

Dietary management of celiac disease: revisiting the guidelines

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Abstract

Objective: Medical nutrition therapy (MNT), by lifelong compliance to a gluten free diet, is the only treatment of celiac disease (CD). Clinical practice guidelines (CPGs) regarding the management of CD emphasize on the role of MNT besides other treatment options. The aim of the present study was to review and critically appraise CD-specific MNT CPGs, and identify the areas in need of improvement for better adherence and outcomes.

Research Methods & Procedures: A comprehensive search was performed at Pubmed, Guidelines International Network (GIN), Google Scholar and related websites for CPGs on the dietary management of CD, published in the English language.

Results: A total of 12 CPGs were retrieved and critically appraised by three independent reviewers utilizing the AGREE II instrument. All CPGs were of low quality based on AGREE II tool. Among the 12 CPGs, the NICE ones achieved the highest score and was unanimously recommended without modifications by the three reviews, while AGA, AHS, BSPGHAN, CREST and FISPGHAN CPGs received the lowest score.

Conclusions: The present study unveils the low quality of guidelines regarding the MNT of CD patients, indicating the need of updated and improved guidelines taking into consideration the proposed items of the AGREE II.

Keywords: medical nutrition therapy; clinical practice; critical appraisal; gluten-free diet; autoimmune disease; nutrition intervention; evidence-based nutrition; gluten; CASP.

1. INTRODUCTION

Celiac disease (CD) is an autoimmune enteropathy, triggered by the consumption of gluten proteins in genetically prone individuals of all ages [1,2]. Since nutrition is the most important effector of autoimmunity in susceptible patients [3], medical nutrition therapy (MNT) characterized by life-long adherence to a gluten free diet (GFD), consists of the only effective treatment of CD [4]. An early initiation and strict adherence to GFD does not only reverse villus atrophy triggered by exposure to gluten, but may also avert CD-related comorbidities including osteoporosis, malignancies and infertility [5], while simultaneously improve patients' quality of life [6].

Even though a gluten restrictive diet is the only accepted efficient therapy for CD [4,7] adherence, rates to the GFD range from 59 to 95% [8] irrespectively of the seriousness of the concurrent comorbidities [9]. This highly heterogeneous adherence range may be the end result of poor compliance by affected patients in addition to ineffective handling and improper management of CD, as applied by experts and non-experts gastroenterologists [10]. Lack of proper patients follow-up has been identified as an important barrier to dietary adherence [9]. Additionally, obstacles to conformity to a GFD include the availability and adulteration of gluten free products [8], their higher cost compared to regular consumer goods [11,12], and the ambiguous labelling of food products [13].

Apart from immunotherapy, clinical practice guidelines (CPGs) for the management of CD emphasize on the role of MNT. However, according to a systematic review [7] among the various therapeutic components of CD, MNT appears to have the lowest compliance rates. Persistent data reveal that follow-up of CD patients is often inadequate [14], missing important critical compliance points [15], while in parallel, gastroenterologists are applying diverse practices, with many not

assessing the level of adherence to a GFD and some not reinforcing patients on the importance of GFD compliance [16]. These findings highlight the need for robust, high-quality CPGs for CD management, aiming to provide clinicians with a step-by-step procedure based on evidence-based criteria, improve clinician adherence, standardize and improve patient care [17].

Several CPGs have been issued over the years by various associations, mainly Gastroenterology Societies (adult and pediatric), but also Nutrition and Dietetic Associations, most from Europe and North America. The aim of the study was to review and critically appraise CPGs regarding the CD-specific MNT, identify shortcomings and provide information concerning the areas needing improvement during CPGs development.

2. MATERIAL AND METHODS

2.1 Search strategy

A search was performed in Pubmed, Guidelines International Network (GIN), Guidelines CENTRAL, Google Scholar, and websites of related societies. The search terms used were (guidelines), (medical nutrition therapy), (gluten free diet), (management), (care), (clinical practice), (consensus), and (celiac disease).

