risk of under- or malnutrition.[12–15] The increasing prevalence of overweight, obesity and metabolic syndrome in children is alarming,[16–24] and early recognition and timely intervention may prevent obesity with adverse consequences in adulthood.[9,17,25–27] Therefore, repeated anthropometric

What is Known

- Assessment of nutritional status is essential for paediatric healthcare.
- Accurate measurement of weight, length/height and head circumference and plotting on percentiles are mandatory for nutritional assessment.
- Data are scarce regarding availability of tools for nutritional assessment and performance of anthropometry in routine practice in paediatric hospitals in Europe.

What is New

- The Quality of Care Survey of European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) identified some deficits in performance and reporting of anthropometric assessment, unrelated to hospital size or type (academic/nonacademic).
- Physicians/consultants appear often unaware of the identified gaps.
- Implementing standard operation procedures, training healthcare professionals and providing essential equipment could improve the quality of anthropometric assessment.

measurements, including calculation of BMI with *z*-score and growth charts based on the best data available for population,[14,28] age and gender, should be an essential element of clinical examination and an integral component of preventive childcare health programs.[12–15,20] Paediatricians and their staff, being the primary providers of auxological data and determinants of further testing needs, are central to this initiative.[10]

2 | METHODS

2.1 | Concept and design of the QoC project

The QoC project evaluates the prevailing QoC across European paediatric hospitals in terms of structure, process and outcome. Its goal is to discern the disparities between existing practices and evidence based ESPGHAN guidelines, launch educational interventions to decrease this gap and monitor QoC shifts over time. Participation is voluntary and open to all hospitals with a paediatrician interested in paediatric gastroenterology.

The QoC project is designed and conducted to assess clinical care services without reference to a standard. The information continuously collected include survey on general hospital data regarding accessibility and availability (no financial data) and retrospective review of documentation in patient files only on performed care, not including individual patient data. The survey of the QoC initiative of ESPGHAN meets the criteria of a 'service evaluation' as outlined by the National Health Service Guidance on Research, Service Evaluation and Clinical Audit.[29]

2.2 | Data protection concept and ethical consideration

The data protection officer of the Ludwig Maximilian University (LMU) Hospital Munich, reviewed the concept and all questionnaires (Supporting Information Methods). He confirmed the criteria for anonymous data collection in accordance with the European Union's General Data Protection Regulation.[30] Based on the design of the survey and the strict data protection concept, the Ethics Committee of the LMU Hospital of Munich has granted a waiver to the project lead (Prof. Sibylle Koletzko), that the QoC project does not require further ethical approval (Project no: 20-1150 KB).

2.3 | Distribution of project information

Information on the project has been disseminated to ESPGHAN members through online newsletters, the ESPGHAN website and directly to the presidents of National Societies of Paediatric Gastroenterology. After the pilot phase in late 2021, questionnaires were distributed country by country to participating centres, gradually expanding across the continent.

2.4 | The three components of the first survey

1. Standardized online questionnaires on (a) hospital data and (b) nutrition service regarding infrastructure and staff, the accessibility and availability of specialized care and procedures, equipment and their use, with emphasis on assessment and documentation of the nutritional status in daily practice. To enable a comparison between the consultant's/physician's perceived performance and actual documented data, respondents had to answer the questions before accessing the practical tasks. The question was phrased: 'Which of the following is routinely recorded in the discharge letter from inpatients: weight on admission, height on admission, BMI on admission and their respective percentile/*z*-score?'. The physicians provided separate estimates for gastrointestinal (GI, defined here as disorders of the digestive tract, the liver and/or nutritional problems) and general paediatric patients for all items ranging from 0% (in none of the letters reported) to 100% (in all letters reported).
2. Practical tasks on documentation of anthropometric data aimed to objectively evaluate the reporting of anthropometric data (weight, height, weight percentiles and height percentiles) in clinical routines for current inpatients (task A) and in discharge letters (task B). The patients under review were from two distinct wards, encompassing GI, general paediatric and, if possible, surgical patients (neonatal, intensive care and oncology wards were excluded).

   Task A: reviewing files/charts for documentation of anthropometric data from eight inpatients on a random day without prior announcement (four GI and four general paediatric patients, two each with the shortest and longest stays).

   Task B: reviewing discharge letters for documentation of anthropometric data from at least four GI and four general paediatric patients discharged 2 and 6 months ago.
3. Educational materials on anthropometry were provided as a PowerPoint presentation with embedded video sequences to educate the staff on correct anthropometric assessment translated into 17 languages, each reviewed by two native speakers.

