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Clinical utility of Picture Your Plate™ as a nutrition screening tool in lymphedema practice: a cross-sectional survey of certified lymphedema therapists, an exploratory study

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Abstract

Lymphedema affects approximately 10 million Americans, with obesity identified as one of its strongest modifiable risk factors. Despite well-established links between dietary patterns, obesity, and lymphatic dysfunction, no standardized nutrition screening tool has been validated for use in lymphedema practice. This cross-sectional survey examined Certified Lymphedema Therapists' (CLTs) perceptions of Picture Your Plate™ (PYP™) as a dietary screening instrument. Findings reveal a field-wide gap in the standardization of nutrition screening and support the need for validated referral protocols and dietary assessment education in lymphedema certification pathways. As these findings are based on clinician perceptions rather than clinical outcomes or real-world practice patterns, they should be interpreted as exploratory. The 12.4% response rate introduces the possibility of selection bias, as respondents may disproportionately represent clinicians with heightened interest in nutrition, which could limit the generalizability of these findings to the broader CLT population.

Key words: lymphedema, training, nutrition, clinicians.

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Introduction

Lymphedema is a chronic, progressive disorder characterized by impaired lymphatic transport and the accumulation of protein-rich interstitial fluid, leading to edema, tissue fibrosis, decreased mobility, and functional decline. As a global health problem, lymphedema affects approximately 10 million Americans and 300 million people worldwide.[1] Current research demonstrates that a cause of lymphedema is the alterations in the tissue microenvironment, characterized by oxidative stress, immune dysregulation, and metabolic disruption, which perpetuate and worsen disease progression.[2] Extracellular matrix remodeling including aberrant collagen deposition, altered proteoglycan composition, and progressive interstitial fibrosis represents an additional pathophysiological mechanism through which chronic lymphatic impairment is sustained and amplified. These interconnected processes of inflammation, immune dysregulation, and matrix remodeling provide essential biological context for understanding how nutritional factors, particularly those modulating systemic inflammation and metabolic homeostasis, may influence lymphedema severity and progression.[3,4]

Obesity is among the strongest modifiable risk factors for lymphatic dysfunction, and these pathological microenvironmental changes are further amplified by obesity and cancer treatments, making these patient populations especially vulnerable.[2] The LIMPRINT international multicenter study of more than 7,000 patients demonstrated that individuals with class III obesity exhibit substantially more advanced stages of chronic edema and worse symptoms than their normal-weight counterparts.[5]

The current evidence supports weight loss as a meaningful intervention in lymphedema management, with multiple studies demonstrating consistent correlations between weight reduction and decreases in limb volume, regardless of the dietary method employed.[1,6-9] The

National Lymphedema Network[10] cautions that current evidence is insufficient to recommend any single diet as a primary treatment. The literature broadly converges on an anti-inflammatory dietary pattern emphasizing whole grains, vegetables, fruits, and omega-3 fatty acids.[2,9,11] Emerging case evidence also highlights the role of coordinated nutritional intervention in complex lymphedema presentations; a multidisciplinary approach incorporating a Very-Low-Calorie Ketogenic Diet (VLCKD) alongside compressive therapy produced substantial reductions in subcutaneous thickness in a patient with stage III lymphedema and morbid obesity, underscoring the clinical importance of integrating dietitian expertise into lymphedema care.[12]

Regardless of this evidence, no standardized nutrition assessment practice exists among lymphedema clinicians.[13] Provider-level barriers further compound the problem: past nutrition education, comfort level, and access to a Registered Dietitian Nutritionist (RDN) are the primary determinants of whether nutrition advice or referrals to an RDN are provided, leaving patients dependent on individual practice environments rather than standardized protocols.[14] Even recent research does not assess diet through dietary intake data, food logs, or nutrition questionnaires, highlighting the distance between nutritional science and lymphedema-specific clinical guidance.[2] A recent survey of lymphedema clinicians in the southeastern United States similarly documented a significant gap between the perceived importance of nutritional intervention and formal training in this area, with 76% of respondents indicating that nutrition education falls within their scope of practice, yet only 41% having received nutritional training during lymphedema certification.[13]

Picture Your Plate™ (PYP™) is a 48-item dietary assessment questionnaire originally developed for cardiac rehabilitation settings to evaluate how closely an individual's dietary patterns align with nutritional recommendations for cardiovascular health.[15,16] It produces a total score of 0-96

reflecting overall diet quality, alongside category sub-scores that help clinicians identify specific dietary behaviors and target areas for intervention.

