



Design and implementation of a clinic-to-community, physical activity health promotion model for healthcare providers

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ABSTRACT

Due to the worldwide burden of noncommunicable disease, the American College of Sports Medicine (ACSM) launched a global health awareness initiative in 2007 called Exercise is Medicine® (EIM®) to create awareness in healthcare providers in promoting physical activity to their patients. To transition awareness into action, Exercise is Medicine Greenville® (EIMG®) launched in 2016 through a first-of-its-kind partnership between a medical school, large healthcare system, and community organization to comprehensively integrate physical activity as a primary prevention strategy into their health system. The EIMG® model connects patients referred by their healthcare provider due to diagnosis of a physical inactivity and/or noncommunicable disease to community partners who provide evidence-based physical activity programs as a population health management strategy. The EIMG® program is inclusive of all patients referred and provides an “open door policy” through the YMCA scholarship fund. Through 2019, 210 patients completed the program (>60% graduation rate). Patients receiving usual care by their healthcare provider decreased body weight ($p < 0.001$) and systolic blood pressure ($p = 0.042$). Patients receiving usual care by their healthcare provider who were referred with hypertension decreased body weight ($p = 0.001$), and both systolic and diastolic blood pressure ($p < 0.001$). Graduating patients were highly satisfied with the program and program personnel (>4 on a 5-point Likert scale). Aligning healthcare and community partners to implement a clinic-to-community model for patients with non-communicable disease may be a beneficial population health promotion strategy. Future efforts will be to refine the referral process, scale the model, and continue to inform national health promotion strategies.

1. Introduction

The Centers for Disease Control and Prevention (CDC) reports that 53% of US adults meet the Physical Activity (PA) Guidelines for aerobic PA (i.e. 150 min/week of moderately-intense PA), and 23% meet both aerobic and muscular strengthening recommendations (Centers for Disease Control and Prevention, 2017). PA and structured exercise are well established methods of decreasing chronic disease prevalence through multiple mechanisms including reduction of blood pressure and body weight (Donnelly et al., 2009). Unfortunately, the CDC also reports that global chronic disease deaths from cardiovascular disease (17.9 million) and diabetes mellitus (1.5 million) are linked with physical inactivity (Centers for Disease Control and Prevention, 2021). While strategies to improve PA on a population level are needed, several

reports demonstrate that healthcare providers (HCPs), who potentially have the best opportunity to affect population health, lack training, confidence, time, and reimbursement models to provide appropriate counseling in lifestyle behaviors that include PA (Astin et al., 2008; Rogers et al., 2006; Hébert et al., 2012).

Due to the U.S. and worldwide burden of physical inactivity-related chronic diseases (Lee et al., 2012), the American College of Sports Medicine (ACSM) launched a global initiative in 2007 called Exercise is Medicine® (EIM®) with a goal to demonstrate the importance of PA in the healthcare sector and to assist HCPs in an evidence-based clinical approach to promote PA to their patients (Lobelo et al., 2014). Subsequently, ACSM and Kaiser Permanente convened a consensus meeting in 2015 with a goal of making PA assessment and prescription a medical standard of care (Sallis et al., 2016). Also in 2015, Heath et al. reported

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preliminary data from an EIMG® pilot study linking primary care with community PA support, suggesting the model was successful in its clinical approach to increase PA in a small sample ($n = 18$), and that HCPs demonstrated strong support to promote PA as a standard of care (Heath et al., 2015). Until now, limited evidence beyond Heath et al. exists to demonstrate effectiveness of large scale implementation of the EIMG® prescription and referral model.

In 2016, the University of South Carolina School of Medicine Greenville, Prisma Health, and YMCA of Greenville leveraged a multi-organizational partnership to design and implement a first-of-its-kind, clinic-to-community, PA health promotion model for HCPs. The *Exercise is Medicine Greenville*® model (EIMG®) was created with the goal of achieving a healthier and more physically active patient population in Greenville County, South Carolina (Exercise is Medicine Greenville, 2018; Trilk and Kennedy, 2017). This paper describes in brief the design and implementation of EIMG®, and provides observations for patient referral rates, retention rates, and satisfaction from 2016 to 2019, as well as limited effectiveness observations for associated changes in body weight, systolic and diastolic blood pressure.