2.5 | Statistical analysis

Descriptive statistics were used to characterize the participating hospitals. We stratified in academic and

nonacademic institutions, assuming that academic hospitals are more likely to be large facilities, certified as paediatric GI training centres and possess greater infrastructure and resources in performing care.

The questions and corresponding answers from the hospital and nutrition questionnaire were analysed as categorical variables and presented in frequencies and proportions (%). To assess significant differences in providing clinical care, particularly in performance of anthropometric measurements between academic and nonacademic hospitals, Pearson's χ^2 test or Fisher's exact test was applied, as appropriate.

In the practical task of reviewing discharge letters, we calculated the percentage of patients with recorded and reported weight, height and their percentiles. This percentage was considered as a measure of actual clinical care performance. We applied Friedman paired test to compare the actual performance and the estimates provided by physicians (ranging from 0% to 100% with 10% increments). For comparison, we categorized them into four final groups: 100%, 80% –90%, 10%–70% and 0%. Here, 100% means that all source documents contain the items requested in the survey, and 0% indicates none.

All data retrieved from practical tasks (including age category) were combined into a single data set independent of hospitals and countries. It allowed us to observe differences in performing care between patients younger and older than 2 years of age. Pearson's χ^2 test or Fisher's exact test were obtained as appropriate. A p-value of ≤0.05 was considered statistically significant.

Statistical analysis was conducted using SAS 9.4 (Statistical Analysis Software; SAS Institute Inc.) and GraphPad Prism 9.4.1 (GraphPad Software LLC).

3 | RESULTS

In June 2023, 121 centres in 28 countries (Supporting Infomation S1: Figure 1) were enroled. At the data closure date, 114 centres completed the Hospital Survey (67% academic and 33% nonacademic), 110 the Nutrition Survey; the Practical Tasks A and B were accomplished in 87 and 100 hospitals, respectively. Consultants and residents answered the questionnaires in 93% and 7%, respectively.

The characteristics comparing nonacademic with academic participating hospitals are summarized in Table 1. At least one paediatric gastroenterologist was available in 79% of nonacademic versus 99% of academic hospitals ($p < 0.01$). Of participating hospitals, 39% of nonacademic and 75% of academic centres were certified for training in paediatric GI ($p < 0.01$). The survey disclosed that 86% of academic and 68% of nonacademic hospitals provided a nutritionist or dietitian for both, in- and outpatients. Other healthcare professionals, for example, psychologists, physiotherapists or specialized nurses, were unavailable for the care of GI patients in a substantial percentage of hospitals. About 50% of the hospitals used a screening tool for malnutrition, with the majority of STRONGkids, followed by local screening tools (Table 2).

3.1 | Anthropometric assessment, technique and available tools for measurements

For most of the survey items, there was no significant difference between academic and nonacademic hospitals. A clear policy (standard operating procedures) on weight and height/length measurements is prevalent in 82% of the centres, uniformly across both academic and nonacademic types. Training sessions for nursing staff on how to correctly perform the anthropometric measurement are conducted in 72% of academic and 81% of nonacademic centres ($p = 0.58$).

Scales to measure standing weight in children or baby scales for infants were calibrated less frequently than every 5 years or not at all in 10% of the hospitals (Table 2). More importantly, a rigid board to measure the length in most infants and children up to 2 years of age was reported for regular use in only 76% of the hospitals, while 15% still used a measuring tape for this purpose (Table 2) (Supporting Infomation S1: Figure 3). A stadiometer fixed to the wall to measure height in children was not available in 13% of hospitals, and in an additional 8% not all patients had access to these stadiometers (Supporting Infomation S1: Figure 4). Measurement of head circumference in infants was reported to be routine in neonatal wards in 66% of nonacademic and 54% of academic hospitals, but in paediatric wards in only 17% of nonacademic and 11% of academic hospitals (Supporting Infomation S1: Figure 2).

3.2 | Anthropometric measurements and documentation in routine practice

Practical tasks A and B include data derived from 1414 charts/discharge letters, with nearly half being from GI patients; 446 (32%) were younger than 2 years of age. The limited data collected in paediatric surgical wards precludes the analysis and may carry a high risk of bias.

Health records of current inpatients in practical Task A revealed that in both groups, GI and general paediatric patients, the reporting of weight was a standard in both academic and nonacademic centres (Figure 1A,B). In contrast, height was not documented in any files of current inpatients in 23%–26% of nonacademic and in 7%–9% of academic hospitals

TABLE 1 Characteristics of hospitals participating in the quality-of-care initiative, $N = 114$.

