

## SHORT REPORT

# The effect of an educational intervention on primary care providers' knowledge, confidence and frequency of patient counselling on strength training and bone density

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**KEYWORDS**

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## 1 | INTRODUCTION

Strength training benefits patients of all ages and with various health problems; it reduces falls, increases independence, promotes healthy weight and uplifts mental health (Bennie et al., 2020; Dieli-Conwright et al., 2018; Liu-Ambrose et al., 2004; Luan et al., 2019; Moraes et al., 2020; Thomas et al., 2019). Strength training also has the potential to dramatically impact the lifetime trajectory of bone health. It is an intervention that is safe and effective in males, premenopausal and postmenopausal females and in those with pre-existing bone loss (Martyn-St James & Carroll, 2010; Watson et al., 2018, 2019).

Strength training refers to exercise which stresses muscles against resistance, such as with weight machines or dumbbells, with the goal of increasing muscular strength (Haff et al., 2016; U.S. Department of Health and Human Services, 2018). The intensity of strength training can be defined against a metric called the 1 repetition maximum (1 rep max) which refers to the maximum load an individual can move through the full range of motion of a specific exercise employing correct form. Moderate intensity strength training typically utilises weights which are 60%–80% of the 1 rep max for a given exercise; this can be approximated with use of a weight where about 8–12 repetitions can be performed before fatigue occurs. These repetition approximations align with exercise recommendations for moderate intensity strength training (U.S.

Department of Health and Human Services, 2018). Low intensity strength training uses lighter weights with more repetitions possible before fatigue; high intensity strength training uses heavier weights with fewer possible repetitions before fatigue.

The LIFTMOR study comparing high intensity and low intensity strength training in postmenopausal osteopenic or osteoporotic women showed that it is not 'too late' to improve bone density through strength training if the dose is right (Watson et al., 2018). As described by the National Osteoporosis Foundation, the risk of osteoporosis begins in one's early 20s when peak bone mass is reached, highlighting the value of strength training as a possible early intervention to prevent osteoporosis (Weaver et al., 2016). For these reasons, the U.S. Department of Health and Human Services and World Health Organization agree: *in addition to 150 min of cardiovascular activity per week, two days per week of moderate intensity strength training are also recommended for patients of all ages* (Bull et al., 2020; U.S. Department of Health and Human Services, 2018).

Primary care providers are an important source of lifestyle advice for patients, trusted to provide recommendations that are accurate, evidence-based and specific. Despite this, limited evidence-based education about exercise during medical training leaves many providers with poor knowledge of guidelines, at low rates of offering exercise advice and with low confidence in their abilities to offer good advice (O'Brien et al., 2017). Statistics on primary care

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providers' knowledge about standard exercise guidelines are not known, but surveys suggest only 16% of physical therapists have a firm grasp of the guidelines (Lowe et al., 2017). To our knowledge, there are no published studies which assess provider confidence about recommending aerobic versus strength exercise.

We sought to leverage this opportunity for growth with an educational intervention for primary care providers with the goal to improve provider knowledge of national exercise guidelines for aerobic and strength training, increase rates of patient counselling on the benefits of strength training and increase providers' confidence in their ability to counsel patients accurately. We also wished to evaluate providers' rates of exercise participation, as higher rates of clinician physical activity have previously been shown to correlate with patient counselling to exercise (Abramson et al., 2000; Oberg & Frank, 2009).

## 2 | METHODS

This training and subsequent survey was an educational intervention based on some of the concepts of 'academic detailing', which includes a focus on interactive discussion between the educator and clinicians, maintaining a small group of learners and focussing the education on a few actionable and evidence-based behaviour changes or key messages (Kennedy et al., 2021). The targeted clinician behaviour changes included improved provider knowledge of national exercise guidelines for aerobic and strength training, increased rates of patient counselling on the benefits of strength training and increased provider confidence in their ability to counsel patients accurately on these topics (Table 1).

Primary care providers including physicians, nurse practitioners and physician assistants were recruited by convenience sample from five internal medicine clinics affiliated with the University of Vermont Medical Center, Vermont's only academic medical centre. Of these,

four clinics were staffed by attending providers and one clinic was composed of internal medicine residents who are members of a designated primary care track. The educational sessions occurred in the attending providers' offices and at the residents' annual primary care track resident retreat.

The educational sessions lasted between 30 and 60 min with variability a result of discussion time. The educational intervention was taught via PowerPoint (Microsoft Corp.) in the offices and included interactive discussion. The workshop for residents included discussion, reading a DEXA scan as a group, collectively reviewing exercise guidelines and reviewing exercises performed in the LIFTMOR study (Watson et al., 2018) by allowing residents to try out exercises with supplied weights. All participants were given educational materials which summarised the content and which were worded to be appropriate for use as patient education materials. In addition to paper handouts, the materials were saved in the local electronic medical record (Epic) to be available for future access.

