The infrastructure of sport and exercise medicine in Canada

by

Justin William Ting

B.Sc., The University of British Columbia, 2005
M.D., The University of Manitoba, 2009

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Abstract
Currently, the Canadian Academy of Sport and Exercise Medicine (CASEM) is seeking special designation for sport and exercise medicine (SEM) from the College of Family Physicians of Canada. Infrastructure is a key criterion in a medical discipline recognition model.

The purpose of the study is to evaluate the infrastructure of Canadian SEM in a quantitative and qualitative manner using a mixed-method study of a cross-sectional survey and focused interviews. The survey study examines the demographics, physician practice profiles, academic presence, research activity and organizational presence of Canadian SEM physicians. The focused interviews examine the promoters and barriers of providing SEM education, providing event coverage and conducting SEM research; and the benefits of SEM organizational bodies to the practice of SEM.

The survey response rate was 55%. There is a national distribution of SEM physicians. The majority of respondents act as consultants and dedicate the majority of their practice to SEM. Eighty-six percent of respondents teach SEM and teaching is primarily done in a clinical setting. The post-secondary affiliation of a physician and the population size of where a physician practises predict the amount of time that a physician dedicates to clinical teaching and research. Approximately half of the respondents provide event coverage in a typical week and nearly one-third of respondents had conducted research within the past five years. Various forms of enjoyment are the main promoters for teaching, event coverage and research while lack of financial compensation and time are the main barriers to these activities. Interviewees appreciated SEM organizations for network and educational opportunities and identified many areas for improvement.

The current SEM physician demographics, geographic distribution, practice profiles, and support from other health professionals indicate that SEM has sufficient infrastructure to support a focused practice. There is a willingness to teach among SEM physicians; however, there may be a need for stronger SEM curriculum in medical education. The barriers to SEM teaching, event coverage and research will need to be addressed to progress Canadian SEM. Professional SEM
organizations are managing SEM physician activities and are viewed as leaders to promote SEM as a profession.
Preface

Collaborators and co-authors are the following:
Dr. Justin Ting developed the research protocol; conducted the literature review; created the quantitative survey and qualitative interview guide; distributed the quantitative surveys; recruited the interview subjects; moderated the focus groups and interviews; and collected, analyzed and interpreted the data. He wrote all ethics and thesis documents.

Dr. Jack Taunton assisted with the development of the qualitative research idea, ethics application (University of British Columbia) and qualitative research protocol. He provided guidance in the writing of the funding application from the British Columbia Sport Medicine Research Foundation.

Dr. Julia Alleyne produced the research idea and assisted in development of the quantitative and qualitative research protocol. She provided guidance in the writing of the funding application from the Canadian Academy of Sport and Exercise Medicine.

Dr. Liisa Jaakkimainen assisted with the ethics application (Sunnybrook Health Science Centre) and the research protocol of the quantitative study. She provided guidance in the writing of the funding application from the Canadian Academy of Sport and Exercise Medicine.

Dr. Michael Koehle assisted with the development of the qualitative research idea and protocol.

Dr. Lucy Ting assisted with the development of the quantitative and qualitative research ideas, data entry and manuscript revision.

Currently, no publications have arisen from the work presented in this thesis document.

University of British Columbia Behavioral Research Ethics Board certificate number: H12-00571.
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1. Introduction

Over the past decade, clinical sport and exercise medicine (SEM) practitioners in the United States and Europe have gained recognition as a specialty or subspecialty\(^1,2\). Currently, SEM has received recognition from the Royal College of Physicians and Surgeons of Canada (RCPSC) as an Area of Focused Competence (Diploma) program\(^3\). Other Area of Focused Competence programs include: transfusion medicine, interventional cardiology, adult cardiac electrophysiology, adult echocardiography, cytopathology, and clinician educator\(^4\). The College of Family Physicians of Canada (CFPC) has recently developed a Section of Family Physicians with Special Interests or Focused Practices within which Sport and Exercise Medicine (SEM) has received official program status\(^5\). However, the CFPC has not conferred special designation status to SEM unlike emergency medicine\(^6\).

The RCPSC has published criteria for a discipline recognition model in which infrastructure is a key criterion. The descriptors of infrastructure are\(^7\):

1. Sufficient number and geographic spread of physicians to devote significant proportion of time to provide sustainable base for practice and education in the proposed discipline
2. At least one site capable of mounting a training program in Canada
3. Identifiable group of experts with capacity to provide a high quality educational experience
4. Sufficient ingredients exist for appropriate program infrastructure
5. Existence of professional organization(s) capable of advancing the field

The literature describing the infrastructure of Canadian SEM has been limited to SEM medical education and editorials\(^8–19\). There are several editorials and reports which report the history, training programs and progress of SEM in Canada\(^8–10,13,15–19\). The research regarding Canadian SEM medical education consists of survey studies. Thompson and Purcell conducted a survey of pediatric residents and found that graduates were uncomfortable with SEM\(^11\). Wiley et al. conducted a survey of Canadian family medicine residency directors regarding the SEM curriculum which found a paucity of SEM instruction for family medicine residents\(^12\). Strother et al. conducted a survey of family medicine residents regarding their comfort with and exposure to various SEM problems\(^14\).

In Canada, SEM training beyond medical residency training and the successful completion of an examination is required to obtain a Diploma of SEM from the Canadian Academy of Sport and Exercise Medicine (CASEM)\(^20\). There are SEM fellowship training programs at multiple Canadian universities which are 10 to 24 months in duration\(^21\). There is a national curriculum of
core competencies which are unique to the practice of sport and exercise medicine and are not currently taught comprehensively in other residency training programs. Sport and exercise medicine has been described as an intradisciplinary practice with primary care SEM physicians working collaboratively rather than competitively with health care professionals including RCPSC specialist physicians.

With the goal of SEM to be recognized as a discipline with special designation by the CFPC and with infrastructure being a key component of a Canadian discipline recognition model, it is essential to determine the current infrastructure of Canadian SEM. The purpose of this study is to evaluate the infrastructure of Canadian SEM in a quantitative and qualitative manner. This study consists of a quantitative cross-sectional survey of physicians who hold a CASEM diploma and qualitative interviews of physicians who are members of CASEM. Quantitatively, the purpose of the study is to examine the demographics, physician practice profiles, academic presence, research activity and organizational presence of Canadian SEM physicians. The specific research questions are:

1. Does the distribution of SEM physicians follow the distribution of the Canadian population?
2. Are over 50% of SEM physicians utilized as consultants by non-SEM physicians?
3. Do over 50% of SEM physicians dedicate the majority of their practice to SEM?
4. Is the proportion of SEM physicians who teach greater than that of the national physician average?
5. Do SEM physicians teach a greater number of hours than the national average physician?
6. Is the proportion of SEM physicians involved in research greater than that of the national physician average?
7. Do SEM physicians spend a greater amount of time in research compared to the national average physician?
8. Do over 50% of SEM physicians utilize membership services?

Qualitatively, the purpose of the study is to examine the promoters and barriers of providing SEM education, providing event coverage and performing SEM research; and to examine the benefits of SEM organizational bodies to the practice of SEM.
2. Methods: quantitative survey

2.1. Ethics

The quantitative survey study was approved by the Sunnybrook Health Sciences Centre’s Research Ethics Board. All survey data collection was performed while the author was a resident at Sunnybrook Health Sciences Centre. Implied consent was assumed if the subject responded to the questionnaire.

2.2. Study subjects

Subjects were physicians identified from a CASEM database of CASEM diploma holders. An additional inclusion criterion for the subjects was having a Canadian mailing address in the CASEM membership database as of March 1, 2011. Physicians with a mailing address outside of Canada as of March 1, 2011 were excluded (n = 26).

2.3. Questionnaire design

The questionnaire consisted of 14 closed and 10 partially-closed questions. The questionnaire was designed to examine physician demographic, practice, teaching, and research profiles. Prior to distribution, the questionnaire was pilot-tested with SEM physicians, family medicine physicians, and family medicine residents in Ontario (n = 10) to examine face validity, question clarity, and timing.

2.4. Questionnaire distribution

In April 2011, an e-mail invitation with a link to the questionnaire was sent via SurveyMonkey.com (Palo Alto, California) to physicians with a valid e-mail address. A reminder e-mail was sent one week after the initial e-mail. A paper-based version of the questionnaire, introduction letter and postage-paid return envelope was sent via letter-post to those who did not have a valid e-mail address, were unable to be contacted via the internet survey tool or did not respond to the electronic questionnaire by two weeks after the reminder e-mail. Participants were invited to enter an optional draw for gift certificates with draw entries separated from the questionnaire to maintain anonymity. The questionnaire and communication methods with the respondents were in English and French, depending on the preferred language.
of the physician indicated in the CASEM database. Personal identifiers were not utilized in data collection.