Factors, *n* (%)	Total ($N = 114$)	Academic hospitals* ($N = 76$)	Nonacademic hospitals* ($N = 38$)	*p* Value[a]
At least one consultant specialized in paediatric GI in medical team	105 (92%)	75 (99%)	30 (79%)	**<0.01**
Number of paediatric beds (excluding paediatric surgery, but including intensive care)				**<0.01**
<50	32 (29%)	11 (15%)	21 (57%)	
50–100	33 (29%)	25 (33%)	8 (22%)	
>100	47 (42%)	39 (52%)	8 (22%)	
Number of paediatric surgery beds (excluding paediatrics, but including intensive care), $n = 104$				**0.03**
<25	61 (59%)	36 (50%)	25 (78%)	
25–50	29 (28%)	25 (35%)	4 (13%)	
>50	14 (13%)	11 (15%)	3 (9%)	
Day clinic for paediatric GI patients	92 (81%)	68 (89%)	24 (63%)	**<0.01**
Outpatient clinic for paediatric GI patients	97 (86%)	68 (91%)	29 (76%)	**0.04**
Certified training centre for paediatric GI subspecialty	72 (63%)	56 (75%)	15 (39%)	**<0.01**
Nutritionist(s)/dietitian(s) with experience or training for paediatric GI				**0.04**
For inpatients only	8 (7%)	4 (5%)	4 (11%)	
For outpatients only	1 (1%)	1 (1%)	0 (0%)	
For in- and outpatients	90 (80%)	65 (86%)	25 (68%)	
Only for selected patient groups	4 (4%)	3 (4%)	1 (3%)	
Not available	10 (9%)	3 (4%)	7 (19%)	
Psychologist for paediatric GI				**0.02**
For inpatients only	13 (12%)	7 (9%)	6 (16%)	
For outpatients only	1 (1%)	1 (1%)	0 (0%)	
For in- and outpatients	74 (65%)	54 (71%)	20 (54%)	
Only for selected patient groups	6 (5%)	6 (8%)	0 (0%)	
Not available	19 (17%)	8 (11%)	11 (30%)	
Physiotherapist for paediatric GI				0.08
For inpatients only	26 (23%)	16 (21%)	10 (27%)	
For in- and outpatients	59 (52%)	45 (59%)	14 (38%)	
Only for selected patient groups	10 (9%)	7 (9%)	3 (8%)	
Not available	18 (16%)	8 (11%)	10 (27%)	
Specialized nurse(s) available				
For endoscopy	83 (73%)	59 (78%)	24 (63%)	0.10
For patients with inflammatory bowel disease (IBD)	46 (40%)	36 (47%)	10 (26%)	**0.03**
For liver patients	21 (18%)	19 (25%)	2 (5%)	**0.01**
For patients with cystic fibrosis (CF)	41 (36%)	36 (47%)	5 (13%)	**<0.01**
For enteral nutrition team	42 (37%)	35 (46%)	7 (18%)	**<0.01**
For parenteral nutrition team	35 (31%)	30 (39%)	5 (13%)	**<0.01**

(Continues)

TABLE 1 (Continued)

Factors, *n* (%)	Total (*N* = 114)	Academic hospitals* (*N* = 76)	Nonacademic hospitals* (*N* = 38)	*p* Value[a]
For patients with GI-stoma	52 (46%)	40 (53%)	12 (32%)	**0.03**
No specialized nurse available	14 (12%)	5 (7%)	9 (24%)	**<0.01**

Note: Academic hospitals include university hospitals, while nonacademic hospitals encompass nonuniversity public paediatric hospitals, nonuniversity public general hospitals with paediatric departments or divisions, church or charity-owned hospitals and other similar nonuniversity institutions.

Abbreviations: CF, cystic fibrosis; GI, gastrointestinal; GI paediatric, paediatric gastroenterology, hepatology and nutrition; IBD, inflammatory bowel disease.

[a]*p* Value obtained from the χ^2 test or Fisher-exact test as appropriate is used to compare the available resources between academic and nonacademic hospitals. *p*-value ≤ 0.05 was considered as significant, given in bold text.

(Figure 1C,D). Weight and height percentiles were missing in all reviewed patients in up to 48% of nonacademic and up to 25% of academic hospitals (Figure 1E–H). Files from children with GI disorders had more often completed growth charts than those from general paediatric patients (Figure 1).

