

BMJ Open Longitudinal qualitative study describing family physicians' experiences with attempting to integrate physical activity prescriptions in their practice: 'It's not easy to change habits'

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ABSTRACT

Objective Physical activity (PA) prescriptions provided by family physicians can promote PA participation among patients, but few physicians regularly write PA prescriptions. The objective of this study was to describe family physicians' experiences of trying to implement written PA prescriptions into their practice.

Design Longitudinal qualitative study where participants were interviewed four times during a 12-month period. After the first interview, they were provided with PA prescription pads. Data were analysed using thematic analysis.

Setting Family medicine clinics in New Brunswick, Canada.

Participants Family physicians (n=11) with no prior experience writing PA prescriptions, but who expressed interest in changing their practice to implement written PA prescriptions.

Results Initially, participants exhibited confidence in their ability to write PA prescriptions in the future and intended to write prescriptions. However, data from the follow-up interviews indicated that the rate of implementation was lower than anticipated by participants and prescriptions were not part of their regular practice. Two themes emerged as factors explaining the gap between their intentions and behaviours: (1) uncertainty about the effectiveness of written PA prescription, and (2) practical concerns (eg, changing well-established habits, time constraints, systemic institutional barriers).

Conclusion It may be effective to increase awareness among family physicians about the effectiveness of writing PA prescriptions and address barriers related to how their practice is organised in order to promote written PA prescription rates.

INTRODUCTION

Participation in physical activity is labelled as 'medicine' as it plays a critical role in disease prevention and control. It can reduce the risk of developing several chronic diseases, including heart disease, type 2 diabetes,

Strengths and limitations of this study

- This is the first study to follow family physicians over a 1-year period as they tried to implement written physical activity (PA) prescriptions into their practice. This design enabled us to document the process that physicians go through as they plan to modify their practice and as they encounter barriers.
- The design of this study did not incorporate a direct measure of the rate of PA prescription, or of the frequency of each barrier.
- Although our study involved multiple face-to-face interviews, it is possible that the 11 physicians participating in this study are not representative of the larger population of family physicians practicing in Canada or elsewhere.

osteoporosis and several types of cancer.¹ In addition, participation in physical activity can help improve insulin sensitivity, assist in diminishing elevated blood glucose levels into the normal range, lower blood pressure and alleviate symptoms of depression among adults diagnosed with various chronic diseases (eg, depression, diabetes, hypertension).²⁻⁵ In light of this evidence and evidence that physical activity can be as effective as frequently prescribed pharmaceutical agents in managing many common chronic diseases,^{6,7} numerous medical practice guidelines recommend introducing physical activity as a first-line therapeutic option.⁸⁻¹²

Advice from family physicians can be a strong external cue for health-promoting actions. Patients expect to receive recommendations to modify behaviours from their primary care providers.¹³ One way of giving advice is to write physical activity prescriptions. Writing physical activity prescriptions

has shown promise in promoting behaviour change. Researchers have concluded that written prescriptions of physical activity by family physicians can lead patients to attain higher physical activity levels.^{14–17} Prescribing physical activity can also lead to improvements in physical fitness¹⁸ and health-related quality of life.¹⁹

Despite the effectiveness of writing physical activity prescriptions and evidence that most family physicians recognise the value of physical activity,²⁰ a national survey indicated that only 16% of family physicians in Canada write physical activity prescriptions for their patients.²¹ Similar proportions have been noted elsewhere.^{22 23}

To increase the likelihood that physical activity promotion becomes part of regular practice, addressing physical inactivity has become a key component of medical curricula and is recognised as part of regular health services in some countries such as England and New Zealand.^{24 25} Although there are no clearly defined expectations of the role family physicians should play in promoting physical activity at the present time in Canada, nor is it typically included in their training, various organisations, including provincial medical societies and the Canadian College of Family Medicine, have prepared and distributed physical activity prescription pads for members at no cost to encourage physicians to write physical activity prescriptions for their patients.^{26 27} This action aligns with results from a previous study where we reported that primary care providers identified a lack of tools (eg, prescription pads) as a barrier to writing physical activity prescriptions.²⁸ To understand if and how the distribution of these prescription pads has impacted family physicians' practice, we conducted a longitudinal qualitative study with family physicians who were new recipients of physical activity prescription pads. We aimed to explore how their prescription habits changed (if at all) over time and to identify barriers and enablers to writing physical activity prescriptions for their patients.