2. Methods

The EIMG® model was designed, implemented, launched at Prisma Health in Greenville, SC as a pilot in 2016 with the onboarding of 2 pilot clinics (1 internal medicine and 1 family medicine), and continually refined and scaled to 18 participating clinics (Table 1; 12 primary care and 6 specialty clinics; i.e. cancer survivorship and endocrinology) and considered at maturity (i.e. all components implemented) in 2018–2019. Collection of observational data from patients onboarding and completing the 12-week community PA program was approved by the Prisma Health Institutional Review Board.

2.1. Implementation of EIMG® into Prisma Health, Provider Training and Patient Eligibility

The implementation of EIMG® into Prisma Health clinics included: 1) programming the Physical Activity Vital Sign 2-question prompt, EIMG® best practice alerts, risk assessment, and order sets into the electronic health record (EHR), and 2) training providers and staff on the Clinical Workflow (see below) completion of the 2-question prompt and electronic referral through the EIMG® Referral Team to the community PA centers. Patients receiving usual care for their health conditions (i.e. medication prescription and adherence, counseling on nutrition, exercise, and/or behavior change) by their Prisma Health HCPs (medical doctors, nurse practitioners, physician's associates) are eligible for referral to EIMG® if they are ≥ 18 years of age, physically inactive (<150 min/week of moderate intensity aerobic activity) and/or have a chronic condition (i.e., overweight/obesity, hypertension, type 2 diabetes, stable heart disease) that may be positively impacted by PA.

2.2. EIMG® Clinical Workflow

The EIMG® Clinical Workflow programmed and incorporated into

Table 1
Yearly numbers across the growth of EIMG®.

	2016	2017	2018	2019	Total
Number of New Referring Clinics per Year	3	4	5	6	18
Completed Healthcare Provider Referrals to EIMG® program (# of patients)	91	156	361	365	973
Referrals to Community Facility	71	105	280	261	717
Enrolled in Exercise Training	31	38	154	124	347
Graduated	15	24	94	77	210
Dropped After Enrolled	16	14	60	47	137

the EHR includes three standard modules: 1) PA assessment, 2) PA prescription, and 3) patient referral to a participating community PA center through a referral team.

2.2.1. PA Assessment

The nurse who rooms the patient captures the patient's current PA behavior via a 2-question EHR prompt ("how many minutes per day do you exercise?" and "how many days/weeks?").

2.2.2. PA Prescription

The HCP informs eligible patients about the EIMG® program, reviews risks, and provides basic PA and health education through the EIMG® Rx for Health handouts for exercising with chronic disease, developed by ACSM experts (American College of Sports Medicine, 2021).

2.2.3. Patient Referral

Through a series of EHR prompts confirming patient eligibility and risks (e.g. ineligible if uncontrolled hypertension or diabetes; increased fall risk), the HCP sends an electronic referral to the EIMG® Referral Team. The patient must sign the EIMG® Consent to Treat and Release of Information in order to continue.

2.3. EIMG® Referral Team

The "EIMG® Referral Team" (i.e. EIMG® Referral Coordinator and EIMG® Registered Nurse Care Coordinator) receives the referral (electronically sent through the EHR) from the participating health clinic. Then team then reviews the referred patient's EHR, contacts them, confirms eligibility and interest, and identifies the patient's preferred location. Since EIMG® guarantees an "open door policy" through the YMCA scholarship, the team also then determines the economic stability of the patient and whether the patient needs financial assistance. If the latter, the EIMG® Referral Coordinator connects the patient with YMCA financial assistant personnel to receive a scholarship, as the mission of the partnering YMCA is "no one is turned away for their inability to pay." Next, the EIMG® Referral Team electronically sends all HIPAA-compliant patient information (a subset of medical information that a patient must consent to sharing because it is deemed to be sensitive and private by the Health Insurance Portability and Accountability Act of 1996) (Centers for Disease Control and Prevention, 2018) to the corresponding EIMG® Site Coordinator at the selected community PA center. Four distinct components are designed to ultimately engage patients in an evidence-informed PA program: 1) EIMG® Community PA Centers, 2) EIMG® Community PA Center Site Coordinators, 3) EIMG® Professionals (EIMG® Pros), and 4) the evidence-based EIMG® PA Program.

