

The Potential of Optometrists Referring Older Patients to Community-Based Exercise Programs:
Findings from a Mixed-Methods Study

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Abstract

Exercise is important for older adults in order to prevent falls and live safer, healthier lives. Visual impairment is a fall risk factor. Older adults tend to visit optometrists frequently; however, assessing patients' physical exercise levels is not a routine practice for optometrists. The purpose of this study was to examine the potential for optometrists' referrals to exercise programs. This study used a mixed-method, cross-sectional design. In focus groups, optometry patients ($N = 42$) discussed the acceptability of an optometrist's prescription to exercise programs. The vast majority of optometry patients (90%) indicated that they would follow such a prescription for exercise from their optometrist. Texas optometrists ($N = 268$) were surveyed about the potential for exercise program prescriptions, and 97% indicated a willingness to prescribe exercise programs to their patients. Results suggest that there is an opportunity for community-clinical partnerships to prevent falls and improve the health of older patients.

Keywords: community-clinical partnerships, community-based exercise programs, focus groups, prescription, surveys, visual impairment

Introduction

The number of older adults (aged 65 and older) relative to other segments of the population in the United States and across the world is rapidly increasing (Oswley, 2010). Older adults face a high risk of falling (Winter, Watt, & Peel, 2013). In fact, one in four older adults falls every year (Stevens, Ballesteros, Mack, Rudd, Decaro, & Adler, 2012). Unintentional falls constituted the highest number of non-fatal injuries among older adults who were treated or hospitalized in 2015 (Centers for Disease Control and Prevention (CDC), 2018) and more than 95% of fractures (Hayes et al., 1993) and traumatic brain injuries (Jager et al., 2000) are caused by falls. Once an older adult falls, the chances of another fall doubles (O'Loughlin, Robitaille, Boivin, & Suissa, 1993). Older adults report a fear of falling (CDC, 2018) and become less active and weaker as a result of this fear (Vellas, Wayne, Romero, Baumgartner, & Garry, 1997). Thus, fall prevention is a public health issue not only because of the risk of falls, but also risk of injury (Rubenstein, 2006).

Visual impairment is one of the factors associated with the risk of falling for older adults (CDC, 2017). As the aging population increases, visual impairment is a serious societal and public health problem because the increased prevalence of visual impairments and eye diseases among older adults affects their level of physical activity (Willis, Jefferys, Vitale, & Ramulu, 2012) and quality of life (Brown & Barrett, 2011; CDC, 2011; Owsley, 2011). Visual impairment affected 2.9 million adults 60 years and older in the United States in 2015, and as the population continues to age due to longevity, this number is estimated to increase to 6.6 million by 2050 (Varma et al., 2016).

Benefits of physical exercise for fall prevention have been extensively studied and documented (Franco et al., 2015; Sherrington et al., 2017). Older adults are more likely to

engage in a community-based program such as an exercise program if a referral is given to them by a health care provider (Leijon, Faskunger, Bendtsen, Festin, & Nilsen, 2011). Inquiries about patients' levels of physical activity and recommendations to exercise by primary care physicians (PCP) are common practices since screening and preventive care are emphasized for Medicare patients (Nicholas & Hall, 2011). However, it may not be a routine practice for eye care providers like optometrists to inquire about their patients' physical activities during their routine annual vision exams. The purpose of this study was to determine the potential for optometrists referring their older patients at risks of falling to community-based exercise programs to promote physical exercise, strengthen their lower body muscles, improve balance, and increase their quality of life.

The Community-Clinical Linkages Model

The CDC published the *Community-clinical linkages for the prevention and control of chronic disease: A practitioner's guide* in 2016. It defines community-clinical linkages as "connections between community and clinical sectors to improve population health" (CDC, 2016, p. 2). It reports that collaboration between clinical (health care provider's offices) and community sectors has produced better care and support for patients than efforts by either sector alone for a variety of outcomes including coronary heart disease, blood pressure (Weinehall, Hellsten, Boman, & Hallmans, 2001), and diabetes (Ingram, Gallegos, & Elenes, 2005), as well as behavioral changes such as nutrition (Holtrop, Dosh, Torres, & Thum, 2008) and smoking cessation (Hollis et al., 2005; Holtrop et al., 2008; Massachusetts Tobacco Cessation and Prevention Program, 2009; Porterfield, Hinnant, Kane, Horne, McAleer, & Roussel, 2012). Of particular significance for this study, one of the areas in which community-linkages improved behavioral outcomes was physical activity, which can be addressed by community and clinical

partnerships (Holtrop et al, 2008; Woolf et al., 2006). This community-clinical linkages model recommends the following steps before launching the community-clinical linkage: (1) engage stakeholders (i.e., optometrists and their patients) from community and clinical settings; and (2) evaluate if both stakeholders can bring together partnerships to agree on goals, activities, and outcomes of the linkage (CDC, 2016). We employed this model's recommendations to guide our inquiry into the potential for referrals to community-based exercise programs.

This study is innovative because instead of PCPs, we examine specialized health care providers, optometrists, as a referral mechanism to reach physically inactive older adults at risk for falls due to their visual impairment. Optometrists are state-licensed health professionals who not only check on the health of eyes and prescribe glasses, but also diagnose and write medication prescriptions to treat many eye diseases (National Conference of State Legislatures, 2019; Texas Optometry Board, 2019). Older adults tend to visit optometrists more frequently than people from other age groups (Wood, Lacherez, Black, Cole, Boon, & Kerr, 2011) due to age-related eye diseases. Optometrists provide more than two-thirds of primary eye care in the United States (American Optometric Association, 2019). Therefore, it is an ideal opportunity for older adult patients and optometrists to discuss a referral to an exercise program.