METHODS

This longitudinal descriptive qualitative study was approved by the Vitalité Health Network research ethics committee. There are an estimated 208 family physicians practising in the Greater Moncton Area.²⁹ We purposefully recruited 11 of these family physicians (100% French speaking, 64% women, average of 17±9 years of practice) whom self-reported having no prior experience in writing physical activity prescriptions but had a desire to implement it into their practice. The Moncton Census Metropolitan Area has a population of 144 810, with 65% speaking English and 32% speaking French as their first language.³⁰ With the majority of the workforce commuting to its urban core for work, Moncton presents as an urban economy with a lower than national average unemployment rate.³¹ Similar to most of Canada, there are four seasons in Moncton and weather varies according to season, with daily average temperatures ranging from -8°C in winter months to 20°C in summer.³²

After providing consent, participants were interviewed four times during a 12-month period. Following the first interview, they received two types of physical activity prescription pads with brief instructions on how to use each pad. One pad was distributed by their provincial medical society and the other was distributed by Exercise is Medicine Canada. Both pads include a section for physicians to specify a recommended type, frequency and duration of activity for each patient and present the Canadian physical activity guideline. Physicians were free to use the pad they preferred. No other intervention was provided to be representative of the context most often associated with the distribution of physical activity prescription pads in practice.

Participants were first interviewed in January 2015, and then again 2, 4 and 12 later (ie, after receiving the physical activity prescription pads). The timing of follow-up interviews was based on previous research³³ and was meant to cover the estimated median time required to form the habit of prescribing physical activity (2 months; first follow-up), the time when we could expect the 75% of participants to have formed the habit (4 months; second follow-up) and a time when all participants would have formed the habit (12 months; third follow-up).³³ This data collection schedule was also designed to allow gaining understanding of the process of behaviour change and adoption and observe whether any behaviour change would be maintained. Interviews were conducted in French at participants' workplace, were semistructured and lasted between 20 and 55 min. The last interview took place in January 2016. The first three cycles of interviews were conducted by one of four residents in family medicine; the fourth cycle of interviews was conducted by one of four fourth year medical students because the residents were no longer available. All interviewers had a clear understanding of the study objectives and were trained on how to use the interview guide for this study. All interviews were audio-recorded and transcribed verbatim.

The interview guide included open-ended questions and probes. Participants were asked about their experiences of implementing written physical activity prescriptions into their practice (eg, 'Describe to me how you go about integrating physical activity prescriptions in your practice—How do you do it? In what contexts? What instructions do you give? What tools do you use? How frequently?'), any challenges they faced (eg, 'Can you tell me about the things that may interfere with you prescribing physical activity?') and what they found that helped them (eg, 'What are things that you find help you prescribe physical activity in writing?'). They were also asked about their feelings about prescribing physical activity now and in the future, the reasons for which they prescribe, their comfort with the practice, their intentions and their best and worst experiences with presenting physical activity prescriptions to patients. The questions included in the interview guide did not change over time and served as a checklist of points for discussion. However, interviewers were instructed to be flexible

and allow participants to take the discussion in any direction they wished to.

Data analysis

The data were imported into NVivo software (V.11) and analysed using the six stages of thematic analysis: familiarisation with data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report.³⁴ Data were analysed within and across cases to illuminate participants' individual experiences over time, as well as to highlight commonalities that existed across cases, respectively. The first four stages were done by two researchers separately. Each used the constant comparative method, which involved the constant and repeated checking of the interpretation of the data.³⁵ Then, they verified their analyses by ascertaining consensus in the explanation, understanding and interpretation of the collected data among three research team members. Quotations were selected to illustrate the themes and convey family physicians' experiences. These were translated from French to English at the time of manuscript writing, and unique participant identifiers were used instead of names to maintain participants' anonymity.

