Assessment of nutritional intake: how to investigate intake and what to ask

Dr Helen White

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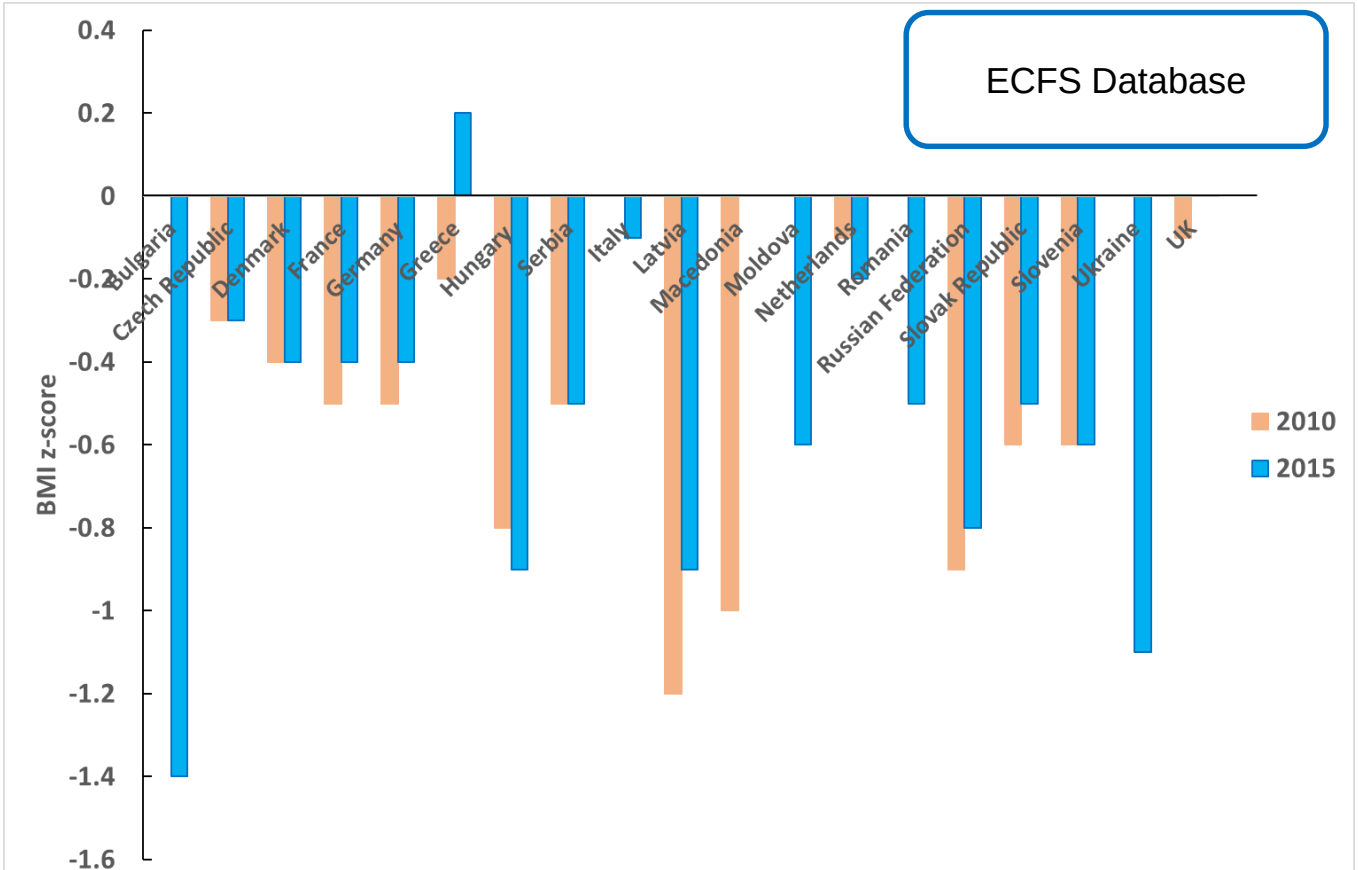
Why is assessment of nutritional intake so important?



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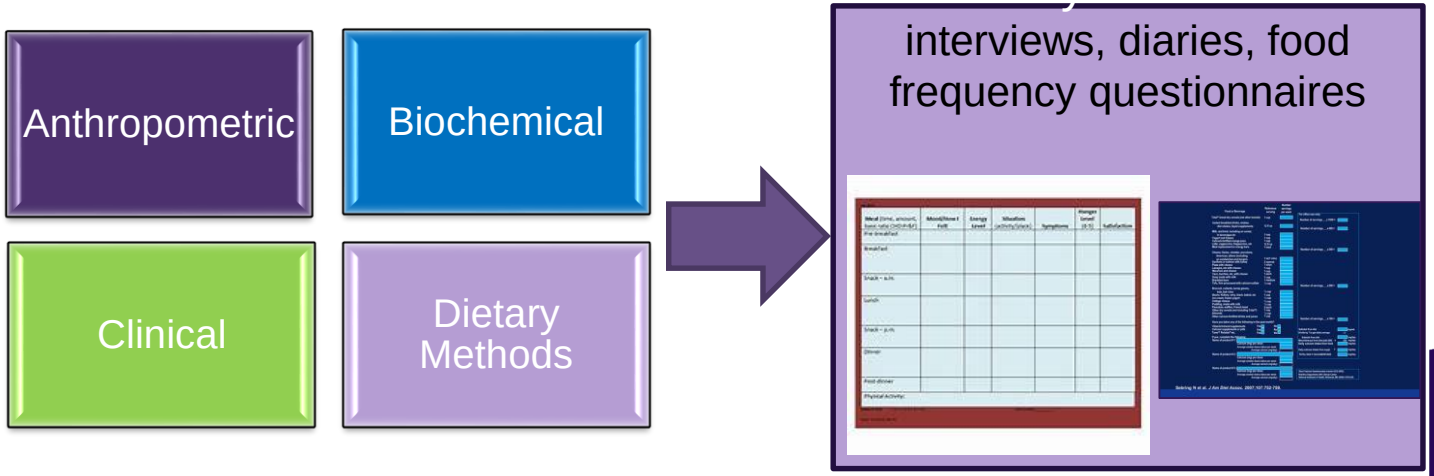
ESPEN-ESPGHAN-ECFS guidelines 2016

