



Avoidant restrictive food intake disorder and pediatric feeding disorder: the pediatric gastroenterology perspective

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Purpose of review

Avoidant/restrictive food intake disorder (ARFID) and pediatric feeding disorder (PFD) are the newest evolutions of frameworks for dysfunctional feeding and share overlapping features but maintain notable differences. This review will compare the two frameworks, highlighting some of the latest advances in diagnosis and management.

Recent findings

Dysfunctional feeding, particularly with the PFD definition, benefits from multidisciplinary care with equal attention to medical, nutritional, skill-based, and behavioral domains. Management requires medical attention, often with functional gastrointestinal disease and anxiety. Pharmacologic appetite stimulation may play a role. A single empirically proved behavioral approach has not been described and multiple options exist regarding type, location, and intensity of feeding therapy.

Summary

ARFID and PFD not only share areas of overlap, but also differ, likely based on the origins of each framework. Ultimately, both frameworks describe dysfunctional feeding and require input from medical providers. The more effective approaches tend to be multidisciplinary, addressing medical, nutritional, skill-based, and/or behavioral aspects of the disorder (the PFD model). Future evolution of both ARFID and PFD frameworks is likely to generate refinement in their defining criteria, hopefully generating a structured link between the two.

Keywords

avoidant/restrictive food intake disorder, malnutrition, multidisciplinary care, pediatric feeding disorder

INTRODUCTION

Dysfunctional feeding in infants and children and its diagnostic criteria are ageless entities and historically have been categorized through different definitions and frameworks across discrete disciplines. Terms such as dysphagia, failure to thrive or gain weight, malnutrition, feeding disorder, and anorexia have attempted to describe dysfunctional feeding and/or its sequelae; however, the conceptualization of each model is both tailored to, and limited by the discipline that generated it. These relevant disciplines include physicians (general or subspecialized), speech-language pathologists, occupational therapists, pediatric psychologists, and other mental health providers, dietitians, and nurses, all overlapping over feeding dysfunction and understanding the problem through the lens of their discipline's research, terminology, and consensus clinical approaches. Examples of this include "infant dysphagia" [1], "sleeper feeder," "dream feeder," "failure to

imbibe" [2], "pediatric malnutrition" [3], and "infant anorexia" [4]. Although each is thoughtful and useful on its own merits, each also is limited by the perspective through which the problem was assessed.

The two most relevant currently utilized terms that describe dysfunctional feeding in infants and children are avoidant-restrictive food intake disorder (ARFID) and pediatric feeding disorder (PFD). ARFID and PFD not only have inherent areas of overlap, but also are distinguished through significant differences in conceptualization. This review

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KEY POINTS

- ARFID and PFD are the newest frameworks that describe dysfunctional feeding.
- PFD is a more appropriate framework from the medical perspective, connecting directly to the multidisciplinary care the medically complex children receive.
- Functional gastrointestinal disease and anxiety are frequent comorbidities in ARFID/PFD patients.
- Medical conditions can masquerade as feeding dysfunction and feeding dysfunction can masquerade as medical conditions.
- Thus far, there is no single and empirically best treatment approach. Management, if highly individualized, and the more complicated patients may require intensive and sometimes inpatient treatment.

will highlight how these terms are utilized, advances in research and clinical practice, and future areas of need, all from the perspective of a pediatric gastroenterologist.

GENESIS OF AVOIDANT-RESTRICTIVE FOOD INTAKE DISORDER

In 2013, the American Psychiatric Association published the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and replaced the previous diagnosis of *feeding disorder of infancy and early childhood* with the new diagnosis, *avoidant-restrictive food intake disorder (ARFID)* [5]. In keeping with the DSM's status as a living document, this evolution presumably was driven by a perceived lack of use of the previous diagnosis in investigation and/or clinical care. The change was apparently successful, as it was followed by a growing stream of clinical and research publications, including over 100 in each of the 2 years preceding this review.