There is currently no consensus regarding which functional outcome measures are most sensitive to Body Mass Index (BMI) or dietary behaviors in lymphedema populations, and no validated nutrition screening tool has been evaluated for use with this population. This study aimed to: i) evaluate the utility of PYP™™ as a nutrition screening instrument among Certified Lymphedema Therapists (CLTs); ii) assess clinician-perceived BMI thresholds for dietitian referral; (iii) examine variability in preferred PYP™ score thresholds; and iv) identify functional outcome measures perceived as BMI-sensitive.

Materials and Methods

Study design and setting

A cross-sectional survey was conducted among CLTs in the Southeastern and Northeastern United States. The University of St. Augustine for Health Sciences' Institutional Review Board approved the study.

Participants and recruitment

A total of 557 survey packets were mailed on November 2, 2025. Of these, 56 were returned undeliverable, yielding 501 deliverable invitations. Sixty-two surveys were completed and returned, for a response rate of 12.4% (62/501). Each packet included a cover letter, a consent form, a survey, and a prepaid return envelope. Participants were given 60 days to return the questionnaire. Participation was voluntary and anonymous.

Survey instrument

The 12-item questionnaire (*Appendix A*) assessed: provider demographics and professional background; clinical experience with lymphedema; nutrition assessment practices; prior use and perceived usefulness of PYP™™; BMI and PYP™ score thresholds for dietitian referral; and functional outcome measures used and those perceived to worsen with elevated BMI. Item types included categorical responses, Likert scales, yes/no responses, check-all-that-apply responses, and open-ended fields. The instrument underwent expert review for clarity and content validity.

Sample size and statistical analysis

Precision analysis indicated that a minimum sample of n=61 would provide a ±10% margin of error at 90% confidence. The final sample (n=62) met this target. Analyses were conducted using IBM Statistical Package for Social Sciences (SPSS) Statistics 29.0.2.0 and Stata 13.1. Descriptive statistics and 90% confidence intervals were calculated. H1 and H2 were tested using one-sample proportion tests; H3 used a chi-square goodness-of-fit test versus a uniform distribution. Exploratory subgroup comparisons used chi-square or Fisher's exact tests. Significance was set at $\alpha=0.05$. The 70% consensus threshold for H1 was selected a priori based on standards commonly applied in Delphi methodology and clinical guideline development, reflecting an agreement level above simple majority that is conventionally interpreted as meaningful clinical consensus.[17] The 60% threshold for H2 was established as a more conservative criterion, acknowledging that endorsement of a tool without a lymphedema-specific evidence base was not expected to reach higher consensus levels; both thresholds were defined prior to data collection to avoid post-hoc threshold adjustment.

Results

Respondents

Of the 501 deliverable surveys, 62 CLTs returned completed questionnaires. Table 1 summarizes participant characteristics. The majority of respondents were physical therapists (59.7%), followed by occupational therapists (32.3%). Over a third (37.1%) reported more than 20 years of experience as a lymphedema clinician.

Hypothesis 1: body mass index threshold for dietitian referral

The most frequently endorsed BMI threshold for referral was 30.0-34.9 kg/m² (40.3%). Full distribution: <18.5 (0%), 18.5-24.9 (3.2%), 25.0-29.9 (25.8%), 30.0-34.9 (40.3%), 35.0-39.9 (17.7%), ≥40 (1.6%), "BMI should not be used" (9.7%), and missing (n=1). Excluding the "should not be used" and missing responses, 37 of 55 eligible respondents (67.3%) endorsed BMI≥30 kg/m², which did not exceed the 70% consensus threshold (exact one-tailed p=0.378; 95% Confidence Interval, CI [0.54, 0.78]). H1 was not supported. No association was observed between years of experience and BMI-threshold selection ($\chi^2(1, N=51) = 0.86$, p=0.36, Cramér's V=0.13) or professional designation (Fisher's exact p>0.05).