- Annual comprehensive nutrition assessments are strongly encouraged. These should encompass a collation of anthropometric, *dietary*, biochemical and relevant clinical data



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Screening questions

Validation of a Nutrition Screening Tool for Pediatric Patients with Cystic Fibrosis

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ABSTRACT
Background In cystic fibrosis (CF), nutrition diagnosis is of critical relevance because the early identification of nutrition-related compromise enables early, adequate intervention and, consequently, influences patient prognosis. Up to now, there has not been a validated nutrition screening tool that takes into consideration clinical variables.
Objective To validate a specific nutritional risk screening tool for patients with CF based on clinical variables, anthropometric parameters, and dietary intake.
Design Cross-sectional study. The nutrition screening tool was compared with a risk screening tool proposed by McDonald and the Cystic Fibrosis Foundation criteria.
Participants/setting Patients aged 6 to 18 years, with a diagnosis of CF confirmed by two determinations of elevated chloride level in sweat (sweat test) and/or by identification of two CF-associated genetic mutations who were receiving follow-up care through the outpatient clinic of a Cystic Fibrosis Treatment Center.
Main outcome measures Earlier identification of nutritional risk in CF patients aged 6 to 18 years when a new screening tool was applied.
Statistical analyses performed Agreement among the tested methods was assessed by means of the kappa coefficient for categorical variables. Sensitivity, specificity, and accuracy values were calculated. The significance level was set at 5% ($P<0.05$). Statistical analyses were carried out in IWSW Statistics for Windows version 18.0 (2009, SPSS Inc).
Results Eighty-two patients (49% men, aged 6 to 18 years) were enrolled in the study. The agreement between the proposed screening tool and the tool for screening nutritional risk for CF by the McDonald method was good ($\kappa=0.804$; $P<0.001$) and the sensitivity and specificity was 85% and 95%, respectively. Agreement with the Cystic Fibrosis Foundation criteria was lower ($\kappa=0.418$; $P<0.001$), and the sensitivity and specificity were both 72%.
Conclusions The proposed screening tool with defined clinical variables promotes earlier identification of nutritional risk in pediatric patients with CF.
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CYSTIC FIBROSIS (CF) IS A GENETIC DISORDER, potentially lethal, progressive, and a multisystem disease. It is characterized clinically by the presence of chronic pulmonary obstructive disease and pancreatic insufficiency, which lead to a constellation of clinical and nutrition-related manifestations and complications. Airway involvement is progressive and varies in intensity. Decline in pulmonary function is associated with increased morbidity, and is the cause of death in more than 90% of patients with CF.[1] Treatment of pulmonary infections, enzyme replacement therapy, and nutritional support play essential roles in the management of CF.[2]

In patients with CF, poor nutritional status is associated with decreased pulmonary function,[3] and maintenance of adequate nutritional status is a most important goal of the multidisciplinary care of CF. Malnutrition in this patient population occurs due to increased energy requirements secondary to pulmonary inflammation and recurrent infections, as well as to pancreatic insufficiency.[4] Nutrition diagnosis is of critical relevance because the early identification of nutrition-related compromise enables early, adequate intervention and, consequently, influences patient prognosis.[5]

Use of a nutrition screening tool is recommended to identify risk of malnutrition in patients with CF. Such a tool should be able to identify a series of variables related to overall nutritional risk and assess specific aspects associated with the course of CF that interfere with nutritional status. Efficacy of the nutrition screening process is ensured by the use of instruments that employ information available for the entire population of interest and that can be administered quickly. Reliability and validity are also essential components of the clinical and nutrition screening process.[6]

Several tools have been advocated for identification of nutritional risk in hospitalized patients.[7-9] In 2002, the Cystic Fibrosis Foundation (CFF), in its CFF Consensus Report,[10] set forth criteria for nutrition-related diagnosis in patients with CF, taking into account stricter cutoff points

Santos Simon et al 2016

Risk factor for malnutrition	Maximum score
Body mass index or weight/height <50th percentile or <10th percentile[a]	1 or 2
Pancreatic insufficiency[b]	1 or 2
Pseudomonas, Burkholderia cepacia complex, or methicillin-resistant *Staphylococcus aureus* colonization[c]	1
Dietary intake <100% Recommended Dietary Allowances	1
Weight gain less than minimum,[d] zero weight gain, or weight loss[e]	1 or 2
Height gain less than minimum[d] or zero height gain	1
Enteral feeding	2
Cystic fibrosis-related diabetes	1
Forced expiratory volume in 1 sec <80%[f]	1
Albumin <3.5 mg/dL	1
Total	14

[a]If body mass index or weight/height <50th percentile, scored 1 point; if <10th percentile, scored 2 points.