The clinical criteria for ARFID (Table 1) have a significant overlap with those of anorexia nervosa, with absence of perturbation of body image perception being the significant difference. The definition, while including sequelae of malnutrition, does not hold nutrition as a major element and tends to focus on the disorder as a behavioral problem that, in turn, may result in malnutrition and possible growth failure. Expert panels have proposed subtypes of ARFID, including those based on fear/anxiety, absent interest/appetite, and sensory problems; some publications have included those with more severe nutritional sequelae as a separate subcategory [6,7]. It is notable that these subtypes do not acknowledge the contribution from complex

medical (e.g., gastroschisis, leukemia, sequelae of prematurity) or skill-based deficits (e.g., congenital airway anomalies, Down syndrome or other hypotonia, sequelae of cerebrovascular accident) to the feeding dysfunction and understandably view the feeding problem as a behaviorally driven dysfunction. It is likely that further evolutions of the ARFID criteria will include a medically complex subtype, as well as further refinements that reduce overlap with other eating disorders [8]. Despite current limitations, the publication of ARFID criteria in 2013 was successful and accomplished the goal of addressing a diagnostic gap in previous editions of the DSM.

Although ARFID is frequently considered in children and adolescent patients with disordered feeding, age is not a defining criterion, and this diagnosis has been applied in patients across all age groups. An Australian demographic study of health-related quality of life surveyed 3000 individuals age at least 15 years in 2014 and 2015 found a mean age of 46 years in those who fulfilled ARFID diagnostic criteria [9]. Whether ARFID exists in a continuum with eating disorders also remains unclear. Early studies followed a cohort of 800 picky/selective eaters for a period of 10 years and found some correlation with subsequent anorexia and also suggested that early mealtime fighting and pica also correlated with bulimia [10]. More recent studies followed a population of co-treated ARFID and anorexia nervosa patients in the same facility and found that those with ARFID did not acquire features of anorexia nervosa [11].

GENESIS OF PEDIATRIC FEEDING DISORDER

Although utilized more effectively and frequently in mental health settings, ARFID examines feeding problems and their sequelae from a behavioral perspective and fails to fully collect all relevant elements that may be encountered, particularly with medically complex infants and children. A multidisciplinary diagnosis of *pediatric feeding disorder* was generated in 2019 via a consensus multidisciplinary expert panel, and while it keeps the behavioral components found in ARFID, it adds information from medical, nutritional, and skill disciplines [12]. As of April 2023, this consensus definition has been cited 303 times (*Google Scholar*).

The PFD diagnostic criteria (Table 1) allow for dysfunction within a single or any combination of its four equal elements that include medical, nutritional, skill-based, and behavioral/psychosocial components. In this manner, the PFD framework can transcend each element's conceptualizations and is tailored for the interdisciplinary clinical care

Table 1. The defining components of avoidant/restrictive food intake disorder and pediatric feeding disorder are tabulated from their respective sources [5,12]

