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Exercise as a vital sign: a preliminary pilot study in a chiropractic setting

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Background: *The association between physical inactivity and non-communicable disease risk has been well documented in recent literature. An exercise vital sign (EVS) is a measure that can routinely capture vital information about a patient's physical activity behaviour. The objective of this study is to understand if (1) patient exercise minutes per week (EMPW) are being recorded by chiropractic interns, and (2) whether these patients are exceeding, meeting or falling short of the current recommendations provided by the Canadian Physical Activity Guidelines (CPAG).*

Methods: *Electronic medical records obtained from two Canadian Memorial Chiropractic College (CMCC) teaching clinics for patients seen between August 01, 2015 and January 31, 2017 (N=273). EMPW, age, and gender were used to compare patient files relative to the CPAG.*

Results: *Overall, 86.4% of patient files had recorded*

Contexte : *L'existence d'un lien entre inactivité physique et risque de maladie non transmissible est bien documentée dans la littérature récente. Exercise vital sign (EVS) est une mesure permettant d'obtenir de fa*çon systématique des données sur l'activité physique d'un patient. *Cette étude visait à savoir si 1) les minutes consacrées* à l'exercice physique *par semaine (MEPPS) sont consignées par les internes en chiropratique et si 2) ces patients suivent les recommandations actuelles énoncées dans les Lignes directrices canadiennes en matière d'activité physique (LDCAC).*

Méthodologie : *Dossiers médicaux électroniques de patients vus entre le 1er août 2015 et le 31 janvier 2017 (n=273) provenant de deux cliniques d'enseignement affiliées au Canadian Memorial Chiropratique College (CMCC). Les MEPPS, l'âge et le sexe ont servi à comparer les dossiers de patients en tenant compte des LDCAC.*

Résultats : *Dans l'ensemble, 86,4 % des dossiers*

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data to the question of how many EMPW they perform. The majority (68.8%) of individuals appear to be meeting or exceeding the CPAG, leaving nearly one third (31.2%) of individuals failing to meet these guidelines.

Conclusions: *In this pilot study with two sports specialist clinicians an exercise vital sign had been integrated alongside traditional vital signs in order to identify issues of physical inactivity and improve opportunities for continued exercise counselling.*

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KEY WORDS: exercise, physical activity, electronic medical records, chiropractic

*de patients contenaient des données sur le nombre de MEPPS. Il semble que la majorité (68,8 %) des sujets respectaient les LDCAC ou allaient m*ême au-delà, alors que presque le tiers *(31,2 %) ne les respectaient pas.*

Conclusions : *Dans cette étude pilote menée par deux cliniciens spécialistes de la médecine sportive, l'exercise vital sign et d'autres signes vitaux classiques ont servi à cerner les problèmes reliés à l'inactivité physique et à accroître les occasions de fournir des conseils en matière d'exercice continu.*

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MOTS CLÉS : exercice, activité physique, dossiers médicaux électroniques, chiropratique

Introduction

The relationship between physical inactivity and poorer health outcomes has become a well-established major public health concern over recent decades.[1] In fact, physical inactivity is the fourth leading cause of death and contributes to the other causes such as heart disease, diabetes and cancer. Sedentary lifestyles are often cited as one of the largest contributing factors towards the development of chronic disease, premature mortality and morbidity.[1,2] The clinical effectiveness of physical activity assessment and intervention should be optimized wherever possible since increasing physical activity levels is such an effective intervention in the management and prevention of chronic disease.[1,2] Although the course of most chronic diseases is multifactorial, the same can be said with respect to enabling a healthier lifestyle, whereby regular evaluation of physical activity levels should be considered part of a routine measure to encourage meaningful life change.