Figure 2A–H depicts the results and *p*-values of documented anthropometric data (weight, height and their respective percentiles of age and sex) in the discharge letters comparing the estimates given by the consultant before reviewing the real-life situation in eight randomly chosen patients in the practical Task B. For GI patients, physicians' estimates and reported values for weight and height documentation did not differ, while there was a trend for overestimation in the general paediatric patients. No height was reported in discharge letters of all general paediatric patients in 28% of the hospitals, contrasting with the estimate of only 4%. Concerning reporting weight and height percentiles in discharge letters, physicians significantly overestimated the documentation compared to the data obtained by the review (Figure 2E,F). Height percentiles were missing in discharge letters for all reviewed general paediatric patients in 52% of hospitals and for GI patients in a third. The results for missing weight percentiles in discharge letters were hardly any better.

Anthropometric data documentation in randomly chosen discharge letters showed no significant differences in reported weight, height or percentiles in patients with GI or other diseases between academic and nonacademic hospitals (Supporting Infomation S1: Table 1).

Height was significantly less frequently documented in charts of current inpatients younger versus older than 2 years of age, as well as weight and height percentiles in discharge letters of infants/toddlers with GI disorders (Supporting Infomation S1: Table 2).

4 | DISCUSSION

Our survey identified various shortcomings in the basic care standards for paediatric patients across 114 paediatric hospitals in 28 European countries. We assessed two aspects of QoC in nutrition: (1) the structure (e.g., availability of certain staff and equipment) and (2) the process (e.g., provision of standards and training to assess anthropometric data, and their performance and documentation in files and discharge letters).

While the structure heavily depends on financial resources in the national healthcare system and type of hospital (academic or nonacademic), the process quality should ideally remain unscathed. Accordingly, 19% of nonacademic but only 4% of academic hospitals had no dietitians for paediatric patients. Dietary assessment, counselling or monitoring by a dietitian/nutritionist with experience in paediatrics is recommended in many ESPGHAN guidelines such as coeliac disease, Crohn's disease, cow's milk allergy, enteral or parenteral nutrition, acute and chronic pancreatitis or pancreatic insufficiency, metabolic or chronic liver diseases or patients with neurological impairments.[31,32] It is highly warranted that a dietitian trained for counselling in such paediatric conditions is available and readily accessible for in- and outpatients in all hospitals taking care of children with diseases of the digestive tract, the liver or malnutrition.

The survey also identified a lack of essential instrumentation for accurate anthropometric measurements, with no difference in proportion between academic and nonacademic hospitals. In 13% of hospitals, a stadiometer fixed to the wall, considered as standard of care, was unavailable, and one-third had no equipment for measuring sitting weight in children who are unable to bear their weight. Alarmingly, 19% of nonacademic and 13% of academic centres routinely relied on tapes to measure children under 2 years rather than the recommended standardized measuring boards. The inaccuracy of this technique has been documented by several comparative studies, showing that about half of children are assigned to different weight/length percentiles when measured with a tape compared to a measuring board.[33,34] Decline in *z*-score or dropping in height percentiles (faltering growth) are red flags in growing children and may initiate costly work up for underlying causes.[32] The decision on nutritional intervention in young children is often based on weight-for-length plots. Imprecision of

TABLE 2 Nutrition care in academic and nonacademic hospitals, $N = 110$.

