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Improved GERD Symptom Control and Medication Burden Through a Telehealth-Based Lifestyle Medicine Program

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Introduction: Gastroesophageal reflux disease (GERD) is a prevalent condition that significantly impacts quality of life. While treatment guidelines recommend lifestyle modifications as first-line therapy, their widespread adoption and efficacy have been limited. Recommended interventions include dietary adjustments, smoking cessation, weight loss, avoiding excessive physical activity, and modifying sleeping positions. Challenges such as patient adherence and a lack of provider expertise in creating sustainable behavior change often shift therapeutic preference toward pharmacotherapy.

Methods: A structured lifestyle medicine (LM) intervention for GERD incorporated the 6 LM pillars and used digital health tools, including telemedicine, to deliver a personalized intervention for GERD patients in the World Trade Center Health Program. Baseline assessment using the GERD-HRQL (Health-Related Quality of Life) survey was followed by a 12-week program involving dietary counseling, behavior change support, motivational interviewing, and symptom tracking. Outcomes included changes in GERD-HRQL scores, medication usage, and patient-reported satisfaction.

Results: Participants completing this pilot program demonstrated significant improvement in overall GERD-HRQL scores (pre: 25.7, post: 13.9; $P < 0.005$) as well as a reduction in medication use. Participant satisfaction was high, with 85% reporting the intervention as effective in managing symptoms. Adherence to the prescribed lifestyle changes was 75% by the conclusion of the program, highlighting the potential for sustained behavior change with systematic support.

Conclusions: This pilot study highlights the potential of structured LM interventions to effectively address GERD symptoms in WTC patients. Improved adherence and symptom management suggest integration of LM principles into clinical practice may enhance patient outcomes and reduce reliance on pharmacotherapy.

Key Words: gastroesophageal reflux disease (GERD), lifestyle medicine, behavior change, telemedicine, digital health intervention, health-related quality of life (HRQL)

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Lifestyle modifications have long been regarded as a cornerstone in managing gastroesophageal reflux disease (GERD). Treatment guidelines, including the 2022 version from the American College of Gastroenterology (ACG), consistently advocate for lifestyle changes as first-line therapy.[1–5]

However, despite the strong endorsement of these strategies, challenges with facilitating sustainable behavior change and patient adherence often shift therapeutic preference to pharmacotherapy.[6] In addition, there is limited published evidence supporting lifestyle interventions for GERD.[3,7] Specifically, there is a lack of randomized controlled trials and standardized intervention protocols, an overemphasis on single factors like weight loss despite the multifactorial nature of GERD, variability in individual physiological responses, insufficient follow-up durations, confounding factors such as concurrent medication use, and a general paucity of research into comprehensive lifestyle modifications and interventions.[1–5,7–11]

While lifestyle modifications for GERD often are considered an ideal approach, there is limited evidence to suggest their widespread adoption or demonstrated efficacy in clinical practice. As such, lifestyle advice is often restricted to educational handouts or generalized recommendations such as "lose weight" or "elevate the head of the bed." While such guidance may provide information about

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E.S. conceptualized the study and designed the methodology. E.S. and J.M. collected and analyzed the data. J.M., E.G., M.K., M.S., A.G., and J.M. assisted with study design, provided statistical analysis, and data interpretation. E.S. drafted the manuscript, with revisions and critical input from M.K., E.G., A.G., M.S., and J.M. All authors reviewed, edited, and approved of the final manuscript.

The data that support the findings of this study are not publicly available, as they include health and personal data on participants. Redacted data that prevents identification or unintended disclosure of individual study participants are available from the investigators upon reasonable request and review for scientific merit. A completed IRB approval and data-sharing agreement that preserves confidentiality and non-transferability will be required from each investigator seeking access to the study data.

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what patients should do, it often fails to address *how* a patient can effectively implement and sustain recommended changes. Prior research has consistently shown that behavior change is not primarily driven by increased patient education, but instead is influenced more by motivation and readiness to change.[7,12] Furthermore, even when providers have high confidence that a particular behavior change will provide benefit, many fail to advise or even discuss it with patients due to limited time, inadequate training, or the belief that most patients are not capable of meaningful and sustained lifestyle change.[2,13] The widespread belief that recommending behavior change is largely ineffective likely discourages clinicians and researchers from thoroughly investigating the potential of lifestyle modifications in GERD treatment.