Method

Guided by the community-clinical linkages model for the prevention and control of chronic diseases (CDC, 2016), the purpose of this study was to evaluate (1) older patients' potential acceptance of a referral to a community-based exercise program by their optometrists, (2) patients' willingness to follow optometrists' referrals to such an exercise program, and (3) optometrists' perceptions of the potential for referring their patients to a community-based exercise program. We chose to examine referrals to community-based, group exercise programs

rather than individualized exercise programs based on evidence suggesting group activities hold multiple appeals for older adults. For example, older adults tend to participate in a group programs (Leijon et al., 2011) not only for the potential benefits of the program, but also for socialization opportunities (Crizzle & Newhouse, 2012; Franco et al., 2015; Kohn, Belza, Petrescu-Prahova, & Miyawaki, 2016).

This formative study used a mixed-methods, cross-sectional design to investigate beliefs, attitudes and behavior among Texas optometrists and older optometry patients in Houston, Texas. As specifically recommended by the community-clinical linkage model (CDC, 2016), we combined quantitative (survey) and qualitative (focus group discussion) data from optometry patients with quantitative (survey) data from optometrists. We used qualitative data to gain more in-depth opinions of optometry patients, and that allowed us to understand further nuances that we were unable to obtain from the quantitative survey data. The study was approved by the university's institutional review board.

Sample and Recruitment – Optometry Patients

The inclusion criteria for optometry patient participants was being a patient currently being seen by an optometrist, age 62 years or older, able to read and understand English, and living in the community independently regardless of using assistive devices such as a cane and/or walker for daily walking. We chose age 62 because this is the age that a person can start receiving retirement benefits in the United States (United States Social Security Administration, 2019). The exclusion criteria were being blind (defined as best-corrected visual acuity of 20/200 or less or a visual field of less than 20 degrees in the better-seeing eye or having a diagnosis of unstable cardiac disease). We excluded blind people because not all optometrists work with patients who are blind, and most likely would refer their significantly visually impaired or blind

patients to a specialty optometrist or other medical or blind rehabilitation services for care (The American Foundation for the Blind, 2019). Exercise instructors may not have sufficient trainings to work with blind people. Furthermore, blind people may have different levels of willingness to attend a community-based exercise program than those without blindness based on concerns that the program would not accommodate them well. We did not want to confound the focus group results by mixing a sample of sighted and blind older adults.

To recruit participants, we first posted study flyers within (*blinded for review*)'s College of Optometry. Flyers were available in exam rooms and were offered to patients with an explanation of the study when the criteria for age and visual impairment were met. In addition, the Principal Investigator (PI) and the Research Assistant (RA) contacted key persons at local community organizations, as well as senior social service agencies where many seniors gather for activities such as book clubs and volunteer works. Because these key personnel knew their participants well, they contacted potential participants individually and provided us a list of their names and contact phone numbers upon permission from the potential participants. The RA conducted telephone screenings of all potential participants to make sure that their eligibilities were met and they were available to attend the focus group at a designated date, time, and location. To reflect the diversity of Houston populations, we recruited participants from different racial/ethnic groups, socioeconomic status, residential locations, and residential types (i.e., own homes, senior housing) within the greater Houston area.

A total of 50 patient participants expressed interest in the study, and based on the participants' residential locations and availability, we formed five focus groups. One participant was found to be ineligible, and one could not be reached at the number provided; therefore, the final number of registered participants was 48. All were informed of a date, time and location of

their focus group meetings, agreed to, and confirmed their participation. On the days of focus group discussions, due to illnesses (three participants), unable to secure transportation (one participant), and no shows (two participants), the final count of focus group participants was 42 (Group 1, $n = 4$; Group 2, $n = 12$; Group 3, $n = 11$; Group 4, $n = 12$; Group 5, $n = 3$).

Measurements and Data Collection – Optometry Patients

Optometry patient survey. The survey questionnaire consisted of 14 questions about the participant's demographic information, reasons for visits to optometrists, current physical activity level, factors affecting participation in physical exercise programs, and falls and fear of falls. The survey was developed drawing on health care and exercise literature in older adults (Lee, Gómez-Marín, Lam, Zheng, & Caban, 2005; Winter et al., 2013) and question items from validated fall assessment survey instruments (Lachman, Howland, Tennstedt, Jette, Assmann, & Peterson, 1998; Rubenstein et al., 2011; Velozo & Peterson, 2001), and a related health care survey (Lorig, Stewart, Ritter, González, Laurent, & Lynch, 1998). The survey was piloted on two older adults who were within the target age group and were currently under the care of an optometrist. No content was revised; however, some adjustments to font sizes and spacing between the lines were made for easier reading for the participants.

Optometry patient focus group interview guide (Appendix 1). The focus group discussion question guide was developed by the PI and reviewed by the co-author (CC) and was piloted with the same two individuals who piloted on the in-person survey questionnaires. Revisions to the guide were made based on the pilot. It was based on the focus group in-person survey questions as well as additional, more in-depth questions in order to gain further opinions and more subtle nuances of the participants' feelings and attributes. The interview guide included questions on falls and fear of falls, frequency of participants' visits to their optometrists, under

what conditions participants would accept a referral to a community-based exercise program, acceptability of optometrists' prescription for an exercise program, reasons for following or not following a referral, and facilitators and barriers for participants to go to exercise programs. Some examples of more in-depth questions included, "What would it take to change your answer to a c [likely] or d [very likely] level?," "What would it take to increase your likelihood of going?," "For those of you who would go to an exercise program because your eye care provider 'prescribed' you to go, tell us why you would go?," "For those of you who would NOT go to an exercise program because your eye care provider 'prescribed' you to go, tell us why you would not go?," "What are the differences between your eye care provider and physician's prescriptions?," and "How could an eye care provider follow up with you regarding their prescription for you to participate in an exercise program?"

