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Development and Evaluation of a Health Behavior Change Clinic in Primary Care: An Interdisciplinary Partnership

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Abstract

Providing effective healthy behavior change interventions within primary care presents numerous challenges. Obesity, tobacco use, and sedentary lifestyle negatively impact the health quality of numerous medical patients, particularly in underserved patient populations with limited resources. Primary Care Behavioral Health (PCBH) models, which incorporate a Behavioral Health Consultant (BHC), can offer point-of-contact psychological consultation, treatment, and also provide opportunities for interdisciplinary psychologist—physician clinical partnerships to pair a BHC's health behavior change expertise with the physician's medical care. Such models can also enhance medical training programs by providing resident physicians with live, case-based learning opportunities when partnered with a BHC to address patient health behaviors. We will describe the development, implementation, and preliminary outcomes of a PCBH psychologist—physician interdisciplinary health behavior change clinic within a Family Medicine residency program. Patient outcomes revealed significant reductions ($p < .01$) in weight, BMI, and tobacco use. Implications and future directions are discussed.

Keywords Health behavior change · Primary care behavioral health (PCBH) · Medical education · Family medicine

Tobacco use, obesity, and sedentary lifestyles have long been associated with a myriad of medical and mental health complications (Avila et al., 2015; Baskaran et al., 2019; King, 2013; Kopelman, 2007; Kuper et al., 2002; Manson et al., 2004; Uhlenhopp et al., 2020; Vallance, et al., 2018). Obesity is considered a global pandemic (Blüher, 2019; Jones, 2020; Swinburn et al., 2011), yet multiple health benefits and reduced medical comorbidities are observed when elevated body weight returns to healthy levels (Haase et al., 2021). Tobacco use is considered the world's leading source of preventable disease (Samet, 2013), with United States mortality rates for both male and female tobacco smokers approximately three times higher than those who never smoked (Courtney, 2015). Tobacco smoking rates are often elevated in younger, less educated, and ethnic minority populations (Okuyemi, et al., 2007). Further, racially and ethnically diverse and underserved patient populations experience unique challenges and considerations with regard to

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cardiovascular health, dietary patterns, exercise adherence, and tobacco dependence (Bowers, 2015; Orzech et al., 2013; Sheffer et al., 2012). Low health literacy rates, prevalent in underserved patient populations (Hasnain-Wynia & Wolf, 2010), are associated with tobacco smoking, elevated stress levels, and overall poor physical health (Dominick et al., 2013; Hoover et al., 2015). However, raising health literacy levels alone has not directly led to healthy behavior change (Harrison et al., 1992), further underscoring the importance of accessible, affordable, and comprehensive interdisciplinary approaches to effectively promote and achieve healthy lifestyle behavior formation and maintenance while serving to address and mitigate individual and contextual factors leading to health disparities (Barclift et al., 2016).

Seeking to promote healthy behavior change in primary care while also addressing health care disparities, the Primary Care Behavioral Health (PCBH) model (Reiter et al., 2018; Robinson & Reiter, 2016; Robinson & Strosahl, 2009; Sandoval et al., 2017) offers a service delivery framework to initially assess and treat mental health concerns as well as healthy behavior change goals all within the primary care clinic, which may reduce treatment barriers of time, transportation, and finances often encountered with external referrals to community-based mental health providers (Ogbeide et al., 2018; O'Loughlin et al., 2019). As explained by Robinson and Reiter (2016), the "GATHER" acronym can further define the PCBH concept: "G" for "Generalist Approach"; "A" for "Accessibility"; "T" for Team-Based"; "H" for "High Productivity"; "E" for "Educator"; and "R" for "Routine." The PCBH model stresses the inclusion of Behavioral Health Consultants (BHCs), such as mental health counselors or psychologists within a primary care medical clinic, to effectively address health behaviors such as tobacco cessation (Bailey et al., 2018) and healthy weight loss (Wilfley et al., 2018) through point-of-contact services while the medical patient is attending their primary care medical appointment. Patients have reported greater satisfaction with their overall care, treatment services, continuity of care, as well as improved health outcomes within these interdisciplinary models as opposed to working with a primary care physician alone (Angantyr et al., 2015; Naughton et al., 2014; Unützer et al., 2002).

Introducing and establishing a new interdisciplinary PCBH model into a primary care clinic requires thoughtful planning and discussion with relevant stakeholders to promote effective long-term team formation while minimizing potential challenges (Beehler et al., 2015; Jones et al., 2014; Kazak et al., 2017; Robinson & Reiter, 2016; Vogel et al., 2017). As the PCBH model is introduced within a clinic, the BHC on the health care team can begin using their expertise to implement a multitude of brief evidence-based psychotherapeutic/behavioral treatments to improve patient health behaviors. These can include Acceptance and Commitment Therapy (ACT) for smoking cessation (Bricker et al., 2017) and physical activity promotion (Butryn et al., 2011), as well as Behavioral Activation (BA) to foster healthy behavior changes for patients with elevated depression levels and disordered binge eating behaviors (Alfonsson et al., 2015), reduce body weight and caloric intake (Pagoto et al., 2008), and increase abstinence rates for tobacco smoking compared to traditional tobacco cessation strategies (MacPherson et al., 2010). Cognitive Behavioral Therapy (CBT) has also shown clinical efficacy in reducing obesity (CBT-OB) (Castelnuovo et al., 2017; Dalle Grave et al., 2017), treating binge eating disorders (Agras et al., 1997), and facilitating tobacco cessation (Hendricks et al., 2010; Ruther et al., 2018).