2.5. Quantitative analysis and statistics

Statistical analyses were performed using the Statistix 9 for Windows Version 2 software (Analytical Software, Tallahassee, FL) and SPSS Version 19 software (IBM Corp, Armonk, NY). A descriptive analysis was undertaken of the physicians’ demographic data and their responses to the survey questions.

Data was analyzed for normality with the Shapiro-Wilk Normality Test. The Mann-Whitney U test for continuous variables was used to compare non-parametric data between family physicians and general practitioners (FP/GP) and specialists (SP). The FP/GP group included physicians who only had a family or general practice licensure, and FP/GPs who had indicated they had licensure in emergency medicine. All other licensure possibilities were included in the SP group. An acute medical problem was defined as a problem with a duration less than 21 days. A sub-acute or chronic medical problem was defined as a problem lasting 21 days or more.

Data analysis comparing the study results with the 2007 and 2010 National Physician Survey results utilized an unpaired t-test since record level data could not be obtained from the 2007 and 2010 National Physician Survey at the time of analysis. The sample sizes of our study and the National Physician Survey were assumed to be sufficient to use parametric analysis when comparing the two populations.

Linear regression analysis was used to determine the predictors of the amount of time spent on teaching, event coverage and research. Since there is minimal literature describing the predictors of SEM teaching, event coverage and research, a forward modeling approach was conducted with the predictors of post-secondary affiliation, population size, province, years with a medical doctorate (MD) degree and gender. Years with a MD degree was utilized as a surrogate marker for medical experience. In the event of missing data, cases were excluded pairwise. Gender, post-secondary affiliation, specialty type, and province were categorical variables. Gender, post-secondary affiliation and specialty type were dummy coded with the comparison groups of male,
“no post-secondary affiliation,” and FP/GP, respectfully. The comparison groups were coded with a value of zero. Province was effect coded so the province values were compared to the average provincial value (Prince Edward Island was arbitrarily given a code value of -1).

Statistical significance was defined as a two tailed p-value of less than 0.05.

2.6. Power analysis
The subject population is approximately 449 subjects. A power of 0.8 was accepted as a sufficient level of power. An a priori power analysis to determine the minimum sample size was conducted using G-Power (version 3.1.3, Düsseldorf, Germany) for two tailed t-tests of two independent means (parametric and non-parametric data). The power analysis conducted for two independent means utilized a medium effect size of 0.5 and alpha of 0.05. Allowing for N2/N1 ratio of 3 (in the case of unequal sample sizes between comparison groups), the number of subjects required for a power 0.8 is 170 and 178 for parametric and non-parametric data, respectively. The allowance of a N2/N1 ratio is based on the approximate ratio of male to female CASEM diploma holders which was 2.5. For linear regression models, 98 subjects would be required for a medium effect size of $f^2 = 0.15$, alpha of 0.05, power of 0.8 and six predictors.

2.7. Survey reliability
A test and one week re-test procedure of the survey was conducted with a convenient group of SEM and family physicians (n = 7). Correlations were conducted on questions which were thought to be the most difficult to replicate on successive testing. The questions involved the respondents to recall their time allocation to various duties in a typical week and patient load. With the exception of one category, there were significant correlations of the answers between the two tests which suggest that external reliability of the survey was sufficient (Table 1).

Internal reliability was assessed for questions involving teaching and research using Cronbach’s alpha. For the three questions regarding teaching, continuous and categorical variables were transformed into dichotomous variables. When transforming the continuous variable, a zero was assigned if the amount of time spent in clinical and non-clinical teaching was zero. When transforming the categorical variables, a zero was assigned if the respondent selected “Do Not
“Teach.” Other responses for both types of questions were given a value of one. A similar approach was used for the two questions involving research. In both the convenient sample and population sample, Cronbach’s alpha was high for the questions relating to teaching and research which suggests that the internal reliability of the survey was sufficient (Table 2).
3. Methods: qualitative interviews

In June 2012, physician members of CASEM in the CASEM member directory were invited via e-mail to participate in one of two focus groups held at the Annual CASEM conference (Kelowna 2012). In addition, CASEM members with specific roles in SEM committees, specialty, and geographic locations were invited through e-mail as key informants for an interview or focus group participation.

The focus groups were held in a private conference room and a lunch was provided. Individual interviews were either done in person or over the phone with the exception of one interview which was done through e-mail exchange. Interviews were conducted by Justin Ting and notes were taken by Justin Ting (individual interviews) or by a research assistant (for the group interviews). Group interviews lasted approximately 60 minutes and individual interviews lasted approximately 15 minutes. Interviews started with an introduction, review of the consent form and reiteration of confidentiality. Baseline demographic information was obtained at the time of the interview.

After the interviews, the interview notes were reviewed and in the case of group interviews discussed with the research assistant. Both types of interviews were audio recorded and subsequently transcribed by a transcription company (Transcription Divas, Toronto, Ontario) within one week of the interviews.

3.1. Ethics

This project received approval from the Behavioural Research Ethics Board at the University of British Columbia.

3.2. Interview guide

The interview guide for all interviews examined the promoters and barriers to providing SEM teaching, to providing event coverage and to conducting SEM research. It also examined the participants perceived benefits of SEM organizations and their thoughts of how these organizations could improve SEM. There were standardized questions for the focus groups and interviews.

3.3. Analysis

Qualitative data analysis was performed using La Pelle’s method. All interview transcripts and notes were read. After reviewing all interview transcripts, a code book was created for themes and sub-themes. The transcripts were coded to the appropriate theme. The coded transcripts of all
interviews were grouped and sorted by theme codes. Quotes of interest were examined in both their original context and in the context of their thematic group.
4. Results: quantitative survey

Figure 1 depicts a flow diagram of the survey distribution and outcome. Out of 479 physicians with CASEM diplomas, 453 had a Canadian mailing address. Two physicians were retired from medical practice according to the database. The total number of responses was 246 resulting in a 55% (246/451) response rate from practicing physicians (Table 3).

4.1. Demographics

Of the 246 respondents, 159 (64.6%) were male and 87 (35.4%) were female. The average age of respondents was 47.1 years (SD 9.0) with the largest age cohort being 50 to 54 years of age (Figure 2). The average number of years that a respondent had a CASEM diploma was 11.3 years (SD 7.2) with the largest proportion of respondents having possessed a diploma for less than 10 years (Figure 3). The respondents’ average number of years between obtaining their medical doctorate (MD) degree and CASEM diploma was 8.9 years (SD 5.4). The respondents’ average age at the time of obtaining a CASEM diploma was 35.7 years (SD 5.6).

There is a national distribution of SEM physicians in Canada (Table 4). There are a greater proportion of SEM physicians in higher populated municipalities than in lesser populated municipalities with the exception of BC and the Atlantic provinces (Table 5).

4.2. Practice profiles

Over 90% of respondents indicated they were licensed as family or general practice physicians (Table 6). Of the respondents’ weekly work hours related to SEM, the majority were spent in patient care without a teaching component (Table 7). Sport and exercise medicine accounted for an average of 64% (SD 29%) of the respondents’ entire medical practice. Seventy-three percent of respondents dedicated half or greater than half of their medical practice to SEM (Figure 4). Twenty-one percent of respondents indicated that their medical practice was solely dedicated to SEM.

The respondents collaborated with a diverse group of health professionals with over 80% of respondents collaborating with physiotherapists, orthopedic surgeons, and family and general practice physicians (Figure 5). Respondents received referrals from physicians, non-physician
health professionals, patients (self-referral) and athletic teams or organizations. The largest source of SEM patients was from physician referrals followed by patient self-referrals (Table 8).

Respondents received a median of 10 consults from physicians per week (range zero to 80 consults per week). Eight percent of respondents did not receive consults. Family and general practice respondents received a significantly lower number of consults from physicians, and had significantly shorter wait times for acute and sub-acute or chronic problems compared to SP respondents (Table 9).

### 4.3. Academic infrastructure

Eighty-six percent of respondents taught and taught a median of four hours per week. The majority of respondents indicated that they taught postgraduate medical trainees and medical students (Figure 6). Of the respondents, 72% taught individuals (1-2 learners), 50% taught small groups (3-20 learners), and 33% taught large groups (>20 learners). Of the respondents, 74% had an affiliation or position with a post-secondary academic institution.