Hypothesis 2: applicability of Picture Your Plate™

Overall, 31 of 61 clinicians (50.8%) indicated PYP™™ would be applicable in lymphedema practice (1 missing), falling short of the hypothesized 60% threshold (one-sample proportion p=0.93; 95% CI [0.39, 0.63]). H2 was not supported. Applicability did not differ by professional role (p=0.159, Fisher's exact) or years of experience (p=1.00).

Hypothesis 3: preferred Picture Your Plate™ score threshold

Preferred PYP™ score thresholds for dietitian referral were: <40 (17%), 41-50 (66%), 51-60 (12%), and >60 (5%). The distribution differed significantly from a uniform distribution ($\chi^2(3, N=59) = 54.83$, $p<0.001$), supporting H3 and indicating substantial heterogeneity in clinician-preferred referral thresholds.

Functional outcome measures (exploratory)

Tables 2 and 3 summarize outcome measure use and perceived BMI associations. Both represent "check all that apply" responses, explaining totals exceeding 100%. The Lower Extremity Functional Scale (LEFS) was the most frequently used measure at initial evaluation (48.4%), followed by Timed Up and Go (TUG) (27.4%), 30-second Sit-To-Stand (30s STS) and 5-times Sit-To-Stand (5x STS) (both 19.4%), and 6 Minutes Walking Test (6MWT) (9.7%). A substantial proportion (66.1%) reported using other measures; free-text responses most frequently referenced the Lymphedema Life Impact Scale (LLIS). The measures most commonly perceived to worsen with elevated BMI were the 30-second STS (59.7%), followed by the 6MWT and LEFS (both 58.1%), the 5x STS (54.8%), and the TUG (51.6%) (Table 4).

Discussion

This exploratory study represents the first known investigation of CLTs perceptions of PYP™™™ as a dietary screening tool in lymphedema practice, and the first to examine CLT-driven BMI-based thresholds for dietitian referral. Rather than confirming the presence of clinical consensus, the findings reveal its absence and in doing so, establish a meaningful baseline that the field has not previously had. The results document substantial variability in how CLTs approach nutrition

assessment and referral, indicating that while awareness of nutrition's relevance to lymphedema management is broadly present, a shared clinical framework for translating that awareness into standardized practice has yet to emerge. These findings have potential exploratory implications for professional education, certification standards, and clinical guideline development.

Hypothesis 1: body mass index threshold for dietitian referral

H1 was not supported; 67.3% of eligible respondents endorsed BMI≥30 kg/m² as the threshold for referral, narrowly falling short of the pre-specified 70% consensus threshold. Interpreted within a standardization framework, however, this finding is informative rather than negative. It establishes that near-consensus exists around obesity-range BMI as the referral trigger, while confirming that a binding clinical standard has not yet formed. The most commonly selected threshold was BMI 30.0-34.9 kg/m² (40.3%), with meaningful spread across adjacent categories and 9.7% of respondents rejecting BMI as a referral criterion entirely. This variability carries direct clinical consequences. The current literature identifies obesity (BMI≥30) as a major risk factor for lymphedema, disease severity, and resistance to complete decongestive therapy, with patients approaching BMI 50-60 potentially nearing a point of irreversible lymphatic dysfunction.[1,18,19]

The absence of any association between years of experience and BMI threshold selection is instructive. It indicates that clinical consensus does not develop gradually through practice exposure, reinforcing evidence that formal nutrition education rather than clinical tenure is the primary determinant of whether dietary counseling and referral are offered.[14]