Additional PCBH-based interventions to promote healthy behavior change (Hooker et al., 2018) have included setting SMART goals (Takahashi et al., 2019), identifying and resolving potential barriers to change, self-monitoring, establishing physical activity goals, addressing unhealthy eating and sleep habits, addressing medication non-adherence, as well as utilizing the "*5Rs" (Relevance, Risks, Rewards, Roadblocks, Repeat)* approach to tobacco cessation (Anderson et al., 2002) and the "*5As" (Assess, Advise, Agree, Assist, & Arrange)* approach to self-management of healthy behavior change and improved management of chronic illness (Glasgow et al., 2002, 2006; Whitlock et al., 2002). *Self-monitoring* behaviors, combined with one or more additional *self-regulatory techniques* derived from Control Theory (Carver & Scheier, 1981, 1982) including *intention formation*, *specific goal setting*, *performance feedback*, and *timely review of behavioral goals*, have also been encouraged in primary care (Michie et al., 2009). Significant weight loss has even been observed when providing educational handouts with follow-up weight loss discussion at subsequent medical appointments (Lally et al., 2008; Rose et al., 2013). Patient food and beverage journaling has also shown benefits for improved calorie awareness and maintaining a sense of personal accountability (Hollis et al., 2008).

Additionally, Motivational interviewing (MI; Miller & Rollnick, 1991, 2002), a patient-centered approach to resolve decision-making ambivalence and enhance intrinsic motivation for healthy behavior change, is frequently used to address health-related behavior change goals (Heckman et al., 2010; Rubak et al., 2005; Smith-West et al., 2007; Van Dorsten, 2007). MI has demonstrated effective outcomes for improving healthy behaviors (Walpole et al., 2013) including weight loss (Armstrong et al., 2011; Carels et al., 2007; Cox et al., 2011); however, the results have been equivocal for MI as a stand-alone weight loss treatment for racially diverse patient populations (Befort et al., 2008), and use of MI as a single approach treatment for tobacco cessation has also shown inconsistent outcomes (Harris, et al., 2010; Hettema & Hendricks, 2010; Lundahl et al., 2010). To improve

MI-based health outcomes, the Transtheoretical Model of Behavior Change (TTM: Prochaska & DiClemente, 1982, 1983; Prochaska et al., 1992) has been recommended for use in primary care (Zimmerman et al., 2000). The TTM offers a complimentary approach for MI interventions (DiClemente & Velasquez, 2002) and provides a stage-based architecture to identify patient readiness to change and track progress over time from the initial *Precontemplation* and *Contemplation* stages toward *Preparation*, *Action*, and *Maintenance* (Spencer et al., 2002; Velicer et al., 1998). The TTM, as a health-promoting intervention approach, has demonstrated significant smoking cessation outcomes (Manuel et al., 2013) and has also found support for multiple concurrent healthy behavior changes (Johnson et al., 2008). However, similar to MI, the efficacy of the TTM as a stand-alone treatment has been questioned (Bridle, et al., 2005; West, 2005; Whitelaw et al., 2000), suggesting that health behavior interventions in primary care should not rely upon a single treatment modality, but instead may benefit from crafting customized patient-specific treatment approaches, which allow the health care team to better appreciate individual patients' goals, needs, barriers, preferred methods of behavior change, and available resources.

In addition to health-promoting interventions, BHCs working within primary care must also remain cognizant of professional and ethical guidelines, including professional scope of practice and licensure laws, when building and maintaining effective PCBH-based interdisciplinary clinical partnerships. For example, patients may seek guidance regarding specific nutritional/caloric recommendations, which may fall beyond the scope of a BHC–Physician partnership model, yet could be addressed by incorporating a Registered Dietician onto the care team (Berendsen et al., 2020). Further, the field of *Lifestyle Medicine* (LM) offers specialized training and expertise in the behavioral and nutritional aspects of chronic disease management and permits various health care specialties to become certified as LM *Diplomats* (ACLM, 2020).

Family Medicine residency primary care outpatient clinics, often located within underserved communities, have long recognized the importance of promoting healthy behaviors for their patients (Zimmerman et al., 2000). The interdisciplinary nature of medical residency training clinics provides abundant opportunities to establish PCBH health care delivery models (Landoll et al., 2020) and provide health promotion interventions while simultaneously providing live case-based education for rotating residents. Medical residency programs often incorporate behavioral science faculty to oversee healthy lifestyle promotion curriculum (Holmboe et al., 2005; Wattanapisit et al., 2018), and The Accreditation Council for Graduate Medical Education (ACGME) even requires the presence of such faculty within Family Medicine residency programs (ACGME, 2021) while the American Academy of Family Physicians (AAFP) defines the scope of Family Medicine to address health problems, "be they biological, behavioral, or social" (2020, p. 6). Residency outpatient clinics often serve lower SES, racially and ethnically diverse communities (Barclift, et al., 2016), highlighting the opportunity for medical training clinics to provide local, accessible, and affordable resources designed to help patients obtain and maintain healthy behavior patterns while simultaneously educating the next generation of primary care physicians in health-promoting interventions.

Following in this vein, we will describe an interdisciplinary PCBH-based clinic model within a Family Medicine residency clinic, the *Lifestyle Change Clinic (LCC)*, which partners a BHC (attending psychologist or postdoctoral psychology fellow) with a resident physician for one half-day (4 h) per week to address patient goals of weight loss, sedentary lifestyle improvement, and/or tobacco cessation. The LCC utilizes provider-selected PCBH evidence-based health behavior interventions matching the patient's specific type of healthy behavior goals coupled with their readiness and motivation to change. However, the LCC has the added benefit of the partnered physician, who can address the medical needs of the patient that would otherwise be beyond the purview of the PCBH-based psychologist. Within an outpatient medical residency training clinic, the rotating resident physician can initially observe the BHC conduct health-related behavior change interventions and subsequently, over the course of the resident's 4-week rotation, begin to provide these interventions with the BHC's guidance and oversight. The LCC appointments are each supervised by an attending physician to review any medical services provided by the resident.