RESULTS

In total, 43 of the 44 interviews planned were conducted among 11 family physicians over a 12-month period (one family physician was not available for the final interview). Overall, participants started with positive attitudes towards prescribing physical activity (either in writing or verbally) because they understood how important physical activity is for health, most notably the role that physical activity plays in the prevention and control of chronic diseases such as type 2 diabetes, cardiovascular disease and cancer. At the time of the first interviews, this motivated participants to start writing physical activity prescriptions for their patients and they felt confident in their ability to do so, as seen in the following quote:

'I'm confident that with time, this will start working out [...].' (P11 interview 1)

However, participants' confidence seemed to dissipate with the passing of time as low confidence was evident among participants throughout interviews 2–4. Indeed, despite feeling confident during the first interview, this physician no longer felt confident:

'My confidence [to write physical activity prescriptions] is low, really low right now [...].' (P11 interview 3)

Over time, there was also evidence of a gap between participants' initial intentions to write physical activity prescriptions during the first set of interviews and their subsequent behaviour. They did not consistently write physical activity prescriptions for their patients. This intention–behaviour gap was best described by one participant during a follow-up interview:

'I'm still talking about it [physical activity]. I still encourage it [physical activity]. I didn't do any written prescription. Zero. Which surprises even me because I had the intention to do it and I was telling myself that it didn't take so long. It doesn't take long, but I didn't do any.' (P8 interview 2)

Participants discussed a number of factors during the follow-up interviews to explain why they had not written more physical activity prescriptions during consultations with patients. These factors can be housed under two main themes: (1) lack of conviction about effectiveness of physical activity prescription, and (2) practical concerns (eg, changing well-established habits, time constraints, systemic institutional barriers).

Lack of conviction about effectiveness of physical activity prescription

When discussing reasons for not regularly writing physical activity prescriptions, participants raised concerns that simply giving their patients a prescription might not be effective unless they could also provide patients with behavioural support. One participant elaborated and explained that if patients do not receive support to help them remove their barriers to physical activity, they likely will not change. Moreover, participants did not know how or did not have confidence in their ability to support their patients, as illustrated by the following quote:

'And really, you know, I'm not sure how to help them in that sense. I find that I give my recommendation, I tell them that it needs to be done, we get a lot of responses like: 'I don't have time, I have too many kids, I work 40 hours a week, I have other activities. When do you want me to do this?'' For doctors it can be tough to say: 'I don't know, but you should be able to find time.'' (P1 interview 1)

Over time, this made participants less likely to want to write physical activity prescriptions for all their patients. Specifically, the potential for low compliance of their patients with the physical activity prescriptions led participants to start writing physical activity prescriptions for patients whom they felt would follow their advice. Being familiar with the transtheoretical model of behaviour change, participants tried to assess patients' readiness to change, and if they felt their patient was ready to become active, they were more inclined to write a physical activity prescription as described in the following quote:

'I start off with the Prochaska steps to see what the patients are currently doing, because if they are already very active then good, I can reinforce that, but if they are completely inactive then I can work with them to sort out their risk factors and can demonstrate to them that a pill will not replace the power of physical activity in the prevention of chronic illnesses, control of diabetes, etc.' (P9 interview 1)

Participants' motivation to write prescriptions selectively for those they believed were ready and open to change was also initially based on the anticipation of negative reactions from some patients. As one participant stated:

It's obvious that physical activity and physical activity prescription unfortunately is not for everybody. Older adults, those with poor cardiac health, patients with arthritis all over, patients who have trouble walking from here to there, patients who are intolerant to glucose might see a prescription as insulting if I were to tell them they should try walking more when they have a cane and can't walk as it is.' (P1 interview 1)