	ARFID	PFD
Publication year	2013	2019
Originators	Expert author panel of mental health providers from the American Psychiatric Association	Multidisciplinary expert consensus panel the included physicians, dietitians, speech-language pathologists, occupational therapists, pediatric psychologists, and family advocates
Format	DSM-5 format; grouped with feeding and eating disorders	Written according to the WHO International Classification of Functioning, Disability and Health. This disability aspect is emphasized by the age-appropriate specification in the primary definition.
Primary definition statement	An eating or feeding disturbance (e.g., apparent lack of interest in eating or food; avoidance based on the sensory characteristics of food; concern about aversive consequences of eating) as manifested by persistent failure to meet appropriate nutritional and/or energy needs associated with one (or more) of the following <i>nutritional and/or behavioral/psychosocial elements</i> :	A disturbance in oral intake of nutrients, inappropriate for age, lasting at least 2 weeks and associated with one or more of the following <i>nutritional, behavioral/psychosocial, skill, or medical elements</i> :
Nutritional elements	Significant weight loss (or failure to achieve expected weight gain or faltering growth in children)	Specific nutrient deficiency or significantly restricted intake of one or more nutrients resulting from decreased dietary diversity.
	Significant nutritional deficiency	Malnutrition
	Dependence on enteral feeding or oral nutritional supplements.	Reliance on enteral feeds or oral supplements to sustain nutrition and/ or hydration
Behavioral/ Psychosocial elements	Marked interference with psychosocial functioning.	Psychosocial dysfunction, as evidenced by any of the following: (a) Active or passive avoidance behaviors by child when feeding or being fed (b) Inappropriate caregiver management of child's feeding and/or nutrition needs (c) Disruption of social functioning within a feeding context (d) Disruption of caregiver-child relationship associated with feeding.
Skill elements	Not addressed	Feeding skill dysfunction, as evidenced by any of the following: (a) Need for texture modification of liquid or food (b) Use of modified feeding position or equipment (c) Use of modified feeding strategies
Medical elements	The eating disturbance is not attributable to a concurrent medical condition or not better explained by another mental disorder. When the eating disturbance occurs in the context of another mental disorder, the severity of the eating disturbance exceeds that routinely associated with the condition or disorder and warrants additional clinical attention	Medical dysfunction, as evidenced by any of the following: (a) Cardiorespiratory compromise during oral feeding (b) Aspiration or recurrent aspiration pneumonitis
Not associated with food scarcity or cultural element	The disturbance is not better explained by lack of available food or by an associated culturally sanctioned practice	Absence of the cognitive processes consistent with eating disorders and pattern of oral intake is not due to a lack of food or congruent with cultural norms.
Not related to disturbance of self-body image	The eating disturbance does not occur exclusively during the course of anorexia nervosa or bulimia nervosa, and there is no evidence of a disturbance in the way in which one's body weight or shape is experienced	
Proposed subtypes (etiologies)	<ul style="list-style-type: none"> • Fear/anxiety • Lack of appetite • Sensory 	All possible subtypes can be accommodated into the four diagnostic elements, above

Although significant overlap between the two frameworks can be noted, the key differences are the multidisciplinary authorship, the crafting as a disability, and the accommodation of medical and skill dysfunction by the PFD definition.

that medically complex children with feeding problems require. Furthermore, the PFD definition was written in accordance with the WHO's framework for disability, the International Classification of Functioning, Disability and Health (ICF); this was done to address a gap in obtaining services and/or allowances in schools or other care settings. The disability aspect is stressed by making the targeted baseline *age-appropriate* feeding, regardless of medical complexity. Furthermore, PFD is not on a level plane with ARFID wherein it would be up to the provider to decide whether a given patient may have PFD or ARFID; the PFD framework is at a higher level and can include the conceptualization of ARFID, as its behavioral element in combination with information from its three other equally relevant elements (Fig. 1). In this manner, all ARFID patients can fit into the PFD framework within the behavioral and nutritional elements; conversely, many PFD patients, particularly those who may be medically complex, are not fully accommodated by the ARFID framework, as the contribution of medical and/or skill-based dysfunction lies outside of the diagnostic criteria.

The prevalence of PFD has been studied in retrospective cohorts from Arizona Medicaid (2009–2017), Wisconsin Medicaid (2005–2014), and a national private insurance database (2009–2015) databases found annual prevalence rates of 4.2, 4.3, and 2.7% in these cohorts, respectively. The

prevalence tended to decrease with age, female sex, and private insurance status with the highest rate in boys 2–12 months of age on public insurance [13].