Factors, *n* (%)	Total ($N = 110$)	Academic hospitals[a] ($N = 73$)	Nonacademic hospitals[a] ($N = 37$)	*p* Value[b]
Which charts (percentile curves) are normally used for weight, height/length, BMI and head circumference?				
WHO (World Health Organization)	61 (55%)	41 (56%)	20 (54%)	0.83
CDC (Centre of Disease Control)	27 (25%)	17 (23%)	10 (27%)	0.67
National	69 (63%)	46 (63%)	23 (62%)	0.93
Other	3 (3%)	3 (4%)	0 (0%)	0.21
Are disease specific percentiles available in your hospital?				
Preterm infants	88 (80%)	63 (86%)	25 (68%)	**0.02**
Trisomy 21	66 (60%)	45 (62%)	21 (57%)	0.62
Turner syndrome	54 (49%)	34 (47%)	20 (54%)	0.46
Cerebral palsy	29 (26%)	22 (30%)	7 (19%)	0.21
Other specific disease growth charts	27 (25%)	14 (19%)	13 (35%)	0.07
No specific percentiles used	16 (15%)	6 (8%)	10 (27%)	**<0.01**
Which malnutrition screening tool is used?				
PYMS	6 (5%)	6 (8%)	0 (0%)	0.10
STAMP	7 (6%)	4 (5%)	3 (8%)	0.69
STRONGkids	26 (24%)	18 (25%)	8 (22%)	0.81
PNST	0	0	0	n.a.
Local screening tool	21 (19%)	14 (19%)	7 (19%)	1.0
No malnutrition screening tool used	44 (40%)	26 (36%)	18 (49%)	0.22
I do not know	10 (9%)	10 (14%)	0	**0.02**
How are percentiles normally recorded in your paediatric hospital or division?				
On paper (filed or scanned)	61 (55%)	42 (58%)	19 (51%)	0.54
Electronically (percentiles automatically plotted)	72 (65%)	51 (70%)	21 (57%)	0.17
No plotting of percentiles in our hospital	6 (5%)	2 (3%)	4 (11%)	0.18
Hospital policy in place to measure weight or height	88 (82%)	58 (82%)	30 (83%)	0.37
Training for nursing staff in measuring weight and height/length	80 (75%)	51 (72%)	29 (81%)	0.58
What kind of scale is used to measure standing weight?				0.50
Scales regularly calibrated used for most or all children	89 (83%)	56 (79%)	33 (92%)	
Scales regularly calibrated not used or accessible to all children	6 (6%)	4 (6%)	2 (6%)	
Scales are calibrated less often than every 5 years	9 (8%)	8 (11%)	1 (3%)	
Non-calibrated scales are used	2 (2%)	2 (3%)	0 (0%)	
I do not know	1 (1%)	1 (1%)	0 (0%)	
Do you have equipment to measure sitting weight (e.g., for children unable to bear their weight)?				0.61
Yes	49 (46%)	34 (48%)	15 (43%)	
Yes, but not accessible to all children	22 (21%)	15 (21%)	7 (20%)	
No	34 (32%)	22 (31%)	12 (34%)	

(Continues)

TABLE 2 (Continued)

Factors, *n* (%)	Total (*N* = 110)	Academic hospitals[a] (*N* = 73)	Nonacademic hospitals[a] (*N* = 37)	*p* Value[b]
I do not know	1 (1%)	0 (0%)	1 (3%)	
What kind of scale is used to measure weight in infants?				0.82
Baby scales regularly calibrated used for most or all infants	93 (87%)	60 (85%)	33 (92%)	
Baby scales regularly calibrated not accessible to all infants	2 (2%)	1 (1%)	1 (3%)	
Scales are calibrated less often than every 5 years	9 (8%)	7 (10%)	2 (6%)	
Non-calibrated baby scales are used	2 (2%)	2 (3%)	0 (0%)	
I do not know	1 (1%)	1 (1%)	0 (0%)	
How is the standing height measured in children?				0.90
A stadiometer fixed to the wall is used for most or all children	83 (78%)	55 (77%)	28 (78%)	
A stadiometer fixed to the wall is available but not used to all children	9 (8%)	6 (8%)	3 (8%)	
No wall-fixed stadiometer is commonly used	10 (9%)	7 (10%)	3 (8%)	
A measuring tape or scale at a wall is commonly used	4 (4%)	2 (3%)	2 (6%)	
I do not know	1 (1%)	1 (1%)	0 (0%)	
How is the length measured in infants and young children up to 2 years of age?				0.36
Infant measuring length rigid board is used for most or all infants	81 (76%)	57 (80%)	24 (67%)	
Infant measuring length rigid board available but not used to all infants	8 (7%)	4 (6%)	4 (11%)	
A measuring tape is used	16 (15%)	9 (13%)	7 (19%)	
I do not know	2 (2%)	1 (1%)	1 (3%)	
Two persons always measure infant or young children in length board	45 (42%)	33 (46%)	12 (33%)	0.24
Are nutritionists or dieticians involved in the care of children at high nutrition risk?				0.13
In most cases	75 (70%)	54 (76%)	21 (58%)	
In few selected cases only	20 (19%)	11 (15%)	9 (25%)	
Not accessible to all children	4 (4%)	3 (4%)	1 (3%)	
Dieticians or nutritionists are not available	8 (7%)	3 (4%)	5 (14%)	

Abbreviations: CF, cystic fibrosis; GI, gastrointestinal; IBD, inflammatory bowel disease; PNTS, paediatric nutrition screening tool; PYMS, paediatric Yorkhill malnutrition score; STAMP, screening tool for the assessment of malnutrition in paediatrics; STRONGkids, screening tool for risk on nutritional status and growth.