Five focus group discussions were held at five different locations at different days/times. The lengths of discussion were from 44 to 58 minutes (Group 1 = 44 minutes; Group 2 = 56; Group 3 = 50; Group 4 = 50; Group 5 = 58). At the beginning of the focus group discussions, a written consent was obtained from all the participants. First, each participant was asked to complete an in-person survey. After filling out the survey form, the RA facilitated the first focus group, and the PI facilitated the rest of the four focus group discussions. Upon agreement from all the participants, focus group discussions were audio-recorded. A \$30 gift card was provided to participants as an appreciation for participation upon completion of the discussion.

Sample and Recruitment – Optometrists

To recruit optometrists, the PI contacted the Executive Director of the Texas Optometry Board and requested a publicly available list of all the members' contact addresses. All optometrists in the State of Texas must be licensed by the Texas Optometry Board as this is the

only state agency commissioned to do so. Thus, this was the most expedient means of gaining the list for all optometrist practicing in Texas. The list included the addresses of over 5,000 optometrists who were licensed to practice in Texas. The inclusion criteria were optometrists who were licensed by the State of Texas Optometry Board and had a listed office or home address at the time of data collection. We excluded those who were listed as “inactive” members. The PI randomly selected 1,500 optometrists who were practicing in Texas from the list, and mailed out a packet, which included the study consent form, study survey and \$1 bill with a postage-paid return envelope. A total of 268 completed surveys was collected between November 2017 and May 2018. Forty-eight packets were returned due to invalid addresses, four unanswered surveys were returned due to their retired status, and two unfilled surveys were returned because the optometrists declined to participate. We randomly selected additional 48 optometrist addresses from the list to replace the 48 with invalid addresses and mailed survey packets to them. The final survey return rate was 18%.

Measurements and Data Collection – Optometrists

Optometrist survey. The survey consisted of 10 questions inquiring about the optometrists’ demographic information, number of patients, percentage of older adult patients, fall risk assessment, any referral experience to community-based programs, ideas of prescription of exercise programs, and years of practice. The survey included multiple choice and open-ended questions. The PI developed the survey based on the health care literature and previously published instruments that were not necessarily created for eye care but were created for health care providers. Considering the limited time that optometrists may have had to fill out a survey, we developed a one-page survey that could easily be answered within a short amount of time but included all the necessary questions to obtain our target responses. The survey was reviewed by

the optometrist co-author (CC), some word changes were made to improve clarity, and the survey was re-formatted to fit to one-page with a regular size font. This survey was piloted with two optometrists who were in the same university clinic and timed.

Data Analysis

Results of all the survey data (i.e., focus group in-person survey and optometrist survey) were entered into SPSS.v19. For the open ended questions, we shortened the answers to 2-3 words and then recoded the responses to categorical values in order for SPSS to be able to read them. We ran descriptive statistics (e.g. frequencies, means and standard deviations, proportions) and analyzed the data using SPSS.v19.

For the focus group discussions, we conducted a qualitative thematic analysis of transcripts of the recorded data. All the digital recordings were professionally transcribed verbatim and the transcripts were entered into the qualitative data software package, ATLAS.tiv8. All the transcripts were double-coded by the PI and RA separately. First, a list of initial codes was created based on *a priori* themes from the interview guide such as (1) knowledge about falls and exercise; (2) relationship with optometrists; (3) optometrists' prescription; (4) important factors for attendance to the exercise program; (5) type of exercise class and facility; and (6) meaning of optometrists' prescription and follow-up methods of prescription. Following, a more in-depth, deductive content analysis (Elo & Kyngäs, 2007; Hsieh & Shannon, 2005) was conducted by the PI and RA on one transcript separately, and a few new subthemes were identified during axial coding. Those subthemes were rather situational reflections that contained similarities and differences between as well as within focus groups and participants. Some examples of these situational perspectives included social aspect of group exercise, insurance coverage, adherence to the program, reasons for following or not following

optometrists' prescriptions, difference between MD and optometrists, and communication between MD and optometrists. These subthemes were compared and repeatedly redefined between the PI and RA. Some subthemes were grouped together and created as one new code, but some were identified as different and thus, created new codes. To improve and maintain analytic rigor and reduce interpretation biases (Charmaz, 2006; Lincoln & Guba, 1985), the PI and RA continued the same procedures, doubled-coded the rest of the transcripts separately, and discussed any coding discrepancies until reconciled.

Results

Optometry Patients' Characteristics

Table 1 shows the characteristics of the optometry patients. Participants were between 62 and 92 years old ($M = 75.1$; $SD = 7.9$), married or widowed (36% each), high-school educated (48%), female (74%), and from various racial/ethnic groups (White: 41%, Black: 36%; Hispanic: 19%). They reported to be in relatively good health as the vast majority of them (76.2%) considered their health in an excellent, very good or good condition.

In regards to the optometry patients' physical conditions, many of them visited their optometrists because of their current vision issues and for visual devices such as glasses, contact lens, and magnifiers. They reported that their current vision affected various aspects of their functioning including reading, driving, balance, and fear of falls. The majority exercised on a regular basis by stretching/strengthening exercise and/or walking. About a half of the participants were not concerned about falling and the majority did not restrict their activities due to fear of falls. However, one-third of them were worried about falling because they had experienced feeling unsteady or had been advised to use assisted devices such as a cane or walker.