With specific relevance to pediatric gastroenterologists and pediatricians alike, the PFD framework may appear more familiar, as the medical element would require one to think about medical diagnoses that could contribute to the feeding disorder. Physicians should also be very familiar with the nutritional element, as it includes with surveillance of growth, assessment of malnutrition, and management of formulas and enteral/tube nutrition they already assess and supervise. The skill element overlaps with the recurring discussion pediatricians may have with colleagues in speech-language disorder, occupational therapy, and otolaryngology. Finally, the behavioral element overlaps significantly with what physicians already provide in the management of functional gastrointestinal disease, including use of nonprescription supplements (peppermint and other herbal products, probiotics, and so on), prescription of medications (anxiolytics), and referral to psychologists or counselors for therapy that may include cognitive behavioral therapy, guided imagery, and hypnotherapy.

DIAGNOSIS AND PRESENTATION

Acknowledging the differences already stated, the frameworks of ARFID and PFD can be grouped

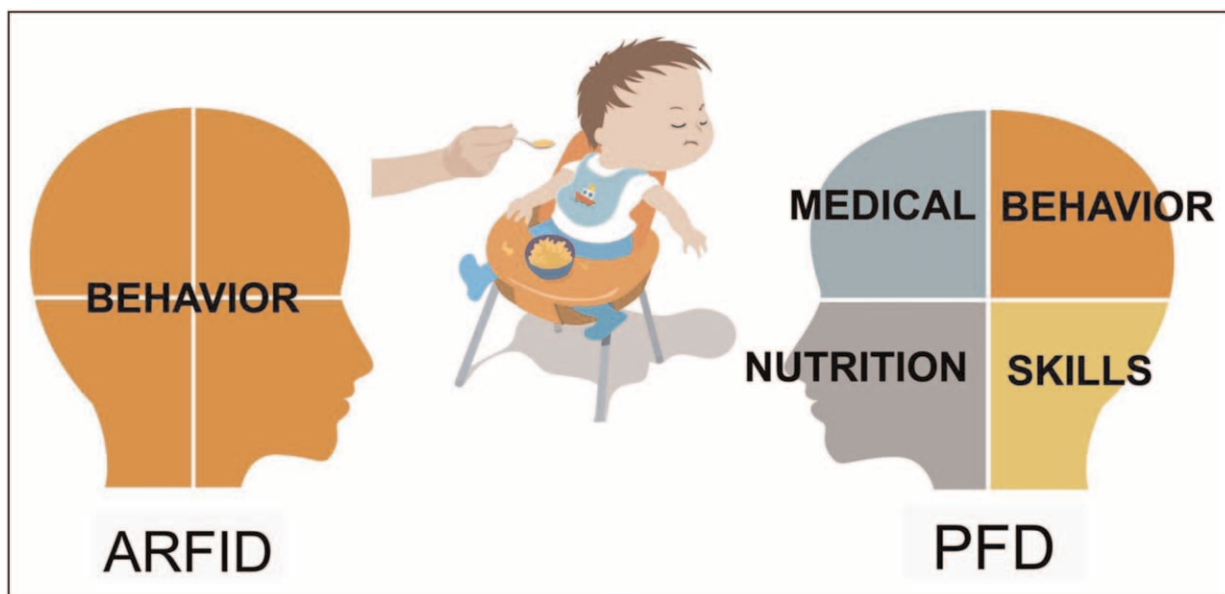


FIGURE 1. Contrasting perspectives of avoidant/restrictive food intake disorder and pediatric feeding disorder. ARFID assesses a feeding dysfunction as an expression of fear/anxiety, lack of appetite, or sensory dysfunction that is amenable to behavioral intervention with nutritional support as needed. PFD assesses the same dysfunction through a multidisciplinary lens that is divided into four elements, each with their own literature, diagnoses, and interventions.