[a]Academic hospitals include university hospitals, while nonacademic hospitals encompass nonuniversity public paediatric hospitals, nonuniversity public general hospitals with paediatric departments or divisions, church or charity-owned hospitals and other similar nonuniversity institutions.

[b]*p* Value was obtained from the χ^2 test or Fisher-exact test as appropriate to compare nutritional care between academic and nonacademic hospitals. *p*-value ≤ 0.05 was considered as significant, given in bold text.

anthropometric data, especially in infants, can lead to under- or overdosing of agents administered based on body surface area.[33] Given these and other crucial reasons, paediatric hospitals should prioritize ensuring the accessibility of appropriate tools for precise weight and height measurements.

Even with optimal equipment, pitfalls may occur when weight, lengths/height and head circumference are measured. We could neither assess the accuracy of measurement by nursing staff in clinical routine nor verify that weight and height were actually measured or whether values were recorded according to information

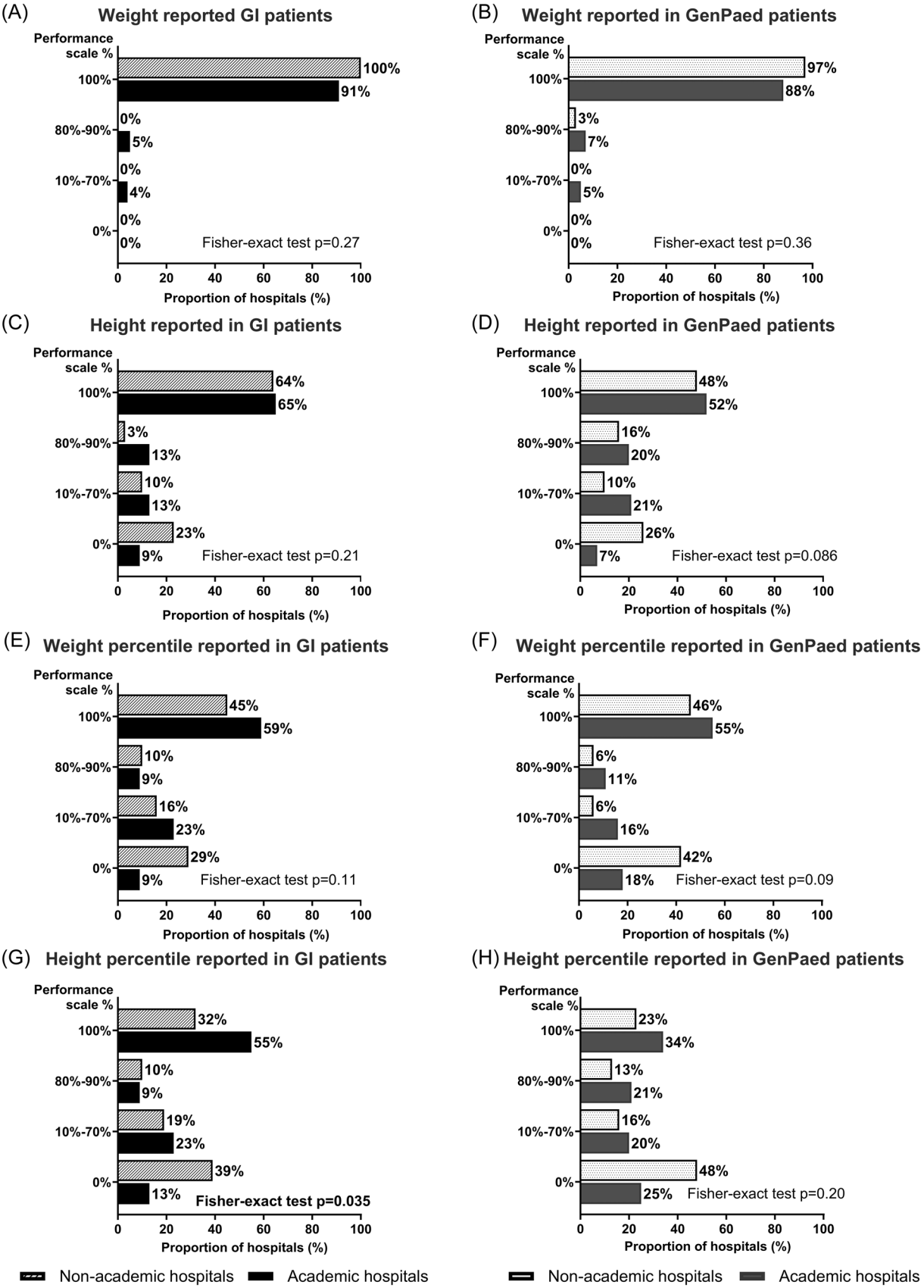

FIGURE 1 Documentation of anthropometric data from randomly chosen inpatients' health records in academic and nonacademic paediatric hospitals in Europe, $N = 87$. The hospital's performance in recording and reporting anthropometric data (weight, height, weight percentiles and height percentiles) was classified into four categories: 0%, 10%–70%, 80%–90% and 100% based on the presence or absence of anthropometric data in randomly chosen health records from GI (A, C, E, G) and general paediatric patients (B, D, F, H). Fisher-exact test was applied to compare academic and nonacademic hospitals. p-value ≤ 0.05 was considered as significant. GenPaed, general paediatric; GI, gastrointestinal.

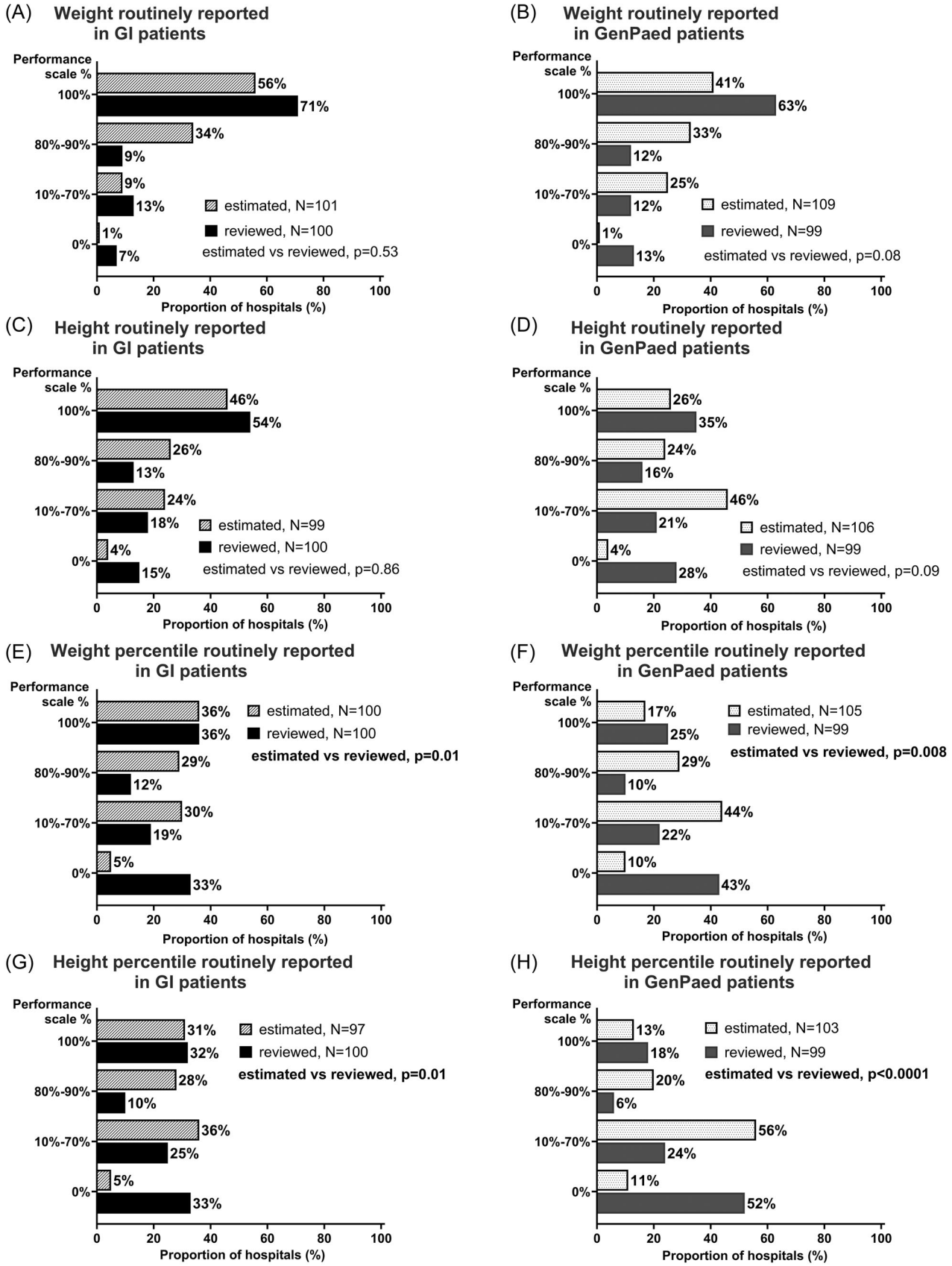

FIGURE 2 (See caption on next page).