However, over time, participants realised that their assumptions may have been false, either because some patients did not have negative reactions to receiving a written physical activity prescription or because they saw change in their patients' behaviour and health. This change in mentality is best described by the same participant as above who had preconceived assumptions and who in a follow-up interview showed a different mindset:

I had a follow-up appointment with someone that I gave a prescription to... She told me that she had followed my prescription, she hadn't started walking like we had discussed but at least she had started! That encouraged me. Hey maybe it works. She had also lost a lot of weight since the prescription! So that was encouraging. When you see results it's fun.' (P1 interview 3)

Another participant also reinforced the notion that patients drive their motivation to write physical activity prescriptions:

I think it's the patients' pride that encourages us to apply it [written physical activity prescriptions].' (P4 interview 3)

In addition to considering patients' readiness to change, participants considered their patients' condition. They generally wrote physical activity prescriptions for patients at risk of developing certain chronic diseases and this pattern persisted over time, as seen in the following quotes from one of the participants at two separate time points:

I think that no matter what physical condition, like hypertension, dyslipidemia, diabetes, whether it's heart failure, cardiovascular disease or even lung disorders like COPD, for example, these people can all benefit from physical activity, but for some reason I only did it with a few of my diabetics [patients].' (P11 interview 2)

If we look at conditions where we have a tendency to prescribe physical activity, it's probably diabetes first, and sleep apnea. I have a tendency to definitely target cholesterol and hypertension patients, as well osteoarthritis.' (P11 interview 4)

Although they acknowledged that writing physical activity prescriptions should be placed on par with writing drug prescriptions for many chronic conditions, participants felt that the former required a greater change in their patients. When asked to explain this, they expressed being more willing to provide drug prescriptions due to how easy they perceived it would be for their patients to comply with the drug prescription in comparison to

complying with the physical activity prescription which would require having to make more significant lifestyle changes. As one participant explained:

'It's easier [for patients] to take a pill than it is to change lifestyles.' (P4, interview 3)

Practical concerns barriers

During the follow-up interviews, participants offered a number of reasons why they did not end up writing physical activity prescriptions as they had initially intended to. One was that it was not part of their 'routine.' The approaches taken towards general practice consultations were often a product of habit, making physical activity less of a focal point compared with other health issues. Despite being aware that physical activity could prevent, treat or control some of the health problems presented by patients, writing physical activity prescriptions instead of writing other types of prescriptions was hard because it would require changing existing habit. As one participant explained during the last interview:

I'm convinced that [physical activity] prescription works. It's just changing habits, it's not easy to change a habit.' (P1 interview 4)

Indeed, the participants appeared more willing to give other prescriptions (eg, metformin to patients with diabetes, psychotherapy for patients with mental health concerns) that arose more consistently in their respective practices.

Another reason participants voiced was that it required more time to properly explain a written physical activity prescription when compared with explaining other types of prescriptions like medication. Their concern with time did not seem to diminish over the 12 months of follow-up and was especially elevated in situations where they have patients presenting with multiple issues that needed to be addressed during a short consultation. As one participant explained during the second interview:

'To be honest, what I can say is that patients come to an appointment with x number of problems, and as a doctor, to be able to give them answers to all of those problems and more, I sincerely think that I would not have enough time.' (P4 interview 2)

In addition, participants discussed systemic institutional barriers to writing physical activity prescriptions. For example, although they had each been given prescription pads (and had access to pads during the course of this study), the lack of visible prescription pads in every consultation room deterred them from writing physical activity prescriptions. They noted that having them everywhere would serve as a reminder for them to prescribe physical activity as well as for their patients to ask about physical activity prescriptions. As one participant explained during the third interview and reinforced during the fourth:

'I don't always work in the same rooms, so it would probably be necessary to have the prescription pads in all four of the rooms that I work in and to leave them there, because I think often at the beginning of my day if they aren't there I'll probably just give non-written advice and wouldn't take the time to write it, so it's more an issue of easy access to the pads.' (P1 interview 3)