The Canadian Society for Exercise Physiology (CSEP) is among the most widely recognized authorities on exercise science and prescription in Canada. The guidelines focus on physical activity requirements for Canadians which includes exercise. Although exercise is often considered more structured, intense and frequent; for the purpose of this document exercise and physical activity are used interchangeably. The 2012 CSEP Canadian Physical Activity Guidelines (CPAG) were developed in conjunction with the CSEP, the Government of Canada, and supported by the Public Health Association of Canada. These guidelines provide clear recommendations for how much physical activity – defined in both minutes per week and intensity – should be prescribed for patients of any age.[3] Individuals between the ages of 18-64 years should engage in a minimum of 150 minutes per week of moderate to vigorous physical activity (MVPA) to be deemed sufficiently active.[3] According to the CPAG, moderate intensity physical activity is estimated to be a 5 to 6 out of 10, or cause an adult to sweat and increase their breathing rate (brisk walking, bike riding), while vigorous intensity physical activity should cause sweating and the participant to be out of breath (jogging, cross-country skiing), rated 7 to 8 out of 10.[3] To achieve MVPA, a combination of moderate and vigorous intensity activities is recommended. Despite the accessibility of these guidelines and the well-known benefits of regular exercise/physical activity, only 1 in 5 Canadian adults actually meets these recommendations, implying that approximately 80% of Canada's adult population is sedentary.[4] In a recent 2016 paper, the annual economic burden attributable to excess weight and physical inactivity was found to be a combined $33.7 billion in Canada.[5] As such, there is an urgent need for a clinical tool that creates continual opportunities for physical activity assessment and counselling.

At present, most CMCC teaching clinics utilize OSCAR 12.1 Electronic Medical Records (2012, as adapted

for use by Indivica for CMCC) to document all patient interactions. Within this program, there is a dedicated text-box for recording patient exercise minutes per week (EMPW) in every patient chart under "Physical Examination", directly following the assessment of traditional patient vital signs. It has been suggested that the widespread effectiveness of traditional vital signs is supported by three main factors: (1) that they help predict likelihood of future disease or illness, (2) that they identify temporal patterns in health that may highlight areas for clinical intervention, and (3) that they can be used to educate and involve patients in their own treatment.[6] When considering the application of EMPW in the context of a 'vital sign', not only does it appear to satisfy these core principles, but more importantly, integrating the application into regular practice would create more opportunities for counselling patients on the health benefits of regular physical activity.

Implementing an exercise vital sign (EVS) may provide assistance in addressing the overwhelming need for improved efforts at successful lifestyle interventions. Using an EVS in clinical practice has been demonstrated to be an efficient measure to ensure routine evaluation of patient physical activity behaviours.[7] A large population based study by Coleman *et al*.[7] evaluated the validity of an EVS added to electronic medical records in a large healthcare system of outpatient clinics in Southern California. Their EVS tool was implemented along with traditional vital signs and consisted of two main questions: "(1) On average how many days per week do you engage in moderate to strenuous exercise (like a brisk walk)?" and (2) "On average how many minutes do you engage in exercise at this level?".[7] After 18 months of EVS collection, they had achieved an EVS measure for 86% of their patients and concluded that this information should be a regular standard of practice for healthcare providers, as it can facilitate improved clinical discussion on lifestyle interventions and help direct treatment decision making.[7] This EVS tool was later adopted by the "Exercise is Medicine" (EIM) initiative and developed into the Physical Activity Vital Sign (PAVS), which can be used as a screening tool for identifying physical inactivity and indicate when exercise prescription may be necessary.[8] Recent studies further assessing the PAVS in routine clinical practice have reaffirmed its usefulness towards addressing physical inactivity. When comparing patients that received a PAVS against those who did not have any physical activity measurement, patients with PAVS data were more likely to report exercise counselling, increased lifestyle-related referrals (weight loss and nutrition), and positive metabolic changes including greater relative weight loss and improved glycemic control in diabetic patients.[8] These results show the usefulness and success of implementing PAVS in clinical practice, highlighting the potential of widespread use of an EVS measure in clinical settings to better address physical inactivity.[9-11]

It has been recommended by the Global Advocacy for Physical Activity Council (GAPA) that primary health care practitioners have a duty to utilize exercise as a vital sign. Through a typical chiropractic interaction, chiropractors may be well suited to incorporate an EVS as part of a patient record and use this to assess and monitor patient health. A chiropractor's scope of practice includes musculoskeletal diagnoses, treatment, and prevention rooted in evidence based medicine that includes the capacity to utilize a variety of multi-modal treatments. Evidence based medicine consists of three interconnected aspects consisting of clinical judgement, relevant scientific evidence, and patients' values and preferences. Lifestyle education, exercise recommendation and rehabilitation are often components of the multi-modal treatments chiropractors include in their practice. There is a significant body of high quality research showing that exercise, especially when paired with manual therapy, is an essential part of successful treatment of commonly experienced acute and chronic pain conditions seen in chiropractic clinics.[12-19] Furthermore, a recent study demonstrated that nearly 70% of CMCC students completed their undergraduate degree in health sciences or kinesiology and approximately 74% of students meet or exceed the recommended CSEP CPAG of 150 minutes/week of MVPA.[20] This provides a strong foundational knowledge for chiropractors to continue their education in focused exercise strategies that can be used in combination with their multi-modal treatments. Utilizing an EVS approach may help chiropractors and all primary health care practitioners to better monitor patients' progress and promote overall wellness through improved standards of care.