2.4. EIMG® Community PA Centers

The EIMG® community PA centers include 1 Prisma Health medical fitness facility and 5 YMCA sites across Greenville County, with a reach of 213 miles². Upon joining the EIMG® network, all associated administration and staff underwent standardized EIMG® training.

2.5. EIMG® Community PA Center Site Coordinators

Upon receiving a patient referral, the EIMG® Site Coordinator contacts the patient, reviews logistic needs, and schedules the patient for onboarding with an EIMG® Professional (Pro). The EIMG® Site Coordinator also is responsible for HIPAA-related patient protection, implementing EIMG® Advisory Board-approved protocols, oversight of EIMG® Pros, and audit reporting.

2.6. EIMG® Professionals

The (EIMG® Pros) are employees of the community PA centers, are required to have a bachelor's degree in exercise science or health-related field, possess a NCCA-accredited personal training certification (National Commission for Certifying Agencies, 2021), and acquire the national ACSM EIMG® Credential. To enhance quality assurance in the Greenville program, additional EIMG® specific certification includes: learning the 12-week evidence-based PA program, HIPAA, Protection of Human Subjects for Research, policies and procedures, and REDCap™ database entry.

2.7. Patient Onboarding

Patient onboarding with the assigned EIMG® Pro includes completing: 1) appropriate membership paperwork, 2) pre-participation surveys (PHQ-9, PROMIS Scale), and 3) measurement for height, body weight, resting blood pressure, and resting heart rate. The assessment measurements and surveys are also completed at the end of the 12-week program. A rolling enrolment feature allows patients to onboard in <10 business days from referral to maximize readiness for behavior change.

2.8. Closing the Loop – Interfacing Back to Prisma Health

All pertinent patient activity (e.g. session completion, contraindications to exercise notifications, graduation, or discontinuation from the program), is documented by the EIMG® Pros and sent through secure fax to the EIMG® Referral Team. The EIMG® Referral Team then provides the patient's summary to the HCP through the EHR (Fig. 1).

2.9. Overview of the 12-week EIMG® PA Training Program

The EIMG® exercise training program provides a small group-level (≤ 7 patients/ group), 12-week (60-minute sessions, 2 sessions/week), exercise protocol conducted by certified EIMG® Pros. The EIMG® program was created using evidence-based research and ACSM Position Stands around meeting national PA guidelines of 150 min/week of moderate intensity aerobic exercise and 2–3 days of resistance training. (American College of Sports Medicine, 2021) The training sessions are guided by the social-cognitive theory following the principles that training is progressive, includes full body movements, and provides active education incorporated into training. Each exercise training session includes a cardiometabolic (aerobic training) component and a full-body musculoskeletal (resistance training) component. While extremely deconditioned patients start the exercise training program with as little as 5 min of aerobic exercise/session, the goal is for patients to progress through the 12 weeks to > 50 min/session of moderate-to-vigorous intensity exercise by graduation.

Consistent with similar successful adaptive and flexible interventions (Haynes et al., 2015; Howie et al., 2014; Saunders, 2015; Saunders et al., 2013; Patton et al., 2003), EIMG® Pros are permitted to deliver the exercise sessions (using essential and recommended “building blocks,”

Fig. 2) to patients based on their individual strengths, their unique class population, and opportunities/limitations within their specific facility setting (i.e., equipment, space, and scheduling). Additionally, to enhance behavior change, patients are provided EIMG® Patient Education Handouts that teach them about adopting a healthy lifestyle (i.e., PA, diet and nutrition, stress management, goal setting, and social support) (Appendix). All PA program sessions, patient progress, and pre-post metrics are tracked using REDCap™ (Research Electronic Data Capture), a cloud-based, HIPAA-compliant software program.