[b]Defined as those receiving pancreatic enzyme replacement therapy. Poorly managed pancreatic insufficiency, scored 2 points.

[c]Presence of any of these, scored 1 point.

[d]According to risk screening tool proposed by McDonald.[11]

[e]Weight gain less than minimum or zero weight gain since last visit for weight, scored 1 point; weight loss, scored 2 points.

[f]In patients aged 6 years or older.

Figure 1. Proposed tool for nutritional risk screening in patients with cystic fibrosis.

Score (points)	Risk for Malnutrition and Need for Intervention	
	Risk	Intervention and follow-up
1-3	Low risk	• Hospital inpatient: individual nutrition advice and follow-up ≥3 times/wk • Cystic fibrosis clinical outpatient: individual nutrition advice and follow-up after 2 mo
4-7	Medium risk	• Hospital inpatient: individual nutrition advice and follow-up ≥4 times/wk • Cystic fibrosis clinical outpatient: individual nutrition advice and follow-up after 1 mo • 3-Day Food Intake[a]
≥8	High risk	• Hospital inpatient: individual nutrition advice and follow-up every day • Cystic fibrosis clinical outpatient: individual nutrition advice and follow-up after 15 d • 3-Day Food Intake[a] • Body composition assessment (arm circumference, triceps skinfold thickness, and muscle arm circumference)

[a]Tool was designed to obtain an accurate description of the types of food and beverage that are consumed over a 3-day period.

Figure 2. Nutritional risk score and recommendations for nutrition interventions.

Recommendations for dietary review

- Appropriate for patients at risk – and especially for those who are consuming or skipping meals and snacks during school
- 24 hour recall a useful qualitative tool
- 3-5 day diet record is necessary for a quantitative evaluation of energy and nutrient intake
- European guidelines suggest 3 monthly dietary review for children and 6 monthly for adults

Current recommendations guide the dietary questions that are asked

110-200% EAR Energy

20% RDI protein

35-40% energy fat

40-45% energy carbohydrate

Calcium requirements should be met

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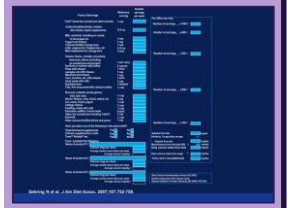
Food diaries

- Establish intakes and eating patterns
  - Energy
  - Protein
  - Calcium
  - All nutrients

interviews, diaries, food frequency questionnaires



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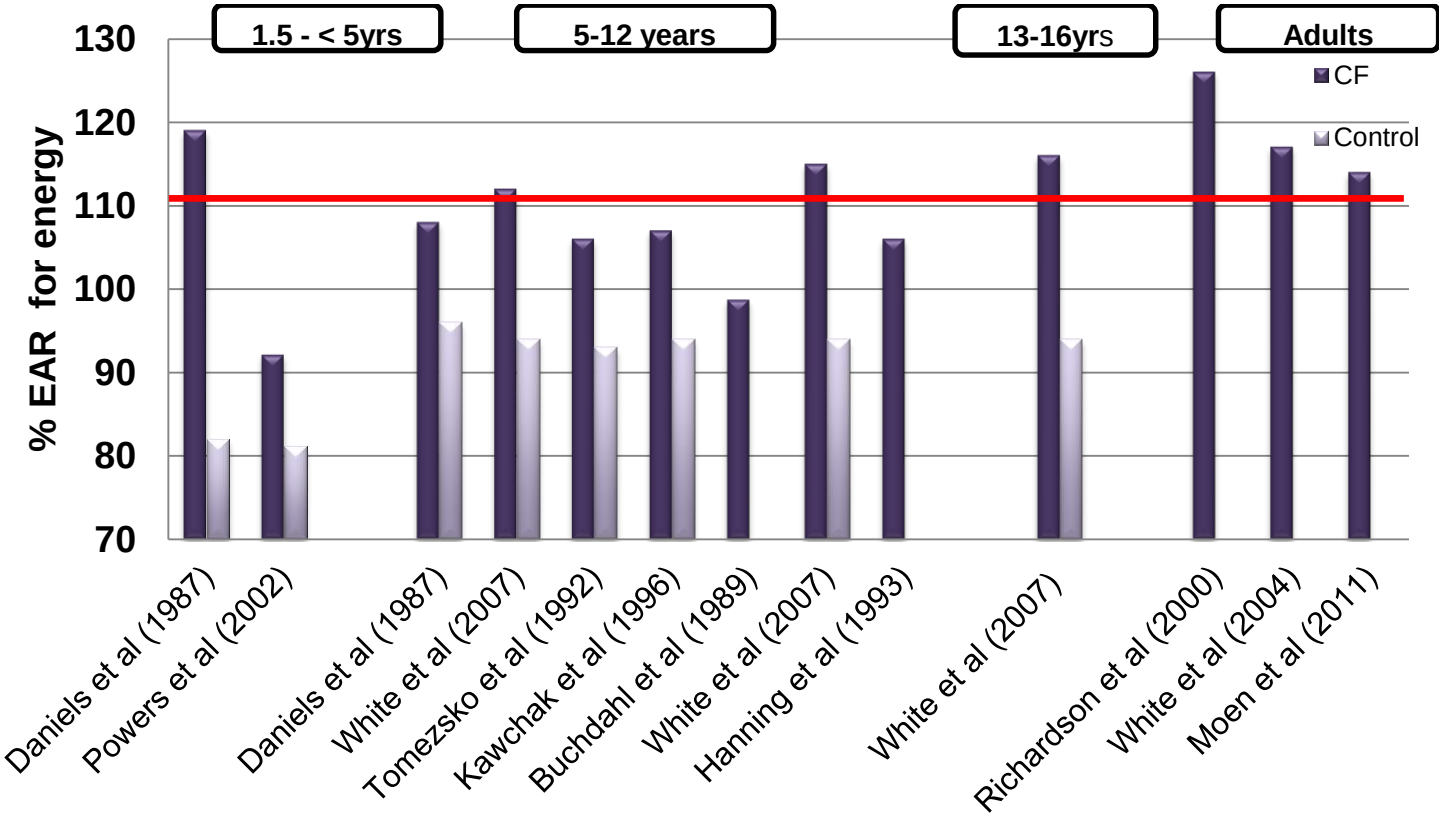
Energy intake for people with CF: consensus guidelines