GERD can profoundly impact quality of life (QOL).[14–17] Symptoms of GERD (eg, heartburn, regurgitation, and noncardiac chest pain), affect QOL through sleep disturbance, psychological distress,[18–21] social and interpersonal disruption, work productivity,[22–25] fear or difficulty adhering to dietary restrictions, and the financial burden of costs associated with treating and managing the disease.[19,26,27]

While long-term use of proton pump inhibitor (PPI) medications generally is considered safe, they have come under increased scrutiny due to potential association with several adverse side effects.[28] Patient awareness of these possible linkages has generated increased interest in alternate approaches to disease management.[28,29] A reduction in QOL, along with concerns about pharmacotherapy, can provide strong motivation to undertake lifestyle modifications for GERD treatment.

Lifestyle medicine (LM), as established by the American College of Lifestyle Medicine (ACLM)[30] https://lifestylemedicine.org/ and the American Board of Lifestyle Medicine (ABLM) https://ablm.org/ is a medical specialty focused on addressing chronic disease through evidence-based lifestyle interventions as a primary therapeutic approach.[31] In contrast to traditional approaches, lifestyle medicine (LM) prioritizes direct collaboration with patients, utilizing structured behavior change techniques such as health coaching and goal setting to empower individuals in making and sustaining meaningful health habit transformations. (Lifestyle Medicine. Accessed November 19, 2020) (https://lifestylemedicine.org/What-is-Lifestyle-Medicine). The LM 6 pillars of health—whole-food plant-predominant nutrition, physical activity, stress management, restorative sleep, avoidance of risky substances, and strong social connections—have been validated in preventing, managing, and even reversing chronic diseases, including GERD.[32] The 6-Pillar Survey is a diagnostic and motivational tool that assesses individual health behaviors against evidence-based recommendations, to guide personalized interventions and sustainable health improvements.

A core principle of LM is the integration of behavioral science techniques into clinical practice, representing a shift from passive patient education to an action-based framework. Clinicians help patients identify their personal health goals, develop concrete action plans, and implement meaningful change.[33] LM providers use the Transtheoretical Model of behavior change, incorporating motivational interviewing (MI), cognitive behavioral therapy (CBT), positive psychology techniques (PPT), and health coaching to support patient-driven progress.[34–38] On the basis of patient readiness and confidence to undertake specific changes, providers write SMART (specific, measurable, achievable, relevant, and time-bound) lifestyle prescriptions, and in follow-up offer ongoing support, problem-solving, and goal refinement to reinforce long-term success.[33]

The COVID-19 pandemic accelerated the adoption of digital technology within health care.[39,40] Before the pandemic, telehealth was used primarily in the behavioral setting, as it allowed for more frequent contact with patients—a critical part of behavioral change management. Telehealth has been shown to increase the success rate of long-term lifestyle change.[41,42] Mobile health applications, such as health tracking apps and wearables, texting platforms, smart medical devices, and cell phones are now commonplace and can facilitate capture of health-related data outside of clinic walls.[43–45] Virtual care and digital health technologies enhance opportunities to support patients' efforts at change in behavior. In addition, patients participating in clinical trials have shown a preference for virtual encounters over traditional in-person assessments.[46,47]

This pilot study involved a structured LM intervention for GERD, believed to be the first of its kind, delivered through telehealth and incorporating data tracking technology. The aim of the intervention was to reduce GERD symptoms and related medication use in the World Trade Center Health Program (WTCHP) first responder cohort, which has a high GERD burden.[48] Many gastrointestinal disorders arose from WTC dust and fume exposure, thought to result from exposure of the digestive lining by highly alkaline pulverized concrete dust and by smoke and combustion products, leading to prolonged inflammation. Longitudinal studies have demonstrated cumulative incidence estimates of GERD of ~40% in WTC first responders. GERD is the second most common WTC exposure disorder seen in the cohort, affecting over 23,000 first responders.[49] GERD substantially impairs responder health and health-related quality of life in the cohort.[50]

The pilot intervention described here, termed the *Lifestyle Medicine for GERD Program* (LMG Program), is novel in its application of a robust LM intervention, its digital-forward approach, and its application to a population with widespread GERD.