The most parsimonious regression model that explained a significant amount of the variance in the number of hours spent teaching in a clinical setting consisted of post-secondary affiliation and population size as predictors (Model 1; R squared 0.199, Adjusted R squared = 0.178, F(6,227) = 9.425, p<0.001; Table 10). Physicians in larger population centers spent a significantly greater amount of time on clinical teaching that those in smaller population centers. On examination of specific post-secondary affiliation ranks compared to the non-affiliated physician, physicians who were lecturers, assistant professors or associate professors provided significantly more clinical teaching than physicians without an academic affiliation. Physicians who were professors or who had an ‘other’ type of university affiliation had a non-significant trend to teach more than those without an academic appointment. Regression models with province, number of years with an MD degree, specialty and gender as additional predictors did not significantly explain an additional amount of variance in the number of hours spent on clinical teaching (six predictor model versus Model 1: R-square change = 0.04, F change (12, 215) = 0.945, p = 0.503).
The most parsimonious model that explained a significant amount of the variance in the number of hours spent teaching in a non-clinical setting consisted of the number of years with an MD degree as a predictor (Model 2; R squared 0.03, Adjusted R squared = 0.026, F(1,232) = 7.175, p=0.008; Table 10). Physicians with a greater number of years with an MD degree provided a significantly greater amount of non-clinical teaching compared to those who had fewer years with an MD degree. The predictors of post-secondary affiliation, population size, province, specialty and gender as additional predictors did not significantly explain an additional amount of variance in the number of hours dedicated to non-clinical teaching (six predictor model versus Model 2; R-square change = 0.075, F change (17, 215) = 1.066, p = 0.389).

4.4. **Event coverage**

Fifty percent of respondents indicated that they provide event coverage in a typical week. They spend on average nearly two hours in a typical week providing event coverage (Table 7). None of the predictors (post-secondary affiliation, population size, province, number of years with an MD degree, specialty and gender) explained a significant amount of the variance in the number of hours dedicated to event coverage in a typical week (six predictor model: R squared = 0.043, Adjusted R squared = 0, F = 0.543, p=0.935).

4.5. **Research infrastructure**

In the past five years, 28% and 30% of respondents conducted quality assurance projects and research requiring research ethics board approval, respectively. Research activity accounted for 4.4% of the respondents’ SEM weekly work hours (Table 7).

The most parsimonious model that explained a significant amount of the variance in the number of hours spent on research consisted of post-secondary affiliation and population size as predictors (Model 3; R squared 0.144, Adjusted R squared = 0.121, F(6,227) = 6.35, p<0.001; Table 10). Physicians in highly populated centers spent a significantly greater amount of time conducting research than those in lesser populated centers. On examination of specific post-secondary affiliation ranks compared to the non-affiliated physician, physicians who were assistant professors or professors spent a significantly greater amount of time conducting research than those without a post-secondary affiliation. Physicians who were associate professors had a non-significant trend to spend more time on research than those without a post-
secondary affiliation. Lecturers and physicians with an ‘other’ type of post-secondary affiliation spent a similar amount of time on research as physicians without an affiliation. Models with province, number of years with an MD degree, specialty and gender as additional predictors did not significantly explain an additional amount of the variance in the number of hours spent on research (six predictor model versus Model 3: R-square change = 0.026, F change (12, 215) = 0.572, p = 0.864).

4.6. Organizational infrastructure

Ninety-seven percent, 60%, 50% and 16% of respondents were members of national, provincial, international and regional SEM organizations, respectively. Eighty-seven percent, 62%, 55% and 55% of respondents attended national, provincial, regional and international SEM conferences, respectively. Of the respondents, 88% utilized member services from professional SEM organizations with journal access being the most utilized service across all provinces (Table 11). Approximately one-fifth of respondents did not use member services in BC, Manitoba (MB) and Saskatchewan (SK), and the Atlantic provinces.

4.7. Assumptions

The assumptions of normality of the residuals was not met (Shapiro-Wilk statistic (dF = 234) = 0.864, p <0.05; (dF = 242) = 0.391, p <0.05; (dF = 234) = 0.582, p <0.05, for Models 1, 2, 3 respectively) but this could be expected given the large sample size. Visually, the residuals approximated a normal distribution for each model. The assumption of independent residuals was violated since there was a correlation between residuals (Durbin Watson statistic = 2.188, 2.008, 2.05, for Models 1, 2, 3 respectively). However, this could be expected as the sample was taken from a specified group (Canadian SEM physicians). There was no multi-collinearity of the predictors in any of the models (variance inflation factors < 4 for all coefficients). The assumption of homoscedasticity was maintained for all models, (White’s test Chi-squared (dF= 26) = 29.77, p>0.05; (dF = 1) = 3.444, p>0.05; (dF = 26) = 21.17, p>0.05, for Models 1, 2, 3 respectively). There was no covariation (no significant correlations) between the residuals and predictors for any of the models. The assumption of linearity between ordinal predictors and the dependent variable was maintained since there were significant linear relationship between the predictors (ordinal and continuous) with the dependent variables, but no significant higher order relationships (quadratic or cubic) between these predictors and dependent variables.
5. **Results: qualitative interviews**

Two group and six individual interviews were conducted (n = 19). The first and second group interviews consisted of eight and five participants, respectively. Table 12 and Table 13 present the demographic data of participants.

5.1. **Education**

5.1.1. **Promoters to providing education**

All participants had taught sport and exercise medicine previously. The participants typically taught residents and medical students. For nearly all physicians, the primary motivations for teaching were enjoyment and satisfaction derived from teaching:

[T]o teach … people who are motivated and want to learn … like nurses, residents, [and] medical students, it's extremely rewarding. … So education and teaching has always been a real passion of mine and I think what really drives me as well is the giving back. If I can give something to help someone's journey be a little easier than mine was along the way, that really makes [me] … satisfied.

Several physicians felt a duty to teach because they were once students. As well, several physicians wanted to teach since they felt that the current SEM education inadequately prepares learners for clinical practice:

I'm sure we feel that the MSK system, particularly … exercise medicine, are … not taught well in … medical school. I think we all know that. So we [teach] because we'd like to see that it be taught better.

Teaching intellectually challenged several physicians and encouraged them to keep up to date with medicine. For a few physicians, career and clinic promotion were additional motivators to teach.

5.1.2. **Barriers to providing education**

All participants verbally or non-verbally agreed that the time required to teach and the lack of financial compensation were the primary barriers to teaching. There was minimal hesitation
among the participants in identifying these barriers. When teaching a student in a clinical setting, many physicians stated they saw fewer patients, reduced their clinical pace and finished providing clinical care at a later time. Ultimately, these physicians felt a loss of income and a loss of personal time due to teaching:

So the combination of I know they're going to put me behind and I'm not going to be compensated and I'm going to have to miss something to be able to teach is a barrier.

[Teaching is] done because you have a personal interest or you like to do it, but it is a financially non-viable option.

Even for lecture-based teaching, the lack of compensation was a barrier since “it's not just time to go and give the lecture, but it's the time to prepare.”

Some academic affiliated practices have alternative funding models for teaching in which their department receives funding for providing teaching services and the funding is subsequently distributed among the teachers. However, the compensation is not consistent for different types of learners:

[S]o per [family medicine] resident we get paid a certain amount which we can then divvy up to the teachers … [b]ut we don't get that for medical students, … physiatry residents and rheumatology residents.

In addition to time and financial barriers, several focus group participants had an animated discussion regarding poor motivation and challenging attitudes of students as barriers to providing teaching:

Just a word about that motivation. That's a huge problem. … I can tell you that residents [who] come to me and the first thing they say is … ‘I need this day off and that day off and I'm going to be here or there’… don't get any teaching. … [I]f you're going to come and be with me, I'll teach non-stop 12, 14 hours a day.
Other barriers mentioned by a few physicians included a lack of formal training on how to teach and a lack of appreciation from the universities for their teaching services.

5.2. **Event coverage**

All participants had provided event coverage previously. The participants provided coverage for amateur and professional athletes participating in all levels of sport (local to international levels).

5.2.1. **Promoters to providing event coverage**

Nearly all physicians indicated an enjoyment of sport as their initial motivator to providing event coverage. Many of the participants indicated they enjoy their relationship with people involved in sport events:

> The initial motivator was the connection: connection with the athletes who I've seen in the office, connection with the [sport organization] that you're working with, [and] connection with the other healthcare professionals that are coming to provide event coverage.

Other motivators to provide event coverage included: the opportunity to participate in and contribute to sport events; the opportunity to watch athletes compete; the challenge of acute medicine during event coverage; the challenge of treating high level athletes; and the personal history of being a previous athlete.

5.2.2. **Barriers to providing event coverage**

The discussion about barriers to event coverage was animated. The primary barrier that was nearly agreed upon by all physicians was a lack of financial compensation for providing event coverage and the subsequent financial loss of income:

> [M]ostly the events do not pay you anything and they certainly do not pay you anything that you’re giving up. So if you give up a clinic day or one of your other jobs to … do a sporting event, you basically take a financial loss. … You still have to put food on the table, put your kids through school, pay your mortgage and attend to all the other parts that our society expects you to do.
One physician reported a financial loss of “thirty to forty thousand [dollars] a year” because of event coverage.