Inclusion criteria involved CPGs published in the English language, containing CD-MNT information. Any other forms of publication such as books, and articles written in languages other than English, were excluded. When previous versions of updated CPGs were retrieved, they were excluded from the appraisal process and the most recent one was used.

2.2 Critical appraisal of the retrieved CPGs

The included CPGs were evaluated by three independent reviewers utilizing the Appraisal of Guidelines Research & Evaluation (AGREE) II instrument [18]. The AGREE II tool assesses the rigour, bias and quality of CPGs via 23 distinct items within six main domains [18]. The AGREE is applicable to CPGs of all specialties, including nutrition [19]. The total score of each CPG is calculated as a percentage of the maximum possible score (based on the number of reviewers), while all reviewers additionally state their opinion on whether they recommend, or reject adherence to specific CPGs [18].

2.3 Pooling CD-MNT recommendations

MNT recommendations from each CPG were extracted by two reviewers independently in an excel file. When information was ambiguous, disagreement was resolved by a third reviewer following constructive discussion. Overview tables were constructed with all nutrition-related recommendations available in the CPGs.

3. RESULTS

A total of 12 CPGs published by the American College of Gastroenterology (ACG) [20], the American Gastroenterology Association (AGA) [21], Alberta Health Services (AHS) [22], the British Society of Gastroenterology (BSG) [23], the British Society of Paediatric Gastroenterology, Hepatology and Nutrition (BSPGHAN) [24], the American Academy of Nutrition and Dietetics (Academy) [25], the Clinical Resource Efficiency Support Team (CREST) [26], the Federation of International Societies of Pediatric Gastroenterology, Hepatology and Nutrition (FISPGHAN) [27], the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) [28], the National Institute for Health and Care Excellence (NICE) [29], the World Gastroenterology Organization (WGO) [30], and the American Academy of Pediatrics expert panel (AAP-EP) [31]

were retrieved (**Table 1**). Four were specific on pediatric patients, two were destined for adult patients and the remaining were for either age group.

Table 2 details the AGREE scores of each CPG. Overall, the quality of guidelines was low, with all CPGs achieving a score lower than 65%. Scores in the scope and purpose domain were high for most CPGs, exceeding 66.7%. The greatest score in this domain was received by the Academy [25] and NICE [29] reaching 98.1%. In the stakeholder involvement domain the Academy [25] received the greatest score, whereas the lowest score (31.5%) was received by the AGA [21] CPGs. Most CPGs failed to include a multidisciplinary team and patients in the CPGs development, scoring low in this specific domain. In the rigor of development domain the FISP GHAN [27] scored the lowest (14.6%), for failing to report search methods and formulations recommendations and for underreporting evidence selection criteria, strengths and limitations and for not explicitly considering benefits and harms. The rigor domain was mostly met by the NICE [29] (72.2%) CPGs. The Academy [25] CPGs demonstrated the highest presentation clarity (85.2%) and applicability (68.1%). Greater editorial independence was demonstrated by the ACG [20], BSG [23], and AAP-EP [31] reaching 100%. Half of the appraised CPGs [21,22,26,28–30] received the lowest possible score in the editorial independence domain (0%), for failing to disclose funding and competing interests of members. Among appraised CPGs, the NICE guidelines [29] obtained the highest score and were unanimously recommended by the review panel, while the AGA [21], AHS [22], BSPGHAN [24], CREST [26] and FISP GHAN [27] CPGs received the lowest scores.

Table 3 details the grading system used in each CPG for recommendations formulation. Different grading systems were utilized by the advising bodies, with the ACG [20] and AAP-EP [31] CPGs using the Grading of Recommendations, Assessment, Development and Evaluations (GRADE)

system [32], and the BSG [23] and NASPGHAN [28] guidelines implementing the Oxford Centre for Evidence-based Medicine [33] and the Canadian Preventive Services Task Force [34], respectively.