2.10. Observations of Referred Patients

Observation metrics regarding patients: 1) referred to the program by their HCP, 2) referred to community facility, 3) enrolled in exercise training, and 4) graduated from the program by completing at least 80% of exercise sessions were collected.

2.11. Exit Survey

Beginning March 2017, an exit survey was introduced to patients after completing the EIMG® exercise training program. The survey included multiple questions addressing the satisfaction with the EIMG® program, HCP, EIMG® Coordinator, and EIMG® Pro, as well as demographic information.

2.12. Revenue vs. Scholarship Reporting

The cost to participate in the EIMG® 12-week exercise program is \$249 to cover the operating cost of the facilities. However, patients with challenged economic stability who are eligible to participate in the program are offered a scholarship through the YMCA at one of the YMCA facilities. Amount of scholarship used, and revenue gained for each year were documented to demonstrate the financial support provided to patients with challenged economic stability, as well as the growth and sustainability of the program for patients who are financially stable to pay.

2.13. Biometric Measurements

Patients receiving usual care by their HCP who were referred into EIMG® had additional biometric data collection performed (body weight, blood pressure, and resting heart rate) at the orientation visit and on the last visit (i.e. program completion). Weight was collected in duplicate while the patient was not wearing shoes utilizing a calibrated digital scale. Blood pressure and resting heart rate were measured in triplicate with the patient in a resting state (seated in a relaxed position; chair with a backrest and feet flat on the floor; minimum of 10 min) utilizing an automated brachial blood pressure cuff (Omron blood pressure 652; Omron Healthcare, Kyoto, Japan).

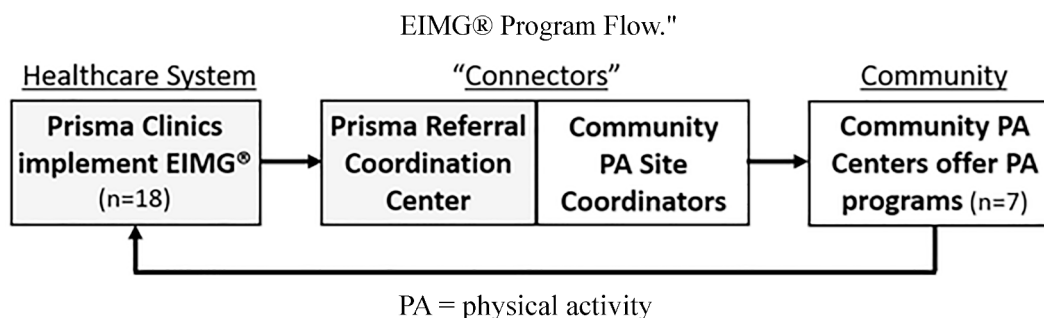


Fig. 1. EIMG® Program Flow. PA = physical activity.

EIMG® Program Building Blocks.

ESSENTIAL BUILDING BLOCKS	RECOMMENDED BUILDING BLOCKS
Aerobic Exercise (Build Stamina)	Enjoyable Classes (Build Fun)
Resistance Training (Build Strength)	Demonstration (Build by Example)
Active Education (Build Learning)	Recommend PA Outside of Class (Build Independence)
Lifestyle Change (Build Commitment)	Social Environment (Build Connection)
Mobility & Stability	Mindfulness (Build Focus)

PA = physical activity

Fig. 2. EIMG® Program Building Blocks. PA = physical activity.

2.14. Statistical Analysis

All observational data were analyzed using IBM SPSS Statistics Version 26 (Armonk, New York). Patient uptake and retention in the program were determined by frequencies. The exit survey questions answered on a 1–5 Likert scale were averaged and reported as mean scores. A single group pre-test, post-test experimental design was used to determine changes in biometrics of all referred patients (inclusion of all eligible patients was warranted as it is deemed unethical to withhold patients from programs expected to improve their chronic disease status), and a paired sample *t*-test was utilized to determine statistically significant changes ($p < 0.05$).