Clinically, the LCC is intended to provide individualized healthy behavior change discussion, planning, implementation, and follow-up care within the privacy of an individual primary care appointment, as opposed to a group medical visit model that might reduce the tailored and individualized aspects of the patient's treatment planning. Referrals to the LCC are culled from the clinic's ambulatory patient population for whom initial health-related behavior change attempts with their primary care physician had not yielded progress, as well as for patients seeking additional support beyond the time constraints of routine medical appointments. Substance use/abuse concerns beyond tobacco are not treated within the LCC but instead referred out to local substance abuse counseling resources within the community. However, a primary care clinic with the available resources and personnel, such as clinical social workers or substance abuse counselors, could incorporate these additional service lines into a BHC- physician clinic partnership to address greater areas of behaviorally based healthy change needs. Examples include the SBIRT model of identifying and providing care or referrals for mental health and substance use

concerns (Hargraves et al., 2017) or even direct onsite substance use disorder treatment services located within the primary care clinic (Ober et al., 2017).

A crucial element of health-related behavior change resides in *patient engagement* (Hibbard & Greene, 2013), defined broadly as engaging patients in their own treatment process while encouraging and building motivation and confidence to implement healthy lifestyle changes. To promote *patient engagement*, the LCC seeks to involve the patient from the outset of treatment with a shared decision-making approach, as opposed to a strictly biopsychosocial educational or provider-driven approach that might engender a passive listening response from the patient, void of actual involvement or self-motivation to change (Barry & Edgman-Levitan, 2012; Hoffmann et al., 2014). The physician also discusses any pertinent medical and pharmacological questions and recommendations (Siu, 2015). Typically, there are no specific session-limits per se for the LCC, though patients are initially seen every 1–2 weeks with subsequent 4-week follow-ups as desired depending upon referral volume. Given the societal health challenges brought on by tobacco use, obesity, and sedentary lifestyle, coupled with the readily available health care resources of primary care outpatient clinics, particularly medical residency clinics located within underserved communities, this paper seeks to provide preliminary support for a PCBH-based psychologist—physician clinical partnership model providing enhanced patient care beyond either specialty alone while also offering a live, case-based educational format for resident physicians to develop health behavior change intervention skills to carry with them into their careers.

The 30-min LCC appointments are designed to first welcome a patient and orient them to the nature of the clinic (e.g., developing long-term healthy behavior patterns as opposed to a "quick fix" or "crash diet" approach), discuss patient health goals, identify patient motivations for healthy change, take a brief health history, and conclude with attainable, short-term goal(s) prior to next appointment, typically 2 weeks from the initial appointment. The LCC is intentionally semi-unstructured in that it is not a manualized treatment approach with interventional flow charts and preset topics to be discussed at specific session numbers, nor are there preset time intervals between appointments. Instead, the LCC is designed to offer a flexible framework in which each patient can have an individualized health care experience that matches their personal goals and readiness to change with appropriate evidence-based change interventions and health education. This process also identifies barriers to change unique to each patient, such as transportation needs, ambulatory abilities, access to affordable healthy food choices and exercise equipment, and physical limitations. Finally, patients are provided with psychologically based healthy behavior change interventions, encouragement, and reinforcement by the LCC team as they work toward their health goals, with emphasis on setting and attaining realistic and obtainable short-term goals as they progress toward their long-term goals.

The present study seeks to provide preliminary empirical support via a non-experimental, retrospective, 50-month medical chart review of LCC patient health outcomes as well as the self-perceived value that rotating 1st- and 2nd-year Family Medicine residents felt the LCC provided to their residency-based medical education curriculum. LCC patient outcome metrics of body weight measured in pounds, Body Mass Index (BMI), and systolic and diastolic blood pressures were examined, as well as TTM stage progress over time for those LCC patients who attended more than 1 LCC appointment.

Methods

The present study sought to examine the effectiveness of the Lifestyle Change Clinic (LCC) on outcome metrics of smoking cessation and weight loss, as well as resident physician perceptions of the LCC's educational value to their overall residency-based education. This study was approved via the sponsoring hospital system's Institutional Review Board (IRB), with ongoing IRB oversight, renewed annually, throughout the duration of the project, and was performed in accordance with the APA Ethical Principles of Psychologists and Code of Conduct governing human participants in research as set forth by the American Psychological Association (2017, Section 8). Data collection consisted of a retrospective chart review in which data from patients' medical charts were gathered archivally, as opposed to a prospective randomized controlled trial (RCT) design. Our study is a non-experimental preliminary examination into the effectiveness of the LCC clinic model seeking to serve as an initial step in providing empirical support for this, and similar, models of PCBH-based interdisciplinary services. LCC patient data and resident evaluation data were gathered over a 50-month data collection time period, which occurred within 5–7 years of the onset of the COVID-19 pandemic, though the exact data collection timeframe dates are not being published to ensure participant anonymity due to the de-identified dataset being made available in open source format.

The LCC receives patient referrals from the Family Medicine residency program's ambulatory clinic if and when initial health-related behavior change interventions with their physician were unsuccessful or if the patient desired greater time be spent addressing health behaviors than is typically available in a brief medical follow-up visit. During the LCC appointments, the BHC typically leads the behavioral interventions, particularly at the start of the 4-week residency

block rotation; however, as the rotation progresses the resident physician takes on a larger, albeit closely supervised, interventional role after having initially observed the BHC earlier in the rotation. The LCC does not mandate specific time intervals between appointments but instead follows patients' preference and schedule availability, though typically we recommend a 1–2-week interval between first and second LCC appointment, and those interested in continuing beyond 2 LCC appointments can increase interval length up to 3–4 weeks between subsequent appointments once initial behavior change preparation is in place and the patient is ready to implement and practice their new healthy behavior patterns. Patient medical chart data were only analyzed over the IRB-approved 50-month data collection time period at three non-standardized intervals: the initial LCC appointment (*Time 1*), final LCC appointment (*Time 2*), and the next subsequent non-LCC primary care medical follow-up appointment in our outpatient medical clinic (*Time 3*). The follow-up, *Time 3,* appointment refers to those patients who concluded their LCC experience and subsequently attended a non-LCC primary care medical appointment in which vitals were also recorded (weight, BMI, blood pressure, etc.) within the 50-month data collection timeframe. Due to these data collection timeframe limits, not all patients within this study were able to have data compared across all three data collection time points, resulting in some analyses only comparing *Time 1* vs. *Time 2*. Further, patients who were already enrolled in the LCC prior to the onset of the data collection time window were excluded from the study so that all patients in this study attended their initial LCC appointment within the 50-month data collection window. Data gathered included demographics (gender, age, race, and ethnicity), specific health behavior(s) to be addressed (e.g., weight loss, smoking cessation, or both), total number of appointments during the data collection period, medical vitals at each appointment (e.g., total body weight, BMI, and blood pressure if a physician was present for appointment, otherwise only weight and BMI were recorded), and amount of cigarettes (or other tobacco product) per day. Patients 17 years and younger were excluded from this study.