Infants and children 2 years 110%-200% of energy requirements for same-age healthy infants and children Energy intake should be adapted to achieve normal weight- and length-for-age percentiles

Children 2-18 years 110%-200% of energy requirements for same-age healthy children Energy intake should be adapted to achieve target BMI percentile tailored to one-year age intervals

Adults >18 years 110%-200% of energy requirements for same-age healthy population to maintain BMI targets Energy intake should be adapted to achieve BMI targets

What is achievable with dietary intervention alone



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Eating frequency

- Evidence that increased frequency of eating increases calorie intake
- 82% of participants consumed 3 daily meals. Eating, meal and snack frequencies were statistically significantly and positively associated with total energy intake.
- Each additional reported meal and snack was associated with an 18·5% and a 9·4% increase in total energy intake, respectively (P<0·001).

CF – 3 meals and 3 snacks?

The role of eating frequency on total energy intake and diet quality in a low-income, racially diverse sample of schoolchildren

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Abstract

Objective: The relationship of meal and snacking patterns with overall dietary intake and relative weight in children is unclear. The current study was done to examine how eating, snack and meal frequencies relate to total energy intake and diet quality.

Design: The cross-sectional associations of eating, meal and snack frequencies with total energy intake and diet quality, measured by the Healthy Eating Index-2005 (HEI-2005), were examined in separate multivariable mixed models. Differences were examined between elementary school-age participants (9–11 years) and adolescents (12–15 years).

Setting: Two non-consecutive 24-h diet recalls were collected from children attending four schools in the greater Boston area, MA, USA.

Subjects: One hundred and seventy-six schoolchildren, aged 9–15 years.

Results: Overall, 82 % of participants consumed three daily meals. Eating, meal and snack frequencies were statistically significantly and positively associated with total energy intake. Each additional reported meal and snack was associated with an 18·5 % and a 9·4 % increase in total energy intake, respectively ($P<0·001$). The relationships of eating, meal and snack frequencies with diet quality differed by age category. In elementary school-age participants, total eating occasions and snacks increased HEI-2005 score. In adolescents, each additional meal increased HEI-2005 score by 5·40 points ($P=0·01$), whereas each additional snack decreased HEI-2005 score by 2·75 points ($P=0·026$).

Conclusions: Findings suggest that snacking increases energy intake in schoolchildren. Snacking is associated with better diet quality in elementary school-age children and lower diet quality in adolescents. Further research is needed to elucidate the role of snacking in excess weight gain in children and adolescents.

Keywords
Childhood obesity
Meal pattern
Snack pattern
Energy intake
Diet quality

Since the 1970s, childhood obesity prevalence has increased in developed countries worldwide[1]. Estimates suggest that up to 60 % of obese adolescents become obese adults[2] and that dietary patterns established during childhood and adolescence often persist into adulthood[3]. Accordingly, there has been an increased focus on diet and dietary behaviours in children and adolescents. Consumption of sugar-sweetened beverages[4–6], increased portion sizes[6,10] and eating more meals away from home[7,8,11] have all been positively associated with excess weight gain in childhood. Further, nationally representative US trend data from children aged 2 to 18 years show that average eating frequency has increased from three to five daily eating occasions between 1970 and the 2000s[9,12] and average total daily energy intake has increased by 770 kJ (184 kcal) over the same time frame[9,13]. These findings, among others, have led researchers to explore what role eating frequency plays in dietary intake and weight status in childhood.

The observed increase in eating frequency is largely attributable to snacking, given that the average American child eats three snacks per day[14]. Snacking contributes nearly one-third of total energy consumed, the majority of which comes from desserts and sugar-sweetened beverages[14]. Further, compared with breakfast, lunch and dinner meals, snacks have a significantly higher energy density[15]. Despite these findings, the cross-sectional literature on the

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Whitney Evans E, Jacques PF, Dallal GE, Sacheck J, Must A. The role of eating frequency on total energy intake and diet quality in a low-income, racially diverse sample of schoolchildren Public Health Nutrition 2014

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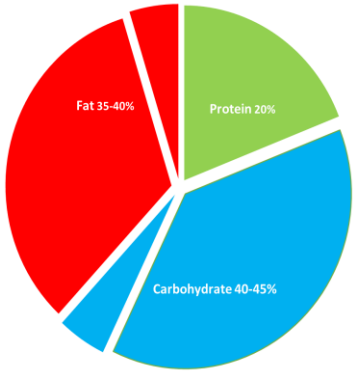
Current macronutrient recommendations