Surveys were used to collect data about providers' personal and patient panel demographics, typical physical activity, knowledge, confidence in making aerobic and strength training recommendations to patients and practices related to recommending exercise to patients. Questions were a combination of open ended, multiple choice or included frequency options of (1) never, (2) less than half the time, (3) about half the time, (4) more than half the time and (5) nearly all the time. Clinicians rated their confidence on a 1–10 scale with 10 most confident. Pre-survey data were collected on paper immediately prior to the educational sessions. Data were entered and managed using REDCap (Harris et al., 2009). Post-surveys were emailed to participants 4–8 weeks after their education session to be completed electronically via the REDCap system. A maximum of three reminders were sent to participants to complete post surveys. Descriptive analyses were used to summarise responses. Agreement between pre- and post-survey responses were compared using paired *t*-tests or proportion tests with  $p < 0.05$  for statistical

TABLE 1 Curriculum content

Curriculum objective	Example curriculum content
Promote national exercise guidelines	The CDC, consistent with other national organisations, recommends <b>150 min weekly of moderate intensity aerobic exercise and 2 days per week moderate intensity muscle strengthening exercise of all major muscle groups</b> for all adults 18 and older, including adults 65 years old and above
Describe strength training benefits to bone density	Low intensity strength training and aerobic exercise offers minimal to no advantage to bone density. <sup>a</sup> Control groups in ALL studies lost bone density Moderate intensity strength training reduced bone loss and in some cases offered mild gains <sup>a</sup> High intensity strength training led to the largest gains in bone density <sup>a</sup>
Explain that clinician exercise mirrors their recommendations to patients	Past study shows that providers who exercise are four to five times more likely to recommend exercise to their patients

<sup>a</sup>Low intensity strength training was defined to the group by <60% 1 repetition maximum (1 rep max) criteria and approximated as weight which can be lifted >12 times without fatigue. Moderate intensity strength training was defined to the group by 60%–80% 1 rep max criteria and approximated as weight which can be lifted about 12 times with fatigue. High intensity strength training was defined to the group by >80% 1 rep max criteria and approximated as weight which can be lifted <12 times with fatigue (Watson et al., 2018).

significance using STATA 16.1 (Stata Corporation). According to the policy defining activities which constitute research at the University of Vermont and University of Vermont Medical Center, this work met criteria for improvement activities exempt from ethics review.

### 3 | RESULTS

Of the 28 providers who completed the pre-survey and participated in the educational session, 24 providers completed the post-survey and were included in analysis. The providers averaged 14.4 years of experience in primary care and they reported that 65.5% of their patients were over aged 50 years. Nearly 80% (79.2%) of providers were female. The providers reported personally engaging in about 3 h of physical activity per week and 1.6 days on average of weight training, with about half believing they met national guidelines for exercise, approximately double the reported national average of about 25% of healthcare workers (Song et al., 2020).

When asked to list the national guidelines for exercise, the majority of providers did not include strength training in their pre-survey responses. Only a few more providers answered correctly in the post-survey due to the same omission (pre 8.3%, post 16.7%,

$p = 0.38$ ). When asked directly about the number of days of strength training advised by national guidelines, 20.8% answered correctly pre-training and 58.3% answered correctly in the post survey ( $p = 0.01$ ).

Providers were asked how often they inquired about physical activity in general and strength training specifically (Table 2). There were no differences in their pre-post responses when asked about how often they discuss physical activity generally at their wellness visits; the average response was between 'more than half the time' and 'nearly all the time' (average score pre 4.6, average score post 4.4,  $p = 0.36$ ). There were significant differences in how often providers reported advising patients about strength training pre- and post-educational intervention. Providers advised strength training to patients younger than 50 years during wellness visits between 'less than half the time' and 'about half the time' pre-education (average score 2.3) and between 'about half the time' and 'more than half the time' post-education (average score 3.1,  $p = 0.003$ ). Similar results were seen for patients over 50 years (average score pre 2.5, average score post 3.5,  $p < 0.001$ ). Providers reported they advised strength training to their patients with osteoporosis or osteopenia between 'about half the time' and 'more than half the time' before the educational intervention and 'more than half the time' afterwards

TABLE 2 Comparisons of pre- and post-survey results

Survey question	Pre-survey (n = 24)	Post-survey (n = 24)	p-value
<b>Provider knowledge and self-reported behaviour</b>			
In an average week, how many minutes do you engage in aerobic physical activity? (mean, SD) <sup>a</sup>	186 (113)	177 (145)	0.70
In an average week, how many days do you engage in strength training? (mean, SD) <sup>b</sup>	1.6 (1.4)	1.8 (1.3)	0.58
Do you believe you meet national guidelines for exercise in a typical week? (# yes, % yes)	11 (45.8)	12 (50.0)	0.77
What are the physical activity recommendations for adults according to the CDC? (# correct, % correct)	2 (8.3)	4 (16.7)	0.38
The CDC recommends ____ days of strength training weekly (# correct, % correct)	5 (20.8)	14 (58.3)	0.01
What is the recommended intensity of strength training? (# correct, % correct)	21 (87.5)	17 (70.8)	0.16
<b>Provider recommendations and confidence</b>			
How often do you ask patients about their physical activity at their wellness visits in a typical week? <sup>c</sup> (mean, SD)	4.6 (0.7)	4.4 (1.0)	0.36
How often do you advise strength training to your patients younger than 50 years old during a wellness visit in a typical week? <sup>c</sup> (mean, SD)	2.3 (1.1)	3.1 (1.2)	0.003
How often do you advise strength training to your patients over age 50 years during a wellness visit in a typical week? <sup>c</sup> (mean, SD)	2.5 (1.0)	3.5 (1.1)	<0.001
How often do you advise strength training to your patients who have osteoporosis or osteopenia during a wellness visit in a typical week? <sup>c</sup> (mean, SD)	3.5 (1.3)	4.0 (1.0)	0.02
On a scale of 1–10 with 10 being the most confident, what is your confidence in recommending aerobic physical activity to patients? (mean, SD)	7.4 (2.1)	8.5 (1.7)	0.01
On a scale of 1–10 with 10 being the most confident, what is your confidence in recommending strength training to patients? (mean, SD)	4.2 (1.7)	7.0 (2.0)	<0.001