An overview of the recommendations regarding CD-specific MNT are outlined in **Tables 4** and **5**. All CPGs underlined the need for involving a dietitian in the therapy, however, detailed nutritional recommendations and important issues on nutritional management were lacking from the majority of CPGs.

4. DISCUSSION

The present approach reveals that current CPGs regarding the MNT of CD patients, are, in their majority, of low quality, scoring inadequately in several AGREE domains, indicating bias, lack of objectivity and of an evidence-based approach during CPGs development. Identification of the domains needing further improvement is important for ameliorating physician and patient adherence, and improving health-related outcomes.

Over the last three decades CPGs development has evolved from an expert consensus matter, to an evidence-based medicine approach. However, despite the evolution observed in CPGs development, quality of most CPGs remains suboptimal [19,35]. Defined scope and purpose are important items of CPGs development, detailed in by all appraised CPGs herein. As far as key stakeholder involvement is concerned, low scores were observed in all CPGs with the exception of the AND [25] and NICE [29] ones. It should be noted that target population preferences and views were not accounted for in either CPGs, reducing the overall domain score. Many organizations recommend the inclusion of patients, patient representatives, or health consumers in the CPGs development panel [36], but CPGs often inadvertently focus on physicians solely [37]. Patient involvement in particular, is an important factor in CPGs development, enhancing

implementability and patient adherence, while ameliorating disease outcome [36]. However, to date, very few guidelines are incorporating members of the public in their development [38]. With studies indicating extremely variable adherence to GFD [15] and the desire of patients and their families for improved treatment [39], the absence of patient involvement indicates lack of a realistic approach for CPGs implementation.

Low rigor was observed in many guidelines pointing out the lack of search methods, formulation of recommendations, external review, and updating procedures. The use of grading systems for the formulation of recommendations is important to identify indirectness, risk of bias, inconsistency, imprecision, and the magnitude of effect of the studies supporting each recommendation [40], while supporting evidence-based medicine. On the other hand, thorough external review is an important part of the CPGs development process, determining the applicability, clarity and validity [41], and was only accounted for adequately by the BSG [23] and the BSPGHAN [24]. All CPGs appraised, failed to mention a scheduled update procedure, except for the Academy [25].

Most of the CPGs provided specific, unambiguous and identifiable key recommendations, but demonstrated low applicability. The Academy guidelines [25] yielded the highest score in the applicability domain, providing methods to translate evidence to simple practice points and comprehensible monitoring criteria, while taking into account the financial factors of implementing the guidelines. On the one hand, adhering to a GFD is usually costly for the patients [11], however, on the other hand, could curtail healthcare costs [42]. As far as editorial independence is concerned, half of the guidelines [21,22,26,28–30] neglected to mention their funding sources and the conflicts of interest (COI) of each author, reducing the trustworthiness of

their recommendations [43]. When COIs are not mentioned it is not possible to exclude authors from participating in specific recommendations when important COI is involved [37].

Many studies highlight the vital role of dietitians in CD management [44–47] and the cost-effectiveness of dietitian visits in CD [48]. In fact, dietitians are the only competent health professionals for educating patients and their relatives on nutrition matters [45,49]. In parallel, CD patients have reported preferring having meetings with dietitians [46] over other health professionals, and tend to exhibit improved GFD adherence when regular dietetic follow-ups are scheduled [45]. Interestingly, despite the fact that diet is the only effective therapy for CD, less than ¼ of patients in Australia and New Zealand and approximately ¾ of New Yorker with CD have had an appointment with a dietitian specialized in their disease [50]. In fact, according to an Australian survey [51], 78% of category 2 and 3 patients referred to the gastroenterologist could be managed exclusively in a dietitian-led clinic. In discordance with the acknowledgement of all included CPGs that a dietitian should be a part of a multidisciplinary team in management of CD, five out of twelve of the guidelines [20,27,28,30,31] did not implicate a dietitian in the guideline development process, while 2/12 guidelines [22,29] failed to report whether a dietitian was deemed necessary in CD therapy.