- European food safety authority recommend 0.83g protein/kg body weight
- CF likely to be higher than this ie 20% of intake – aligned with protein intake needs of other individuals with inflammatory disease
- Current consensus is that individuals should consume
  - 35-40% of calories from fat
  - **20% calories from protein**
  - 40-45% calories from carbohydrate
- Adequate supplies of energy are essential to spare protein breakdown
- High fat mass but low lean mass not necessarily protective of lung function



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Fat

- 35-40% energy intake
- Fat targets? 100g

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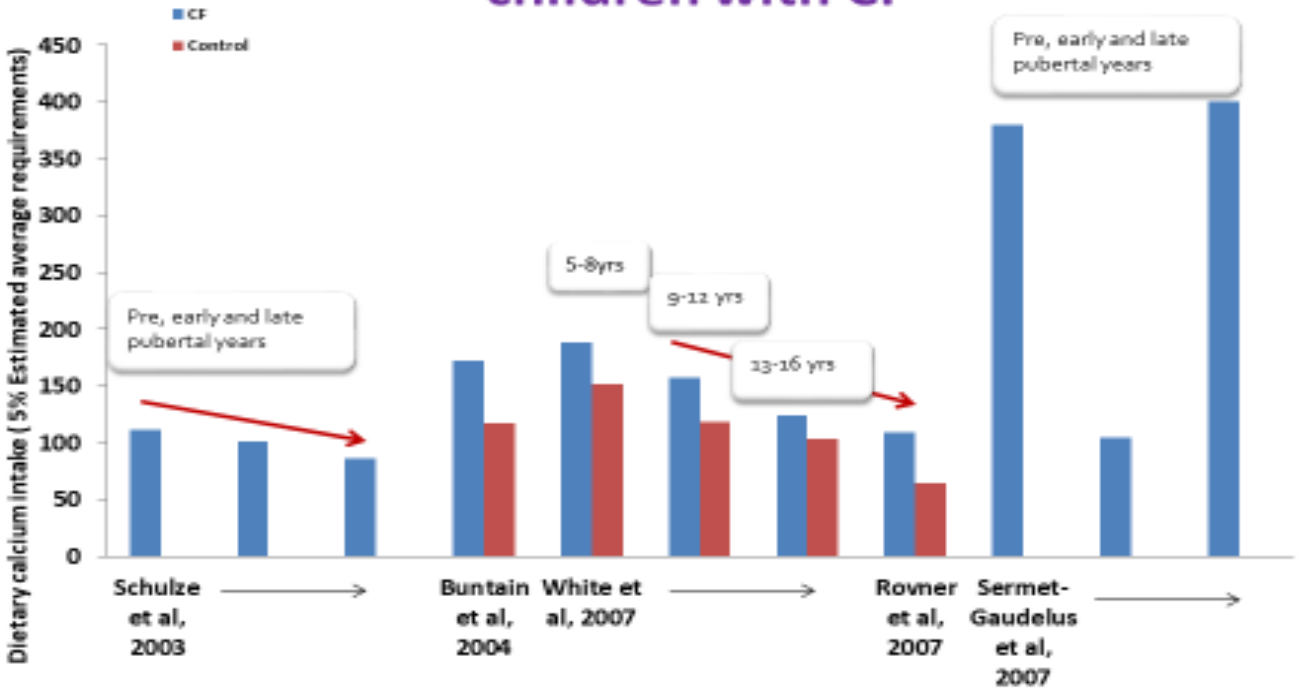
Calcium

- Should be assessed at least annually (ESPEN-ESPGHAN-ECFS Guidelines)
- More frequently in children with abnormal growth rate, weight stagnation or weight loss
- Daily calcium intakes should be at a minimum to achieve dietary intake recommended by the EFSA

Calcium intake for people with CF: recommendations guided by EFSA

Age	Dietary reference values
0-6 months	200mg
7-11 months	280mg
1-3 years	450mg
4-10 years	800mg
11-17 years	1150mg (1300mg)
18-25 years	1000mg
>25 years	950mg

Reported Dietary Calcium Intakes in children with CF



Calcium – the questions to ask

Number of portions of
Dairy products
Nuts
Dried fruits
Tinned, oily fish
Bread

- https://www.healthyeating.org/Healthy-Eating/Healthy-Eating-Tools/Calcium-Calculator