METHODS

Study Design

A single arm, prepost, prospective pilot study was devised to assess the potential benefit of a telehealth-based LM intervention for GERD that integrated mobile health-data tracking technology. The primary objectives were to assess change in GERD symptoms and medication use, and to evaluate program feasibility and satisfaction in WTCHP patients.

Participants and Setting

Study participants were recruited from the WTCHP Clinical Center of Excellence at the Selikoff Centers for Occupational Health, which is located at Mount Sinai Hospital (MSH) in New York City. The WTCHP General Responder Cohort (the cohort) consists of workers and volunteers who were part of the rescue and recovery effort that followed the September 11, 2001, attack on the World Trade Center towers. Eligibility criteria for entry into the WTCHP have been described previously.[51]

Study participants were eligible for enrollment in the LMG Program intervention if they met inclusion criteria,

which included: (a) a prior diagnosis of GERD based on the presence of heartburn symptoms (defined as burning sensations in the retrosternal chest, usually after eating, which might be worse at night and noncardiac in nature, greater than once per week) and, (b) previous partial or full response to acid reduction pharmacotherapy including an H2 receptor blocker (H2B), proton pump inhibitor (PPI), over-the-counter antacid (OTCAA), or other "natural" therapy (ie, aloe or apple cider vinegar). Further details, including exclusion criteria, are discussed in a previous publication[52] and can also be found in the Supplement.

Recruitment strategies included posters and flyers placed in clinic spaces, invitations sent by mail, email, and text message, and referrals by clinic providers. Interested patients were contacted by the study program coordinator, who explained the nature of the monthly follow-up and the commitment required for focused behavior change to reduce GERD symptoms and/or medication use, obtained consent to participate in the study, and scheduled initial and follow-up visits. The study was launched in January 2023, and the last study participant visit occurred in July 2024. Sample-size estimates for this pilot study were made based on previous research, which indicated that full discontinuation of long-term PPI therapy in GERD patients (without peptic ulcer or esophagitis and using no other substitute treatment) was successful in 27% of patients.[53] Using this figure and the assumption that reduction or discontinuation of medications, with our intervention substituted as treatment, a sample size of 50 subjects would be required to have 80% power to demonstrate an effect at an alpha of 0.05.

Data Collection

Primary and secondary outcome measures were derived from self-administered surveys, including the GERD Health-Related Quality of Life (HRQL) survey,[54,55] participant self-reported measures of GERD medication use, and feasibility and satisfaction surveys. The GERD-HRQL questionnaire generates symptom scores for the 2 primary typical GERD symptoms, heartburn and regurgitation, as well as a composite score. Data relevant to GERD symptoms and medication were collected just before each visit at baseline, 2 weeks later, and at monthly intervals for 6 months. Relevant demographic and lifestyle data were collected on the initial visit and if relevant at the last visit and included age, sex, race/ethnicity, BMI, and current alcohol and tobacco use.

Feasibility of the intervention was measured with the modified Acceptability of Intervention Measure (AIM), the Intervention Appropriateness Measure (IAM), and the Feasibility of Intervention Measure surveys, all validated measures of implementation outcomes. Satisfaction was measured by the Client Satisfaction Questionnaire adapted to Internet-based interventions (CSQ-I).[56] Data related to feasibility and satisfaction was collected approximately one week after completion of the LMG Program.

GERD-HRQL, GERD medication use, feasibility, and satisfaction data were obtained through text message prompts sent through a HIPAA-compliant, secure short message service (SMS) texting platform accessed by participants on their mobile devices with a link to a secure web form accessed on the device's native web browser, allowing patients to securely submit the requested survey data. A data collection texting tool was devised by the collaborating data management software company, Q-Reviews (Quality Reviews, Inc., New York, NY) (https://q-reviews.com). Investigators accessed and downloaded data in comma separate value (CSV) format from the secure-site Q-Reviews platform. Data were transferred into an SPSS database (SPSS, IBM Inc., Armonk, NY) for inspection, cleaning, and statistical analysis.

