



Applied nutritional investigation

Dietary management of celiac disease: Revisiting the guidelines



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ABSTRACT

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

Methods: A comprehensive search was performed using PubMed, Guidelines International Network (GIN), Google Scholar, gray literature, and websites of CD scientific organizations for CPGs, consensus and practice papers 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 using the Appraisal of Guidelines Research & Evaluation (AGREE) II instrument. All CPGs were of low quality based on AGREE II. Among the 12 CPGs, the National Institute for Health and Care Excellence guidelines achieved the highest score and were unanimously recommended without modifications by the three reviewers, whereas the American Gastroenterology Association, Alberta Health Services, British Society of Paediatric Gastroenterology, Hepatology and Nutrition, Clinical Resource Efficiency Support Team, and Federation of International Societies of Pediatric Gastroenterology, Hepatology and Nutrition guidelines received the lowest scores.

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

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Introduction

Celiac disease (CD) is an autoimmune enteropathy, triggered by the consumption of gluten proteins in genetically prone individuals of all ages [1,2]. Because nutrition is the most important effector of autoimmunity in susceptible patients [3], medical nutrition therapy (MNT) characterized by lifelong 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].

Although 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] irrespective 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 patient follow-up has been identified as an important barrier to dietary adherence [9]. In addition, obstacles to conformity to a GFD include the availability and adulteration of gluten-free products [8], their higher cost compared with regular consumer goods [11,12], and the ambiguous labeling of food products [13].

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Apart from immunotherapy, clinical practice guidelines (CPGs) for the management of CD emphasize 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 high-quality CPGs for CD management, aiming to provide clinicians with a step-by-step procedure based on evidence-based criteria, improve clinician adherence, and 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.

Material and methods

Search strategy

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

Inclusion criteria involved CPGs, consensus and practice papers published in the English language containing CD-MNT recommendations. 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.

Critical appraisal of the retrieved CPGs

The included CPGs were evaluated by three independent reviewers using the Appraisal of Guidelines Research & Evaluation (AGREE) II instrument [18]. The AGREE II tool assesses the rigor, 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 guideline is calculated as a percentage of the maximum possible score (based on the number of reviewers), and all reviewers additionally state their opinion on whether they recommend or reject adherence to specific CPGs [18].

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]	North 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
FISPGHAN [27]	North America	2008		✓	✓		✓		6
NASPGHAN [28]	North America	2005	✓		✓		✓		19
NICE [29]	UK	2015	✓			✓	✓	✓	145
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.

Pooling CD-MNT recommendations

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

Results

A total of 12 CPGs published by the American College of Gastroenterology (ACG) [20]; American Gastroenterology Association (AGA) [21]; Alberta Health Services (AHS) [22]; British Society of Gastroenterology (BSG) [23]; British Society of Paediatric Gastroenterology, Hepatology and Nutrition (BSPGHAN) [24]; American Academy of Nutrition and Dietetics (Academy) [25]; Clinical Resource Efficiency Support Team (CREST) [26]; Federation of International Societies of Pediatric Gastroenterology, Hepatology and Nutrition (FISPGHAN) [27]; North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) [28]; National Institute for Health and Care Excellence (NICE) [29]; World Gastroenterology Organization [30]; and 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 II 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 obtained by the AGA [21] guidelines. 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 FISPGHAN [27] scored the lowest (14.6%) for failing to report search methods and formulations recommendations; underreporting evidence selection criteria, strengths, and limitations, and not explicitly considering benefits and harms. The rigor domain was mostly met by the NICE [29] (72.2%) CPGs. The Academy [25] CPGs had the highest presentation clarity (85.2%) and applicability (68.1%). Greater editorial independence was found in the ACG [20], BSG

Table 2
AGREE II scores of guidelines for the nutritional management of celiac disease (percentage 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 recommendations	83.3	0.0	0.0	0.0	0.0	94.4	0.0	11.1	0.0	72.2	94.4	11.1	
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 application	44.4	50.0	27.8	61.1	27.8	38.9	33.3	66.7	50.0	38.9	27.8	38.9	
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 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		CPGs
	Level of evidence	Strength of recommendation	
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 [61]			NASPGHAN [28]
Academy Recommendation Rating Scheme [62]			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.

[23], and AAP-EP [31] guidelines, 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, whereas the AGA [21], AHS [22], BSPGHAN [24], CREST [26], and FISP GHAN [27] CPGs received the lowest scores.