Allowed foods and foods to avoid were not reported by the majority of CPGs, despite research indicating that many CD patients are unable to correctly identify gluten-free foods [50] and many overestimating their nutrition literacy [52]. Noteworthy, many of the appraised guidelines stressed the importance of the nutritional education of CD patients. According to research, poor knowledge may lead to dietary over-restrictions, and poorer dietary adherence [12,50]. According to Swift and Woodward [53] nutrition education should be prescribed in CD patients in a manner akin to medication prescription in other disease. Inadequate patient education appears to be a universal

problem [53] and the recommendation for nutrition education suggested by some CPGs offers a promising note for better disease adherence and outcomes.

The issue of oats consumption was stressed by most CPGs, suggesting the use of pure, uncontaminated oats in a moderate amount for most patients [20–26,30]. However, oats introduction must be performed with caution and close monitoring of the patient for adverse reactions [20]. Based on a recent systematic review and meta-analysis [54] there is no evidence indicating that addition of oats to a GFD affects symptoms, histology, immunity, or serologic features of patients.

Standards for labelling of GF foods was missed by most CPGs, with the exception of the AGA [21] and BSPGHAN [24]. A preferred meal pattern was only suggested by the AHS [22]. As for the adoption of a lactose-free diet, the BSPGHAN [24] and NASPGHAN [28] did not recommend its use for the majority of children, except for those with more severe CD, or inadequate dietary compliance.

Finally, oral nutrient supplements were deemed necessary by the NICE [29] and the Academy [25], in cases of inadequate micronutrient intake. The rest of the advising bodies failed to address the issue of micronutrient deficiencies in CD. In parallel, the need for nutritional assessment and routine screening was missed by most CPGs [22–24,27,29], despite the variety of nutritional deficiencies that often accompany CD [55,56].

As far as breastfeeding is concerned, the CREST [26] CPGs suggested that breastfeeding may delay the onset of CD, however, according to a more recent meta-analysis, infant feeding practices do not appear to have an effect on the risk of CD onset during childhood [57]. The remaining CPGs

were either more recent than the CREST, or did not include any information regarding breastfeeding.

CPGs consist of one important foundation in the effort to improve healthcare [37]. CPGs adherence standardizes care and improves patient outcome [58], while, on the flip side, reasons for non-adherence behave us [17]. Limitations of the present study include the lack of appraisal of CPGs published in languages other than the English and in forms other than electronic. Furthermore, in our study three independent reviewers critical appraise the CPGs, while AGREE II tool recommends the employment of four reviewers for minimizing the risk of bias. The importance of the present review however, stems from the critical appraisal of the CPGs, providing information on the domains in need of improvement during future CPGs development/update in order to improve dietetic practice. Given that CD in particular is the opportunity for dietitians to showcase the efficacy of the nutrition science, a collective effort is needed to include dietitians in all nutrition-related CPGs and ameliorate the quality of the CPGs, in order to advance dietetic practice and provide evidence-based nutrition.

5. CONCLUSION

In conclusion, the aim of the present study was to critically appraise and review CPGs regarding CD-specific MNT, in an attempt to provide guidance for future enhancement of guidelines, leading to superior guidelines, improvement of healthcare services and simultaneously reducing healthcare costs.

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Conflicts of Interest: None.

Authorship

Author contributions: DPB, MGG, and XT designed the study. XT, MGG, and DBG wrote the manuscript. AP, MP, and SP reviewed and critically appraised the guidelines. KG and MK extracted the data for the overview tables. All authors approved the manuscript for submission.

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Table 1. General description of the retrieved guidelines and their scope.