3. Results

From August 2016 – December 2019, EIMG® expanded from 2 to 18 Prisma Health practices (Table 1) and 6 community PA centers across Greenville County. Since 2016, participating clinics correctly referred (i. e. eligible patients with all referral components completed) 973 patients to the EIMG® Referral Team (Table 1). Out of those patients, 347 patients (36%) chose to enroll in the 12-week PA program. Patients graduated at a rate of 48% ($n = 15$) in 2016, 63% ($n = 24$) in 2017, 68% ($n = 94$) in 2018, and 62% ($n = 77$) in 2019. Graduation for the 2019 enrollees was on track to have a rate of 72%, but the program was paused for 15 patients in early March 2020 due to the COVID-19 pandemic shutdowns. Across the program development timeline of 2016–2019, 210 (61%) of the enrolled patients graduated from the program by attending at least 80% of the training sessions (Table 1). As the program has matured, both correct referrals and enrollment

increased each year as expected since the number of EIMG®-referring clinics increased.

3.1. Exit Survey

One hundred seventy EIMG® graduates have completed the survey since its addition in March 2017. All components of the program and personnel (providers, project coordinator, and EIMG® Pros) received high satisfaction scores (Likert scale 1–5, with 5 rating “highly satisfied” Table 2). All HCP scores were above 4.75. EIMG® Program Coordinator and EIMG® Pro satisfaction scores were above 4.9 (Table 2). Two patients provided testimonials for an informational video posted on the program website, and others have provided written testimonials to ACSM for promotion of the world-wide EIM initiative.

3.2. Revenue vs. Scholarship Reporting

Scholarship provided to and revenue generated from EIMG® from 2016 to 2019 demonstrate that as the program grew, the percentage of patients who received scholarship as well as patients who paid also increased (Table 3).

3.3. Biometric Measurements

Patients receiving usual care by their HCP for their health conditions, and who were also referred to EIMG® were followed throughout the program. Table 4 represents patients who: 1) enrolled from 2016 to 2019 (Table 4A); 2) completed the program; and 3) completed pre- and post-program measurements. Data in Table 4B are from years

Table 2
Frequencies: patient exit survey answers (N = 170).

Did the EIMG® program help you improve any of the following skills or abilities?						
	1 = No help at all	2	3 = Neutral	4	5 = Very helpful	Average
Understanding the importance of regular physical activity/exercise	0	0	3	17	147	4.86
Overcoming barriers to physical activity/exercise	0	0	3	35	131	4.76
Increasing the frequency and duration of my physical activity/exercise sessions	0	0	2	24	143	4.83
The ease of keeping a record of my physical activity/exercise sessions	0	2	7	29	129	4.71
Making friends who are physically active	3	5	38	26	97	4.24
How much do you agree with the following statements about the EIMG® program?						
	1 = Strongly disagree	2	3 = Neutral	4	5 = Strongly agree	Average
I would recommend EIMG® to other family, friends, co-workers	1	0	0	6	162	4.94
EIMG® has had a positive impact on my physical activity/exercise habits	1	0	1	14	152	4.88
I made lasting friends in the EIMG® program	5	9	50	25	76	3.96
Physical activity/exercise will become a routine part of my lifestyle	0	1	6	41	121	4.67
I feel better now than I did at the start of the program	1	0	2	18	145	4.84
Please answer the following about the EIMG® Coordinator.						
	1 = Strongly disagree	2	3 = Neutral	4	5 = Strongly Agree	Average
Was helpful	0	0	3	11	154	4.90
Was friendly	0	0	2	9	157	4.92
Answered all my questions	0	0	2	10	155	4.92
Was prompt with communication	0	0	3	8	156	4.92
Worked with me to find the best facility to meet my needs	0	0	3	6	156	4.93
Please answer the following about your EIMG® Fitness Professional.						
	1 = Strongly disagree	2	3 = Neutral	4	5 = Strongly Agree	Average
Was enthusiastic about EIMG®	0	0	0	7	163	4.96
Was always on time	0	0	1	10	122	4.91
Made me feel welcome	0	0	1	2	167	4.98
Made the exercise sessions fun	0	0	0	10	159	4.94
Listens to my concerns	0	0	0	4	166	4.98
Cares about me	0	0	1	5	162	4.96
Is open minded	0	0	1	6	163	4.95