Several themes within the subject of financial compensation emerged: volunteerism versus professionalism; amateur versus professional sport; and academic or salary vs. fee-for-service physicians.

5.2.2.1. Financial barriers: volunteerism versus professionalism

Volunteer event coverage and professional event coverage were two models of event coverage described by the participants. As defined by the participants, volunteer event coverage does not compensate the physician financially while professional event coverage compensates the physician financially.

Although volunteer event coverage does not provide financial compensation, one physician felt he was adequately compensated in a non-financial manner:

There are other ways of being compensated … than getting actual money. … I've been around the world. I have seen the best of the best. I have been to two Olympics. … That is my compensation for my volunteer time.

However, several other physicians expressed that the lack of financial compensation was a barrier to providing event coverage and found that it is difficult to receive financial compensation if others provide coverage for free. One physician stated that volunteer event coverage can be “union busting” and that “it's so sexy [for event organizers] that someone else will step in [to provide coverage for free] if you don't do it.” This response was met by verbal and non-verbal agreement of other participants in the focus group.

In addition to volunteer event coverage performed by others, one’s own history of volunteer coverage may make it difficult to request compensation:
So we get a little anxious as you get older in your career because the end will come. I'd better actually make some money. So I think that's a barrier to event coverage and yet … I've done it so long [as a] volunteer. … I find it hard to figure out how to say ‘I'm sorry, I can't do it [without compensation].’

However, not all physicians have difficulty asking for financial compensation. One physician indicated that she and her colleagues are shifting their mentality from volunteerism to professionalism:

When I was a resident, I had a lawyer who became a doctor teach me[:] ‘… Don't be afraid to charge for this and this.’ … So if I don't get paid, I don't do it. … I want to promote and push sports medicine as a career and as a profession. … Some of us have this philosophy[:] … ‘[if] you don't pay us we don't do it.’

Similarly, a few physicians expressed that sport medicine physicians must “move sports medicine from the volunteer world into the professional world” in order to receive financial compensation for event coverage.

5.2.2.2. Financial barriers: academic versus fee-for-service funding

Among the participants there were salary and fee-for-service physicians. Several physicians in a fee-for-service compensation model stated that providing event coverage takes time away from clinical care and subsequently results in a financial loss. Physicians who have a salary position may be less affected by the reduced amount of clinical care. One physician who has an academic salary position indicated that he can incorporate event coverage into his practice easily because he is already being paid for his time:

The [u]niversity … is paying me a whack of money. … So I can afford very easily to be a volunteer because I'm already being paid. … So [when] I see [a fee-for-service physician doing event coverage], I realize the [u]niversity … isn't putting bucks in [his] … hand. … [T]here's academic medicine and then there's out in the practice, pure clinical business. And it's awkward when you're trying to say, okay, well those are the same, because they aren't.
However, not all academic salary positions have the same flexibility. Another salary-based physician has difficulty in taking time to provide event coverage:

[For] me working in the academic setting, I’m on salary. So I usually have to go to my Division Head and sort of explain the situation and, you know, sort of beg to have time off to be able to do [event coverage].

5.2.2.3. Amateur versus professional athlete and organizations

There were differing and strong opinions regarding the practicality of receiving financial compensation for amateur event coverage. On the one hand, one physician felt strongly that amateur sport associations may not have a budget for medical coverage and that athletes may be left uncovered if medical coverage required financial compensation:

[W]e could argue all day long about whether it's right to be paid for amateur sport. …[W]e're not talking about professional which is a totally different game because that is a business. The amateur kids are not a business. Yes, their associations have money but if you really look at their structure they don't have much money. … So now the association is left with not having any coverage because they can't afford it. I mean their reality is they cannot afford it. …[N]ow we have kids that are uncovered.

On the other hand, another physician disagreed about the availability of funding:

No, it's a matter of looking at your budget and realigning your budget. … I mean I've worked with some figure skaters who come to me at my clinic … and they're telling me how … they pay $10,000 for their uniform. And there's money. … It's a mindset you have to change. … I'm not … going to punish these poor little kids. … All I'm saying is that we have to start valuing what we do. It's not a lot of money I get.

A few physicians stated that medical coverage is not a priority for event organizers. The lack of importance that event organizers give to medical coverage may be a reason for the lack of funding for medical coverage:
[Medical coverage is] in the background. … [I]t's behind the scenes … and it's usually the last thing that anybody ever thinks about. And that's why there's never any money for it and it's poorly organized half the time.

When medical services are mandatory for a sport, the priority of medical coverage increases. One physician found that the availability of funding for medical services depended if medical services were required:

So the college … eventually after two or three years … [had] to have a doctor at games … for football. Then, they … do have money to pay a doctor per game, right. It's about a change in attitude and it's not going to happen my generation. Hopefully, … when they make their budgets now they've got to put a little across to keep their kids healthy, to keep their concussions managed well so their kids finish school. And they're going to shift; it will be a paradigm shift.

5.2.2.4. **Time barriers**

Nearly all the physicians indicated that the time commitment required by event coverage was another barrier to providing event coverage. Many physicians indicated time away from family was a barrier to provide coverage:

Time away from family is [an] important [barrier]. For example, if there’s a Christmas tournament or a holiday tournament, then I’m away for that … important holiday, missing birthdays, all that kinda [sic] thing. That would be a barrier.

As well, several physicians stated that time away from their clinical practice and the level of commitment required was a barrier to provide event coverage:

[T]iming-wise some of these events are all day sort of things or covering for a couple of weeks. Again, it means time away from the clinic [and] time away from the patients.
I think one of the other big barriers in covering several multisport events is that either you're all in or you're out, and that's, as you mentioned it, it's a huge commitment because you can't do it partway.

5.2.2.5. **Medicolegal risk**

Several physicians stated that performing event coverage, even as a volunteer, carries significant medicolegal and professional risk which may be a barrier to provide event coverage. One physician describes the challenges of having a limited amount of time to make a clinical decision:

>[T]he medical legal aspects of the charting [and] with making sure you're actually advising people appropriately with the time restraints of trying to get people back to play … when you only have a certain amount of time. Those sorts of … challenges … are very different from the clinical setting in the office.

Other physicians stated succinctly:

If something goes wrong it's your neck.

The buck stops with you.

In addition to the challenge of providing individual care, physicians may make medical decisions that affect entire events and be solely responsible for the decision:

You have to have the guts to be able to say ‘time out. This race is going to stop’ because you don't have the supplies, you don't have the water, [and] the temperature is too hot. … You are putting yourself out on a limb.

5.2.2.6. **Relationship barriers**

Although many physicians enjoy the relationships they develop with athletes, a few physicians have had poor experiences which can be a barrier for future event coverage:
Sometimes the athletes … are used to being sorta [sic] coddled and getting everything. … And so sometimes that makes working with them a little less fulfilling. … They have sometimes attitudes that might sort of turn you off a little bit with working with them. Most are great, but some can create that barrier and give you a bit of a sour taste.

Another physician felt an athlete was ungrateful for her care and commitment:

I went to five World Championships with [an athlete] … and [the athlete] didn't actually even say thank you. So I kind of had really wonderful moments with athletes but, man, there's been some real down ones that make you think, well, they're not going to be there when I'm on my deathbed, that's for sure.

5.3. Research

5.3.1. Research promoters
Only a few of the participants were actively involved in SEM research. Those who were involved in research enjoyed research, had an interest in research and used research to answer their clinical questions:

[T]he motivation is the academic motivation of improving your care and your evidence base for everybody. It's answering your own clinical questions. It's trying to figure out best practices. It's hard to do.

5.3.2. Research barriers

5.3.2.1. Time and financial barriers
The majority of physicians involved did not conduct research. The lack of time to conduct research was the primary barrier for many physicians. A few physicians felt they would have to use their personal time in order to conduct research:

There’s just no time to do research. …Yeah, I could stay up late at night doing research or I could go and exercise myself and stay in shape. I could go down to the park with the
kids or I could [do] research. So yeah, it just falls to the wayside, because it’s not doable right now.

Some physicians indicated that financial compensation would be necessary for them to conduct research:

It would take more time and more money [in order to conduct research]. [Research] would have to replace something else [financially].

Even for a physician in an academic position, the lack of protected time or salary for research was a barrier:

I’m on salary in an academic setting I actually have zero percent research in my clinical deliverables. … In an academic setting it’s becoming more and more clinical. So there actually is no real, true protected time.

5.3.2.2. Support barriers
A lack of research support was another barrier to conducting research. Several physicians stated that delegating research or clinical work to others was necessary to support a clinical and research practice:

All the guys that do clinical research have got residents on a chronic basis that can do their caseload, do this, do that, or fellows, whatever. I don't have any of that. I have an extremely busy clinical practice seeing tons and tons of patients. … [T]o gather data … [is] totally impossible.