Advising Body	Country/ Region	Publication year	Scope		Organization		Target Population		Total pages
			CD management with enclosed MNT recommendations	MNT for CD	Professional	Government	Children	Adults	
AAP-EP [31]	N. America	2016	√		√		√		17
Academy [25]	USA	2015	√	√	√		√	√	55
ACG [20]	USA	2013	√		√		√	√	21
AGA [21]	USA	2005		√	√		√	√	7
AHS [22]	Canada	2013	√		√		√	√	6
BSG [23]	UK	2014	√		√			√	22
BSPGHAN [24]	UK	2013	√		√		√		6
CREST [26]	Ireland	2006		√	√			√	28
FISPGHN [27]	N. America	2008		√	√		√		6
NASPGHAN [28]	N. America	2005	√		√		√		19
NICE [29]	UK	2015	√			√	√	√	145

Advising Body	Country/ Region	Publication year	Scope		Organization		Target Population		Total pages
			CD management with enclosed MNT recommendations	MNT for CD	Professional	Government	Children	Adults	
WGO [30]	International	2016	√		√		√	√	35

AAP-EP: American Academy of Pediatrics Expert Panel; Academy: Academy of Nutrition and Dietetics; ACG: American College of Gastroenterology; AGA: American Gastroenterology Association; AHS: Alberta Health Services; BSG: British Society of Gastroenterology; BSPGHAN: British Society of Pediatric Gastroenterology, Hepatology and Nutrition; CD: Celiac disease; CREST: Clinical Resource Efficiency Support Team; FISPGHAN: Federation of the Societies of Pediatric Gastroenterology, Hepatology, and Nutrition; MNT: Medical Nutrition Therapy; NASPGHAN: North American Society for Pediatric Gastroenterology, Hepatology and Nutrition; NICE: National Institute for Health and Clinical Excellence; WGO: World Gastroenterology Organization.

Table 2. AGREE II scores of guidelines for the nutritional management of celiac disease (% of maximum scoring for each domain and subcategory^{*}).

AGREE II domains	CPGs on the nutritional management of CD											
	AAP-EP [31]	Academy [25]	ACG [20]	AGA [21]	AHS [22]	BSG [23]	BSPGHAN [24]	CREST [26]	FISPGHAN [27]	NASPGHAN [28]	NICE [29]	WGO [30]
1. Scope & purpose	85.2	98.1	87.0	77.8	83.3	88.9	83.3	92.6	72.2	96.3	98.1	87.0
1a. Objectives	88.9	100	88.9	77.8	72.2	83.3	88.9	100	66.7	100	94.4	83.3
1b. Questions	77.8	94.4	83.3	77.8	94.4	83.3	77.8	77.8	72.2	94.4	100	94.4
1c. Populations	88.9	100	88.9	77.8	83.3	100	83.3	100	77.8	94.4	100	83.3
2. Stakeholder involvement	59.3	81.5	40.7	31.5	33.3	50.0	27.8	53.7	27.8	55.6	77.8	40.7
2a. Group membership	94.4	55.6	100	94.4	0.0	83.3	83.3	66.7	83.3	72.2	94.4	44.4
2b. Patient views	0.0	88.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	50.0	0.0
2c. Target users	83.3	100	22.2	0.0	100	66.7	0.0	94.4	0.0	88.9	88.9	77.8
3. Rigor	59.0	36.1	28.0	18.1	16.0	69.4	14.6	15.3	14.6	56.9	72.2	22.9
3a. Search methods	100	0.0	16.7	0.0	0.0	83.3	5.6	0.0	0.0	100	94.4	0.0
3b. Evidence selection criteria	88.9	0.0	5.6	11.1	5.6	94.4	0.0	11.1	11.1	100	100	16.7
3c. Evidence strengths & limitations	72.2	50.0	55.6	16.7	5.6	77.8	0.0	0.0	11.1	55.6	83.3	11.1
3d. Formulation of	83.3	0.0	0.0	0.0	0.0	94.4	0.0	11.1	0.0	72.2	94.4	11.1