provided by the caregiver. However, the questionnaires disclosed some shortcomings, for example, 18% of hospitals had no written standards, 25% did not offer training on anthropometry to nursing staff and almost 60% admitted that infant length is usually measured by one, not by two healthcare professionals as recommended to ensure straight positioning with fixed knees.[9] Any type of screening tool for malnutrition was used in about 50% of hospitals, with 20% applying a local 'in-house' version.

A comparison between physicians' estimates and actual data from source files and letters revealed discrepancies in documentation. Many consultants appeared to be unaware of these deficits. In our analysis, we grouped the performance into four arbitrary categories. If the items were documented in all reviewed charts or letters (100%), the hospital is considered as perfect regarding anthropometry reporting. A performance of 80%–90% may still be acceptable, while 70% or lower is considered as insufficient. Except for weight, which seemed to be prioritized, height and especially percentiles were often lacking in health records of current inpatients, with no significant difference between academic and nonacademic hospitals. Length/height is more difficult and time-consuming to measure, particularly in infants and toddlers, and was recorded in only 66% of current GI-inpatients below 2 years of age, and length percentiles in only 33%, significantly less than in older children. 'Eyeballing' without charting anthropometric measurements is very inaccurate[35] and misses about one out of three underweight children, particularly infants.[36]

Discharge letters, crucial for communication with other healthcare professionals, should consistently report weight, height/length, calculated BMI and their relevant percentiles, especially for children with chronic diseases.[32] Certain hospital softwares have the capability to automatically calculate BMI, plot all values in the growth charts in the patient's electronic record, and generate a text block with all anthropometric data in the prepared discharge letter. These tools may save physicians' time and enhance patient care.

The study design of the QoC project has limitations. With the small number of enroled hospitals in some of the 28 countries (Supporting Infomation S1: Figure 1), we could not provide national data or perform comparisons. Although we encouraged enrolment of nonacademic hospitals, they represent only one-third. With increasing numbers of participating hospitals, the results could become more representative. However, the deficits identified in the 114 hospitals are likely to remain in a larger sample.

We consider the review of medical documents of 1414 random patients for objective documentation and reporting as a very important part of this survey. The comparison of real-life data with the overly optimistic self-reported estimates from physicians points to the limited reliability of surveying by questionnaires only. Obviously, the participating physicians had confidence in our data protection concept, provided honest answers, and adhered to our instructions to choose patient records randomly to minimize the risk of selection bias. While some participants concerned about the ~2 h required for data collection, the majority appreciated the initiative and expressed gratitude for the 'eye opener' experience gained through the practical tasks. Participating hospitals received educational slides in both English and their native language to educate healthcare professionals and students on accurate anthropometric assessment. Versions in 17 languages are available to download from the ESPGHAN website (https://www.espghan.org/our-organisation/Quality-of-Care-Initiative).

In conclusion, this survey revealed multiple shortcomings in the basic areas of paediatric patients' nutritional care, particularly in measuring and documenting anthropometric data. There was no significant difference in the performance between academic and nonacademic hospitals. Consultants were often unaware of the identified deficits and appreciated the provided educational materials to train their teams to narrow the gaps. Paediatric hospitals from Europe who want to join the QoC network are welcome to contact the ESPGHAN office (QoC@espghan.org)

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FIGURE 2 Comparison of anthropometric data documentation in randomly chosen patients' discharge letters: estimates perceived by physicians versus reviewed source data. Physicians estimated the percentage of patients' discharge letters that include anthropometric data (weight, height, weight percentiles and height percentiles). The estimates were classified into four categories: 0%, 10%–70%, 80%–90% and 100% and compared with presence or absence of anthropometric data in randomly chosen patients' discharge letters (source data) from GI (A, C, E, G) and general paediatric patients (B, D, F, H). Friedman-paired test was used to compare the perceived estimates with the source data of the respective hospitals. p-value ≤ 0.05 was considered as significant. GenPaed, general paediatric; GI, gastrointestinal.

in providing access to the platform with a reduced license fee. ESPGHAN provided financial support to set up the Quality of Care project. Anna Litwin received a grant from the Ludwig Maximilian University for her Doctoral thesis of total 4000 € over 8 months.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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