'It's about having access to the prescription pad at all times. It'd be useful to have it in all of the rooms and make sure they don't leave the room, sometimes they get taken out in piles of paper.' (P1 interview 4)

An additional systemic institutional barrier identified by participants was change in procedures to manage patients' dossiers. During the course of this study, participants were introduced to a new electronic medical records programme, which required them to learn this new system. They felt this interfered with their ability to write physical activity prescriptions as captured here:

'It's a challenge with the electronic files because I have still not established a routine and am still adapting to it.' (P6 interview 3)

Participants explained that, with the new system, pharmacological prescriptions were made electronically and printed for patients. However, the physical activity prescription pads were hard copy, meaning they would have to use two systems to make prescriptions and then take the time to enter the information in the patients' dossier. For this reason, they suggested that an electronic version or template of the physical activity prescription pads be included within the systems to improve accessibility.

DISCUSSION

Although seemingly effective in promoting behaviour change in primary care, the provision of written physical activity prescriptions is not common practice among family physicians.²¹ Results from this study suggest that even among family physicians who intend to start writing physical activity prescriptions within their practice and who feel confident in their ability to do so, providing physical activity prescription pads was not sufficient to entice a real change in practice. Based on previous research, the distribution of prescription pads may be more effective in changing practice if combined with training on how to use them.³⁶ Specifically, researchers have reported that 3 hours of training which focus on the process of prescribing physical activity to patients increased the rates of written physical activity prescriptions by 70% among family physicians.³⁶ Such training may be necessary as it would help family physicians understand what to prescribe (eg, intensity, duration, frequency and mode of physical activity) and give them background information that could be included in a physical activity prescription for it to be effective and appropriate to the needs and abilities of their patients.³⁷ It would also provide an

opportunity to inform family physicians that physical activity can be beneficial for everyone, not only patients presenting certain conditions. This is particularly relevant since our findings revealed that physicians factored in their patients' condition when deciding whether to prescribe physical activity versus other therapies.

Incorporation of evidence that writing physical activity prescriptions is effective in changing patients' behaviour would also be valuable because doubt about its effectiveness was identified as a key barrier by physicians. For example, information that writing physical activity prescriptions can lead to increases in physical activity of about 10%,¹⁴ which from a public health and an economic perspective can represent enormous beneficial effects,³⁸ could be presented. Furthermore, evidence that adherence to physical activity as prescribed by family physicians can be as good as adherence to most treatments for chronic diseases¹⁷ should be communicated. This is especially important, because without having any prior experience, participants initially anticipated that patients would react negatively to receiving written prescriptions of physical activity and fail to comply with it. However, participants in this study reported that negative reactions did not occur. Moreover, some physicians reported that patients did follow their physical activity prescriptions and this influenced participants to become more open to writing more such prescriptions.

Whereas it appears necessary to offer training to the current generation of physicians, targeting the next generation of physicians is also important for successful implementation in the future. In an attempt to do this, the Canadian Medical Association adopted a motion to support the development of education on the prescription of physical activity within the country's medical schools during its 149th annual meeting in 2016.³⁹ Analysis of whether this contributes to address the various challenges reported by physicians when trying to implement written physical activity prescription into their practice (eg, barriers stemming from practical concerns such as not being part of their routine and often being easier to use courses of treatment that did not include physical activity) will be needed. It is possible that the inclusion of training on physical activity prescription within medical curriculums will help 'normalize' this type of intervention and create norms around writing physical activity prescriptions. This is nevertheless unclear as a recent systematic review reported that although medical training programmes that incorporate physical activity counselling education lead their students to have more positive self-efficacy to conduct physical activity counselling, there is currently no information on the effects of such training on the future practice of physicians and their patients' participation in physical activity or on the mechanisms through which it may yield change.⁴⁰ The effects of training on physical activity counselling by primary care providers may also depend on other factors. For example, whereas it is possible for family physicians and nurse practitioners to refer patients to exercise

professionals in some countries,^{41 42} such services are not covered under the Canadian publicly funded system of universal healthcare. In the absence of generally available publicly funded exercise referral programmes, physical activity prescriptions may represent the best option for current primary care practices in Canada.