Intervention

The LMG Program used a standardized approach to facilitate behavior change which has been fully described in a previous publication.[52] Participants underwent the LMG Program clinical intervention, which included:

1. Baseline self-administered surveys to assess lifestyle habits and potential health goals across the 6 pillars of health, the GERD-HRQL symptom survey, and the GERD medication use questionnaire.
2. An initial telemedicine visit of 1-hour duration with an LM study provider which included thorough review of GERD history, GERD specific lifestyle modifications, discussion of responses to the 6-pillar survey relative to evidence-based recommendations, determination of 3 specific lifestyle modifications that the participant would rate as 7 or better on a 10-point scale of being of high interest and confident of their undertaking change, health coaching for goal setting, writing SMART lifestyle prescriptions, a virtual "handshake" commitment to work toward specific goals, and provision of appropriate educational materials and resources.
3. Follow-up visits, through a telehealth video platform, of 20 to 40 minutes duration at 2-weeks and then monthly for 6 months for a total of 7 visits over the study period reviewed progress towards behavior change goals and review of monthly GERD-HRQL and medication use surveys.
4. Resurvey through text of the 6 pillars of health at the final visit to assess progress towards goals and to evaluate change in health status.
5. Survey through text for feasibility and satisfaction one week after the intervention concluded.

All LMG Program study providers completed training through the ACLM and board certification through ABLM.

Primary Outcomes

We hypothesized that participants in the LMG Program would experience a reduction in symptoms and/or medication use associated with GERD, and that they would report improvement in satisfaction with their current condition. The analytic plan used the initial and 2-week questionnaire results serving as the preintervention assessment (the 2 early assessments accounting for potential regression to the mean and intrasubject repeat-test variability) and subsequent data representing postintervention results. By using the participant as their own control, greater statistical power was obtained to estimate the effect of the intervention; internal evidence from the WTC program indicates that use of PPI and related medication remains stable with little fluctuation in the WTC responders, and a comparable control-treatment mechanism beyond usual care is not available. Responses on the GERD-HRQL were contrasted with the published literature related to responses to treatment and reduction of symptomatology in prior trials of medical treatment for GERD. Most trials use cut-points on the GERD-HRQL of 10 or lower to indicate little or no GERD symptoms, and therefore success in treatment, whereas a score of 15 or higher is indicative of clear and persistent GERD in most participants. Analyses were

performed using general linear models for repeated measures to assess changes in symptomatology based on GERD-HRQL scores. Differences in preintervention and post-intervention outcomes reported on the questionnaires were analyzed using χ^2 testing for proportions or the Wilcoxon signed-rank test.

Ethical Considerations

This study protocol was reviewed and approved by the Mount Sinai Institutional Review Board (IRB) (Protocol # 21-00261, approved August 11, 2021 and renewed July 7, 2023). All recruitment methods respected patients' privacy and confidentiality and complied with HIPAA standards when using patient data. The voluntary nature of participation was emphasized to avoid any perception of coercion; continued care and treatment in the WTCHP was not contingent on participation in the study. Participants provided verbal consent after a thorough explanation of the study procedures, risks and benefits and after all their questions had been answered.

RESULTS

A total of 53 patients were enrolled, consented to treatment, and scheduled; 38 attended at least one treatment visit with an LM provider, and 15 completed some or all the initial questionnaires but did not follow up for treatment. During the initial visit, 2 patients were determined to have conditions that excluded them from the full intervention.

Baseline data on enrollees and participants are shown in Table 1. The mean age of all enrolled participants was 59.8 years, and 60.3 years for those who received at least one treatment session; the majority of enrollees were male (77%) and non-Hispanic white (66%); 19% of white participants identified as Hispanic or Latino. Sixty-four percent of initial enrollees were dissatisfied with their present condition upon enrollment; this figure was essentially the same (66%) for those who continued with at least one treatment visit. Initial GERD-HRQL scores were 26.6 for all enrollees and 27.3 for those completing one visit or more, indicating persistent symptoms despite prestudy medical treatment.

Prestudy treatment with GERD medication among enrollees was high, with 81% on regular or standing (eg, daily) medications and 82% taking as-needed medications for symptoms. Types of medication enrollees used for treatment are shown in Figure 1; over two-thirds used a PPI alone or in combination with other medicines. No differences were noted for any demographic, lifestyle, or GERD-related characteristics in Table 1 (χ^2 test for proportions all yielding P values of 0.30 or greater) in the proportions of those continuing with treatment versus those not continuing.