Hypothesis 2: perceived applicability of Picture Your Plate™

H2 was not supported in the strict statistical sense; 50.8% of respondents endorsed PYP™ as applicable in lymphedema practice, falling below the 60% threshold. This result, however, warrants careful interpretation. CLTs were asked to evaluate a tool developed and validated primarily in cardiac rehabilitation settings, with no existing lymphedema-specific evidence base to draw upon the very gap this study was designed to begin addressing. Endorsement by half of respondents under these conditions is a meaningful signal of sincerity, not a significant rejection. It suggests that receptivity to PYP™ is present and could be cultivated through targeted education and the development of lymphedema-specific validation data. It is important to acknowledge explicitly, however, that Picture Your Plate™ has not been validated in lymphedema populations and was developed and tested exclusively in cardiac rehabilitation contexts. Its disease-specific applicability to lymphedema practice has not been established, and the findings of this study should not be interpreted as evidence of clinical utility in this population. Validation studies in lymphedema-specific cohorts are a prerequisite before PYP™ can be recommended for clinical use in this setting.

The absence of differences in applicability by professional designation or years of experience confirms that unfamiliarity with PYP™ reflects a field-wide phenomenon rather than a training- or tenure-specific gap. This is consistent with the broader literature demonstrating that access to formal nutrition education and registered dietitian nutritionists within the practice setting not individual experience are the primary drivers of whether nutritional guidance is provided.[1] PYP™'s capacity to detect dietary behaviors directly relevant to lymphedema pathophysiology including excess sodium intake, high consumption of processed foods, and insufficient intake of anti-inflammatory plant-based foods makes it a conceptually strong candidate for cross-setting adaptation.

Hypothesis 3: variability in preferred Picture Your Plate™ score thresholds

H3 was strongly supported ($\chi^2(3, N=59) = 54.83$, $p<0.001$), confirming significant heterogeneity in clinician-preferred PYP™ referral thresholds. While 66% of respondents favored the 41-50 range, the non-uniform distribution makes clear that no evidence-based threshold currently exists to guide practice. This is itself an important contribution: documenting the degree of variability is a necessary precondition for threshold-validation research that must follow. The modal preference for the 41-50 range provides a preliminary empirical anchor for that work, offering researchers a starting point grounded in actual clinician judgment rather than assumption. This pattern mirrors the broader guideline deficit in lymphedema care, where existing clinical practice guidelines have been.

Functional outcome measures and body mass index sensitivity

The exploratory analysis of functional outcomes adds a practically significant dimension to the study's core findings. The LEFS was the most frequently used outcome measure at initial evaluation (48.4%), followed by the TUG (27.4%) and both the 30s and 5x STS tests (19.4%). The 6MWT was used by fewer than 10% of respondents, and 66.1% reported using measures beyond those listed, most frequently citing the LLIS. Endorsement of BMI sensitivity was high across all measures (51.6%-59.7%), with the 30s STS endorsed most frequently. It should be recognized, however, that BMI, while a practical and widely available screening parameter,[20] does not fully capture body composition, regional fluid distribution, or the tissue-level alterations that are characteristic of lymphedema, including localized extracellular fluid accumulation and fibrotic changes.[2,4]

Limitations

Several limitations must be considered in interpreting these findings. The 12.4% response rate, while meeting the pre-specified precision threshold for a ±10% margin of error at 90% confidence, limits generalizability and introduces the possibility of non-response bias; clinicians who returned surveys may differ systematically from non-respondents in their engagement with nutrition topics. This constitutes a meaningful form of selection bias that may inflate estimates of PYP™ familiarity and receptivity, and caution is warranted in generalizing these perceptions to the broader CLT population. The geographic restriction to the Southeastern and Northeastern United States was a deliberate pilot scope chosen to establish initial feasibility, but it limits applicability to CLTs practicing in other regions. The survey assessed perceptions rather than actual clinical behavior, meaning endorsed thresholds and perceived tool applicability may not fully reflect practice patterns. The 12-item survey instrument was reviewed for content validity but was not independently psychometrically validated prior to administration, and this should be addressed in future work.

Clinical implications and future directions

Taken together, these findings describe a field in which nutrition's importance is broadly recognized but inadequately operationalized. The absence of a BMI referral consensus, limited familiarity with PYP™, and significant variability in preferred score thresholds reflect a clinical infrastructure gap unlikely to close without targeted intervention at the levels of professional education, certification standards, and practice guidelines. The finding that approximately half of CLTs were receptive to PYP™ despite having no prior lymphedema-specific evidence base is

encouraging and suggests that openness to structured dietary screening exists and can be cultivated.