The current study sought to examine whether measurements of physical activity as a vital sign were reported during the history of a new patient assessment by chiropractic interns. Specifically, are EMPW being recorded

in electronic patient files by chiropractic interns of the Canadian Memorial Chiropractic College (CMCC) in the Patient Management Teams of two chiropractic sports fellows. If so, the actual number of EMPW recorded was analyzed for whether they met, exceeded, or fell short of the CSEP CPAG for EMPW compared with their corresponding age bracket.

Methods

Study Design: A cross-sectional case series chart review.

Every consecutive new patient receiving care between August 01, 2015 through January 31, 2017 from each clinic were reviewed for inclusion in this study. Data was extracted from new patient files within the OSCAR electronic health records of the CMCC teaching clinic groups of two chiropractic sports fellows. One of the groups was at the college campus clinic and the other was off campus at an outpatient clinic of a rehabilitation hospital. Exclusion criteria for file analysis included the following: patient files in which privacy forms were not evident, patients under four years old, or duplicated file numbers. Non-personal identifying data collected from each file included patient age, gender, initial visit date, student status, and EMPW (if recorded). Patient age was further grouped into three broad categories (5-17, 18-64, 65+), consistent with the CPAG guidelines. The data was extracted manually by each clinician reviewing their own data sets for each file number provided by administration to the authors. The data was then stored on encrypted flash drives. No identifiable patient information was reviewed or recorded for the purpose of this study. The authors, who were in the circle of care of the patients ensured privacy during data collection and storage. This responsibility and strategy was shared and reviewed with clinical administration. It received ethics board approval from CMCC (REB# 1702A01).

Outcome Measures

The data collection and data entry of patients EVS by CMCC interns was recorded in a specific EMPW text-box as part of a new patient electronic health record. In order to assess whether the sample was achieving the recommended amount of weekly physical activity, the most recent CPAG were used. The CPAG recommend adults ages 18-64 and 65+ have a minimum of 150 minutes/week of MVPA and children ages 5-17 have a minimum of 60 minutes/day of MVPA.[3] These CPAG are often regarded as the 'gold standard' for the assessment of weekly physical activity that constitutes part of a healthy lifestyle. The data collected was simply reviewed using descriptive statistics, frequencies, percentages and averages.

Table 1.
Characteristics of electronic patient files evaluated.

	Males	Females	Total
Total number of files	137	136	273
Number of files with some notation of EMPW	122	114	236 (86.4%)
Number of files with a numerical EMPW value	108	99	207 (75.8%)
Number of files with a descriptor of weekly exercise	14	15	29 (10.6%)
Number of files of student patients	24	17	41 (15%)

Results

In total, 337 electronic patient files were extracted for review. Of the 337 files, 273 (81%) met the inclusion criteria and were included for analysis in this study. The gender of the patients files were evenly split, with 137 male and 136 female patient files composing the total 273 files evaluated. Students were 15% (41) of the sample. Overall, 86.4% (236) of total patients recorded an answer to the question of how many EMPW they perform, as indicated by some level of completion of the dedicated EMPW text-box in their new patient intake. Therefore, only 13.6% (37) of patients were presumably not engaged in a discussion of their weekly exercise behaviours or did not have their response recorded. Of the 236 files that had some discussion of EMPW in their intake form, 87.7% (207) had a recorded numerical value of EMPW. The remaining 29 files (12.3%) did not have a numerical value, but rather a description of their weekly exercise habits (i.e.: varsity athlete, very active athlete, likes to walk, or "daily" recorded with no numerical value) (Table 1). Similarly, this

Table 2.
Range and average EMPW for CPAG specific age groupings.

	Male	Female	Total files evaluated	Range of EMPW recorded	Average EMPW
Ages 5-17	6	3	9 (4.3%)	90-1080	379
Ages 18-64	92	88	180 (86.9%)	0-1200	255
Ages 65+	10	8	18 (8.7%)	0- 840	257
Total number of files with numerical EMPW values	108 (52.1%)	99 (47.8%)	207	0-1200	297

can be further interpreted as 207 of the total 75.8% (273) patient files evaluated had a numerical value of EMPW recorded, while 10.6% had a descriptive summary of the patient's exercise habits.