At the conclusion of each LCC appointment, the TTM stage of change was recorded in the patient's LCC appointment chart note, and this was determined via group discussion and consensus by the health care providers present at the appointment (e.g., typically 1 psychologist and 1–2 resident physicians). This process involved the BHC holding a qualitative discussion with the rotating residents, after the patient interview had concluded, to form a group consensus. This process serves an educational role for resident physicians less familiar with the TTM as well as providing an informal method of assigning a patient's TTM-based stage of change to track patient progress over time (Prochaska & DiClemente, 1982, 1983; Prochaska et al., 1992). For instances in which a resident physician was not available to attend the LCC, the BHC would still conduct the appointments but would focus only on the behavioral aspects of the patient's goals and interventions, assign a TTM stage, and document accordingly.

To evaluate the resident physicians' perceptions regarding the educational merits of the LCC as a medical training experience, we utilized an IRB-approved process of retrospectively analyzing archival anonymous behavioral science rotation evaluation survey responses specific to the LCC experience, which were distributed at the conclusion of each 4-week behavioral science block rotation and coincided with the same 50-month data collection time period used for gathering LCC patient data. Our Family Medicine residents participate in the LCC for 4-week rotations during their 1st and 2nd year in residency (ACGME-accredited FM residency programs consist of 3 full-time calendar years in total). During each of their two, annual, 4-week behavioral science rotations, the residents can participate in up to four Lifestyle Change Clinic (LCC) afternoons, though some residents may only attend 2–3 LCCs during their rotation

Lifestyle Change Clinic:
Please rate the Lifestyle Change Clinic experience from 1-5 as to its **VALUE IN YOUR LEARNING.**

1	2	3	4	5	N/A
Unsatisfactory				**Outstanding**	

A. _____ How well did this activity achieve the stated objectives in your orientation packet?

B. _____ How relevant / useful do you think this activity was to your current and future practice of Family Medicine?

C. _____ In your opinion, should this activity be continued as a required activity on this rotation?
YES NO

D. Comments, especially ways we could improve this experience.

Fig. 1 Behavioral science rotation evaluation questions, to be completed by Resident Physicians at the conclusion of their 4-week block rotation, pertaining to their perceived educational value of participating in the LCC

due to vacation time, etc. The rotation evaluations contain four questions pertaining specifically to their LCC involvement and ask the residents to provide both quantitative and qualitative evaluative feedback regarding their perceived value of the LCC to their residency education (See Fig. 1). Due to 1st-year residents attending the 4-week behavioral science rotation again in their 2nd year, it is likely some individual residents provided survey data twice during the 50-month data collection time period, once in year-1 and again in year-2.

To examine the LCC patient outcomes, descriptive statistics including means, standard deviations, frequencies, and percentages were used for demographic data. One-way ANOVA was used to initially compare means between the three referral groups using a post hoc Bonferroni test for pairwise comparisons. A repeated-measures ANOVA was used to compare mean weight, BMI, and blood pressure between the three time points (*T1*, *T2*, and *T3*), and a post hoc Bonferroni test was used for pairwise comparisons between groups. Due to inconsistent and often incomplete medical chart documentation for exact tobacco usage amounts at *Time 3* (medical follow-up appointment following completion of LCC), a paired samples *t* test was used to compare daily tobacco cigarette use between the LCC appointments *Time 1* (initial LCC appointment) and *Time 2* (final LCC appointment) only, while *Time 3* was not used in the tobacco cessation longitudinal analyses. Multiple regression analysis was also used to determine if a patient's blood pressure (systolic BP or diastolic BP) was associated with any of the other outcome variables or TTM stages.

Results

Resident Physicians' Behavioral Science Rotation Satisfaction Ratings

A total of 60 anonymous Family Medicine resident physician surveys were completed from a potential participant pool of 104 resident physicians (58% response rate) during the 50-month LCC data collection timeframe. Of these 60 surveys, 33 were completed by residents during their postgraduate year one (PGY-I) behavioral science rotation, and 27 were completed during their postgraduate year two (PGY-II) behavioral science rotation. Due to the anonymous nature of the surveys and the 50-month data collection window, it is likely some residents completed the survey twice (e.g., during their PGY-I and PGY-II rotations). As noted in Fig. 1, the resident physicians were asked to rate their training experiences with the LCC on a 5-point Likert scale from 1 (unsatisfactory) to 5 (outstanding). The first question asked how well residents' LCC participation achieved the rotation curriculum objectives (i.e., understand and effectively deliver brief, evidence-based health-related behavior change interventions for patients' smoking cessation and weight loss goals). As summarized in Fig. 2, 96.7% ($n=59$) rated this question "4" or "5" on the 1–5 scale ($M=4.37$, SD = 0.67). The second Question addressed relevancy of the LCC experience toward the resident's future practice, with results revealing 95% ($n=57$) selecting "4" or "5" ($M=4.46$, SD = 0.7). For question three, 88.3% ($n=53$) of residents endorsed maintaining the LCC participation experience as an ongoing required curriculum component of the behavioral science rotation for 1st- and 2nd-year residents.