together for simplicity as ARFID/PFD, simply referring to the disordered feeding that is central to both frameworks. One of the most comprehensive examinations of the demographics of disordered feeding comes from the Hospital for Sick Children in Toronto, Ontario, Canada [14]. In this publication, the authors examine 369 children and adolescents referred to their eating disorder center. Of the 369 referrals, 31 fulfilled criteria for ARFID; this population had a mean age of 13.2 ± 2.3 years and was 64.5% female. A portion (39%) had failure to gain weight. The mean duration of illness prior to referral was greater than 2 years and almost half of the referrals had prior evaluations/treatment that failed to resolve the issue. Importantly, 57% of referrals had a comorbid mental health disorder with anxiety being the most frequently represented. The most common presenting sign was decreasing portion size, noted in 96%. Other presenting signs or symptoms included items that could be referred initially to medical providers who, in turn, may fail to perceive a behavioral component and therefore fail to address the root cause; these presenting symptoms included nausea (60%), early satiety (57%), abdominal pain (50%), and fear of choking (21%). A recent and demographic study provided retrospective review of 239 children with a mean age of 12.8 years and a male predominance (57%). This larger population differed from the Ontario population by having better nutrition (mean BMI for age Z score of -1.14), but had a similarly high frequency of mental health problems, particularly anxiety that was diagnosed in 55% of the cases [15].

TREATMENT

Nutritional supervision

Although the goal of ARFID/PFD is the normalization of feeding, this cannot occur with ongoing malnutrition; whenever advancement of feeding comes into conflict with growth and nutrition, one must always err on the side of the latter. Joint consensus assessment standards have been published by the Academy of Nutrition and Dietetics and the American Society for Parenteral and Enteral Nutrition [3]. Beyond careful examination of dietary intake and growth parameters, assessment may include a nutrition focused physical examination [16]. With regard to laboratory assessment, vitamin D and iron stores are frequently queried in children with a narrow dietary spectrum; however, there are no empiric data on the laboratory assessment of micronutrient levels. The largest retrospective cohort of children with ARFID published its findings from its numerous nutritional labs, but these were

only performed in 1–33% of cases, confirming that an empirically validated set of nutritional laboratories for disordered feeding has not been created and assessment depends on clinical indications [15]. In the acute setting, intervention for malnutrition may include supplemental tube feeding and monitoring for refeeding syndrome as needed. In the chronic or maintenance phases, nutritional supervision will require ongoing monitoring of dietary intake and growth parameters.

Appetite manipulation

Social and environmental interventions with proven efficacy at promoting feeding and appetite include the establishment of a fasted state in between meals [17,18] and the family interaction and modeling that should occur at the table [19]. When these are insufficient or unfeasible, medical augmentation of appetite is an option that has been demonstrated with drugs that antagonize 5HT_{2C} receptors, including cyproheptadine and mirtazapine. Cyproheptadine is a first-generation antihistamine with multiple side effects, including antiserotonergic, anticholinergic, and antiadrenergic effects. Cyproheptadine has been shown to be as effective as megestrol in appetite stimulation in at least one trial [20]. Cyproheptadine also has been shown to be an effective appetite stimulant in cystic fibrosis where augmentation of appetite is desirable towards improving nutrition and overall outcomes [21]. Mirtazapine is an atypical tetracyclic antidepressant that often is used off-label as an anxiolytic. As with cyproheptadine, mirtazapine interacts with multiple different receptors, including 5HT_{2C} receptor antagonism and has been utilized as a component in the successful treatment of ARFID [22,23,24].

Management of functional and mucosal gastrointestinal disease

Pediatric gastroenterologists play a significant role in the management of ARFID/PFD that includes intervention with both nutrition and appetite. A more familiar role includes the management of associated functional gastrointestinal disease, mucosal gastrointestinal disease, and helping determine the end of medical assessment to shift the focus to the proper skill and/or behavioral providers.

Regarding functional gastrointestinal disease, a survey of ARFID patients noted that dyspepsia, abdominal pain, nausea, and constipation may be common comorbidities [14]. Although each of these symptoms is unlikely to be the sole driver of disordered feeding, resolving these functional symptoms may be important for successful treatment of the

feeding disorder. Anxiety that is common in ARFID also is known to be a frequent comorbid condition with functional gastrointestinal disease and can augment gastrointestinal symptoms. It should also be noted that children with severe irritable bowel syndrome have been known to resort to dysfunctional eating as a means of abrogating their gastrointestinal symptoms, suggesting a contributing role for functional gastrointestinal disease in disordered feeding [25]. The management of functional gastrointestinal disease has become increasingly sophisticated, as we now have solutions that can effectively address symptoms that, while not at the center of ARFID/PFD may become a significant factor in its treatment. A recent review provides a thorough list of treatments and the evidence that supports their use in pediatric patients [26[■]].