Table 1. Focus Group Sample Characteristics and Selected Responses from Survey ($N = 42$)

	<i>M</i>	<i>SD</i>
Age in years (62-92)	75.1	7.9
	<i>n</i>	
Female	31	
Race/ethnicity		
White	17	
Black	15	
Hispanic	8	
Other	2	
Marital status		
Married/partnered	15	
Single/never married/divorced/separated	12	
Widowed	15	
Education		
High school diploma	20	
2-year college	5	
College degree	10	
Graduate degree	7	
Self-reported health status		
Poor	2	
Fair	8	
Good	18	
Very good	10	
Excellent	4	
Survey items (yes responses)		
Knowledge of falls and exercise		
Have fallen to the ground	24	
Exercise is good for our health	42	
Exercise can reduce the possibility of falls	42	
Falling is related to your vision	40	
Relationship with eye care provider		
Do you see optometrist?	32	
Do you see ophthalmologist?	25	
How often do you see him/her? Once a year	17	
How often do you see him/her? Twice a year	9	
How long have you known your eye care provider (ECP)? 3-10 years	25	
Do you trust your ECP?	42	
ECP's prescription		
If your ECP prescribed a medication, do you buy?	41	
If your physician prescribed an exercise program, would you go?	38	
If your ECP prescribed an exercise program, would you go?	38	
Important factors for attendance to exercise programs		
Exercise with your age group is important	40	

Distance to the program is important	41
Time of class is important	41
Cost of class is important	41
Someone to go with is important	38
Type of exercise class & facility participants would be willing to attend	
Stretching class	36
Yoga class	18
Tai-chi class	10
Aerobics class	19
Muscle strength class	27
YMCA	33
Church	28
Health club	25
ECP's prescription and follow-up methods that would likely be motivational	
Have confidence in your ECP's recommendations	42
Follow-up call from ECP's office	35
Reminder card from ECP's office	38
Call from the exercise program	39

Note. *M* = mean; *SD* = standard deviation; ECP = eye care provider

Table 1 presents the optometry patients' opinions about optometrists and their prescription of exercise programs. All the participants believed that exercise is good for their health and exercise can reduce the possibility of falls. Further, the vast majority believed that falling is associated with vision. Many of them saw an optometrist and/or ophthalmologist on a regular basis (1-2 times/year) and knew their optometrists for quite a long time (3-10+ years). They trusted their optometrists and stated if their optometrists' prescribed medication, they would follow the prescription and buy the recommended medication. However, when it came to the prescription of an exercise program, the rate of participants' willingness to follow the referral dropped slightly regardless of whether the prescription was written by their PCP or optometrists. When considering to attend the exercise class, participants reported the following aspects would matter for their participation: proximity to the class, time of the class, the age of classmates, and the cost of the class, and attending class with someone else such as their family member(s). Stretching and muscle strengthening classes seemed to be popular, and the YMCA was the most

popular place as a facility. Follow-up calls or a reminder card from their optometrists' office and/or the exercise program were endorsed as a good way to encourage them to participate in the exercise program.

These results were supported by the focus group discussions. From the *a priori* six themes, a few subthemes were identified, and five new themes emerged as a results of five focus group discussions: (1) lack of link between eyesight and exercise; (2) social aspect of group exercise program; (3) reasons for following optometrists' prescription; (4) reasons for not following optometrists' prescription; and (5) cost of exercise program.

Theme 1: Lack of link between eyesight and exercise. Many focus group participants were surprised about the inquiry into eyesight and exercise because although their PCP had inquired about their level of exercise, they had not discussed this with their optometrists. One participant said, "He [my optometrist] never even brought it up. This is the first time I've ever heard of anything about it" (Focus Group (FG) 1, female). Another stated, "My eye care provider is just focused on my eyes...to me, there's a definite division in my mind between what an eye care provider does and what my physician does" (FG 1, male). Similarly, another noted, "I would listen to my physician quicker than I would my eye doctor, just because he's my health doctor, and the other one is strictly here [eyes]... I've never thought of eye and exercise as being as important as, you know, the rest of the body and exercise" (FG 2, male). However, at the end, the vast majority of focus group participants agreed about the importance of link between eyesight and exercise because "we still think we're 20 years old" (FG 1, male); "You still think of yourself as young and you don't slow down and pay attention more like you should, realizing that you are older, and that is the reason why we [older people] tend to fall" (FG 1, female).

Theme 2: Social aspect of group exercise program. Focus group participants liked the social aspect of group exercise programs. One woman exemplified this saying, “I think I would do it [exercise] just for the social aspect of it, not necessarily for the exercising aspect...I think if someone would push me to do it, I probably would do it. If somebody came up to me and said, ‘Come on, with me,’ you know. ‘Let’s go to exercise class’” (FG 1, female).

Some expressed the benefits and joy of being in a group based on their own current and past experiences:

I go to exercise class, and I really enjoy it because then, if you don't come, they call your friends and want to know what happened to you, and they motivate you to come back (FG 2, female).

Get to meet people. People and enjoy talking and being around them (FG 4, female).

To be around people who were interested in doing the same thing I was interested in (FG 4, female).

Others talked about accountability being in a group setting: For instance, “Because you know that you are with a group or with someone, you have to do it. If you’re by yourself, you don't have to do it. I’m tired today...and don’t do it” (FG 3, female) or “Accountability, and I think that's important because, you know, I get lazy sometimes” (FG 2, male). At the same time, the importance of an appropriate exercise group was highlighted. Many preferred to be with the people of the same age or ability. One participant noted, “Because they’re the same age, and I can talk, socialize” (FG 4, female); another relayed, “I went one time [to a health club], and they had just for women that were older, so that was amazing” (FG 3, female).

They also did not want “to bring everybody else down – I’d rather find a group that's more attuned to my level” (FG 2, male and female). Others expressed, “I wouldn't want to bring the other people down and going to make you feel like you can't keep up with the group” (FG 2, female) and “Because you can feel out of place...you feel left behind” (FG 3, female).

Theme 3: Reasons of following optometrists' prescription. The majority of participants agreed to follow their optometrists' prescription of exercise programs if given because of the health reasons. One woman linked it to valuing her general health saying, "I want to live long and happy...I don't want to end up sitting and not doing anything" (FG 2, female). Another connected her agreement to eye health noting, "I would go because my eyesight is very important to me, and if he told me that that would help not only my physical but my eyesight, I would go!" (FG 2, female). A male participant in FG 5 expressed that he would follow because:

Exercise affects all aspects of your life, of your body, including parts of your vision, and it affects your appetite. It affects the way you feel, the way you think, the way you sleep. It affects everything.