TABLE 2 – Calcium in different foods

Calcium in dairy products	Quantity	Calcium (mg)	Stars 1 star = 60mg
Milk, all types	200ml	240	++++
Cheese	matchbox-size 30g	220	++++
Cheese triangle	1 triangle = 16g	60	+
Yoghurt	120g	200	+++
Fromage frais	1 pot/pouch = 45-100g	60	+
Calcium-enriched fromage frais	1 pot/pouch = 50-90g	125	++
Malted milk drink	28g serving in 200ml milk	440-710	++++++++ to ++++++++++++
Hot chocolate (light) 30g (with water)	28g serving in 200ml water	200	+++
Rice pudding	½ large tin (200g)	176	+++
Custard	1 serving (120ml)	120	++
Milk chocolate	30g	66	+
Non-dairy sources of calcium **Calcium fortified products**			
Calcium enriched milk alternatives eg. rice*/ soya/oat/nut/coconut etc	200 mls	240	++++
Soya bean curd/tofu (Only if set with calcium chloride (E509) or calcium sulphate (E516), not nigari)	60g	200	+++
Calcium fortified soya yoghurt/dessert/ custard	125g	150	++
Calcium enriched orange juice	150mls	150	+++
Calcium fortified infant cereals	1 serving	60-120	+ to ++
Calcium fortified cereals	30g serving	120-150	++
Calcium fortified instant hot oat cereal	1 tbsp dry cereal (15g)	200	+++
Calcium-fortified bread	1 slice (40g)	191	+ to +++
Other non-dairy sources of calcium			
Sardines (with bones)	¼ tin (50g)	255	++++
Pilchards (with bones)	1 serving (90g)	150	++
Tinned salmon (with bones)	¼ tin (52g)	47	+
Whitebait	1 small portion (90g)	420	++++++++
Scampi in breadcrumbs	6 pieces (90g)	190	+++
White bread	2 large slices (100g)	100	+
Wholemeal bread	2 large slices (100g)	94	+
Pitta bread/chapati	1 portion (65g)	80	+
Orange	1 medium (120g)	75	+
Broccoli, boiled	2 spears (85g)	34	+
Spring greens	1 serving (75g)	90	+

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But….. not just about nutrient intake

Our questions should also be about

- ❑ Behaviours
- ❑ Adherence
- ❑ Knowledge

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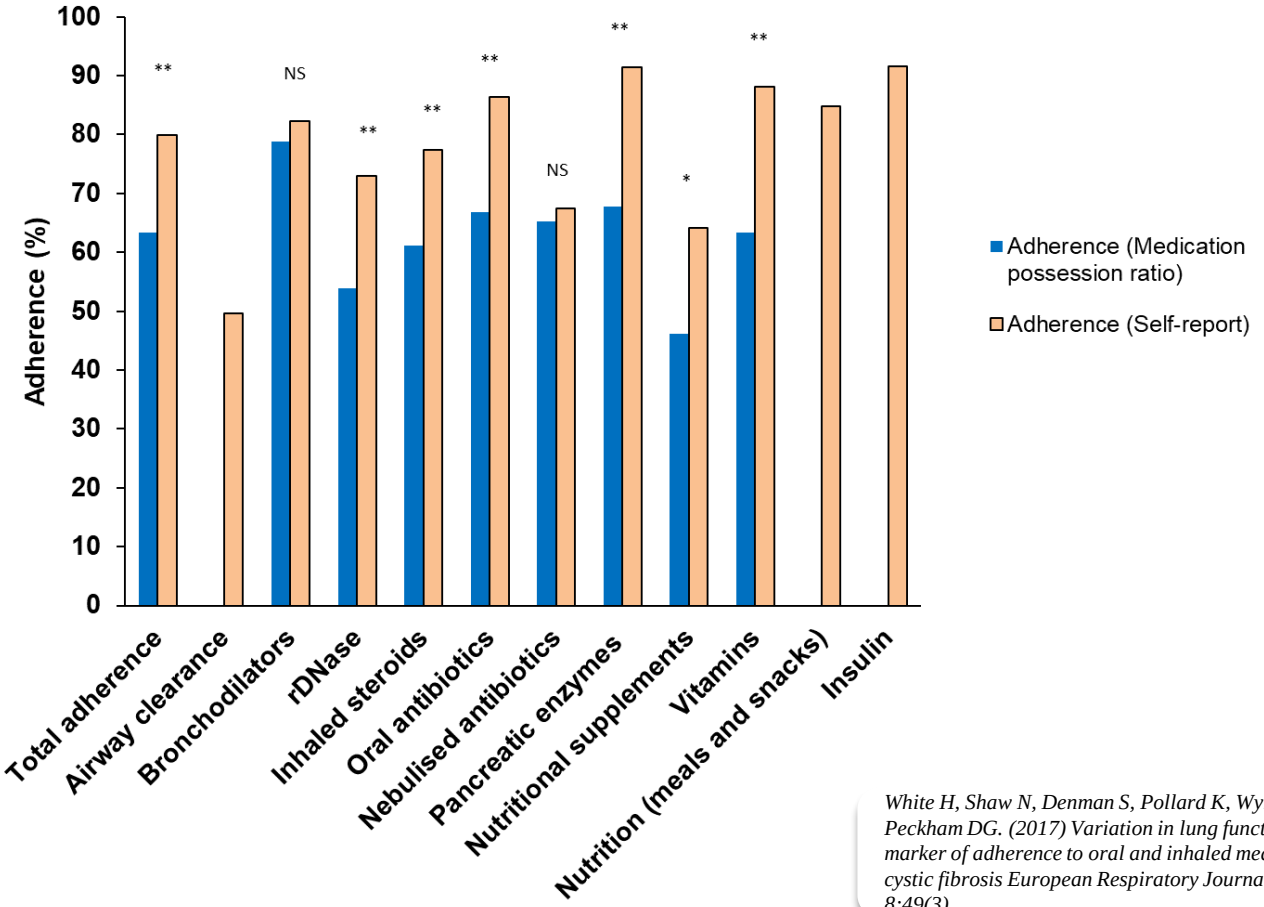
Eating behaviours