Finally, participants in the current study indicated that the time required to provide a proper physical activity prescription represented an important barrier for its inclusion in regular practice. This is in line with findings from previous studies with family physicians.^{43 44} Even if the merits of 2–4 min interventions to promote physical activity have been well documented,⁴⁵ tools and strategies are needed to help family physicians integrate physical activity prescriptions in their practice more easily. As suggested by the normalisation process theory,⁴⁶ new interventions need to be perceived as beneficial to physicians and their patients and need to fit with what physicians are already using in order to be integrated into routine care. Although the recent development and distribution of physical activity prescription pads is a step in the right direction, results from the current study suggest that more efforts are needed. It must be recognised that in addition to addressing physical inactivity, family physicians are under considerable pressure to provide a wide range of services to their patients.^{47 48} Faced with the need to prioritise actions, it is not surprising that participants in the current study reported being more inclined to prescribe physical activity to patients with conditions they judged most likely to improve because of physical activity. Advances with electronic medical records, mobile services and wearable technology may eventually lead to easier and as effective ways for physicians to intervene, but in the interim, physicians are encouraged to approach the prescription of physical activity as they do for other treatments.⁴⁹ When possible, referrals to health professionals with expertise in physical activity counselling may also be considered.⁵⁰

Although the qualitative longitudinal methods used in this study enabled a rich and in-depth exploration of family physicians' experiences, there are several limitations. First, this study does not aim to quantify rates of prescription or frequency of each barrier. Second, results may not be transferable to other family physicians. Although data saturation was reached in this study with this sample,⁵¹ French-speaking family physicians were recruited through self-referrals and we cannot rule that these self-selected family physicians are different from the larger population of family physicians across Canada and other countries who work in different healthcare systems.

CONCLUSIONS

Based on the results from this study, the simple distribution of physical activity prescription pads may not be sufficient to encourage the written prescription among family physicians practising in Canada. Even among family physicians self-described as confident and intending to

start writing physical activity prescriptions regularly within their practice, there was a considerable gap between their intentions and their behaviour. Most factors that contributed to this intention–behaviour gap could seemingly be attenuated if physicians were more knowledgeable of the effectiveness of writing physical activity prescriptions and by making changes to the environment physicians practice in.

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REFERENCES

1. Booth FW, Roberts CK, Laye MJ. Lack of exercise is a major cause of chronic diseases. *Compr Physiol* 2012;2:1143–211.
2. Cooney GM, et al. Exercise for depression. *Cochrane database Syst. Rev* 2013;9:CD004366.
3. Josefsson T, Lindwall M, Archer T. Physical exercise intervention in depressive disorders: meta-analysis and systematic review. *Scand J Med Sci Sports* 2014;24:259–72.
4. Umpierre D, Ribeiro PA, Kramer CK, et al. Physical activity advice only or structured exercise training and association with HbA1c levels in type 2 diabetes: a systematic review and meta-analysis. *JAMA* 2011;305:1790–9.
5. Cornelissen VA, Smart NA. Exercise training for blood pressure: a systematic review and meta-analysis. *J Am Heart Assoc* 2013;2:e004473.
6. Naci H, Ioannidis JP. Comparative effectiveness of exercise and drug interventions on mortality outcomes: metaepidemiological study. *BMJ* 2013;347:f5577.
7. Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scand J Med Sci Sports* 2015;25(Suppl 3):1–72.
8. Dasgupta K, Quinn RR, Zarnke KB, et al. The 2014 Canadian hypertension education program recommendations for blood pressure measurement, diagnosis, assessment of risk, prevention, and treatment of hypertension. *Can J Cardiol* 2014;30:485–501.
9. Grimes D, Gordon J, Snelgrove B, et al. Canadian guidelines on Parkinson's Disease. *Can J Neurol Sci* 2012;39:S1–30.
10. Leon AS, et al. Cardiac rehabilitation and secondary prevention of coronary heart disease: an American Heart Association scientific statement from the council on clinical cardiology (Subcommittee on