Others would follow because of more practical reason such as "There's also the fact of knowing that I'm paying for it. So because I don't want to pay for something and not use it" (FG 2, female). In addition, a female participant (FG 1) pointed out that if her optometrist prescribed an exercise program that would mean joining the exercise program is medically necessary:

With a prescription, as opposed to him [her optometrists] just saying, "Why don't you go exercise?" You know, plus I think too just the fact that a doctor gives you a prescription to exercise, it's just a little bit stronger. It's like, OK, well, you really need to do this now. I'm not just suggesting it, you know. It's like this is a medical thing that you need.

Theme 4: Reasons for not following optometrists' prescription. Only few, but some participants disagreed and expressed their reasons as to their disagreement:

I think it's [prescribing exercise programs] outside the parameters of the ophthalmological specialty... if I could be convinced that there was a connection, yes [I would go]... if I felt that there was a very sound reason that I understood as to the cause and effect of going to exercise and how it was going to improve my vision (FG 5, male).

Another male participant (FG 1) expressed his probable disagreement with his optometrists' prescription not because he does not exercise, but did not want to participate in a group setting: "I prefer to do my exercise at home, the treadmill. I just, at my own leisure, so I just prefer to do

it that way.” Another participant would not follow because “I wouldn't stick to it, and I think when you go to something like that, you need to stick to it, and I'm not a sticker” (FG 1, female).

Theme 5: Cost of exercise program. For many participants, because they are not currently working, but retired with limited income, cost was an important factor to consider, and that concern was reflected and expressed in many ways: “That [cost] has a lot to do with it. It determines whether I can go or not...Definitely! That would be helpful [if insurance would cover the cost of the exercise program]” (FG 3, female) or “If Medicare would pay for it, then I would definitely, absolutely, 100% go. I worry about cost” (FG 5, female). A female participant (FG 3) already had the experience of medical insurance coverage (Medicare) of her exercise program: “I called the other day to find out about water aerobics if my insurance [Medicare] would pay for it, and the lady told me that it's only if the doctor prescribes it, they'll pay for it.”

Optometrist Survey

Table 2 presents the characteristics of the optometrists who participated in the survey. Survey respondents ($N = 268$) were optometrists aged between 27 and 82 years old ($M = 47.1$; $SD = 12.7$) with an average of 19 practice years ($SD = 37.5$). The average number of patients was 4,117/year/site ($SD = 3,426.1$) and an average of approximately 31% of their patients were over 62 years old. Although the majority (90%) believed a vision-fall connection, 81% of them did not assess patients' fall risks in their routine check. The reasons were because fall risk assessment is not necessary/required (23.9%), not trained (19.6%), never thought of (18.7%), no time (14.3%), and no reimbursement (2.6%). When considering hypothetically implementing fall risk assessments in their routine practice, nearly half (45.9%) stated that they would conduct it at the beginning of the examination during the patient history intake or when the use of assisted devices such as a cane or walker was noted ($n = 123$). The optometrists cited other times for

assessing fall risks such as when the patients reported concerns for history of falls (4.5%) or had special eye care needs such as those with low vision or newly prescribed bifocal lenses (10%). In spite of the low participation of routine risk assessment within their practices, optometrists reported being willing to (1) develop partnerships with community-based exercise programs (95.3%); (2) create a one-page list of community-based exercise program offered in the local areas (96.9%); (3) prescribe a community-based exercise program (97.3%); or (4) use a specialized prescription pad for exercise programs if provided (88.9%).

Table 2. Optometrist Sample Characteristics and Responses from Entire Survey ($N = 268$)

	<i>n</i> or <i>M</i>	% or <i>SD</i>
Age in years (27-82)	47.1	12.7
Gender (Male)	133	50.6
Number of patient per year (120-25000)	4117	3426.1
Percent of patients over 62 years old (1-95%)	31.2%	66.5%
Practice years (1-54)	18.7	37.5
Do you see evidence of connection between vision, balance and falls?		
None	2	0.8
Little	23	8.9
Somewhat	94	36.4
Strong	97	37.6
Very strong	42	16.3
Do you assess patient's fall risk as routine vision care? (Yes)	52	19.4
If yes, what are the reasons for providing the risk assessment?		
Types of patients		
Well-being	18	34.6
Fall prevention	9	17.3
Lens design	8	15.4
Required test	8	15.4
Other	4	7.7
If no, what are the reasons for not providing the risk assessment? ($n = 230$)		
Not necessary	55	23.9
Not trained	45	19.6
Never thought about	43	18.7
No time	33	14.3
No reimbursement	6	2.6

When would you assess fall risk of your patients? ($n = 178$)		
Beginning of the exam	123	45.9
During the exam	6	2.2
End of the exam	10	3.7
If patients brought up the topic	12	4.5
Special patients	27	10.1
Have you referred your patients to any community-based programs? (Yes)	45	16.8
Are you familiar with community-based exercise program in your area? (Yes)	55	20.8
Is it possible to develop partnerships between local community-based exercise programs and your office?		
Yes	132	51.8
No	12	4.7
Maybe	111	43.5
Is it possible to create a one-page list of community-based exercise programs that can be given to patients?		
Yes	182	71.1
No	8	3.1
Maybe	66	25.8
If a community-based exercise program is found to be appropriate for a patient, would you be willing to “prescribe” this for your patient?		
Yes	189	72.4
No	7	2.7
Maybe	65	24.9
Would you be interested in giving your patients a referral to an exercise program from a pre-printed prescription pad?		
Yes	140	53.4
No	36	13.8
Maybe	86	32.8
If a pre-printed prescription pad was provided, would you use it to prescribe a patient to an exercise program?		
Yes	156	59.5
No	29	11.1
Maybe	77	29.4

Note. The items listed above comprise the entire survey sent to the optometrists in Texas to assess their attitudes and beliefs about fall prevention for their older patients. M = mean; SD = standard deviation.