GERD-HRQL Scores

During the study period, total GERD-HRQL scores in the 38 participants who completed one or more visits improved from 27.3 (SD: 14.7) to 18.5 (SD: 13.7); a mean within-participant score reduction of 8.8 ($P < 0.001$) (Table 2). Of 38 participants completing at least one visit, 24 (63.2%) completed the full 7-visit (12 wk) intervention. Total GERD-HRQL scores in those completing the 12-week program improved from 25.7 to 13.9 (mean individual difference score 11.8, $P = 0.005$). Subscores for heartburn declined by 42% (11.8 to 6.9; $P = 0.05$) and for regurgitation by 44% (10.3 to 5.8; $P = 0.04$). Women had higher baseline total GERD-HRQL scores than men (31.1 vs. 23.9) although the difference was not significant, and both sexes

TABLE 1. Demographics and Characteristics of WTC GERD Treatment Program Enrollees; Baseline Data for All Those Enrolled and Those Who Completed at Least One LM Treatment Session

Baseline characteristics	All enrolled (N = 53), n (%)	1 or more treatment session (N = 38), n (%)
Age	59.8	60.3
Male sex	41 (77)	30 (80)
Race/ethnicity		
White non-Hispanic	35	26
Hispanic/Latino	8	4
Black/African-American	9	7
Asian	1	1
Initial GERD-HRQL score (SD)	26.6 (13.8)	27.3 (14.7)
Satisfaction with present condition		
Dissatisfied	34	25
Neutral	15	10
Satisfied	4	3
Managing GERD with regular or maintenance medicines:		
Yes	43	31
No	9	7
No response	1	
Took as-needed meds in the last month to reduce reflux symptoms:		
Yes	44	31
No	7	6
No response	2	1
Alcohol use last month		
Yes	34	22
No	15	13
No response	4	3
Tobacco/ e-cigarette use		
Yes	2	2
No	47	33
No response	4	3
Mean (median) number of LM treatment sessions		4.9 (6.0)

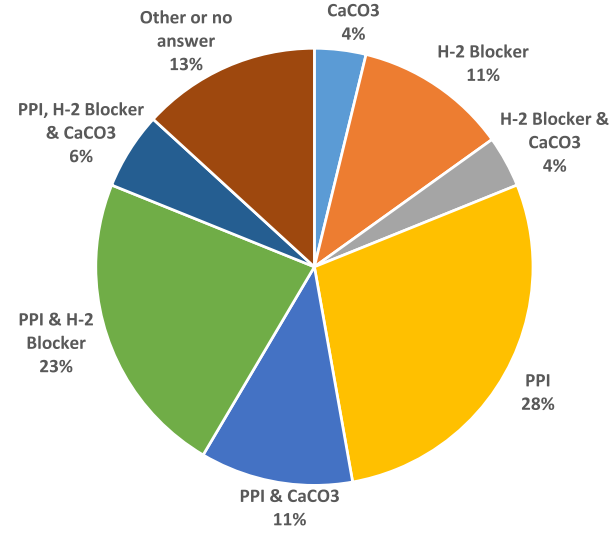

FIGURE 1. Types of medicines taken by LM GERD Program enrollees (N = 53). Includes both regular/maintenance and as-needed treatments. $CaCO_3$ indicates calcium carbonate or other antacid; H-2 blocker, histamine H2-receptor antagonists; PPI, proton-pump inhibitor.

TABLE 2. Mean GERD-HRQL Total Scores and Subscores at Initial and Sixth LMG Program Visit for Those Completing Program

	Total GERD score (SE)			Heartburn score (SE)			Regurgitation score (SE)		
Model	**Visit 1**	**Visit 6**	***P***	**Visit 1**	**Visit 6**	***P***	**Visit 1**	**Visit 6**	***P***
Unadjusted	25.7 (3.4)	13.9 (2.5)	0.005	11.8 (1.3)	7.0 (1.1)	0.005	10.3 (1.4)	5.8 (1.0)	0.012
Adjusted for age and sex	27.1 (3.7)	14.0 (2.9)	0.005	12.2 (1.5)	6.8 (1.3)	0.006	10.7 (1.5)	5.7 (1.2)	0.012
Adjusted for age, sex, tobacco, and alcohol use	27.5 (4.1)	12.8 (3.0)	0.001	12.1 (1.6)	6.3 (1.4)	0.002	11.0 (1.8)	5.1 (1.3)	0.006

(N = 24).
Adjusted for age (years, continuous), sex (M/F), tobacco and alcohol use (Y/N for each).
SE indicates standard error of the mean.

exhibited comparable improvement in GERD-HRQL scores across the intervention. Adjustment of GERD-HRQL scores for age, sex, tobacco and alcohol use produced little change in results (Table 2). Mean total GERD-HRQL sores and subscores showed a steady decline with each visit, as shown in Figure 2, to a point where regurgitation and heartburn symptoms were minimal to nearly eliminated by the sixth visit.