CPGs on the nutritional management of CD												
AGREE II domains	AAP-EP	Academy	ACG	AGA	AHS	BSG	BSPGHAN	CREST	FISPGHAN	NASPGHAN	NICE	WGO [30]
	[31]	[25]	[20]	[21]	[22]	[23]	[24]	[26]	[27]	[28]	[29]	
recommendations												
3e. Benefits & harms consideration	16.7	77.8	61.1	66.7	55.6	16.7	0.0	50.0	38.9	38.9	94.4	44.4
3f. Recommendations & evidence link	88.9	61.1	83.3	50.0	61.1	88.9	11.1	50.0	55.6	77.8	100	88.9
3g. External review	11.1	0.0	0.0	0.0	0.0	94.4	100	0.0	0.0	11.1	11.1	11.1
3h. Updating procedures	11.1	100	0.0	0.0	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0
4. Clarity of presentation	75.9	85.2	63.0	57.4	74.1	64.8	48.1	81.5	66.7	53.7	74.1	77.8
4a. Specific, unambiguous recommendations	83.3	88.9	88.9	66.7	83.3	94.4	72.2	94.4	66.7	94.4	94.4	94.4
4b. Management options	55.6	83.3	11.1	38.9	44.4	0.0	0.0	55.6	44.4	11.1	27.8	44.4
4c. Identifiable key recommendations	88.9	83.3	88.9	66.7	94.4	100	72.2	94.4	88.9	55.6	100	94.4
5. Applicability	44.4	68.1	26.4	37.5	45.8	40.3	36.1	61.1	34.7	43.1	55.6	37.5
5a. Facilitators & barriers to	44.4	50.0	27.8	61.1	27.8	38.9	33.3	66.7	50.0	38.9	27.8	38.9

CPGs on the nutritional management of CD												
AGREE II domains	AAP-EP	Academy	ACG	AGA	AHS	BSG	BSPGHAN	CREST	FISPGHAN	NASPGHAN	NICE	WGO [30]
	[31]	[25]	[20]	[21]	[22]	[23]	[24]	[26]	[27]	[28]	[29]	
application												
5b. Implementation advice/tools	5.6	83.3	11.1	72.2	66.7	0.0	44.4	94.4	11.1	16.7	33.3	16.7
5c. Resource implications	66.7	77.8	0.0	0.0	61.1	55.6	0.0	16.7	44.4	44.4	77.8	11.1
5d. Monitor/audit criteria	61.1	61.1	66.7	16.7	27.8	66.7	66.7	66.7	33.3	72.2	83.3	83.3
6. Editorial Independence	100	75.0	100	0.0	0.0	100	50.0	0.0	50.0	0.0	0.0	0.0
6a. Funding body	100	50.0	100	0.0	0.0	100	0.0	0.0	0.0	0.0	0.0	0.0
6b. Competing interests	100	100	100	0.0	0.0	100	100	0.0	100	0.0	0.0	0.0
Overall quality	61.1	55.6	55.6	38.9	38.9	61.1	38.9	38.9	38.9	50.0	66.7	50.0
Recommendation:												
Without Modification	33.3	100	66.6	0	33.3	100	0	33.3	0	33.3	100	66.6
With Modification	66.6	0	33.3	66.6	66.6	0	100	66.6	33.3	66.6	0	33.3
Not recommended	0	0	0	33.3	0	0	0	0	66.6	0	0	0

AAP-EP: American Academy of Pediatrics Expert Panel; Academy: Academy of Nutrition and Dietetics; ACG: American College of Gastroenterology; AGA: American Gastroenterology Association; AGREE: Appraisal of Guidelines Research & Evaluation; AHS: Alberta Health Services; BSG: British Society of Gastroenterology; BSPGHAN: British

CPGs on the nutritional management of CD

AGREE II domains	AAP-EP	Academy	ACG	AGA	AHS	BSG	BSPGHAN	CREST	FISPGHAN	NASPGHAN	NICE	WGO [30]
	[31]	[25]	[20]	[21]	[22]	[23]	[24]	[26]	[27]	[28]	[29]	

Society of Pediatric Gastroenterology, Hepatology and Nutrition; CD: Celiac Disease; CPGs: Clinical Practice Guidelines; CREST: Clinical Resource Efficiency Support Team; FISPGHAN: Federation of the Societies of Pediatric Gastroenterology, Hepatology, and Nutrition; NASPGHAN: North American Society for Pediatric Gastroenterology, Hepatology and Nutrition; NICE: National Institute for Health and Clinical Excellence; WGO: World Gastroenterology Organization.