	BPFAS-UK statement	CF	Control	P (X^2)
DCB	Does not enjoy eating	32.8	4.6	0.000
	Reluctant to come to mealtimes	20.0	3.1	0.005
	Eats snacks but will not come to mealtimes	20.0	1.5	0.001
	Has a poor appetite	30.0	7.8	0.002
	Would rather drink than eat	22.1	4.7	0.005
	Negotiates food to be eaten	20.9	7.8	0.046
IPR	I get frustrated when feeding	30.0	4.5	0.000
	I coax my child to take bites	23.5	1.5	0.000
	I don't feel confident my child eats enough	21.5	7.8	0.045
	I am unhappy about my child's growth	30.0	4.8	0.000
	My child's eating pattern hurts health	24.2	3.1	0.000

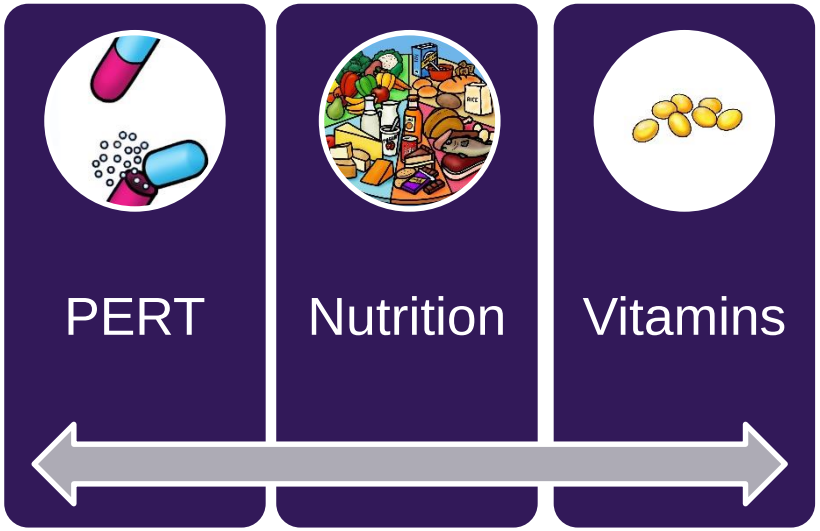
Adherence consistently reported as poor



White H, Shaw N, Denman S, Pollard K, Wynne S, Peckham DG. (2017) Variation in lung function as a marker of adherence to oral and inhaled medication in cystic fibrosis European Respiratory Journal 2017 Mar 8;49(3)

Addressing adherence early in conversations

- ‘Most adults find it hard to do all their treatments each day for good CF care. Please tell us which treatments you have done over the last week. You’re not alone if you’ve been missing some medications and treatments. It is hard to fit it in every day’



Treatment Adherence Questionnaire-CF
(Quittner et al, 2008)

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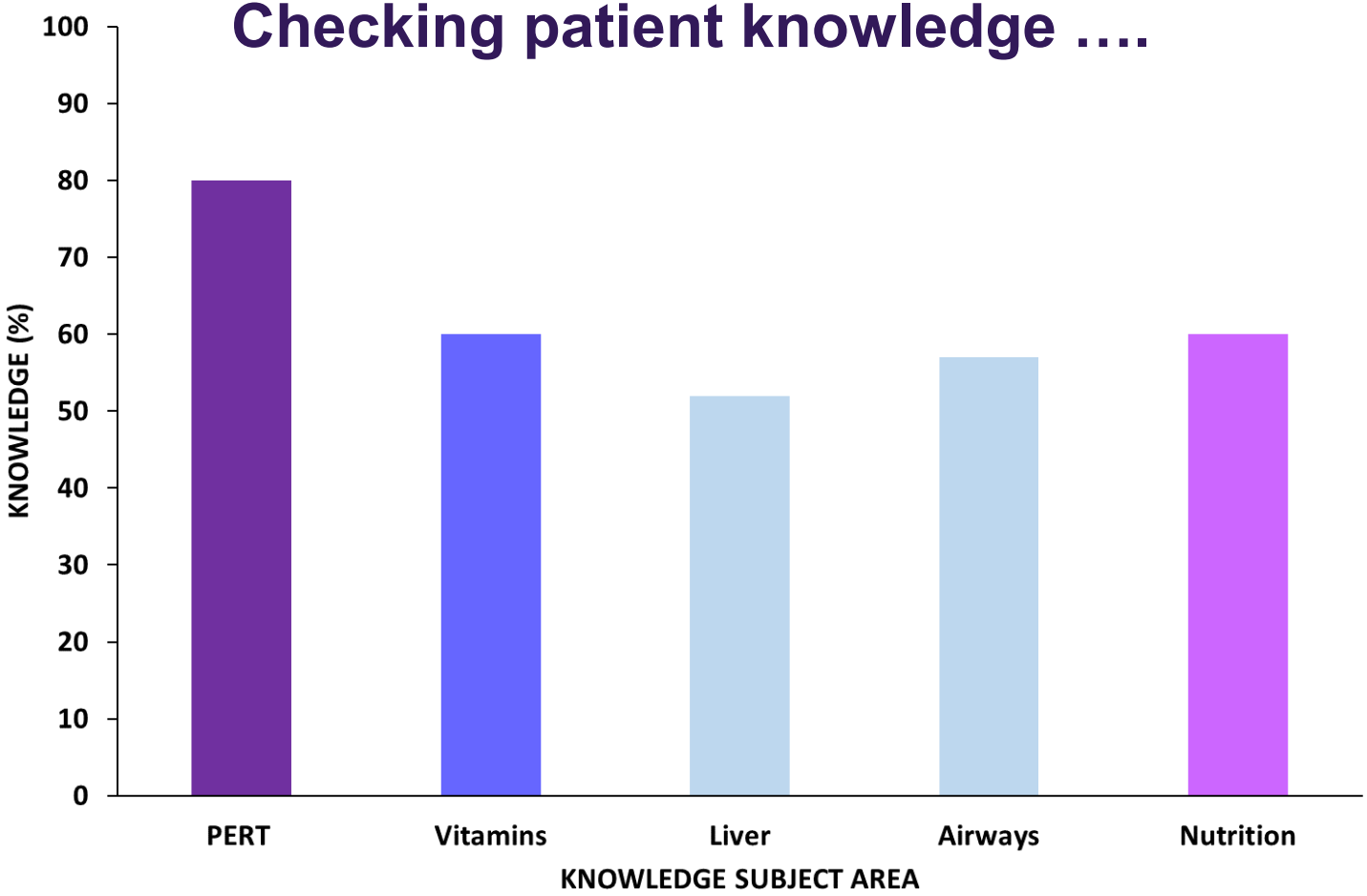
Checking patient knowledge ….