Table 2 (continued)

Did the EIMG® program help you improve any of the following skills or abilities?						
	1 = Strongly disagree	2	3 = Neutral	4	5 = Strongly Agree	Average
Pays close attention to what I say	0	0	0	6	164	4.96
I trust my fitness professional	0	0	0	8	161	4.95
I like my fitness professional	0	0	0	2	168	4.99
I feel comfortable asking my fitness professional questions	0	0	0	3	167	4.98
I understand my fitness professional's suggestions and explanations	0	0	0	4	163	4.98
Please tell us how much you agree with the following statements about your healthcare provider						
	1 = Strongly disagree	2	3 = Neutral	4	5 = Strongly Agree	Average
Encouraged me to take part in the EIMG® program	1	0	6	15	147	4.82
Is open minded	1	0	7	18	143	4.79
Listens to my concerns	1	1	4	19	144	4.80
Pays close attention to what I say	1	0	5	24	139	4.78
Cares about me	1	0	5	24	137	4.77
I like my healthcare provider	1	0	5	20	143	4.80
I trust my healthcare provider	1	0	5	22	140	4.79
I do not feel judged by my healthcare provider	1	1	6	18	142	4.78
I feel comfortable asking my healthcare provider questions	1	3	2	17	146	4.80
I understand my healthcare provider's suggestions and explanations	1	0	3	21	144	4.82

Not all patients answered every survey question.

Table 3
EIMG® Annual Scholarship and Revenue.

Total Amount of Scholarship Provided	Amount	% Increase by Year
January 1 – December 31, 2019	\$10,240	28%
January 1 – December 31, 2018	\$7,983	116%
January 1 – December 31, 2017	\$3,686	140%
August 1 – December 31, 2016	\$1,537	
Total Amount of Non-Scholarship Revenue		
January 1 – December 31, 2019	\$21,648	275%
January 1 – December 31, 2018	\$5,771	222%
January 1 – December 31, 2017	\$1,791	125%
August 1 – December 31, 2016	\$796	

2018–2019 when the program was considered at maturity. While a total of 196 patients from 2016 to 2019 (those with hypertension n = 122; non-hypertension n = 74) met the above conditions, some patients had missing data points.

3.3.1. 2016–2019

Although outcomes cannot be determined as causal per se, adding EIMG® program participation to usual care was associated with a modest but statistically significant decrease in body weight and systolic blood pressure, with no significant decrease in resting heart rate or

Table 4

Biometric measurements of EIMG® patients: 4A are data from 2016 to 2019; 4B are data from 2018 to 2019.

A. 2016–2019 Patients Referred Who Completed Program and Post Measurements						
	N	Pre-intervention	Post-intervention	Change	% Change	P-value
Body Weight (kg)	196	102.5 ± 28.0	100.9 ± 27.3	-1.6 ± 4.4	1.5	<0.001*
Resting Heart Rate (bpm)	194	76 ± 11	76 ± 11	0 ± 10	0.0	0.916
Systolic Blood Pressure (mmHg)	184	128 ± 16	126 ± 13	-2 ± 15	1.6	0.042*
Diastolic Blood Pressure (mmHg)	184	81 ± 11	80 ± 10	-1 ± 9	1.2	0.137
2016–2019 HTN Patients Referred Who Completed Program and Post Measurements						
	N	Pre-intervention	Post-intervention	Change	% Change	P-value
Body Weight (kg)	122	105.4 ± 27.7	104.0 ± 26.8	-1.4 ± 4.4	1.3	0.001*
Resting Heart Rate (bpm)	120	77 ± 12	77 ± 10	0 ± 9	0.0	0.572
Systolic Blood Pressure (mmHg)	116	136 ± 14	129 ± 12	-7 ± 15	5.1	<0.001*
Diastolic Blood Pressure (mmHg)	116	86 ± 9	83 ± 9	-3 ± 8	3.5	<0.001*
B. 2018–2019 Patients Referred Who Completed Program and Post Measurements						
	N	Pre-intervention	Post-intervention	Change	% Change	P-value
Body Weight (kg)	159	100.2 ± 26.9	98.2 ± 26.0	-2.0 ± 4.6	2.0	<0.001*
Resting Heart Rate (bpm)	157	76 ± 10	75 ± 11	-1 ± 10	1.3	0.909
Systolic Blood Pressure (mmHg)	148	128 ± 16	126 ± 13	-2 ± 15	1.6	0.069
Diastolic Blood Pressure (mmHg)	148	81 ± 10	80 ± 10	-1 ± 9	1.2	0.160
2018–2019 HTN Patients Referred Who Completed Program and Post Measurements						
	N	Pre-intervention	Post-intervention	Change	% Change	P-value
Body Weight (kg)	100	103.1 ± 27.2	101.3 ± 26.2	-1.8 ± 4.6	1.7	<0.001*
Resting Heart Rate (bpm)	98	77 ± 11	76 ± 10	-1 ± 9	1.3	0.500
Systolic Blood Pressure (mmHg)	95	136 ± 14	129 ± 12	-7 ± 14	5.1	<0.001*
Diastolic Blood Pressure (mmHg)	95	86 ± 9	82 ± 9	-4 ± 8	4.7	<0.001*