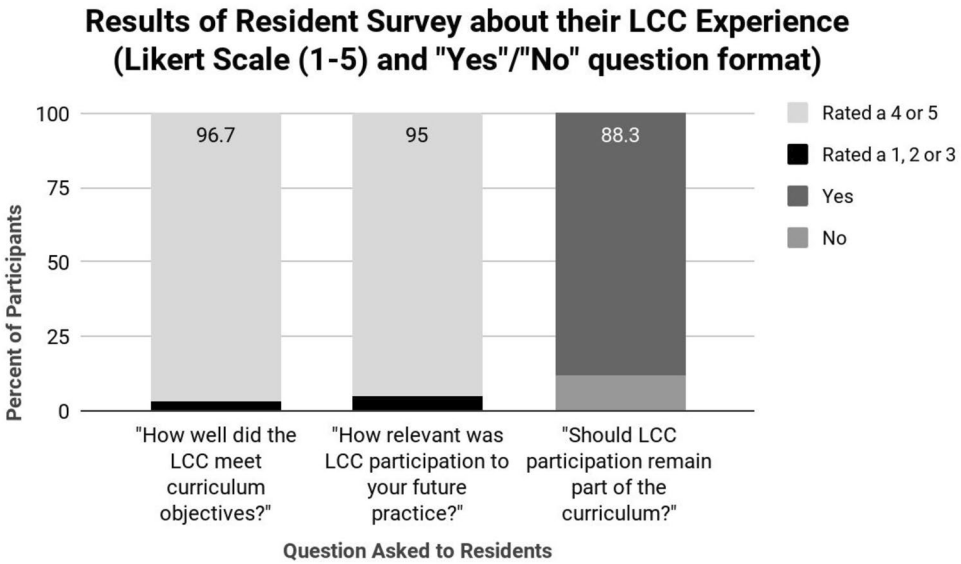

Fig. 2 Resident Physicians' perceived educational value of the LCC as a component of their Family Medicine residency-based educational curriculum

Table 1 LCC patient demographics and descriptive statistics

Total Patients: $n = 249$		
Total LCC appointments $n = 451$ ($M = 1.81$, SD = 1.43)		
Sex		
Female	$n = 187$ (75.1%)	
Male	$n = 62$ (24.9%)	
Race/ethnicity		
White	$n = 166$ (66.7%)	
Black/African American	$n = 63$ (25.3%)	
Multi-Ethnic or Biracial	$n = 13$ (5.2%)	
Unknown	$n = 5$ (2.0%)	
American Indian or Alaska Native	$n = 1$ (0.4%)	
Latino/Hispanic	$n = 1$ (0.4%)	
Reason for referral to LCC		
Weight loss-only	$n = 191$ (76.7%)	
Tobacco cessation-only	$n = 50$ (20.1%)	
Combined wt. loss & smk. cess	$n = 8$ (3.2%)	
Total group measurements at initial appointment $n = 249$		
Age at initial LCC appointment	$M = 40.25$ years	SD = 13.43 years
Weight	$M = 245.6$ lbs	SD = 70 lbs
BMI	$M = 39.7$	SD = 10.8
Systolic blood pressure	$M = 134.9$	SD = 17.6
Diastolic blood pressure	$M = 73.1$	SD = 12.3

LCC Patient Demographics

There were 249 total patients in this study (See Table 1), who attended a total of 451 in-person LCC appointments ($M = 1.8$, SD = 1.4). The 50-month data collection window occurred within 7–10 years of onset of the COVID-19 pandemic. 150 patients (60.2%) attended only 1 LCC appointment and the maximum appointments attended was 10 ($n = 1$, 0.4%). Our primary care clinic is located within an urban, lower SES community in the Midwestern United States, though overall tobacco use rates and body weight/BMI levels for the aggregate clinic patient population are not available to offer comparisons to the LCC study population. The large number of patients who only attended 1 LCC appointment ($n = 150$, 60.2% of total sample) also suggests that some patients may have found the initial psycho-educational introductory appointment sufficient for encouraging change and answering their health-related behavior change questions, while others may have found the LCC and its

Table 2 LCC patients' TTM stages* by treatment group and appointment (Initial LCC appt. vs. Final LCC appt.)

		Precont.*	Contempl.*	Preparation*	Action*	Maint.*	Relapse*	No Data
Total group								
Initial	($n = 249$)	0 (0%)	73 (29.3%)	137 (55%)	32 (12.9%)	0 (0%)	3 (1.2%)	4 (1.6%)
Final LCC appt.	($n = 99$)	0 (0%)	8 (8.1%)	25 (25.3%)	58 (58.6%)	4 (4.0%)	1 (1.0%)	3 (3.0%)
Weight loss-only								
Initial	($n = 191$)	0 (0%)	58 (30.4%)	106 (55.5%)	23 (12%)	0 (0%)	2 (1%)	2 (1%)
Final LCC appt.	($n = 78$)	0 (0%)	7 (8.9%)	23 (29.5%)	44 (56.4%)	1 (1.2%)	1 (1.2%)	2 (2.5%)
Tobacco cessation-only								
Initial	($n = 50$)	0 (0%)	14 (28%)	27 (54%)	7 (14%)	0 (0%)	1 (2%)	1 (2%)
Final LCC appt.	($n = 19$)	0 (0%)	1 (5.3%)	2 (10.5%)	12 (63.2%)	3 (15.8%)	0 (0%)	1 (5.3%)

*Transtheoretical Model of Behavior Change (TTM) stages: Precontemplation, Contemplation, Preparation, Action, Maintenance, and Relapse (Prochaska & DiClemente, 1982, 1983)

focus on healthy behavior change to not be of interest/perceived value at that time.