Mucosal inflammatory gastrointestinal diseases in pediatric patients, including celiac and Crohn disease, have been demonstrated to be associated with dysfunctional feeding [27,28]. A more direct impact can be seen in children with eosinophilic esophagitis (EoE). This disorder is known to sometimes have disordered feeding as its sole presenting sign/symptom, particularly in the youngest patients (infants and toddlers) [29]. Children with EoE also are at risk for disordered eating, particularly when elimination diets have been part of the treatment [30]. Of note, a survey of adults with EoE describes in their own words the struggles they encounter on a regular basis that include disordered eating [31].

A level of complexity is added by the fact that ARFID/PFD can mimic gastrointestinal disease presentations and gastroenterologists must maintain a high index of suspicion for feeding disorder, whether up front, or soon thereafter if supported by early screening studies. In a review of patients fulfilling ARFID criteria in a general pediatric practice, 33 children ultimately diagnosed with ARFID presented for medical care for evaluation of symptoms that included failure to gain weight and undernutrition (27), poor appetite (10), abdominal pain (9), weight loss (5), reflux (5), nausea (3), diarrhea (3), and food allergies (3) [32]. Conversely, pediatric patients with organic/mucosal disease have been misdiagnosed with ARFID/eating disorder; some of these underlying diagnoses include Crohn disease, celiac disease, eosinophilic esophagitis, trichobezoar, Addison's disease, giardiasis, and familial polyposis [27,30,33–37].

Management of mental health disorders

Mental health disorders, most-commonly anxiety, have been described as frequent comorbidities in

patients with ARFID [14,15]. Behavioral therapies that have proved beneficial include cognitive behavioral therapy (CBT) and an ARFID-specific version that is still under investigation (CBT-AR) [38]. Given the young age of many patients with ARFID/PFD, standard CBT approaches that require insight are not uniformly feasible. Successful adaptation of CBT to younger children has been described via the “Feeling Body Investigators.” This program utilizes cartoons to expand access of CBT concepts to younger children and has been successful in the treatment of ARFID [39]. In some cases wherein children have limitations that preclude their participation in behavioral therapy, parent-centered treatment has been described [40]. When medications are indicated, serotonin selective reuptake inhibitors (SSRIs) and mirtazapine (off-label) have been described. The latter has the benefit of its simultaneous orexic effect [24].

Feeding therapy

Ultimately, there are no empirically proved therapies for ARFID/PFD and treatments are chosen on an individual basis. Treatments vary in intensity, as well as setting (outpatient vs. inpatient). Therapies are also customized to the needs of a patient regarding the targeting of nutritional, skill, and/or behavioral dysfunction. Ideally, medical issues should be controlled or resolved for therapy to be expected to progress; however, some potential contributing factors, such as suspected COVID-19 dysgeusia, do not have a specific medical treatment and patients simply enter into feeding therapy [41]. Outpatient approaches are best indicated when there are different avenues of care at play; in this way, nutritional rehabilitation can occur simultaneously with medical evaluation and skill acquisition and/or establishment of behavioral foundations. Intensive outpatient treatment results in improved dietary variety, mealtime behaviors, and nutrient intake in a general ARFID population [42[■]]. Intensive outpatient treatment also has proved well tolerated and efficacious through an 8-week weaning of tube feeding dependency [43]. Although outpatient treatment offers the most flexibility, it can be limited by inability to establish safe appetite manipulation. One controversial exception is the method known popularly as the “Graz” protocol that performs gastrostomy tube feeding weans with appetite manipulation in an outpatient setting [44]. Although successes have been reported in patients with specific conditions, the overall efficacy of this treatment, including treatment failures, has not been studied thoroughly.