Discussion

This study examined the potential for a community-clinical linkage involving optometrists making referrals to community-based exercise programs to prevent falls for their older patients. Fall prevention is a public health imperative that can be addressed with

collaborative efforts (Markle-Reid, et al., 2017; Svantesson, Babagbemi, Foster, & Alricsson, 2014), particularly those involving partners not traditionally involved in fall prevention efforts (Thoreson, Shields, Dowler, & Bauer, 2015). Because poor vision is a well-documented risk factor for falls among older adults (Reed-Jones, Solis, Lawson, Loyae, Cude-Islas, & Berger, 2013; Saftari & Kwon, 2018), optometrists are well-positioned to detect when their older patients may be at risk for falling and to engage in fall prevention efforts.

Results from this study's surveys and focus groups suggest that optometrists could serve as a valuable link in a community-clinical collaboration for fall prevention. The optometrists in this study had substantial contact with older adults in the community. Indeed, on average, 31% of their patients were age 62 and older. The older patients who participated in the focus groups reported having long-term, trusting relationships with their optometrists. Almost 60% had known their optometrists for 3-10 years, slightly more saw their optometrists one or two times per year, and all reported that they trusted their optometrists and had confidence in their recommendations. Trusting relationships with health care providers have been linked to treatment adherence and improved health for among patients (Müller, Zill, Dirmaier, Härter, & Scholl, 2014). Our findings indicate that in general, optometrists have trusting relationships with their older patients which could be influential in fall prevention interventions.

Not only did optometrists have practices and patient relationships that promised to be valuable in promoting fall prevention, but they also indicated that participating in fall prevention was important and could be possible in their practices. Most were aware of evidence linking older adults' vision and falls. Only a very small minority (less than 5%) stated it would not be possible to develop community-clinical partnerships in support of exercise programs or provide older patients with a one-page list of community-based exercise programs. A majority (72%)

indicated their willingness to prescribe an exercise program to an older patient when appropriate and over half (53%) would use a pre-printed prescription pad to make the referral.

From the patient perspective, the vast majority of optometry patients (91%) reported they would go to an exercise program if it was prescribed by their optometrists. In general, they understood that exercise was important and could help prevent falls. They were also willing to recognize that exercise might be important for their eye health, particularly if their optometrists made this connection for them.

In spite of the positive attitudes toward fall prevention and exercise program referrals from optometrists and their patients, few optometrists conducted fall risk assessments as routine vision care or referred patients to any community-based program. It is noteworthy that the lack of reimbursement was not a barrier to conducting fall risk assessment as only 2.6% of the optometrists indicated no funding was a factor. Rather, our findings suggest other factors, such as being unfamiliar with community-based exercise programs and fall assessments, were more salient barriers to optometrists incorporating fall prevention efforts in their practices.

Implications for Optometrists

It is important to recognize that effective fall prevention strategies might necessitate changes to optometrists' practices. Educating optometrists on fall prevention strategies could be implemented at the practitioner level as well as at the optometric student level. Providing course or workshop opportunities at various organizational meetings where optometrists are seeking required continued education unit would be a reasonable approach (Rosenbloom, Gorman, Davidoff, Swanson, Thomas, Waltke, & Wingert, 2000). Educational programs highlighting the relationship of vision and falls, fall prevention strategies with a fall risk screening assessment, and suggested materials for prescribing community-based exercise programs could be offered for

presentation at local, state, or national optometric conferences. Providing this information to optometric educators during their special interest meetings could build interest in incorporating fall prevention information into the optometric student's course work. Related articles in optometry forums or journals would also allow better access to the optometric community to disseminate fall related information.

Other potential changes include incorporating fall assessments at the beginning of routine care appointments, using prescription pads to make referrals to community-based exercise programs (which patients emphasized would motivate them more than just an oral referral), and sending exercise reminder cards to patients (which 91% of the patients acknowledged would encourage them to participate in an exercise program). Moreover, screening assessments should include suggestions of identifying professionals in their area for possible referrals when the need of further fall prevention assistance for their patients has been found to be needed.

Since 95% of the patients in this study believed there is connection between vision and falls, during an eye examination, optometrists could leverage this belief and further inform patients about the associated benefit of exercise to reduce falls (Guirguis-Blake, Michael, Perdue, Coppola, & Beil, 2018). Optometrists should be ready to share evidence-based data that show physical activity to be protective against developing exudative age-related macular degeneration, a leading cause of visual impairment in adults age 50 and older (Knudtson, Klein, & Klein, 2006; National Eye Institute, 2015) as well as decreasing the risk of cataracts by as much as 13% (Williams, 2013; Zheng Selin, Orsini, Ejdermik Lindblad, & Wolk, 2015). Effective communication between optometrists and their patients is an important link in facilitating patients' motivation to make positive lifestyle choices. To facilitate this, optometrists can gain evidence-based exercise data by accessing available electronic databases such as the

Cochrane Collaboration Library. They can develop materials and make them available in booklet at their office or their online website. This information could help overcome some patients' skepticism that encouraging physical exercise is within optometrists' areas of concern.

Implications for Community-Based Organizations and Community-Clinical Linkages

Our research suggests that community-based organizations (CBOs) should consider outreach to optometrists to promote their exercise classes and enhance their fall prevention efforts. Using materials designed specifically for use in an optometrist practice could be particularly effective. If they receive referrals from an optometrist, we recommend they consult with the optometrist to understand special needs of older adults with vision impairment in exercise programs.