* Highest score in each principal domain is presented in bold.

Table 3. Grading system used for recommendation formulation in the retrieved guidelines.

Grading systems	Codes of evidence and recommendation		
	Level of evidence	Strength of recommendation	CPGs
GRADE [32]	A, B, C	1, 2	ACG [20], AAP-EP [31]
mGRADE	A, B, C	1, 2	NICE [29]
Oxford Centre for Evidence-based Medicine [33]	1a, 1b, 1c, 2a, 2b, 2c, 3a, 3b, 4, 5	A, B, C, D	BSG [23]
Canadian Task force on Preventive Health Care [59]			NASPGHAN [28]
Academy Recommendation Rating Scheme [60]			Academy [25]
None Reported			AGA [21], AHS [22], BSPGHAN [24], CREST [26], FISP GHAN [27], WGO [30]

Academy: Academy of Nutrition and Dietetics; ACG: American College of Gastroenterology; AGA: American Gastroenterology Association; AHS: Alberta Health Services; BSG: British Society of Gastroenterology; BSPGHAN: British Society of Pediatric Gastroenterology, Hepatology and Nutrition; CPGs: Clinical Practice Guidelines; CREST: Clinical Resource Efficiency Support Team; GRADE: Grading of Recommendations Assessment, Development and Evaluation; mGRADE: Modified Grading of Recommendations Assessment, Development and Evaluation; NASPGHAN: North American Society for Pediatric Gastroenterology, Hepatology and Nutrition; NICE: National Institute for Health and Clinical Excellence; WGO: World Gastroenterology Organization.

Table 4. Outline of the general nutrition recommendations included in the clinical practice guidelines for Celiac Disease Medical Nutrition Therapy.

Recommendations:	CPGs by advising bodies:											
	AAP-EP [31]	Academy [25]	ACG [20]	AGA [21]	AHS [22]	BSG [23]	BSPGHAN [24]	CREST [26]	FISPGHAN [27]	NASPGHAN [28]	NICE [29]	WGO [30]
Dietitian Needed:	√	√	√	√	√	√	√	√	√	√	√	√
Nutrition Education:	√	√	√	√								√
Nutritional Assessment:	√	√	√	√				√		√		√
Routine Screening:	√	√	√	√				√		√		√
Allowed Foods:		√		√				√				√
Foods to Avoid:			√	√	√			√				√
Gluten intake limit:						< 10 mg/d						10–100 mg/d

Academy: Academy of Nutrition and Dietetics; ACG: American College of Gastroenterology; AGA: American Gastroenterology Association; AHS: Alberta Health Services; BSG: British Society of Gastroenterology; BSPGHAN: British Society of Pediatric Gastroenterology, Hepatology and Nutrition; CPGs: Clinical Practice Guidelines; CREST: Clinical Resource Efficiency Support Team; NASPGHAN: North American Society for Pediatric Gastroenterology, Hepatology and Nutrition; NICE: National Institute for Health and Clinical Excellence; WGO: World Gastroenterology Organization.

Table 5. Issues of nutritional concern included in the clinical practice guidelines for celiac disease medical nutrition therapy.