* p < 0.05; N = number of patients; % = percent; kg = kilograms; bpm = beats/minute; mmHg = millimeters of mercury.

diastolic blood pressure. Adding EIMG® program participation to usual care for patients with hypertension at time of referral was associated with a loss in body weight and decreased systolic and diastolic blood pressure, with no significant change in resting heart rate.

3.3.2. 2018–2019

Adding EIMG® program participation to usual care (N = 159; n = 100 patients with hypertension n = 59 non-hypertension) was associated with a significant decrease in body weight, with no significant decrease in resting heart rate, systolic blood pressure, or diastolic blood pressure. Adding EIMG® program participation to usual care for patients with hypertension at time of referral (n = 100) was associated with a statistically significant loss in body weight and reduced systolic and diastolic blood pressure, with no statistically significant change in resting heart rate.

4. Discussion

The purpose of this paper was to describe the design and implementation of a PA health promotion model for HCPs and that informs on a larger scale, building off of the preliminary data observed by Heath et al. (Heath et al., 2015). Observational data for program-related changes in body weight, systolic and diastolic blood pressure, as well as patient retention rates and satisfaction from 2016 to 2019 demonstrate promising results for this health promotion model. Further evaluation of implementation facilitation is needed at the clinic level to improve HCP referral conversion rates of onboarding of patients to the community portion of the model. While the conversion of HCP referrals to program onboarding needs improvement, patient completion rates were above expected. The program experienced a 48% retention rate (% of enrolled patients who graduated) in the first year of implementation (August 2016 – February 2017), a sustained rate above 60% was realized over the last 34 months (March 2017 – December 2019). Though attrition in exercise intervention studies varies greatly, EIMG® model retention is consistent with other studies (Linke et al., 2011; Chinn et al., 1999). Similar to reports by Heath et al., that demonstrates HCP and fitness professional satisfaction of this model (Heath et al., 2015), observations of the EIMG® model demonstrate patient satisfaction of the overall and individual components of the program. Based on the EIMG® program exit survey, patients have a high level of trust in their HCP, were highly satisfied with the program coordinator and developed a

relationship of trust and confidence with the EIMG® Pros. The acceptable retention rates and high satisfaction are good indicators of the potential that the EIMG® clinic-to-community model has in aiding patients at-risk of noncommunicable disease to develop lifestyle behavior change.