LCC Patients' *TTM-Based Stages of Change* Outcomes

Patients' TTM-based stage of change was assigned at each LCC appointment based upon consensus of the treatment team (See Table 2), which consisted of informal qualitative discussion among the BHC and the 1–2 rotating resident physician(s), and served as both an attempt to track change over time and a teaching opportunity for the BHC working with medical learners for whom the TTM might be an unfamiliar construct. However, this informal method of assigning TTM stages also runs the risk of potentially unreliable inter-rater agreement as well as the potential for favorability bias among the treatment team in overemphasizing readiness to change given the nature of the LCC as a change-based clinic. Further, within our primary care clinic a TTM stage is not typically assigned to patients during their general medical appointments outside of the LCC, so follow-up TTM data on patients' post-LCC appointments are not available to aid in identifying potential ongoing healthy behavior change motivation and implementation (or lack thereof) from a TTM stage-based approach. The results revealed 29.3% ($n = 73$) of patients in the *Contemplation stage* and the majority of patients (55%, $n = 137$) in the *Preparation stage* at the initial LCC appointment (*T1*). Yet, by the final (*T2*) LCC appointment (for those patients who attended more than one LCC appointment $n = 99$), 58.6% ($n = 58$) of patients were in the *Action stage* while only 25.3% ($n = 25$) remained in the *Preparation stage*. This trend suggests that many LCC patients, who continued beyond the initial LCC appointment, were matriculating from *contemplation* and *preparation* for healthy behavior change into *actionable* lifestyle change, which is consistent with the aims of the TTM (Prochaska & DiClemente, 1982, 1983; Prochaska et al., 1992).

LCC Patients' Weight Loss and Tobacco Cessation Outcomes

An initial ANOVA test, with subsequent Bonferroni post hoc analysis, was used to compare the three groups (e.g., weight loss-only $n = 191$, tobacco cessation-only $n = 50$, or combined weight loss and tobacco cessation $n = 8$) at baseline across variables of weight, Body Mass Index (BMI), and systolic and diastolic blood pressure levels. At the initial visit, a significant difference in body weight ($F(2, 246) = 37.06$, $p < .0001$) and BMI ($F(2, 246) = 52.57$, $p < .0001$) was found among the three groups, with Bonferroni post hoc analyses revealing an expected significantly lower mean body weight and BMI for the tobacco cessation-only group when compared to the weight loss-only group ($p < .0001$) as well as when compared to the combined weight loss plus tobacco cessation group ($p < .01$). No significant differences were found in systolic or diastolic blood pressure levels between the groups at the initial LLC appointment. Use of antihypertensive medication was not controlled for in this study, with all patients being treated outside of the LCC by their primary care physicians, as medically indicated, for any hypertension concerns.

Weight Loss-Only Group

A total of 191 patients were referred to the LCC for weight loss during the 50-month study timeframe. The majority of these patients were female (81.2%), White (63.4%), and identified to be in the *Preparation* stage of the TTM (55.5%). As illustrated in Table 3, a repeated-measures ANOVA was utilized to compare outcome variables for patients who attended appointments at all three data collection points (e.g., *T1* = Initial LCC appointment, *T2* = Final LCC appointment, and *T3* = First general medical follow-up appointment following final LCC appointment). Of these 191 patients, 67 patients attended appointments at each data collection point.

For the 67 weight loss group patients who attended LCC appointments at each data collection point, significant reductions were found in body weight ($F(1.74, 114.76) = 11.43$, $p < .0001$) and BMI ($F(1.39, 92.07) = 9.27$, $p = .001$) across time, and Bonferroni post hoc analyses also revealed significant reductions in body weight and BMI from *Time 1* to *Time 2*, and well as from *Time 1* to *Time 3*. No differences were found in systolic and diastolic blood pressures across time for this group ($F(1.73, 77.68) = 0.37$, $p = .66$; $F(1.93, 86.68) = 0.38$, $p = .67$, respectively). Multiple linear regression analysis revealed a one unit decrease in a patient's BMI to be associated with a 0.41 mmHg decrease in systolic blood pressure when holding number of LCC visits and TTM stage of change constant ($F(3, 148) = 3.09$, $p = .03$), which is consistent with previous research identifying a positive association between body weight and blood pressure (Staessen et al., 1988).

Tobacco Cessation-Only Group

A total of 50 participants were referred to the LCC for tobacco cessation. The majority of these patients were female (54%), white (84%), and in the *Preparation stage* of the TTM (54%). 16 patients in this group attended all 3 data collection time points. Across time, the mean weight and BMI of these 16 patients remained relatively stable from 170.2 lbs., BMI = 27.6 at *Time 1* to 169.9 lbs., BMI = 27.6 at *Time 3* ($F(1.41, 21.14) = 0.07$, $p = .87$; $F(1.43, 21.39) = 0.02$, $p = .95$, respectively). This is

Table 3 ANOVA results for weight loss and smoking cessation groups across time

		Weight loss-only group ($n=67$) (Age at 1st LCC appt. $M=37.5$ years, SD = 12.7 years)				Tobacco cessation-only group ($n=16$) (Age at 1st LCC appt. $M=50.7$ years, SD = 10.7 years)				
		Weight (lbs) ($n=67$)	BMI ($n=67$)	Systolic BP ($n=47$)	Diastolic BP ($n=47$)	Weight (lbs) ($n=16$)	BMI ($n=16$)	Systolic BP ($n=12$)	Diastolic BP ($n=12$)	Cigarettes per day ($n=14$)
T1: Initial LCC Appointment	Mean	276.3	45.3	133.5	72.1	170.2	27.6	124.7	66.6	19.4
	(SD)	(66.6)	(10.6)	(16.7)	(13.2)	(52.0)	(7.0)	(20.1)	(13.2)	(12.3)
T2: Final LCC Appointment	Mean	272.9*	44.8*	131.7	73.8	169.4	27.6	127.2	70.3	8.2**
	(SD)	(65.4)	(10.5)	(20.5)	(14.0)	(48.5)	(7.0)	(17.7)	(12.3)	(9.5)
T3: Medical Follow-up Appointment After Final LCC	Mean	271.9***	44.2***	134.2	73.8	169.9	27.6	120.6	65.5	Not Recorded
	(SD)	(66.1)	(10.7)	(20.5)	(14.8)	(48.9)	(6.9)	(16.6)	(7.6)	Not Recorded

*T1 vs T2 Weight and BMI (Bonferroni post hoc $p<.01$)

**T1 vs T2 Tobacco Use ($t=4.3$, $p<.001$)

***Weight across time ($F=11.43$) and BMI across time ($F=9.3$), $p<.0001$; T1 vs T3 Weight and BMI (Bonferroni post hoc $p<.01$)

consistent with previous research in which tobacco cessation partnered with weight loss counseling mitigated weight gains (Bush et al., 2016). No differences were found in systolic and diastolic blood pressures across time ($n=12$; $F(2, 22)=1.49$, $p=.25$; $F(2, 22)=1.65$, $p=.22$, respectively). Tobacco usage for this group was all in the form of tobacco cigarettes. As previously noted, exact daily tobacco use amounts were not typically recorded by physicians during patients' routine medical follow-up appointments (*T3*), therefore change in cigarette use over time was examined using a paired samples t-test comparison of initial LCC appointment (*T1*) to final LCC appointment (*T2*). Results ($n=16$) revealed a significant decrease in cigarette use between these two time periods $t(13)=4.2$, $p<.001$.