A few physicians felt an academic setting facilitated research but support for SEM research may be lacking compared to that of other departments:

It's much easier if you're in an academic setting where it's expected of you to do research but … sports medicine that doesn't come with the kind of support that you would [have] if you were in a cancer agency where you would have the full research team.
Another barrier for physicians to conduct research is the difficulty in obtaining funding. One physician was required to organize fundraising events or conduct research on hot topics to fund research:

We had to get very innovative [to produce funding]. … I put on a bike race [and] … golf tournaments … so we can raise money to do [research]. Sure, we apply to foundations … but … we've been lucky to be able to get some significant funding … only because it's the flavor of the month.

5.3.2.3. **Interest and training barriers**

Although the importance of research was agreed upon by all the participants, a few participants had a lack of interest and training in research:

I think research is very important to sustain a particular specialty or profession. But in itself it is a specialty and you have to like it. … Well most people don't like doing research in my anecdotal community. I don't particularly like organizing research. … I don't like going through to the ethics committee five or six times. I don't have that acumen … but I certainly push the importance of it and support it.

Even for those with training and interest, getting an academic appointment may be difficult once one leaves academia:

Having left the academic sort of arena, it's very tough to enter back in. … So the problem then becomes that if you can't get a position you can't apply for a grant and so I mean it's just one thing after another.

5.4. **Sport and exercise organizations**

All the physicians felt that the CASEM, the national SEM body, benefitted their career in some manner but there was minimal discussion about provincial or local SEM organizations. Many physicians stated that the networking and educational opportunities were the primary benefits provided by the CASEM:
The biggest benefit I think is actually the network that you've built: whether that helps you because you're dealing with team[s] and … athletes; … whether that's looking at mentorship; or … learning more from other people's practices and understanding what all the sport medicine physician is. So it definitely is key.

Specifically, many physicians enjoyed the scientific conference and published material of CASEM:

The scientific program [at CASEM] … [has] changed the way I do things. …[T]he research presented or the material presented … impressed me enough to change how I do things.

The CASEM diploma in sport medicine conferred some benefit to physicians and for one that was the sole motivator for being part of CASEM:

The only reason I did CASEM was to get my [diploma].

However, other physicians questioned the significance of the diploma certification:

I can just say that I'm a CASEM certified physician. I don't know if many people know what that is.

Many physicians indicated that CASEM needs to promote SEM as a professional body to colleagues and the public:

I think that ultimately as sports medicine becomes more organized and … recognized, … it [becomes] more of a professional calling and less of a volunteer and side stream calling.

Several physicians felt the CASEM certification and the roles of a SEM physician should be promoted to colleagues and the public:
Making … the fact that you are a CASEM certified physician a bit more noticeable out there, a little bit more advertised … would be probably beneficial in the long run. Just the fact that you've gone to the extra training and got the extra credentials, that probably could help your practice.

[Non-SEM physicians] think all we do is stand on the sidelines of the elite athletes and we have no other function. So an organization like this is extremely helpful in our practices to educate our family medicine colleagues who refer to us as to what we do, what our scope of practice really is.

By promoting SEM as a professional body, some physicians feel that CASEM could represent SEM physicians in area of financial compensation:

Well, I think a big step is [becoming] … like a union almost for things like getting compensated and maybe setting rates. … All of us kind of volunteer for our local club teams … but you can at least set some standards, so that's where I see it.

Another role that CASEM could coordinate nationally is research and public policy:

There's an opportunity where we could have multi-centred studies, we haven't done it. It could be a much, much greater opportunity for a research base funding source. … We've got such a tremendous opportunity to look at sport and exercise medicine now and to look across the country. And we could do a whole host of … health promotion, across the country. But it needs coordination, it needs to take that as a real priority and it needs the clout of CASEM to be able to go out and embrace our other potential partners to come in to fund these kind of things. Because there's nobody else in the country is going to do it; CASEM has to do it.

5.4.1. Limitations of sport and exercise organizations
Several physicians indicated that CASEM is largely a volunteer organization and that financial and time barriers limit its function:
We're doing that on the backs of volunteers. We need more professional people to run with these ideas.

It's a volunteer organization so we don't get the financial support. So again it's taking time off of your practice and that's the barrier.

Since CASEM is a national organization with committee members across the country, one physician in a committee found it difficult to transform ideas into practice:

It’s really hard to get concrete commitment from committee members to actually do anything. … There’s lots of ideas, but the actual getting them done ... is hard when you’re spread across the country.
6. **Discussion: integration of quantitative and qualitative data**

This is the first study to examine the infrastructure of SEM in Canada from a quantitative and qualitative manner. The survey study was representative of physicians who held a CASEM diploma across Canada since the response rates between provinces were similar. The response rate of 55% was adequate since it approximates previously reported response rates for physician questionnaires\(^{25,26}\). The qualitative study consisted of participants from across Canada and from multiple specialties.

6.1. **Demographics**

The physician demographic data provides insight into the Canadian SEM physician base. There are a steady number of physicians in the younger age cohorts between 35 to 49 years of age which suggests that there will be a constant supply of SEM physicians after the largest age cohort (50-54 years of age) ceases to practice medicine. Since SEM physicians obtain their CASEM diploma at an average age of 35.7 years old, it is not surprising to find that the physician population under 35 years of age is the smallest cohort. Many SEM physicians may be in the early stages of their SEM careers since the largest proportion of respondents obtained their CASEM diploma within the past 10 years.

The national distribution of SEM physicians is similar to that of the general population with the exception of British Columbia (BC) and Quebec (QC)\(^ {27}\). British Columbia may have a relatively greater distribution of SEM physicians since the first fellowship training program in Canada was established in British Columbia in 1982\(^ {21}\). Quebec may have a relatively lesser distribution of SEM physicians since family physicians are required to partake in the Special Medical Activities (Activités Médicales Particulières) program which is unique to Quebec\(^ {28}\). By devoting time to other areas of medicine, it may be more difficult for an SEM physician to establish a focused SEM practice in Quebec. However, the overall similarity between the SEM physician and general population distributions may suggest sufficient geographic spread of SEM physicians. However, the adequacy of the SEM physician distribution would need to take into account population needs which have not been examined.
6.2. Practice profiles
With almost 75% of the respondents having SEM as the majority of their practice and one-fifth of respondents practicing solely SEM, physicians are able to devote a significant proportion of their time to SEM. These results contrast with data from SEM physicians in the United States in which over 80% of SEM physicians devoted less than half of their clinical time to SEM and nearly 60% spent less than 30% of their clinical time in SEM\textsuperscript{29}. Thus, the current practice of SEM in Canada reflects a sufficient patient demand for SEM to support a focused medical practice.

The large degree of collaboration between SEM physicians and other related health professionals supports the opinion that SEM physicians have a cooperative rather than competitive relationship with other health professionals who serve the same patient population\textsuperscript{8,23}.

Physician referrals and patient self-referrals are the two major sources of patients for SEM physicians which suggest that SEM physicians are recognized to have specialized knowledge and viewed as consultants by physicians and patients.

Although SPs had a significantly greater number of consults from physicians per week compared to FP/GPs, the absolute number of consults was similar and may not be clinically significant (10 vs. 8 median consults per week). The significantly lower wait times for a patient to see FP/GPs compared to SPs suggest that family and general practice physicians who practice SEM play an important role in timely patient access to SEM care.

6.3. Academic infrastructure
From the quantitative results, nearly all the teaching is performed in a clinical patient care setting. Physicians who are lecturers, assistant professors, and associate professors dedicate a greater number of hours to clinical teaching than physicians who do not have a post-secondary affiliation. Physicians with an academic affiliation may have a greater interest to teach, better access to students and more requirements to teach compared to those without an affiliation. Greater access to students and universities may also explain why physicians in higher populated centers provide more teaching in a clinical setting than those in lesser populated centers.
It is surprising to find that physicians who are professors or who have an “other” type of post-secondary affiliation do not teach a significantly greater number of hours than non-affiliated physicians. However, in these two groups there were non-significant trends, which approached significance, to teach more than a non-affiliated physician. Potentially, with a larger sample, the trend may become statistically significant.

The gender, specialty (GP/FP or specialist), province, and amount of medical experience of a physician do not affect the amount of time dedicated to clinical teaching.

It is interesting to find that the predictors of non-clinical teaching are not the same as for clinical teaching. The amount of medical experience was the only predictor of the amount of time dedicated to non-clinical teaching. Physicians with more experience provided more hours of non-clinical teaching. However, the importance of this finding may be limited since experience only explained a small amount of variance in the amount of time dedicated to non-clinical teaching (2.6%).