<sup>a</sup>n = 20.

<sup>b</sup>n = 19.

<sup>c</sup>The answer options were (1) never, (2) less than half the time, (3) about half the time, (4) more than half the time and (5) nearly all the time.

(average score pre 3.5, average score post 4.0,  $p = 0.02$ ). No correlation was seen between personal exercise habits and exercise recommendations to patients.

Providers were more confident recommending aerobic exercise than they were recommending strength training. However, confidence in recommending strength training rose from 4.2 pre-education to 7.0 post-education using a 1–10 confidence scale ( $p < 0.001$ ). Several of the survey questions were open-ended, inquiring about specific advice and resources the participants recommended to patients. Pre-education, the most common answer was 'none'. In the post-survey, providers reported describing the need for moderate or high strength training, defining what this meant and noting how often it should occur. Other common advice was use of the patient educational fact sheet which was shared during the training, recommending personal trainers or physical therapy and recommending online resources.

## 4 | DISCUSSION

Aware that physical therapists tended to have low baseline knowledge about the national exercise recommendations, we expected similar results when we surveyed primary care providers' pre-educational intervention (Lowe et al., 2017). Findings were as expected, primarily because strength training was excluded from the open-ended responses. Surveyed providers answered the open-ended question only slightly better post-education, again because strength training advice was excluded. However, when specifically queried about national guidelines on strength training, there was a significant improvement with approximately three times as many correct responses, up to 58.3% correct. This implies that while aerobic exercise advice is common knowledge for primary care providers, inclusion of strength training is not yet similarly ingrained. Integrating reminders into workflow or wellness visit templates could provide cueing for providers which appears to be needed. As a result of this training and subsequent survey, we have introduced a brief statement about the benefits of moderate to high intensity strength training in our DEXA scan results in our health system as a way of prompting primary care providers to discuss this topic with their patients.

Lack of knowledge mirrored confidence. At baseline, provider confidence in counselling about aerobic exercise was greater than their confidence in counselling about strength training, but the metric appeared to be very malleable via education. The training resulted in significant improvement in reported confidence on strength training counselling. Behaviour appeared to follow, as providers reported they were more frequently recommending strength training to patients of all ages and to patients with osteoporosis and osteopenia after the training than they had been before. Additionally, rather than answering 'none', when asked what specific advice they offered to patients, nearly all responded with

practical ideas raised during the educational session, demonstrating greater facility with the subject.

Previous studies which showed a relationship between providers' exercise and recommending exercise to their patients compared exercising and non-exercising providers (Abramson et al., 2000). Our data did not have any providers who reported not exercising at all, making the assessment impossible to duplicate exactly; attempts to correlate more minutes of aerobic exercise or more days of strength training to more recommendations to patients did not show a statistical relationship.

Limitations included a small sample size and short follow through period of 4–8 weeks. It was conducted via self-report which introduces possible bias. In addition, the survey was not validated. The education for the residents was slightly different than that for attending providers as the resident session was incorporated as part of a retreat. It is possible that this difference could have influenced the results though we did not see evidence of that.

In conclusion, despite strength training's myriad benefits including promotion of osteogenesis, provider knowledge about and rates of counselling on strength training are both low. Our results showed that brief, interactive, small group educational sessions delineating specifically how strength training at moderate to high intensity can benefit bone health led to an increase in provider-reported confidence and in rates of advising strength training to their patients. Similarly, trainings could be easily duplicated and studied in other health systems. In addition, making patient education materials on strength training and bone health widely available to patients and providers would help encourage providers to engage in increased counselling on this topic.

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## CONFLICT OF INTEREST

The authors declare no conflict of interests.

## ETHICS STATEMENT

According to the policy defining activities which constitute research at the University of Vermont and University of Vermont Medical Center, this work met criteria for improvement activities exempt from ethics review.

## AUTHOR CONTRIBUTIONS

Sara Roberts and Amanda G. Kennedy participated in the design of the protocol. Sara Roberts was directly involved in protocol implementation. All authors participated in data management. Bradley J. Tompkins organised and cleaned the data and performed the statistical analysis. All authors participated in interpreting the results and writing of the manuscript. All the authors read and approved the final manuscript.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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