Conclusions

This exploratory study establishes a first empirical baseline for nutrition screening practice among CLTs, documenting the absence of clinical consensus around BMI-based dietitian referral thresholds, limited field-wide familiarity with the PYP™™ dietary assessment tool, and significant variability in preferred PYP™ score thresholds for referral. Despite the lack of a lymphedema-specific evidence base, approximately half of CLTs expressed openness to PYP™, suggesting meaningful potential for adoption with targeted education. The strong alignment between functional outcome measures most commonly used and those perceived as BMI-sensitive further supports the integration of dietary screening into routine lymphedema assessment. The results of this exploratory study underscore the substantial variability in clinical perception and the absence of consensus around nutrition screening in lymphedema practice. These findings should not be interpreted as evidence of direct clinical applicability; rather, they highlight the need for future validation studies including disease-specific validation of PYP™, establishment of evidence-based referral thresholds, and exploration of more sensitive body composition measures before standardized, nutrition-informed protocols can be recommended for routine clinical use.

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Conflict of interest: the authors declare no potential conflict of interest.

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Informed consent: each packet included a consent form. Participation was voluntary and anonymous.

Patient's consent for publication: not applicable.

Availability of data and materials: all data generated or analyzed during this study are included in this published article.

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Table 1. Participant characteristics (N=62).

	n (%)
Professional credentials	
Physical therapist	37 (59.7)
Physical therapist assistant	2 (3.2)
Occupational therapist	20 (32.3)
Certified occupational therapy assistant	1 (1.6)
Nurse practitioner	1 (1.6)
Massage therapist	1 (1.6)
Physician, nurse, other	0 (0)
Years practicing as a lymphedema clinician	
0-5 years	7 (11.3)
6-10 years	13 (21.0)
11-15 years	12 (19.4)
16-20 years	7 (11.3)

20+ years	23 (37.1)

Note: percentages may not sum to 100% due to rounding

Table 2. Outcome measures used at initial evaluation.

Outcome measure	**Used at initial evaluation, n (%)**
30-second Sit-To-Stand (30s STS)	12 (19.4)
6-minute walk test (6MWT)	6 (9.7)
Timed Up and Go (TUG)	17 (27.4)
5-times Sit-To-Stand (5x STS)	12 (19.4)
Lower Extremity Functional Scale (LEFS)	30 (48.4)
Other	41 (66.1)

Note: respondents selected all applicable measures; totals exceed 100%

Table 3. Outcome measures perceived to worsen with higher Body Mass Index (BMI).

Outcome measure	**Perceived to worsen, n (%)**
30-second Sit-To-Stand (30s STS)	37 (59.7)
6-minute Walk Test (6MWT)	36 (58.1)
Timed Up and Go (TUG)	32 (51.6)
5-times Sit-To-Stand (5x STS)	34 (54.8)
Lower Extremity Functional Scale (LEFS)	36 (58.1)
Other	14 (22.6)

Note: respondents selected all applicable measures; totals exceed 100%

Table 4. Summary of hypothesis testing.

Hypothesis	Outcome and key results
H1. BMI≥30 kg/m² should trigger referral	Not supported. 37/55 (67.3%) endorsed BMI≥30; below 70% threshold (p=0.378; 95% CI [0.54, 0.78]). No association with experience (χ^2=0.86, p=0.36).
H2. PYP™ is applicable in practice	Not supported. 31/61 (50.8%); did not exceed 60% (p=0.93; 95% CI [0.39, 0.63]). No differences by profession or experience.
H3. Preferred PYP™ score cutoffs vary significantly	Supported. Distribution differed from uniform (χ^2(3, N=59) =54.83, p<0.001).

Note: H1 and H2 tested using one-sample proportion tests; H3 tested using chi-square goodness-of-fit against a uniform distribution. p values are one-tailed for H1 and H2, two-tailed for H3

BMI, Body Mass Index; PYP™, Picture Your Plate™; CI, Confidence Interval

Online supplementary material.

Appendix A. *Study description and questionnaire sample.*