- exercise, cardiac rehabilitation, and prevention) and the council on Nut. *Circulation* 2005;111:369–76.
11. O'Donnell DE, Hernandez P, Kaplan A, *et al.* Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease - 2008 update - highlights for primary care. *Can Respir J* 2008;15(Suppl A):1A–8.
 12. Papaioannou A, Morin S, Cheung AM, *et al.* 2010 clinical practice guidelines for the diagnosis and management of osteoporosis in Canada: summary. *CMAJ* 2010;182:1864–73.
 13. Whitlock EP, Orleans CT, Pender N, *et al.* Evaluating primary care behavioral counseling interventions: an evidence-based approach. *Am J Prev Med* 2002;22:267–84.
 14. Elley CR, Kerse N, Arroll B, *et al.* Effectiveness of counselling patients on physical activity in general practice: cluster randomised controlled trial. *BMJ* 2003;326:793.
 15. Grandes G, Sanchez A, Sanchez-Pinilla RO, *et al.* Effectiveness of physical activity advice and prescription by physicians in routine primary care: a cluster randomized trial. *Arch Intern Med* 2009;169:694–701.
 16. Leijon ME, Bendtsen P, Ståhle A, *et al.* Factors associated with patients self-reported adherence to prescribed physical activity in routine primary health care. *BMC Fam Pract* 2010;11:38.
 17. Kallings LV, Leijon ME, Kowalski J, *et al.* Self-reported adherence: a method for evaluating prescribed physical activity in primary health care patients. *J Phys Act Health* 2009;6:483–92.
 18. Petrella RJ, Lattanzio CN, Shapiro S, *et al.* Improving aerobic fitness in older adults: effects of a physician-based exercise counseling and prescription program. *Can Fam Physician* 2010;56:e191–200.
 19. Kallings LV, Leijon M, Hellénus ML, *et al.* Physical activity on prescription in primary health care: a follow-up of physical activity level and quality of life. *Scand J Med Sci Sports* 2008;18:154–61.
 20. Abildsnes E, Walseth LT, Flottorp SA, *et al.* Lifestyle consultation in general practice--the doctor's toolbox: a qualitative focus group study. *Fam Pract* 2011;28:220–5.
 21. Petrella RJ, Lattanzio CN, Overend TJ. Physical activity counseling and prescription among canadian primary care physicians. *Arch Intern Med* 2007;167:1774–81.
 22. Siqueira FV, Nahas MV, Facchini LA, *et al.* [Counseling for physical activity as a health education strategy]. *Cad Saude Publica* 2009;25:203–13.
 23. Croteau K, Schofield G, McLean G. Physical activity advice in the primary care setting: results of a population study in New Zealand. *Aust N Z J Public Health* 2006;30:262–7.
 24. DCLG & Government, L. *Making every contact count*, 2012:1–10.
 25. Gates AB. Making every contact count for physical activity--for tomorrow's patients: the launch of the interdisciplinary, undergraduate, resources on exercise medicine and health in the U.K. *Br J Sports Med* 2016;50:322–3.
 26. Frémont P, Fortier M, Frankovich RJ. Exercise prescription and referral tool to facilitate brief advice to adults in primary care. *Can Fam Physician* 2014;60:e591–2.
 27. Owens B. Exercise prescriptions endorsed. *CMAJ* 2014;186:E478.
 28. Bélanger M, *et al.* Family Physicians' Perceptions toward Writing Physical Activity Prescriptions: I Tell Patients it's Like the Super Pill! . *Qual Prim Care* 2015;23:113–21.
 29. College of Physicians and Surgeons of New Brunswick. Medical Directory, CPSNB Membership Database User Form. 2017. http://www.cpsnb.org/webdata/drdbase_form.shtml (accessed 6 Jun 2017).
 30. Statistics Canada. National Household survey (NHS) Profile, 2011. 2016. <http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/index.cfm?Lang=E>