Community-clinical linkages (CDC, 2016) could facilitate optometrists incorporating fall prevention strategies in their practices. Oversight and coordination from state and local health departments and public health professionals may be important to facilitate these partnerships (Markle-Reid et al., 2017), particularly since they are not a traditional component of fall prevention public health collaborations. An example of a possible collaborator with optometrists is a community partner like an Area Agency on Aging or an aging-related CBO. These organizations could help bridge the gap between optometrists and exercise programs in senior centers, churches, or YMCAs that offer exercise classes for older adults by providing education, information, and materials to optometrists and program administrators about the benefits and opportunities of such a community-clinical partnership. Community partners could also help optometrists identify community-based exercise programs that have classes specifically for older adults, are accessible, and offer times that are convenient to patients. Case managers at CBOs could support referring optometrists by helping their patients find funding and transportation for

the exercise classes and overcome other individual-level obstacles to program participation.

Patient survey results showed that YMCAs were the most popular sites for older adults to go for an exercise program. The YMCA seems to be well integrated into the Houston community and many older adults are aware of their senior exercise programs. They offer multi-family member discount, which also supports senior's preference to go to exercise with their family members, and certain classes (e.g., SilverSneakers) can be covered by their Medicare. According to the patient survey, stretching and strength exercises were some of the activities that have already been doing as their physical activity besides walking. Tai Chi is a fall prevention program supported by evidence (Hu et al., 2016; Sherrington, et al., 2019) that includes both stretching and strengthening (Huston & McFarlane, 2016), and is offered in many venues and easily accessible. Many YMCAs also offer Tai Chi as one of their classes.

Geriatricians could also be an important part of a clinical team to enhance the potential for, and outcomes of optometrists screening and referrals. They could partner with optometrists to share fall risk assessment materials, and provide training and consultation. As a trusted source of health information for older adults, geriatricians can reinforce the connection between eye health, vision, and exercise for their patients. This is particularly important because behavioral change is facilitated when information is received from a complex variety of sources (Dearing, 2009). Hearing about the connection between eye health and physical health from both an optometrist and a physician might improve the likelihood that a patient would begin or continue an exercise program. Due to the prevalence of eye diseases among older adults, optometrists are networking more with others in the medical community (New England College of Optometry, 2019; Rosenbloom et al., 2000); this is most evident in the optometric participation with diabetic patient management (Ferrucci & Yeh, 2016). As health care providers, optometrists should also

be aware of the relationship between vision and falls, the dangers and devastating health consequences of falls, the need for fall preventions, and how they can actively engage in working toward fall prevention of their patients. Better awareness in the importance of the optometrist-geriatrician collaboration for quality patient care at both the student and practitioner levels could help boost this connection as well (Kergoat & Kergoat, 2016).

Implications for Research

This study is a first step in exploring the potential for optometrists to refer their older patients to community-based exercise programs as a part of a comprehensive community-clinical linkage for fall prevention. Future research should seek to find or develop and evaluate collaborations between optometrists and CBOs for the purpose of increasing older adults' participation in exercise classes. This study could also be replicated in different states and with older adults from different races and ethnicities than our study to better understand if political, geographic, and cultural differences provide different results.

Another suggested area of future research is economic modeling of optometrists' referrals to exercise programs. Economic modeling has shown that prevention interventions for falls can be cost-effective (Farag, Howard, Ferreira, & Sherrington, 2015). Research to examine the effectiveness – including cost-effectiveness – of optometrists' intervention to prevent falls is needed. This would be particularly beneficial to support policy changes to allow Medicare reimbursement for optometrists screening and referrals to community-based exercise programs.

Study Limitations

In spite of this study's promise to inform practices of those involved community-clinical linkages for fall prevention, it has some limitations. We randomly selected optometrists who held an active license in the state of Texas. However, the sampling frame was limited to those

optometrists who were licensed by the Texas Optometry Board at the time of this study. Optometrists in Texas who were newly licensed after the list was provided, as well as those listed as inactive, were omitted from the study. The response rate for the survey sent to optometrists was 18%. Although this response rate is comparable to other studies with optometrists (Lam, Leat, & Leung, 2015), it is possible that non-response bias affected the results. For example, perhaps only the least busy optometrists responded to our survey and their willingness to assess for fall risk and refer patients is not reflective of optometrists with busier schedules. For the focus groups, purposive sampling was used to collect focus group participants from community organizations and senior social service agencies where the vast majority of clients are older adults. This potential selection bias may have resulted in participants who were inherently more willing to participate in group activities than if we had recruited participants from optometrist practices or used other means to access more socially isolated older adults. Nonetheless, those who are socially isolated most likely do not participate in focus group discussions although their opinions are critical to be included. We excluded older adults who are blind, specifically for the reason of blindness being a potential confounding factor in our focus group discussions with people with sight. For future studies, we recommend to include blind people and replicate the focus groups with blind older adults to see if they have unique concerns and perspectives. Although we used items from three validated instruments for fear and risk of falling, we did not use the complete validated scales. For future studies, the use of complete validated instruments is recommended.

Conclusion

We conducted focus group discussions with a diverse group of older patients who were optometrist patients and surveyed optometrists regarding their perspectives on prescription of

exercise programs. The results showed that optometrists are willing to give prescriptions to their patients for exercise programs, and patients are willing to fill their optometrists' prescriptions by going to exercise programs. Thus, it is a perfect opportunity for optometrists to prescribe and for their patients to implement exercise programs to prevent falls. In spite of this, only a very small number of optometrists referred exercise programs to their older patients, indicating a need and opportunity for community-clinical partnerships to improve patients' outcomes. Research has shown better outcomes with clinical practice (Babiker et al., 2014) and research collaboration (Green & Johnson, 2015). For example, optometrists could provide fall risk assessments and prescribe exercise for fall prevention for their older patients, while social workers advocate for their healthier lifestyle. Furthermore, cost effectiveness research on this clinical (PCP, optometrists, social workers) – community (senior centers, churches, YMCAs) partnerships may lead to policy changes in Medicare reimbursement for optometrists' fall risk assessment and prescription of community exercise programs for the health benefits of older patients.