The gender, specialty (GP/FP or specialist), province, municipality population, and post-secondary affiliation status of a physician do not affect the amount of time dedicated to non-clinical teaching.

From the quantitative survey, there is a strong willingness to teach among SEM physicians and a strong academic presence in post-secondary institutions since both the percentages of respondents who teach and who have a post-secondary affiliation are large and greater than that of the national physician average (86.4% vs. 13.9% and 73.7% vs. 32.5%, respectively)\textsuperscript{30,31}.

The willingness to teach is also supported from the qualitative interviews in which nearly all the physicians had a strong passion and expressed interest in teaching. Various themes of personal enjoyment were the primary promoters for providing SEM teaching.

Several physicians in the interviews expressed they taught because the current level of SEM training inadequately prepares learners for clinical practice. This opinion is supported by others who have reported an insufficient amount of SEM teaching in Canadian undergraduate and
postgraduate medical education and a lack of confidence among trainees with certain SEM skills. From the survey data, there is a lack of teaching in the non-clinical setting for SEM since the time spent on teaching in non-clinical settings among the respondents is significantly less than that of the national average (0.8 vs. 1.63 hours per week, \( p = 0.0001 \))\(^{31} \). Even though respondents and the average Canadian physician dedicate a similar amount of time to teaching in a patient care setting (7.5 vs. 6.66 hours per week, \( p = 0.23 \), respectively), there may be a need for a larger amount of clinical SEM teaching since clinical SEM teaching has been found to be time consuming and to require close supervision of trainees\(^{15,31} \). Thus, more time may be required for non-clinical and clinical SEM teaching.

The time required to teach and the lack of financial compensation were the primary barriers to providing teaching. These two barriers appear to be intricately linked since time commitment to these activities prevents a physician from performing services which provide a greater amount of financial compensation. Time and compensations are barriers to teaching that have been reported in international literature of other areas of medicine\(^{32-34} \).

Possible solutions to improve SEM teaching include: improved preclinical training to allow trainees to maximize their clinical SEM experience; increased availability of SEM training as previously advocated by others\(^{8,11-13} \); and reexamining the reimbursement structure for clinical training since income loss secondary to the time consuming nature of SEM teaching can be a limiting factor to the amount of clinical teaching offered\(^ {15} \).

### 6.4. Event coverage

About half of the survey respondents indicated they spend time performing event coverage in a typical week. The gender, specialty (GP/FP or specialist), province, post-secondary affiliation status and medical experience of a physician do not affect the amount of time dedicated to event coverage.

The interviewed physicians had a strong passion and expressed interest in event coverage. Personal enjoyment was the primary promoter for providing SEM event coverage. The lack of financial compensation and the time commitment required were the primary barriers to providing
these services. While both barriers are evident among fee-for-service physicians, time barriers may be the predominant barrier for academic salaried physicians.

Financial and time barriers are key components of professional and volunteer models of service. From the interviews and literature, volunteerism has been a component in the history of SEM in Canada\textsuperscript{10}. However, many of the interviewed physicians indicated that a shift from volunteerism to professionalism is warranted to overcome the primary barriers of event coverage. Although choosing to provide event coverage as a volunteer is an individual choice, several physicians felt this decision may have a negative impact on those who choose to provide coverage as a professional. Since event coverage carries significant medicolegal risk and professional responsibility, event coverage may be more suitable for a professional model of service. However, there were differing opinions regarding the availability of funds in sport organizations, especially in amateur sports, to support a professional model of event coverage.

From the interviews, potential steps to overcoming the barriers are: defining and setting standards for compensation; promoting the utilization of compensation standards among SEM physicians; and convincing event organizers that medical coverage should be a priority in event planning.

6.5.  Research infrastructure

Research appears to have a prominent presence in Canadian SEM since a higher proportion of survey respondents indicated they participated in research compared to the national physician average (30\% vs. 6.8\%)\textsuperscript{30}. The large proportion of physicians conducting research suggests there is a relatively large interest in research compared to the national physician average. From the interviews, the primary promoter to conduct research was the motivation to contribute to the existing knowledge base through an evidence-based approach.

However, the time dedicated to research activity accounted for a small proportion of the survey respondents’ work hours. The time dedicated to research is similar to that of the national physician average (1.6 vs. 1.56 hours per week, p=0.9, respectively)\textsuperscript{31}. The limited amount of time dedicated to research may be due to the primary barriers identified in the interviews: the lack of financial compensation, time, and a research support team. The relationship between the
financial and time barrier to conducting research appears similar to that of providing teaching and event coverage. Additionally, the lack of a research team or staff may increase the time required for research and thus, magnify the time barrier.

The lack of a research team as a barrier to conducting research is supported by the quantitative data. Physicians in highly populated centers dedicated a greater amount of time to research than those in lesser populated areas. Physicians in highly populated centers may have greater access to post-secondary academic resources and research support than physicians in less populated centers. The greater amount of time dedicated to research by assistant professors and professors, and the trend for associate professors to dedicate more time to research than non-affiliated physicians, support that academic affiliation provides research support. However, this finding is absent for physicians who are lecturers or who have an ‘other’ type of post-secondary affiliation. These physicians may have less access to academic or research resources and their academic duties may not include research. The differing roles in research of different types of academic physicians have been reported in literature\textsuperscript{35}.

The gender, specialty (GP/FP or specialist), province, and medical experience of a physician do not affect the amount of time dedicated to research.

6.6. Sport and exercise medicine organizations

There are various levels of SEM organizations that Canadian SEM physicians belong to. With 88% of respondents using membership services from these organizations and 97% of respondents attending SEM conferences, professional SEM organizations are managing and sponsoring physician activities. The large utilization of journal access and attendance of SEM conferences supports the qualitative finding that knowledge transfer disseminated from CASEM and networking with other SEM professionals are the primary benefits to CASEM members.

The member services offered to SEM physicians in BC, MB, SK, and Atlantic provinces may need to be re-evaluated since approximately one-fifth of respondents in these provinces did not use member services.
From the interviews, physicians desired that SEM organizations promote SEM as a professional body; take a lead on areas such as financial compensation for SEM services and education to others; and coordinate research activity. There may be a need for CASEM to evolve from a volunteer organization to a professional organization in order to progress with these ideas.
6.7. **Strength and limitations**

In the quantitative survey, recall and response bias may be present since this was a self-report study. This study did not examine physicians who practice SEM without a CASEM diploma. Forty-five percent of invited physicians did not respond. The low response rate of the National Physician Surveys may limit the validity of comparisons made with the respondents\textsuperscript{30,31}. Since the data of the regression models violated the assumptions of normality and independence of residuals, the models may be limited to representing the Canadian SEM physician population only. The post-secondary affiliation predictor only examined affiliation rank and did not differentiate between tenure and non-tenure track physicians. As well, other possible predictors for the regression analysis may have been left out in this study.

In the qualitative interviews, there was representation nationally and from multiple specialties but there was a relative over-representation of British Columbian physicians and an underrepresentation of orthopedic and emergency medicine SEM physicians. The over-representation of British Columbian physicians is likely secondary to location of the Annual Scientific Meeting of CASEM (Kelowna, British Columbia). The recurrence of themes in successive individual interviews of all methods and focus groups suggested thematic saturation but it is possible that other themes exist and were not discussed. Group interviews have inherent biases due to group dynamics. These biases were countered by ensuring confidentiality of the interview, by encouraging a safe environment for differing opinions and by seeking input from all participants.

6.8. **Conclusion**

The current SEM physician demographics, geographic distribution, practice profiles, and support from other health professionals indicate that SEM has sufficient infrastructure to thrive as a focused practice. There is a willingness to teach among SEM physicians; however, there is a need for stronger SEM curriculum in medical education. The lack of financial compensation and time are the primary barriers to providing teaching and event coverage among SEM physicians. Research support appears to be an important facilitator to conduct SEM research. Professional SEM organizations are managing SEM physician activities and services. Physicians view SEM organizations as leaders to promote SEM as a profession.
6.9. Future Directions

This study is the first to provide a broad picture of the infrastructure in Canadian SEM. This study presents evidence that SEM in Canada has sufficient infrastructure to support a focused practice: a national distribution of SEM physicians; a large proportion of patient care dedicated to SEM; the utilization of SEM physicians as consultants by non-SEM physicians; the collaborative approach of SEM physicians with other healthcare professionals; the large proportion of SEM physicians that teach; the presence of SEM physicians conducting SEM research; and the presence of a supported central organizational body (CASEM). Leaders in Canadian SEM may use this evidence to support the special designation application to the CFPC. Furthermore, this data may be used to advocate for additional teaching of SEM in medical education; for compensation models for providing teaching and event coverage; and for research support in terms of staff and funding. CASEM leaders may use the data on membership usage and the opinions of SEM physicians regarding CASEM to help them reflect on its leadership role among Canadian SEM physicians.