Table 2 demonstrates the exercise characteristics of the study population that had a numerical EMPW value recorded in their file (207 files total). An overwhelming majority of these patients are represented by the 18-64 age group (86.9%), with much smaller contributions from the 5-17 and 65+ age groups. Patients aged 5-17 (n=6) were found to have an average of 379 EMPW, with a range of 90 to 1080 minutes per week. Those in the 18-64 age category (n=92) were found to have an average of 255 EMPW, with a range of 0 to 1200 minutes per week. Finally, those in the 65+ age group (n=10) had an average of 257 EMPW, with a range of 0-840 minutes per week.

Table 3 shows the number of subjects that meet, exceed, or fall short of the CPAG guidelines for EMPW for their corresponding age bracket. Ultimately, 68.8% (141) of patient files evaluated either met or exceeded the CPAG EMPW recommendations for their respective age group. In comparison, 31.2% (66) patient files failed to meet the minimum number of EMPW required for their specific age group, 29% of which were found to perform zero EMPW, contributing to the large range of EMPW observed in Table 2. Those aged 5-17 years old were noted to have the highest rate of meeting or exceeding the current guidelines (88.8%). Conversely, those aged 65 and older were noted to have the highest rate of failing to meet the current guidelines (44.5%). While these trends are of value, it is important to consider that both the youngest and oldest age categories only accounted for a combined 13% of the total study population, with the remainder belonging to the 18-64 year old age category. Due to the high proportion of patient files within this age range, the results of this group very closely parallel the overall trends observed in the literature. In general, the males reported a greater success obtaining the required EMPW compared to females (71.3% of males vs 64.7%

Table 3.
Age and sex-specific comparison of those who meet or fail to meet the CPAG.

Grouped age categories	Fall short of CPAG guidelines	Meet or exceed CPAG age-specific guidelines
5-17	1 (11.2%)	8 (88.8%)
18-64	57 (31.6%)	123 (68.4%)
65+	8 (44.5%)	10 (55.5%)
Total	66 (31.2%)	141 (68.8%)
Males	31 (28.7%)	77 (71.3%)
Females	35 (35.3%)	64 (64.7%)

of females). Future work can use this data to perform a power analysis to determine an appropriate sample size to better evaluate these trends in the data.

Discussion

To our knowledge, this is the first study examining the collection of EMPW data in a chiropractic setting, as well as comparing the physical activity habits of chiropractic patients in relation to the CPAG. The results indicate that the majority of patient files (86.4%) have had some discussion surrounding weekly exercise or physical activity habits in a clinical setting and that interns are routinely using this tool to capture patient health information, similar to a vital sign. Numerical values were used most commonly to record this information in patient files (87.7%), while a smaller proportion of files had only written descriptions of activity for patients, where it was noted that they may be meeting or exceeding sufficient EMPW in order to perform their sport optimally, such as "varsity athletes". A recent study of chiropractic students demonstrated that 99% of the 344 students surveyed viewed exercise counselling as relevant to their future practices and 90% intended to promote exercise as part of patient treatment.[20] Based on this information we suspect that exercise prescription and exercise as a vital sign should be viewed as a significant component of patient care amongst future chiropractors.

With respect to the CPAG, the majority of patients (68.8%) in our study are meeting or exceeding the recommended minimum number of EMPW for their respective age group; however, nearly one-third of patients (31.2%) are failing to meet these basic requirements on a weekly basis. This subset of patients may represent a significant opportunity for chiropractors at CMCC and other primary healthcare providers alike to emphasize the importance of addressing regular physical activity with patients throughout routine clinical encounters. Consistent with health professionals strong desire to utilize evidence based approaches to healthcare, chiropractors are well suited to monitor and facilitate exercise behaviour changes among sedentary patients. The implementation of a mainstream EVS measure throughout chiropractic teaching clinics may help to close the gap on exercise insufficiency by providing baseline and subsequent measurements of physical activity that can be used to engage patients towards making healthy, long lasting lifestyle changes over time. There is no shortage of evidence supporting the use of exercise interventions for a wide range of musculoskeletal complaints commonly encountered by chiropractors.[12-19] Equally as important is the ability of tracking regular physical activity through an EVS for the treatment and prevention of non-musculoskeletal conditions that are prevalent in today's society and modifiable through lifestyle change. According to a recent position statement by the American Heart Association, there is robust evidence to show that even minor increases in exercise/physical activity leads to a considerable reduction in cardiovascular disease risk and associated mortality.[21] Additionally, they emphasize the need to make an EVS a standard component of all clinical encounters in order to maximize efforts at improving cardiorespiratory fitness.[21] By properly educating patients of the important benefits of regular exercise and vigilant monitoring of exercise habits via EMPW, chiropractors can not only treat presenting MSK complaints, but can also encourage lifestyle changes that may have positive ramifications for prominent public health concerns that are at the forefront of modern healthcare challenges.