Table 3 describes the grading system applied in each CPG for the formulation of recommendations. Different grading systems were used by the advising bodies, with the ACG [20] and AAP-EP [31] CPGs using the Grading of Recommendations, Assessment, Development and Evaluations system [32], and the BSG [23] and NASPGHAN [28] guidelines implementing the Oxford Centre for Evidence-based Medicine [33] and Canadian Preventive Services Task Force [34] systems, 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 the nutritional management of patients were lacking from most CPGs.

Discussion

The present approach reveals that current CPGs regarding the MNT of CD patients, are, in the majority, of low quality, scoring inadequately in several AGREE II domains, indicating bias and 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 calculated for all CPGs with the exception of the Academy [25] and NICE [29] guidelines. 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 had 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. Adhering to a GFD is usually costly for the patients [11], although it might curtail health care 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 one fourth of patients in Australia and New Zealand and approximately three fourths of New Yorkers 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 acknowledgment of all included CPGs that

Table 4
Outline of the general nutrition recommendations included in the clinical practice guidelines, consensus and practice papers 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.

a dietitian should be a part of a multidisciplinary team in management of CD, 5 out of 12 of the appraised guidelines [20,27,28,30,31] did not implicate a dietitian in the guideline development process, and 2 out of 12 CPGs [22,29] failed to report whether a dietitian was 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 that many overestimate their nutrition literacy [52]. Noteworthy, many of the appraised guidelines stressed the importance of the nutritional education of CD patients. Research has indicated that poor nutrition knowledge may lead to dietary overrestrictions and poorer dietary adherence [12,50,53]. Subsequently, the need for educating CD patients on nutrition has been highlighted in the literature [53], whereas, according to Swift and Woodward [54], 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 [54] 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 [55], there is no evidence indicating that addition of oats to a GFD affects symptoms, histology, immunity, or serologic features of patients.

Standards for gluten-free foods labeling was missed by most CPGs, with the exception of the AGA [21] and the 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 form of CD or those with inadequate dietary compliance.

Finally, oral nutrient supplements were deemed necessary by the NICE [29] and Academy [25] guidelines 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 [56–58].

As far as breastfeeding is concerned, the CREST [26] CPG 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 [59]. 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 health care [37]. CPG adherence standardizes care and improves patient outcome [60], whereas, reasons for non-adherence behoove 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 critically appraised the eligible CPGs, although the AGREE II manual recommends the employment of four reviewers to minimize risk of bias. The importance of the present review, however, involves the critical appraisal of the guidelines, providing information on the domains in need of improvement during future CPGs development and updates to improve dietetic practice. Given that CD in particular is an opportunity for dietitians to showcase the efficacy of the nutrition science, effort is needed to include dietitians in all nutrition-related CPGs

Table 5

Issues of nutritional concern included in the clinical practice guidelines, consensus and practice papers 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: <ul style="list-style-type: none"> • Adults 1/2–3/4 cup dry oats/d (125–175 mL) • children 1/4 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 per day) of pure oats 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 gluten/1 kg). Other countries use 200 ppm.		Products with barley malt extract must be <20 ppm to be GF. Codex wheat starch is used in GF or VLG foods. GF: Safe for all unless separate non-coeliac wheat sensitivity. VLG: Acceptable for most celiacs, except those with ↑ gluten sensitivity.				
Meals				3 regular meals and snacks daily					
Lactose-free diet (LFD)					Rarely needed, although in some, temporary lactose intolerance can coexist. More persistent lactose intolerance needs further assessment to exclude inadequate dietary compliance or additional pathologic condition requiring separate treatment (e.g., cow's milk-sensitive enteropathy).		Most children with newly diagnosed CD tolerate lactose in moderate amounts. Thus LFD is not necessary. Young children with severe disease may benefit from a LFD initially.		
Oral nutrient supplements	Consume a GF age- and sex-specific MV and mineral ONS if usual food intake is inadequate and cannot be improved via eating.							Explain to patients and families that ONS (calcium, vitamin D) is needed in insufficient diets.	
Breastfeeding						Recommended for delaying 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, 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.

and ameliorate guidelines quality, to advance dietetic practice and provide evidence-based nutrition.

Conclusions

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 and improvement of health care services while simultaneously reducing health care costs. With GFD being the only treatment for CD, emphasis should be given to the development of quality CPGs in the future, involving patients and dietitians in the development process, increasing the rigor of development, and declaring all possible conflicts of interest.

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