Future research with non-SEM physicians and patients regarding their understanding of the role of SEM physicians may be beneficial to determine if further promotion of SEM among these groups is required. Research into SEM physician opinions regarding adequate financial compensation for teaching and event coverage, and research into financial budget considerations of medical education programs and sport organizations would aid in developing compensation models.
7. Tables and figures

Table 1. Correlation between test and one week retest of the survey.

<table>
<thead>
<tr>
<th>Question</th>
<th>n</th>
<th>Pearson R</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of hours per week spent on practising medicine not related to SEM</td>
<td>7</td>
<td>0.999</td>
<td>0.000</td>
</tr>
<tr>
<td>Average number of SEM patients per hour seen</td>
<td>7</td>
<td>0.983</td>
<td>0.000</td>
</tr>
<tr>
<td>Average number of physician referred consults per week</td>
<td>7</td>
<td>0.996</td>
<td>0.000</td>
</tr>
<tr>
<td>Average number of hours per week performing the following SEM related activities:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient care without learners present</td>
<td>7</td>
<td>0.999</td>
<td>0.000</td>
</tr>
<tr>
<td>Patient care with learners present</td>
<td>7</td>
<td>0.998</td>
<td>0.000</td>
</tr>
<tr>
<td>Administrative duties</td>
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<td>0.001</td>
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<td>Research</td>
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<td>0.000</td>
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<td>Teaching in a non-patient care setting</td>
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<td>0.800</td>
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<td>Continuing Medical Education</td>
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<td>0.488</td>
<td>0.267</td>
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<td>Event coverage</td>
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<tr>
<td>Other</td>
<td>7</td>
<td>1.000</td>
<td>0.000</td>
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</table>
Table 2. Cronbach’s alpha for the survey (n=246) and convenient samples (n =7).

<table>
<thead>
<tr>
<th>Population</th>
<th>Question</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey sample</td>
<td>Do you conduct SEM research?</td>
<td>0.731</td>
</tr>
<tr>
<td>Convenient sample</td>
<td>Do you conduct SEM research?</td>
<td>0.769</td>
</tr>
<tr>
<td>Survey sample</td>
<td>Do you provide SEM teaching?</td>
<td>0.846</td>
</tr>
<tr>
<td>Convenient sample</td>
<td>Do you provide SEM teaching?</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 3. Survey response rates.

<table>
<thead>
<tr>
<th></th>
<th>BC</th>
<th>AB</th>
<th>MB and SK</th>
<th>ON</th>
<th>QC</th>
<th>Atlantic Provinces</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response rate</td>
<td>54%</td>
<td>56%</td>
<td>76%</td>
<td>54%</td>
<td>43%</td>
<td>60%</td>
<td>55%</td>
</tr>
</tbody>
</table>

Atlantic Provinces included Newfoundland, New Brunswick, Nova Scotia and Prince Edward Island. BC = British Columbia, AB = Alberta, MB = Manitoba, SK = Saskatchewan, ON = Ontario, QC = Quebec. Note: For the provincial response rates: the numerator was determined by the respondents’ primary SEM practice province and the denominator was determined by the province of the mailing address. The primary SEM practice location of physicians may be different from their mailing address.
Table 4. National distributions of Canadian sport and exercise medicine physicians and the 2010 general Canadian population.

<table>
<thead>
<tr>
<th></th>
<th>BC</th>
<th>AB</th>
<th>MB and SK</th>
<th>ON</th>
<th>QC</th>
<th>Atlantic Provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents</td>
<td>22%</td>
<td>12%</td>
<td>8%</td>
<td>40%</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>General Canadian</td>
<td>13.3%</td>
<td>10.9%</td>
<td>6.7%</td>
<td>38.7%</td>
<td>23.2%</td>
<td>6.9%</td>
</tr>
<tr>
<td>population*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Atlantic Provinces included Newfoundland, New Brunswick, Nova Scotia and Prince Edward Island.  BC = British Columbia, AB = Alberta, MB = Manitoba, SK = Saskatchewan, ON = Ontario, QC = Quebec

*Statistics Canada 2010
Table 5. Canadian sport and exercise medicine physician distribution in various municipalities grouped by provinces.

<table>
<thead>
<tr>
<th>Type of municipality (population size)</th>
<th>BC</th>
<th>AB</th>
<th>MB and SK</th>
<th>ON</th>
<th>QC</th>
<th>Atlantic</th>
<th>Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major metropolitan (&gt;1,000,000)</td>
<td>46%</td>
<td>67%</td>
<td>0%</td>
<td>39%</td>
<td>54%</td>
<td>0%</td>
<td>40%</td>
</tr>
<tr>
<td>Mid-size metropolitan (250,000-999,999)</td>
<td>13%</td>
<td>17%</td>
<td>74%</td>
<td>25%</td>
<td>27%</td>
<td>39%</td>
<td>26%</td>
</tr>
<tr>
<td>Smaller metropolitan (50,000-249,999)</td>
<td>30%</td>
<td>10%</td>
<td>16%</td>
<td>21%</td>
<td>12%</td>
<td>39%</td>
<td>22%</td>
</tr>
<tr>
<td>Non-metropolitan small city zone and smaller (&lt;50,000)</td>
<td>11%</td>
<td>7%</td>
<td>11%</td>
<td>14%</td>
<td>8%</td>
<td>22%</td>
<td>12%</td>
</tr>
</tbody>
</table>
Table 6. Medical practice licenses of respondents.

<table>
<thead>
<tr>
<th>License to Practice</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family and General Practice</td>
<td>94%</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>12%</td>
</tr>
<tr>
<td>Orthopedics</td>
<td>11%</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>4%</td>
</tr>
<tr>
<td>Physiatry</td>
<td>3%</td>
</tr>
<tr>
<td>Internal Medicine</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>2%</td>
</tr>
</tbody>
</table>

Note: Categories are not mutually exclusive and therefore, the percentage of respondents has a sum greater than 100%.
Table 7. Average weekly work hours spent in sport and exercise medicine.

<table>
<thead>
<tr>
<th>Category</th>
<th>Median (hours)</th>
<th>Mean (hours)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient care without teaching component</td>
<td>16.0</td>
<td>18.6</td>
<td>15.6</td>
</tr>
<tr>
<td>Patient care with teaching component</td>
<td>4.0</td>
<td>7.5</td>
<td>10.0</td>
</tr>
<tr>
<td>Teaching in non-patient care setting</td>
<td>0.0</td>
<td>0.8</td>
<td>2.5</td>
</tr>
<tr>
<td>Research</td>
<td>0.0</td>
<td>1.6</td>
<td>4.5</td>
</tr>
<tr>
<td>Event or Sport Coverage</td>
<td>0.5</td>
<td>1.8</td>
<td>4.2</td>
</tr>
<tr>
<td>CME</td>
<td>1.5</td>
<td>1.9</td>
<td>2.0</td>
</tr>
<tr>
<td>Administrative duties</td>
<td>3.0</td>
<td>3.9</td>
<td>5.8</td>
</tr>
<tr>
<td>Other</td>
<td>0.0</td>
<td>1.2</td>
<td>4.5</td>
</tr>
</tbody>
</table>

CME = continuing medical education, SD = standard deviation.
Table 8. Percentage of respondents who indicated their largest referral source of SEM patients.

<table>
<thead>
<tr>
<th>Largest referral source</th>
<th>Percentage of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician</td>
<td>54.2%</td>
</tr>
<tr>
<td>Self-referral</td>
<td>33.3%</td>
</tr>
<tr>
<td>Team or Organization</td>
<td>6.3%</td>
</tr>
<tr>
<td>Health professional (non-physician)</td>
<td>3.8%</td>
</tr>
<tr>
<td>Other</td>
<td>2.5%</td>
</tr>
</tbody>
</table>
Table 9. Comparison of family and general practice physicians (FP/GP) with specialist physicians (SP) in the number of physician consults per week and wait times to see a new patient with acute and sub-acute or chronic problems.

<table>
<thead>
<tr>
<th></th>
<th>Consults per week</th>
<th>Wait time for acute problem (days)</th>
<th>Wait time for sub-acute or chronic problem (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Median</td>
<td>Mean</td>
</tr>
<tr>
<td>FP/GP</td>
<td>179</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>SP</td>
<td>54</td>
<td>10</td>
<td>16.5</td>
</tr>
<tr>
<td>Overall</td>
<td>233</td>
<td>10</td>
<td>12.9</td>
</tr>
</tbody>
</table>

SD = standard deviation, *p<0.05
Table 10. Regression coefficients (b) of the significant and most parsimonious predictor models for clinical teaching, non-clinical teaching and research.