Limitations

Several limitations have been identified that may affect the generalizability of the results of this study. In 2014, approximately 53.7% of Canadians self-reported as being moderately active, which was defined as "walking at least 30 minutes a day or taking an hour-long exercise class at least three times a week".[22] Compared to the results of our study, we see 15% more individuals that are self-reporting as being sufficiently physically active. Due to the subjectivity of our self-report measure, there remains the possibility that our results may overestimate the number of people accurately reporting their exercise intensity or duration. In a recent study from Canning *et al*.[23] at York University, it was suggested that the majority of individuals aged 18-64 years are likely underestimating the effort required to exercise at a moderate to vigorous intensity in order to achieve the minimum health benefits in accordance with the CPAG. Their results show that 80% of participants identified the CPAG recommendations for exercise intensity as easy to understand, and 57% self-reported that they currently met these requirements; however, only 24% of participants were able to correctly estimate moderate to vigorous intensity exercise

when performing a treadmill test.[23] These results highlight the challenge of self-reporting exercise. This is further complicated by recent data from the Canadian Health Measures Survey (2011), in which objectively measured physical activity data obtained via accelerometers found a mere 15% of Canadian adults to be sufficiently active at a moderate to vigorous intensity.[24] The combination of overestimation of exercise intensity and objectively determined poor physical activity habits among Canadians maintains the need for healthcare providers to engage patients in more meaningful discussions surrounding exercise frequency and intensity and further supports the need to utilize an EVS.

Pre-analytical factors such as recall and social desirability biases may have been introduced during the initial new patient interaction. Subjective reports of EMPW may have been over-reported by patients in this study leading to an underestimation of individuals falling short of the recommended CPAG guidelines. As stated in the methods, the patient files analyzed for this study were obtained from two of the seven CMCC teaching clinics. Due to this convenience-type sampling, the presence of a sampling bias is possible despite the respectable number of patient files analyzed, as the selected cohort may not be generalizable to the entire CMCC patient population. In addition, the clinicians overseeing the two clinics where the patient files were obtained from are both chiropractic sports fellows and members of the Royal College of Chiropractic Sports Sciences (RCCSS) of Canada that promotes the EIM movement, and as such there is some uncertainty to the degree that this may influence the culture and behaviour of their interns and patients. This may further affect the generalizability of the results to the entire CMCC patient population. Other factors to consider, which may have contributed to the physical activity levels recorded include the high representation of the 18-64 age category and students in our sample. However, the students only represented 15% of our sample which likely had a minimal impact. Future research with more power will be able to evaluate the differences between the groups.

Conclusion

This study gives insight into the likelihood of CMCC chiropractic interns to ask and record EMPW, and the exercise behaviours of their patients. The large majority of chiropractic interns under the supervision of two sports specialists clinicians appear to be engaging their patients in discussion surrounding their weekly exercise habits, and nearly 70% of chiropractic patients in this study appear to meet or exceed the age dependent minimum number EMPW in regards to the CPAG. Despite this, almost one-third of patients are still failing to meet these basic requirements, and as such, represent a great opportunity to improve their health by incorporating exercise as a vital sign into their doctor-patient interactions. Furthermore, we suggest that the exercise vital sign would naturally be a standard aspect of care, and should be included in all patient files.

Future research should seek to identify if an association exists between the frequency of collecting an exercise vital sign among chiropractic patients and whether this positively influences their exercise behaviours over time. Additionally, it would be beneficial to know if recording of the vital sign and the exercise habits of patients seen in this pilot study are reproducible across all of CMCC teaching clinics, regardless of clinician training.

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