Medication Use

Thirty-one of 38 (82%) of program participants reported taking standing medication for acid reflux symptoms over the month before enrollment, nearly all once or twice per day. The same proportion (although not the same individuals) took as-needed GERD medications; 8% (3) who were not on regular-dose treatment took as-needed medicine, and a similar number of those taking regular medication did not take additional as-needed medicine. At the conclusion of the 7-visit course, the number of participants taking standing medication had not changed. However, the frequency of as-needed GERD medication use decreased in 60% of participants and increased in only 14% of the program participants. Five participants denied as-needed medication use at the start of the program, while 12 took none at the end; similarly, the number of participants taking as-needed medications 5 or more times per week dropped from 11 to 4 (Fig. 3). Of the 7 participants not taking as-needed medication at the end of the program, 4 were no longer taking a PPI and 3 stopped taking the H2B they had been using at the start of the program. Three additional participants were able to reduce the use of both a PPI and H2B in combination for as-needed therapy from > 5 days to 1-4 days per week. As-needed medication frequency use was reduced by a median value of 2 days out of a weekly 7 (−28%; $P < 0.02$). Total GERD-HRQL scores deceased most substantially in those taking medications nearly every day (6 to 7 d/wk), from 39.4 to 11.1 or by 72%. Smaller improvements were seen in those taking meds less often initially, and all exhibited reductions in symptoms.

Satisfaction With Current Condition

While some participants were interested in reducing symptoms, others were already satisfied with their current condition but sought to discontinue or reduce their reliance on medications. At baseline, a majority of initial enrollees (64%) were dissatisfied with their current condition; these figures were not substantially different from those who attended at least one session. Participant satisfaction with their present health condition improved over the course of the intervention; those completing the LM intervention and reporting they were "neutral" or satisfied rose from 40.9% to 72.8% (Fig. 4). Mean self-rated level of health (on a 10-point