Adding EIMG® program participation to HCP usual care for patients diagnosed with physical inactivity and/or noncommunicable disease was associated with blood pressure and body weight changes that may benefit patients in reducing co-morbid noncommunicable disease risk. These results are consistent with Baghaiee et al. in a 12-week moderate intensity exercise intervention for men with primary hypertension in which the exercise group had significant weight loss and decrease in systolic and diastolic blood pressure (Baghaiee et al., 2018). Hypertension is both a risk factor for, and direct cause of some noncommunicable diseases (Sharman et al., 2015). In the current observations, the group of patients who entered the program with elevated blood pressure realized an average systolic blood pressure reduction that was enough to change the systolic blood pressure categorization from stage 1 hypertension (130–139 mmHg) to elevated blood pressure (120–129 mmHg) (Whelton et al., 2018). The increased PA due to participation in the program and resulting lower blood pressure in patients receiving both usual care and participating in EIMG® may lead to changes in the structural, functional, and biochemical characteristics of the cardiovascular system, thereby potentially decreasing CVD associated risk (Cornelissen et al., 2013).

The partnership with the YMCA as a community PA facility brings a unique aspect to this model, by ensuring that there is no financial barrier to patient entry, as the mission of the partner YMCA is “no one is turned away for their inability to pay.” In addition, to assist the patient in maintaining the PA behavior change after graduation, the YMCA of Greenville offers the patient a membership at the same discounted rate following program completion. Due to the COVID pandemic and subsequent shut-down of YMCA facilities and EIMG®, it was not possible to fully predict how many patients converted and stayed with membership after graduating from EIMG®. However, as EIMG® was relaunched in March of 2021, next-step observations will be made to determine whether patients will convert to a YMCA membership after EIMG®.

The goal of the reporting of the design and implementation of EIMG® is to demonstrate an effective clinic-to-community model that provides HCPs with a method to 1) prescribe exercise to at-risk patients and catalyze patients to optimally achieve long-term lifestyle behavior

change reflective of low noncommunicable disease risk, and 2) realize the health outcomes of a structured PA program. At follow-up clinical visits, this model also provides the HCP with tools to track and address PA prescription compliance with the patient (Sallis et al., 2016). While the next step in model implementation evaluation will be to determine if patient behavior change maintains beyond graduation, the observed outcomes of patient uptake, retention rates, graduates' satisfaction, and biometric measurements demonstrate an effective program implementation required to lay the foundation for long-term program success.

While observations of the EIMG® model greatly adds to the understanding of how a large-scale, clinic-to-community model may beneficially facilitate population-level behavior change, interpretation of these observations is not without limitation. Since EIMG® is not a research study, but a program offered to all qualified patients at participating healthcare facilities, a randomized control research design was neither possible nor ethical. Observation of changes in body weights and blood pressures in patients participating in EIMG® in addition to receiving usual care cannot be attributed to the program alone; however, engagement in multiple behavior change strategies clearly improves health. In addition, as the patients ranked the EIMG® program extremely high in satisfaction, the program may substantially attribute to behavior change and subsequent health improvements.

Next steps are to: 1) conduct an implementation evaluation on the clinical workflow with a goal of improving conversion rate to onboarding; and 2) expand our understanding of program benefits through capturing additional biometrics related to patients' chronic conditions. Follow-up with patients every 3 months for the year following EIMG® graduation will also allow us to determine if the program is attaining the long-term goal of lifestyle behavior change.

5. Conclusion

Observational outcomes of EIMG® suggest that aligning healthcare and community partners to implement a clinic-to-community model may be beneficial for implementing PA as a core prevention strategy in a U.S.-based health system in assisting patients with/at-risk for non-communicable disease to slow, stop and potentially reverse their risk of future disease. In addition, patients who interface with HCPs, program coordinator, and EIMG® Pros as a continuum may have greater success due to satisfaction with a clinic-to-community model. Cardiovascular benefit may occur by adding PA to usual care for patients referred with hypertension by decreasing systolic and diastolic blood pressure. This information may help inform future implementation strategies using a clinic-to-community PA health promotion model for HCPs.

CRedit authorship contribution statement

Ryan R. Porter: Formal analysis, Writing – original draft, Writing – review & editing. **Patton McClelland:** Writing – original draft, Writing – review & editing. **Alex Ewing:** Formal analysis, Writing – review & editing. **Victoria Sonka:** Investigation, Project administration. **Jennifer L. Trilk:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Supervision, Project administration.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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