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Knowledge

- Ability to manage medications
- Ability to manage nutrition therapy and food-related behaviours
- Perceived ability to follow CF Centre recommendations.

Conclusion: Questionnaire aspects could be incorporated within outpatient visits to identify problem areas in

- **knowledge,**
- **food security**
- **confidence in skills**

Evidence-Based Practice Reports

Nutrition Knowledge and Confidence Levels of Parents of Children With Cystic Fibrosis

Catherine M. McDonald, PhD, RD, Nadia K. Christiansen, PhD, RD, Catherine Lingard, MS, RD, Kimberly A. Pool, MS, RD, and Sarah Walker, MS, MPH, RD

Abstract: Optimal growth and nutrition status predict better lung function and longevity for children with cystic fibrosis (CF). Daily nutrition therapy for children with CF requires adequate food resources, parental knowledge of nutrition and behavior management, and confidence in one's ability to apply the skills. The Mountain West Cystic Fibrosis Consortium Questionnaire (MWCFC Q) was designed to identify educational intervention targets to improve the growth and nutrition of children with CF. Parents of children with CF returned 305 anonymous MWCFC Qs. Data analyzed included household food security, knowledge of nutrition and general CF therapies, and self-confidence in one's ability to manage components of CF care. Factors associated with food insecurity were reported by 26.3% of respondents. The median accuracy for questions regarding nutrient content of commonly used foods was 71.4% and 57.9% for CF nutrition therapy. Parents' self-confidence in overall CF management was relatively high at a mean ± value 0.28 ± 1.22 of 10 possible. However, mean self-confidence in the CF nutrition domain was significantly less than mean self-confidence for the CF related tasks domain, which included chest physiotherapy and medication administration (7.75 ± 1.56, 8.62 ± 1.24, P < .001, respectively). Parental knowledge of nutrition for CF and confidence in the application of this knowledge can improve the growth and nutrition status of children with CF. Identification of food security issues may enable health care professionals to adjust nutrition interventions and direct families to appropriate food resources. The MWCFC Q could be useful for designing and testing educational interventions for nutrition management of CF.

Keywords: cystic fibrosis; parental knowledge of child's special dietary needs; survey

The emphasis of CF management has shifted from reactive treatment of symptoms to proactive, early prevention of disease progression. Concurrently, the locus of control is shifting from health care providers treating acute CF exacerbations to collaboration among providers, patients, and families to maintain optimal health.[1] Life expectancy for persons with cystic fibrosis (CF) has risen along with an increased complexity of prescribed therapies.[1,2]

Improved nutritional status with early, aggressive intervention is associated with better pulmonary health.[3,4] A Cystic Fibrosis Foundation (CFF) consensus report recommends routine nutrition monitoring and anticipatory counseling with a goal of normal growth for children with CF.[5] Adherence to prescribed nutrition therapy is positively correlated with weight of the child.[6] Maternal CF-specific nutrition knowledge predicts a child's adherence to prescribed therapy.[6]

Data from the CFF Patient Registry suggest that adherence to proven therapies maximizes health outcomes and longevity.[7] To promote optimal health and longevity, families are encouraged to learn and consistently implement multimodal and evolving therapies as well as adapt as needed with age- and condition-related changes of the child with CF.[8] It is possible that some health care providers may assume families are sufficiently knowledgeable about managing a complex CF regimen because of the families' long tenure at a CF clinic. According to published reports, an estimated 12% to 32% of mothers did not

DOI: 10.1177/1941406408325197. From Primary Children's Medical Center, Salt Lake City, Utah (CMM); Department of Nutrition and Food Sciences, Utah State University, Logan (NKC); The Children's Hospital, Aurora, Colorado (CL); Phoenix Children's Hospital, Phoenix, Arizona (KAP); and Cystic Fibrosis Center, University of New Mexico, Albuquerque (SW). Address correspondence to Catherine M. McDonald, PhD, RD, Primary Children's Medical Center, 100 North Mario Capecchi Drive, Salt Lake City, UT 84113; e-mail: kelly.mcclure@imail.org.

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Conclusion – our questions should be…..

- Energy and protein intakes and how these are measured against recommendations
- Calcium intake - number of portions of calcium containing foods each day
- Frequency of eating each day
- Food behaviours
- Knowledge of food content
- Adherence to treatments (Vitamins, Enzymes, higher fat, calorie diet)

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Thank you for listening

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