Weight Loss and Tobacco Cessation Combined Group

There were a total of eight patients referred to the clinic for concurrent weight loss and smoking cessation (See Table 1). Five patients (62.5%) were female and three patients (37.5%) were male. Four of the patients were Black or African American (50%), three were White or Caucasian (37.5%), and one was Multi-Ethnic or Biracial (12.5%). One participant (12.5%) was rated in the *Contemplation* stage of the TTM, four participants (50%) were rated in the *Preparation stage* of the TTM and two participants (25%) were rated in the *Action stage* of the TTM. One of the participants (12.5%) did not have a stage identified. The mean number of cigarettes per day was 17 ($n=5$) at *T1*, 13 ($n=1$) at *T2*, and zero ($n=2$) at *T3*. The small sample size limited any conclusive statistical analyses though results were trending toward reduced body weight and tobacco use, consistent with previous support of the TTM's effective use for multiple concurrent health behavior changes (Johnson, et al., 2008).

Discussion

The Lifestyle Change Clinic (LCC) is a psychologist - physician clinical partnership model at a Family Medicine residency outpatient clinic designed to effectively address patient smoking cessation and weight loss goals. The aim of this paper sought to study the clinical effectiveness of this model on outcomes of body weight and BMI reduction, as well as tobacco use reduction. Preliminary patient outcomes from this study, though not an experimental randomized controlled design, revealed statistically significant reductions in body weight and BMI during the course of the patients' LCC appointments and maintained lower body weight and BMI levels by their 1st follow-up medical (non-LCC) appointment (*Time 3*) after concluding the LCC. Significant reductions in tobacco cigarette use over time were

also observed in the tobacco cessation group. The combined weight loss and tobacco cessation group, though small in size and statistical power ($n = 8$), revealed no statistically significant differences over time, yet still suggested trends toward weight loss and reduced tobacco use. Results also found patients, in general, predictably advanced through TTM stages of *Contemplation* and *Preparation* into *Action* as they progressed in their healthy behavior change goals, though it should be re-emphasized that the assignment of TTM stages per visit was conducted via informal qualitative discussion among the BHC and 1–2 rotating residents as opposed to a quantitative TTM stage screening measure (Kristal et al., 1999). Overall, the LCC study findings appear to lend preliminary support for the efficacy of PCBH-based psychologist – physician interdisciplinary clinical partnership models within underserved, lower SES communities for smoking cessation and weight loss goals.

Also of note from the results was the absence of any significant weight gained by the tobacco cessation group, potentially attributed to the LCC format of counseling and promoting overall healthy lifestyle choices to reduce weight gain potential when quitting tobacco use. While the metabolic mechanisms surrounding weight gain during, and after, successful tobacco cessation remain both complex and not fully understood (Harris et al., 2016), weight gain is, however, a common and undesired outcome of tobacco cessation particularly among previously heavy smokers (Veldheer et al., 2015). While weight gain following smoking cessation may increase short-term risk of developing Type II Diabetes Mellitus (Yang Hu et al., 2022), those authors noted that even when undesirable weight gain occurred leading to risk for Diabetes development, this health risk still did not reduce the overall health benefits of smoking cessation. Nevertheless, successful tobacco cessation without experiencing weight gain remains the goal, and our results are consistent with past findings (Bush et al., 2016) in suggesting that the addition of healthy lifestyle change behavioral counseling may mitigate unwanted weight gain following tobacco cessation.

Clinics such as the LCC can also provide an opportunity for BHC's to add clinical value to medical treatment centers beyond traditional psychotherapy and psychological assessment services and can be woven into medical education curricula while also providing valuable outreach to underserved patient populations through affordable and accessible weight loss and tobacco cessation services. PCBH-based clinic models similar to the LCC may also fulfill pre-surgical weight loss counseling requirements for patients pursuing bariatric weight loss surgery. Further, the ability to offer accessible health care services, designed to improve long-term population-based healthy lifestyle behaviors (Carey et al., 2018), may also increase potential for lowering societal health care costs (Shrank et al., 2019) while simultaneously offering patients quality-of-life improvements such as increased physical energy, greater engagement in family and social support networks, improved physical ability to maintain employment, and increased physical recreation and volunteerism, etc. However, challenges remain for establishing effective and equitable reimbursement models for non-traditional behavioral services within medical settings (Wilson et al., 2019), without which widespread adoption may be hindered.

In terms of clinic attendance, the large number of patients within this study who attended only one LCC appointment ($n = 150$; 60.2% of patients referred to LCC), could be interpreted in several ways, from patients finding the LCC to not be of interest or perceived usefulness, to those who wished to only gain skill-building education and then begin implementing these interventions on their own without ongoing follow-ups. Further, it is possible that some variance in the significant findings of this study could be accounted for by greater motivation levels of patients who attended multiple appointments, as opposed to only 1 appointment, and therefore might have even experienced some level of healthy behavior change without the aid of the LCC due to their increased motivation for change. The benefits found for patients who attended more than 1 LCC appointment, coupled with the findings of less than half of patients seeking a 2nd LCC appointment, suggests greater emphasis and encouragement for follow-up LCC attendance be communicated during the initial appointment as well as highlighting a need to conduct future quality-improvement inquiry into reasons patients may have elected not to follow-up beyond the initial appointment. Future research could also incorporate experimental controls and measure initial and ongoing motivation levels for health-related behavior change as a potential covariate.