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Appendix 1

**Interview Guide for Focus Groups for Patients Seen in
an Eye Care Provider's Office**

Study Title: Feasibility of Referrals from Eye Care Providers to Community-Based Programs for Older Adults with Visual Impairment in Texas

1. Have you fallen to the ground in the past? Can you raise your hand? [Count hands.]
2. Where did you fall and what were the reasons for the fall?
3. Did any of these falls need medical attention? [Count hands.]
4. Did you know that almost 1/3 of adults who are 65 years and older fall every year? [Count hands.]
5. Do you know the major reasons for their fall?
They fell because of the unbalance in walk, weak muscle, gait problems – they thought they saw the height of the object, but they didn't lift their legs high enough.
6. Have you experienced something like that? Please raise your hand. [Count hands.]
7. I am pretty sure that everyone in this discussion group knows that exercise is good for our health. Right?
Do you believe exercise could reduce the possibility of falls? [Count hands.]
Studies show that exercise, especially balancing and muscle strength exercises reduce the risk of falls for all ages.
8. Do you believe the possibility of falling is related to your vision? [Count hands.]
Yes, some studies show that vision affects the number of falls.

Today's discussion is about your eye care providers. Let's talk about your eye care providers now.

1. In our survey, we asked you the reason why you go see your eye care provider. Is your eye care provider an optometrist or ophthalmologist? Please raise your hand.

Optometrist? [Count hands.]
Ophthalmologist? [Count hands.]
2. How often do you go see him/her?

Once a year? [Count hands.]
Twice a year? [Count hands.]
Three times a year? [Count hands.]

Every other year [Count hands.]
Other

3. How long have you been going to the same eye care provider?

One year? [Count hands.]
Two years? [Count hands.]
More than 3 years? [Count hands.]
How long?

4. Did you know your eye care provider quite well? Do you trust him/her and listen to his/her advice? [Count hands.]
5. If your eye care provider said, let's try this medicine for your eye problem and prescribed you a medication, would you go to the pharmacy and buy that medication?

Yes [Count hands.]
No [Count hands.] Why not?

6. What about if they prescribed you to go to an exercise program to improve your balance and strengthen your muscles, how likely would you be to go?
- a. Not at all [Count hands.]
 - b. Somewhat likely [Count hands.]
 - c. Likely [Count hands.]
 - d. Very likely [Count hands.]
7. What about if the exercise program is held close to your home, how likely would you be to go?
- a. Not at all [Count hands.]
 - b. Somewhat likely [Count hands.]
 - c. Likely [Count hands.]
 - d. Very likely [Count hands.]
8. What about if the exercise program is for people of your age or ability, how likely would you be to go?
- a. Not at all [Count hands.]
 - b. Somewhat likely [Count hands.]
 - c. Likely [Count hands.]
 - d. Very likely [Count hands.]
9. What would it take to change your answer to a c (likely) or d (very likely) level?

10. Or what would it take to increase your likelihood of going?
11. For those of you who would go to an exercise program because your eye care provider “prescribed” you to go, tell us why you would go?
12. For those of you who would NOT go to an exercise program because your eye care provider “prescribed” you to go, tell us why you would not go?
13. Now, let’s talk about exercise and exercise classes. What is important to you if you were to participate in an exercise class?
[Wait until participants say their answers.]
- Please raise your hand if you think close to home (distance) is important? [Count hands.]
 - What about the time of the class? Is it important [Count hands.]
 - The type of exercise program for example: stretching? [Count hands.]
 - What about yoga class? [Count hands.]
 - What about Tai-chi class? [Count hands.]
 - What about aerobics class? [Count hands.]
 - Muscle strength class? [Count hands.]
 - Do you think the type of facility is important?
For example, if the exercise program is held at YMCA, would you go? [Count hands.]
 - What about at church? [Count hands.]
 - What about at health club? [Count hands.]
 - Is the cost of the program important? [Count hands.]
 - What about if the participants are people of your age? [Count hands.]
 - What do you think if you have people of different ages are in the class?
 - What about if your family can attend the exercise program, would that help you to attend the class? [Count hands.]
14. Do you think you would accept your eye care provider’s prescription because you believe the link between participating in an exercise program and improve your health? [Count hands.]
15. Do you have confidence in your eye care provider’s recommendations? [Count hands.]
16. What reasons do you think your eye care provider would prescribe you to an exercise program? [Wait until everyone talks.]
- [Probe] Do you think they are concerned about you falling, and exercise is good for everyone to prevent falls?
17. What about if your **physician** prescribed you an exercise program, how likely would you be to go?

- a. Not at all [Count hands.]
- b. Somewhat likely [Count hands.]
- c. Likely [Count hands.]
- d. Very likely [Count hands.]

18. What are the differences between your eye care provider and physician's prescriptions?
19. If medications were prescribed, most people would go to the pharmacy and pick up the meds. What are the differences between the meds and exercise program?
[Wait until everyone talks.]
20. When picking up medication, you just go and pick it up. It is simple. But when going to an exercise program, you need to be a bit more involved. That may require some **lifestyle changes** because you have to incorporate exercise time into your daily activities. Why is that more difficult to do?
[Wait until everyone talks.]
21. How could an eye care provider follow up with you regarding their prescription for you to participate in a physical exercise program?
[Wait until everyone talks.]
22. What do you think if your eye care provider's office set an appointment with an exercise program contact person for you? Would that help you to go to an exercise program?
23. What do you think about if a contact person from the exercise program called you?
24. What about if your eye care provider's office followed up on their referral with a phone call to you?
25. What about if your eye care provider's office sent you a reminder card to register for an exercise program?
26. Do you have other comments for us? We would be particularly interested in knowing what you think about the relationship between your vision and your physical activity.