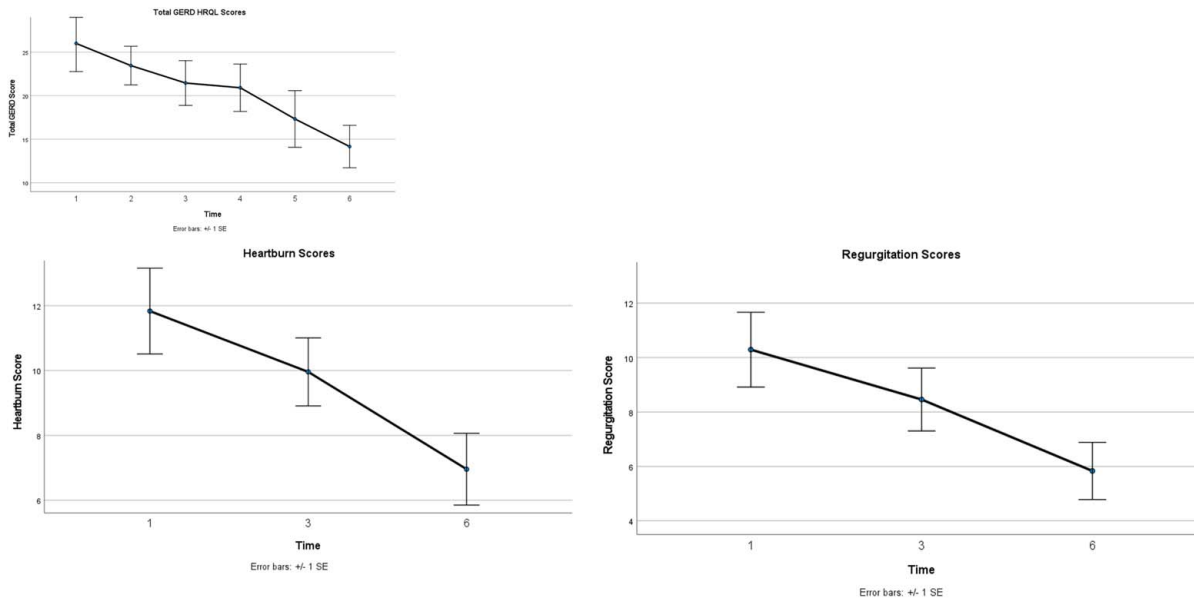

FIGURE 2. Mean scores (unadjusted) from GERD-HRQL questionnaire across treatment sessions for those completing 6 visits (N = 24). Top panel: Total GERD score; lower left and right panels: subscores for heartburn and reflux, respectively. Error bars represent ± 1 SE.

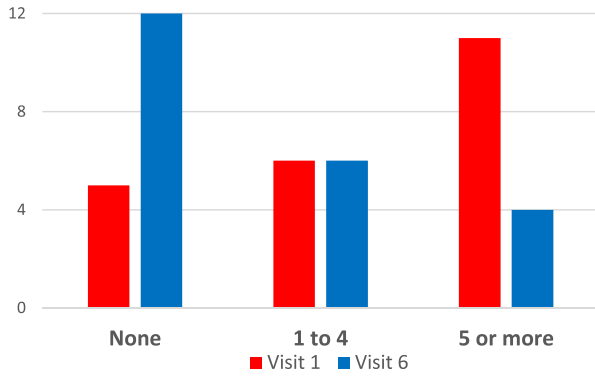

FIGURE 3. Frequency of use of as-needed medicines for control of GERD symptoms within the previous week for those completing 6 visits (N = 22). Comparison of preproportions and postproportions is significant ($P = 0.006$) by the Wilcoxon signed-rank test.

scale) increased from 6.5 to 7.0; ($P = 0.02$). Changes in hours of sleep were not seen, though participant assessments of their difficulty staying awake during the day improved across the intervention.

Feasibility and Satisfaction With LMG Program

Review participants (23/24 completers) rated the LM program highly in terms of acceptability (4.9/5), appropriateness (4.8/5), and feasibility (4.8/5). All participants agreed that they would recommend the LMG Program to a friend (21/23 completely agree; 2/23 agree), and that the intervention was of high quality (19/23 completely agree; 4/23 agree). Over 90% of participants agreed that the LMG Program helped them deal with their GERD more effectively, and 100% of participants were satisfied with the intervention.

DISCUSSION

This pilot study demonstrated that an LM-structured program, delivered entirely through telehealth and targeted at the reduction of GERD symptoms and/or medication use, can be developed and deployed effectively in a vulnerable population with high GERD prevalence. Despite challenges often associated with implementing behavior change programs, participant engagement was high, and significant improvements in GERD symptoms and medication use were observed. Two-thirds of enrollees completed at least one treatment visit, and approximately half of those patients completed the full 7-visit, 12-week program. GERD symptom reduction occurred regardless of whether participants aimed to reduce symptoms, medication use, or both, reinforcing the broad applicability of LM interventions in GERD management. Notably, symptom improvement was demonstrated by the second visit and improved with each visit thereafter. A significant proportion of participants were able to reduce as-needed medication use, with concurrent significant increases in overall health satisfaction.

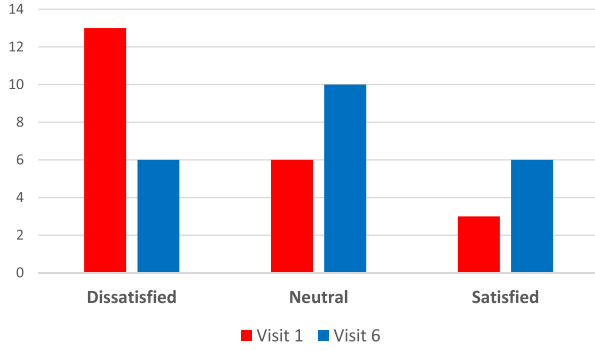

FIGURE 4. Self-rated satisfaction with present condition for those completing 6 visits (N = 22). Comparison of preproportions and postproportions significant ($P = 0.04$) by the Wilcoxon signed-rank test.