When outpatient treatment is not an option due to case severity, or if behavioral/functional progress is stalled despite known ability to succeed, inpatient treatment can be considered. These programs focus more intensely on treatment, as there are no competing concerns that likely exist in the home or family setting. More importantly, inpatient therapy can overcome the entrenched behavioral reluctance via appetite manipulation that cannot be safely performed in outpatient settings. It is known that adverse effects of appetite manipulation, including dehydration and hypoglycemia, can be predicted and addressed in the inpatient center in a manner that maintains the treatment focus on behavioral/functional feeding outcomes [45]. Multiple centers have reviewed their experience with inpatient care and meta-analysis has calculated an overall 71% efficacy in weaning dependence on tube feeding, with 80% of cases maintaining treatment gains posthospitalization [46]. This is notable, as these children almost uniformly failed prior outpatient interventions. This same meta-analysis also describes the metrics that should be tracked at different centers to maximize information from future studies.

Multimodal therapy has been described for the more dramatic cases of ARFID/PFD. In a published case, an 11-year-old with malnutrition secondary to a significantly restricted diet was hospitalized for 7 weeks for treatment that included nutritional rehabilitation with a nasogastric tube, CBT and family-based therapy, and the initiation of medications (sertraline and olanzapine) [47]. The authors describe a severely malnourished child who almost exclusively ate yogurt at presentation and subsequently improved with the noted therapy, reporting an 8 kg weight gain, acceptance of a complete pediatric formula, and acceptance of juice and applesauce.

CONCLUSION

Feeding problems often include a complex mixture of nutritional, skill-based, medical, and behavioral dysfunction. This being the case, they are often better addressed in multidisciplinary settings where experts from each discipline can work collaboratively to achieve resolution. As noted, feeding problems are a long-recognized entity that until recently have not received the attention they merit from the medical system. The recent frameworks of ARFID and PFD have evolved the inadequate notion of feeding dysfunction as “maternal deprivation,” to complex frameworks that are based on data and strive to generate further gains in knowledge. The

creation of ARFID for the DSM-5 has been successful, as it has generated the desired utilization in clinical care and research. The increasing citation frequency of the PFD consensus framework also highlights the growing interest in improving care for these patients.

The differences between ARFID and PFD frameworks likely are based on the groups that generated them. ARFID is an expansion of eating disorder literature and is solidly rooted with the mental health providers and researchers who utilize that information. Conversely, PFD was generated by experts from multiple disciplines and advocates who treat a larger fraction of pediatric patients in whom the ARFID definition may account for psychosocial dysfunction and some of the sequelae of malnutrition but fails to accommodate medical and/or skill-based problems as contributors to feeding dysfunction. The PFD definition seeks to address this limitation by adding medical, a larger nutritional component, and skill elements to the psychosocial paradigms generated by ARFID researchers, establishing a framework that treats its four foundational elements equally. Ultimately, the PFD framework is more familiar and superior for the management of feeding dysfunction in medically complex patients a pediatric gastroenterologist may encounter.

For physicians treating ARFID/PFD (pediatric gastroenterologists in particular), the burden required for clinical competence will continue to increase, as the skillset will include expanding catalogues of relevant medical diagnoses and treatments, as well as an understanding of the similarly evolving clinical perspectives simultaneously held by the other relevant disciplines. The data for these disorders will also likely increase, as leading research centers may collaborate in multicenter endeavors with standardization of metrics available for the whole of the field to review and utilize. Most importantly, with ongoing research and multidisciplinary care, the clinical criteria for ARFID and PFD will be further refined, removing overlap with other eating disorders, and perhaps eventually referring to each other in a structured manner and establishing a beneficial link between the two.

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Conflicts of interest

There are no conflicts of interest.

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- of special interest
- ■ of outstanding interest

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