Also notable is the difference in the overall LCC study sample population being predominately White (67%), including those in the *Time 1* weight loss-only group (63.4%) and tobacco cessation group (84%), which stands in contrast to our overall primary care clinic population in which approximately 47% patients identify as White/Caucasian, 47% Black/African American, 5% multi-ethnic/biracial, and 1% comprised of Native American/Alaska Native and Latino/Hispanic. Overweight and obese bodyweights are also more prevalent among the Black community comparative to their White counterparts (Fitzgibbon, et al., 2012). As such, our clinic population has the capacity to support a more racially/ethnically diverse LCC patient sample yet we did not observe this in the present study. Potential contributing factors for this discrepancy are not fully clear, though it is plausible that social norms of the local community did not align with changing health behaviors, possible effects of the resident physicians' communication skill and content when identifying and recommending their patients for referral to

the LCC, as well as culturally appropriate methods for discussing smoking, obesity, and sedentary lifestyles.

During the COVID-19 pandemic, many 3rd-party insurers permitted patients to attend medical appointments virtually (encrypted video internet connection) or via telephone-based appointments. Although all data utilized for the current study were collected prior to the COVID-19 pandemic, we have observed, anecdotally, since the onset of the COVID-19 pandemic that LCC patients responded very favorably to the option of attending these appointments virtually/telemedicine from their homes, especially in cases of transportation and physical/ambulation difficulties. These observations are consistent with recent policy statements and health disparity research highlighting the value of improved access afforded by telemedicine during the COVID-19 pandemic (Ortega et al., 2020). As a result, the LCC is planning to continue offering remote access appointments if state licensure laws and 3rd-party payers continue to support these remote virtual services. A slight drawback occurs with inability to obtain and record patients' medical vitals that would otherwise be possible with an in-person appointment, nor easily exchange and review food/beverage journals, etc. However, the convenience afforded to the LCC patients via the telemedicine option has appeared to outweigh the drawbacks thus far. That being said, many of our lower SES patients qualify for free transportation to medical appointments through their Medicaid insurance programs, reducing financial and transportation barriers to attend in-person appointments should they desire in-person vs. virtual appointments.

With regard to medical education, the results revealed that Resident Physicians rated the LCC as a highly relevant and useful component of their primary care medical training in terms of current and future medical practice, as well as overwhelmingly recommending that the LCC remains within the residency curriculum during the PGY-I and II behavioral science block rotations. In addition to the specialized training in behavior change, the LCC also provides resident physicians the opportunity to engage with patients verbally for a dedicated 30-min appointment typically absent a physical examination or in-depth medication review. This allows resident physicians greater time to listen and appreciate individual cultural and economic variables impacting patients' daily health choices, obstacles, and realistic options for making healthy change. While educational didactics and assigned readings can provide conceptual knowledge, the LCC experience provides real-time doctor–patient dialogue focused on topics often not covered in such depth during routine medical appointments. Family Medicine residents often encounter observational training rotations during their residency years in which they shadow medical specialists, though are not always integrated into the actual health care delivery and interventions during these rotations. A strength of LCC-based clinical partnerships is the ability to work side-by-side with a BHC to first learn brief health promotion interventions and effective communication styles followed by conducting these interventions with the BHC in attendance to assist and provide follow-up feedback to the resident after the LCC appointment. From a cost–benefit standpoint to the residency program, the BHC is already onsite at the residency clinic as either a residency faculty member or postdoctoral Fellow, therefore typically no additional expenditures would be required from the residency budget to account for the LCC from a teaching/rotation standpoint.

The present study faced limitations in gathering and analyzing patient data, yet collection of resident physician perceptions of the clinic proved more readily attainable. When reviewing patient chart notes for tobacco use, records often only indicated "yes or no" yet did not identify specific daily use amounts, highlighting the importance of physicians recording specific health data into patient charts during medical visits to enable the tracking of change over time. Further, the LCC itself does not standardize tobacco use recording via smoking logs/software app for each patient, though could be included as a future addition to the LCC. This study was also limited to a single primary care outpatient residency clinic located in an urban, lower SES community, which may limit generalizability to non-similar settings.

The encouraging results from this study suggest that medical training centers should consider implementing PCBH-based interdisciplinary BHC–physician partnerships to lead healthy behavior change clinics, which maximize expertise from various disciplines to benefit patients while concurrently providing live case-based educational experiences for participating learners. Offering such clinics in underserved communities may help to further reduce health care disparities by providing accessible and affordable weight loss and smoking cessation treatment options within the patient's primary care clinic in which patients are already familiar and have established methods of financial/insurance coverage and transportation. Resource allocation and reimbursement structures, to develop and support interdisciplinary clinic models beyond medical residency clinics, remain desperately needed to better allow for these models to exist and thrive.

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were prepared by SJN as well as final incorporation of all editorial contributions and revisions. All authors contributed original text and editorial feedback to previous manuscript versions as well as read and approved the final manuscript.

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Data Availability The original data gathering forms are maintained by Ascension Genesys Hospital Depts. of Clinical Health Psychology and Research. The de-identified dataset has been made available via Harvard Dataverse https://doi.org/10.7910/DVN/7KIQTH.

Code Availability Not Applicable.

Declarations

Conflict of interest Scott J. Nyman, Mark E. Vogel, Grant M. Heller, Jennifer R. Hella, Rose A. Illes, and Heather A. Kirkpatrick declare that they have no conflict of interest.

Ethical Approval Approved and renewed annually by the Ascension Genesys Hospital IRB, Grand Blanc, MI; ID# ME 12 0027, Protocol # 367020-3.

Consent to Participate Implied consent was utilized due to IRB-approved retrospective medical chart review and retrospective resident physician ratings culled from anonymous Behavioral Science rotation evaluation survey ratings.

Consent for Publication The authors provide our consent for publication of this data, text, and images.

Human and Animal Rights This research was conducted in accordance with ethical and legal standards, as approved by the institutional review board at Ascension Genesys Hospital. This study received exemption status from the institutional review board due to use of archival data.

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