One of the most notable findings was that even participants already on GERD medication experienced significant symptom improvement, suggesting that LM could serve both as an adjunct to pharmacotherapy and as an alternative for those seeking to minimize or even avoid long-term medication use. The largest symptom reductions were observed in participants taking medications daily, further supporting LM as a potential strategy for enhancing GERD management and reducing dependency on PPIs, which are a source of concern for many patients.

The study highlights the role of telehealth in overcoming barriers to care, particularly in populations with travel limitations, restricted clinical access, or general reluctance to undertake lifestyle modifications. The telemedicine format facilitated frequent follow-ups, which likely contributed to the observed improvements. Future research should explore whether a lower dose of intervention—fewer than 6 visits—could achieve similar outcomes and whether increasing digital engagement opportunities, such as asynchronous coaching or automated reminders, may help optimize accessibility, efficiency, and sustainability.

The integration of health data tracking technology was a key success of this pilot, highlighting the effectiveness of streamlined, low-effort methods for acquiring and incorporating patient-reported clinical outcomes into encounters. Participants rated the intervention highly in terms of feasibility, acceptability, and effectiveness, with 100% reporting satisfaction and over 90% stating it improved their ability to manage GERD.

Limitations

While the study yielded promising results, there are important limitations to the findings and to generalizability of this program to other populations. Despite significant outreach efforts, recruitment fell short of the planned target. This may have been due to the perceived burden of participating in frequent follow-up visits or preconceptions related to how lifestyle medicine works, as well as a belief that requirements for participation might be strict or strenuous. It is important to note that participants were not required or encouraged to undertake any lifestyle change they were not interested in or confident they could achieve. The fact that significant results were achieved with a smaller sample size suggests that the intervention was highly effective, even among a limited number of participants. However, this may reflect volunteer bias, as those who enrolled may have been more motivated and ready to undertake lifestyle modifications. A further limitation was reliance solely on the typical clinical presentation to diagnose GERD. However, most patients with GERD have at least one typical symptom (heartburn or regurgitation). In addition, patients with atypical symptoms alone are likely to be diagnosed only after referral to a gastroenterologist (and appropriate testing). A benefit to the intervention described

here is that nongastroenterologists can effectively manage mild GERD without using up GI-related resources, which is less relevant for patients with atypical symptoms only.

The study duration of 12 weeks was likely insufficient to fully assess the impact of LM interventions on long-term GERD management as it relates to how sustained symptom relief and the ability to taper down or off any GERD medications. This may reflect the unique underlying pathophysiology of GERD in the WTC population. A longer follow-up period is needed to evaluate the durability of symptom improvements and the potential for sustained medication reduction.

While asynchronous digital health data capture from participants was technically successful, the inability to integrate these data directly into the electronic health record generated additional manual workflows with increased administrative burden. The platform also lacked built-in data analysis capabilities, complicating real-time assessment of patient progress. Future iterations of this program should consider EHR integration and automation to streamline workflow and improve efficiency.

CONCLUSION

This pilot study demonstrates that a structured LM intervention can be successfully delivered through telehealth to reduce GERD symptoms and medication use in a population with a high GERD burden. The program's feasibility, high patient satisfaction, and significant symptom improvements suggest that LM-based approaches could serve as a viable adjunct—or alternative—to pharmacologic GERD management. Such interventions may best be delivered within the framework of a multidisciplinary team, especially when the GERD burden of disease has reached a point where a gastroenterologist is involved in the patient's care. It must be acknowledged that clinicians need additional training to successfully integrate LM into medical encounters. Without formal education in behavior change strategies, many clinicians struggle to effectively guide patients in implementing lifestyle modifications. Despite rapidly growing interest, opportunities for LM training in medical undergraduate and graduate training remains limited. Furthermore, integration of LM principles into clinic time management, workflow, and billing remains a challenge, requiring institutional support to develop and integrate new protocols. In addition, the lack of clear reimbursement models for LM interventions further limits widespread adoption. Addressing these gaps through enhanced medical education, structured LM training programs, and advocacy for reimbursement will be essential to fully integrate LM into routine clinical practice and maximize its impact on patient care.

Future research should focus on optimizing the effective frequency of structured LM interventions, streamlining digital integration, extending follow-up duration to assess long-term outcomes, exploring strategies to increase accessibility, engagement, and adherence to additional clinical populations, and creating greater LM awareness and training for clinicians.

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