Recommendations:	CPGs by advising bodies:								
	Academy [25]	ACG [20]	AGA [21]	AHS [22]	BSPGHAN [24]	CREST [26]	NASPGHAN [28]	NICE [29]	WGO [30]
Oats:	Incorporating pure oats (50 g dry oats/d) with wheat, barley or rye is safe and improves GFD compliance.	Pure oats are safely tolerated by most. Introduced with caution and patient monitoring for adverse reactions.	The inclusion of oats and wheat starch in the GFD is controversial.	Consume moderate amount of pure uncontaminated dry oats as follows: • adults ½ – ¾ cup dry oats/d (125–175 mL) • children ¼ cup dry oats/d (60 mL).	Safe for most CD patients although ≈5% of patients are oat-sensitive. Use uncontaminated oats only.	Coeliac UK advise on a moderate intake (<50 g, i.e. 1 serving) of pure oats/d by most celiacs, without risk.			Pure, uncontaminated oats are not toxic for >95% of CD patients.
Gluten-free products standards:			GF foods must have <20 ppm of gluten (20 mg		Products with barley malt extract must be <20 ppm to be GF.				

CPGs by advising bodies:

Recommendations:	Academy [25]	ACG [20]	AGA [21]	AHS [22]	BSPGHAN [24]	CREST [26]	NASPGHAN [28]	NICE [29]	WGO [30]
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gluten/1 kg).
 Other count-
 ries use 200
 ppm.
 Codex wheat
 starch is used in
 GF or VLG foods.
 GF: safe for all
 unless separate
 non-coeliac whe-
 at sensitivity.
 VLG: acceptable
 for most celiacs,
 except those
 with ↑ gluten
 sensitivity.

Meals:
 3 regular meals
 and snacks daily

Lactose-free diet
 (LFD):
 Rarely needed, al-
 though in some,
 Most children
 with newly di-

CPGs by advising bodies:

Recommendations:	Academy [25]	ACG [20]	AGA [21]	AHS [22]	BSPGHAN [24]	CREST [26]	NASPGHAN [28]	NICE [29]	WGO [30]
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temporary lacto-
 agnosed CD to-
 se intolerance can
 lerate lactose,
 coexist. More
 in moderate
 persistent lactose
 amounts. Thus,
 intolerance needs
 LFD is not ne-
 further assess-
 cessary. Young
 ment to exclude
 children with
 inadequate diet-
 more severe
 ary compliance or
 disease may
 additional patho-
 benefit from a
 logy requiring se-
 LFD initially.
 parate treatment
 (eg, cow's milk
 sensitive enter-
 opathy).

Oral Nutrient Consume a

Explain to pa-

CPGs by advising bodies:

Recommendations:	Academy [25]	ACG [20]	AGA [21]	AHS [22]	BSPGHAN [24]	CREST [26]	NASPGHAN [28]	NICE [29]	WGO [30]
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Supplements: gluten-free
 age- and sex-
 specific MV
 and mineral
 ONS if usual
 food intake is
 inadequate
 and cannot
 be alleviated
 through imp-
 roved eating.

tients and fa-
 milies that
 ONS (Ca, vit
 D) is needed
 in insufficient
 diets.

Breastfeeding: Recommended. It
 can delay CD
 onset.

ACG: American College of Gastroenterology; AGA: American Gastroenterology Association; Academy: Academy of Nutrition and Dietetics; BSPGHAN: British Society of Pediatric Gastroenterology, Hepatology and Nutrition; CD: Celiac Disease; CPGs: Clinical Practice Guidelines; CREST: Clinical Resource Efficiency Support Team; GF:

CPGs by advising bodies:

Recommendations:	Academy	ACG [20]	AGA [21]	AHS [22]	BSPGHAN [24]	CREST [26]	NASPGHAN	NICE [29]	WGO [30]
	[25]						[28]		

Gluten free (<20 ppm); GFD: Gluten-free diet; LFD: Lactose-free diet; MV: Multivitamin; NASPGHAN: North American Society for Pediatric Gastroenterology, Hepatology and Nutrition; NICE: National Institute for Health and Clinical Excellence; ONS: Oral nutrient supplements; VLG: Very low gluten (21–100 ppm); WGO: World Gastroenterology Organization; ↑: high.