 31. Community Information Database. Metropolitan influence zones (MIZ) typology 2006. 2006. http://map.cid-bdc.ca/#sly=can_sdr_DR;f=0;I=en;i=comtype.miz;v=map1;s=2006;sid=689
 32. Canada E. Station results - Historical data - Climate - Environment and climate Change Canada. 2017. http://climate.weather.gc.ca/historical_data/search_historic_data_stations_e.html?searchType=stnProv&timeframe=1&lstProvince=NB&optLimit=yearRange&StartYear=1840&EndYear=2017&Year=2017&Month=5&Day=29&selRowPerPage=25
 33. Lally P, van Jaarsveld CHM, Potts HWW, *et al.* How are habits formed: Modelling habit formation in the real world. *Eur J Soc Psychol* 2010;40:998–1009.
 34. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
 35. Glaser B. The constant comparative method of qualitative analysis. *Soc Probl* 1965.
 36. Windt J, Windt A, Davis J, *et al.* Can a 3-hour educational workshop and the provision of practical tools encourage family physicians to prescribe physical activity as medicine? A pre-post study. *BMJ Open* 2015;5:e007920.
 37. Hoffmann TC, Maher CG, Briffa T, *et al.* Prescribing exercise interventions for patients with chronic conditions. *CMAJ* 2016;188:510–8.
 38. Ding D, Lawson KD, Kolbe-Alexander TL, *et al.* The economic burden of physical inactivity: a global analysis of major non-communicable diseases. *Lancet* 2016;388:1311–24.
 39. General Council. RESOLUTIONS ADOPTED (unconfirmed) 149th annual meeting of the Canadian Medical Association General Council 2016 - Vancouver. *Can Med Assoc* 2016.
 40. Dacey ML, Kennedy MA, Polak R, *et al.* Physical activity counseling in medical school education: a systematic review. *Med Educ Online* 2014;19:24325.
 41. *Physical activity: exercise referral schemes | 1-Recommendations | guidance and guidelines* | NICE.
 42. Ministry of Health . Green Prescriptions A Green Prescription/prescription (GRx) is a health professional's written advice to a patient to be physically active, as part of the patient's health management(2016). 2017. <http://www.health.govt.nz/our-work/preventative-health-wellness/physical-activity/green-prescriptions>
 43. Brotons C, Björkelund C, Bulc M, *et al.* Prevention and health promotion in clinical practice: the views of general practitioners in Europe. *Prev Med* 2005;40:595–601.
 44. Lawlor DA, Keen S, Neal RD. Increasing population levels of physical activity through primary care: GPs' knowledge, attitudes and self-reported practice. *Fam Pract* 1999;16:250–4.
 45. *Physical activity: brief advice for adults in primary care | guidance and guidelines* | NICE.
 46. Murray E, Treweek S, Pope C, *et al.* Normalisation process theory: a framework for developing, evaluating and implementing complex interventions. *BMC Med* 2010;8:63.
 47. Yarnall KS, Pollak KI, Østbye T, *et al.* Primary care: is there enough time for prevention? *Am J Public Health* 2003;93:635–41.
 48. Østbye T, Yarnall KS, Krause KM, *et al.* Is there time for management of patients with chronic diseases in primary care? *Ann Fam Med* 2005;3:209–14.
 49. Thornton JS, Frémont P, Khan K, *et al.* Physical activity prescription: a critical opportunity to address a modifiable risk factor for the prevention and management of chronic disease: a position statement by the Canadian Academy of Sport and Exercise Medicine. *Br J Sports Med* 2016;50:1109–14.
 50. Feltmate I, Ian Murphy R. *Prescription for wellness: The feasibility of physician-prescribed kinesiology care in Nova Scotia*: Administrative Sciences Association of Canada 13–25 (Research Gate), 2005.
 51. Francis JJ, Johnston M, Robertson C, *et al.* What is an adequate sample size? Operationalising data saturation for theory-based interview studies. *Psychol Health* 2010;25:1229–45.