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Predictor</th>
<th>b</th>
<th>Standard Error</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical teaching</td>
<td>Population</td>
<td>1.142</td>
<td>.465</td>
<td>2.456</td>
<td>.015*</td>
</tr>
<tr>
<td></td>
<td>D-LCT</td>
<td>6.819</td>
<td>1.647</td>
<td>4.139</td>
<td>.000*</td>
</tr>
<tr>
<td></td>
<td>D-AST</td>
<td>10.951</td>
<td>1.636</td>
<td>6.693</td>
<td>.000*</td>
</tr>
<tr>
<td></td>
<td>D-ASO</td>
<td>8.492</td>
<td>1.882</td>
<td>4.511</td>
<td>.000*</td>
</tr>
<tr>
<td></td>
<td>D-PRF</td>
<td>6.442</td>
<td>3.632</td>
<td>1.774</td>
<td>.077</td>
</tr>
<tr>
<td></td>
<td>D-Other</td>
<td>5.489</td>
<td>3.091</td>
<td>1.776</td>
<td>.077</td>
</tr>
<tr>
<td>Non-Clinical</td>
<td>Years with an MD degree</td>
<td>.046</td>
<td>.017</td>
<td>2.679</td>
<td>.008*</td>
</tr>
<tr>
<td>Teaching</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td>Population</td>
<td>.483</td>
<td>.216</td>
<td>2.234</td>
<td>.026*</td>
</tr>
<tr>
<td></td>
<td>D-LCT</td>
<td>.260</td>
<td>.766</td>
<td>.340</td>
<td>.734</td>
</tr>
<tr>
<td></td>
<td>D-AST</td>
<td>1.514</td>
<td>.761</td>
<td>1.991</td>
<td>.048*</td>
</tr>
<tr>
<td></td>
<td>D-ASO</td>
<td>1.344</td>
<td>.875</td>
<td>1.536</td>
<td>.126</td>
</tr>
<tr>
<td></td>
<td>D-PRF</td>
<td>8.629</td>
<td>1.688</td>
<td>5.111</td>
<td>.000*</td>
</tr>
<tr>
<td></td>
<td>D-Other</td>
<td>-.019</td>
<td>1.437</td>
<td>-.013</td>
<td>.989</td>
</tr>
</tbody>
</table>

Note: Dummy coded post-secondary affiliation (D-): LCT = lecturer, AST = assistant professor, ASO = associate professor, PRF = professor; “No affiliation” was the comparison group and coded with zeroes. MD = medical doctorate. *p<0.05
Table 11. Percentage of respondents in each province who utilize the following membership service from sport and exercise medicine organizations.

<table>
<thead>
<tr>
<th>Service</th>
<th>AB</th>
<th>BC</th>
<th>MB-SK</th>
<th>ON</th>
<th>QC</th>
<th>Atlantic</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>26</td>
<td>54</td>
<td>19</td>
<td>93</td>
<td>26</td>
<td>18</td>
<td>236</td>
</tr>
<tr>
<td>Journal Access</td>
<td>88%</td>
<td>72%</td>
<td>79%</td>
<td>91%</td>
<td>85%</td>
<td>78%</td>
<td>84%</td>
</tr>
<tr>
<td>Event coverage</td>
<td>31%</td>
<td>30%</td>
<td>26%</td>
<td>35%</td>
<td>15%</td>
<td>17%</td>
<td>29%</td>
</tr>
<tr>
<td>CME funding</td>
<td>23%</td>
<td>20%</td>
<td>32%</td>
<td>23%</td>
<td>8%</td>
<td>6%</td>
<td>20%</td>
</tr>
<tr>
<td>Job Listing</td>
<td>12%</td>
<td>13%</td>
<td>0%</td>
<td>15%</td>
<td>0%</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>Research grant</td>
<td>12%</td>
<td>15%</td>
<td>11%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>9%</td>
</tr>
<tr>
<td>Do not use</td>
<td>8%</td>
<td>19%</td>
<td>21%</td>
<td>4%</td>
<td>15%</td>
<td>22%</td>
<td>12%</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
<td>0%</td>
<td>5%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
</tr>
</tbody>
</table>

N = respondents for this question. Atlantic Provinces included Newfoundland, New Brunswick, Nova Scotia and Prince Edward Island. BC = British Columbia, AB = Alberta, MB = Manitoba, SK = Saskatchewan, ON = Ontario, QC = Quebec.
Table 12. Demographic data of interview participants.

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>49</td>
<td>30 to 66</td>
</tr>
<tr>
<td>Number of years with MD</td>
<td>23</td>
<td>4 to 41</td>
</tr>
<tr>
<td>Years with CASEM diploma*</td>
<td>15</td>
<td>3 to 23</td>
</tr>
</tbody>
</table>

*results are of those who indicated they had a diploma. CASEM = Canadian Academy of Sport and Exercise Medicine.
Table 13. Demographic data of interviewed participants (n= 19).

<table>
<thead>
<tr>
<th>Demographic Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
</tr>
<tr>
<td>Province</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>9</td>
</tr>
<tr>
<td>AB</td>
<td>2</td>
</tr>
<tr>
<td>Prairie provinces (MB, SK)</td>
<td>1</td>
</tr>
<tr>
<td>ON</td>
<td>5</td>
</tr>
<tr>
<td>PQ</td>
<td>1</td>
</tr>
<tr>
<td>Atlantic provinces</td>
<td>1</td>
</tr>
<tr>
<td>Practice Type</td>
<td></td>
</tr>
<tr>
<td>Family or General Practice</td>
<td>14</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>1</td>
</tr>
<tr>
<td>Internal Medicine</td>
<td>1</td>
</tr>
<tr>
<td>Orthopedics</td>
<td>1</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>1</td>
</tr>
<tr>
<td>Physiatry</td>
<td>1</td>
</tr>
<tr>
<td>CASEM Diploma</td>
<td></td>
</tr>
<tr>
<td>Obtained a CASEM Diploma</td>
<td>16</td>
</tr>
<tr>
<td>Clinical Fellowship</td>
<td></td>
</tr>
<tr>
<td>Completed a SEM clinical fellowship</td>
<td>13</td>
</tr>
</tbody>
</table>

CASEM = Canadian Academy of Sport and Exercise Medicine; SEM = sport and exercise medicine. Atlantic Provinces included Newfoundland, New Brunswick, Nova Scotia and Prince Edward Island. BC = British Columbia, AB = Alberta, MB = Manitoba, SK = Saskatchewan, ON = Ontario, QC = Quebec.
Figure 1. Flow diagram of survey distribution and outcome.

SM= SurveyMonkey.com (Palo Alto, California).
Figure 2. Age distribution of respondents in five-year cohorts.
Figure 3. Percentage of respondents grouped in 5 year cohorts of the number of years holding a CASEM Diploma.

CASEM = Canadian Academy of Sport and Exercise Medicine.
Figure 4. Percentage of the respondents’ medical practice devoted to sport and exercise medicine.
Figure 5. Percentage of respondents who collaborate with various health professionals.
*Foot Care Professional included podiatrists, chiropodists, pedorthists and orthotists.
Figure 6. The percentage of respondents who taught various groups of learners.
References


Appendix A: quantitative survey

1. Please indicate your gender:
   - Male
   - Female

2. Please answer the following (yyyy):
   - Year of birth
   - Year of Medical School Graduation
   - Year of obtaining CASEM diploma

3. Please write the province/territory of your primary Sport and Exercise Medicine (SEM) practice:
   - Province/Territory:

4. Indicate the geographical population where your primary SEM practice is located (population size) (select one):
   - Major metropolitan (>1 000 000)
   - Mid-size metropolitan (250 000 – 999 999)
   - Smaller metropolitan (50 000 – 249 999)
   - Non-metropolitan small city zone: (20 000 - 49 999)
   - Small town zone (2500-19 999)
   - Predominantly rural (<2500)
   - Other (please specify): ____________

5. Indicate the branch of medicine that you are licensed to practice in Canada (select all that apply):
   - Family Medicine
   - Emergency Medicine
   - Internal medicine
   - General Practice
   - Physiatry
   - Rheumatology
   - Orthopedics
   - Pediatrics
   - Other (please specify): ____________

6. Of your SEM-RELATED ACTIVITIES, enter the average number of HOURS PER WEEK (in a typical week) you spend in:
   - Patient care WITHOUT learners present (e.g. clinic, booked patients, operating room, review of investigations)
   - Patient care WITH learners present
   - Administrative duties
   - Research
   - Teaching in non-patient care setting (e.g. lecture)
   - Continuing Medical Education
   - On-site event/sport coverage
   - Other


7. Enter the average number of HOURS PER WEEK you spend practising medicine NOT-RELATED to SEM (in a typical week):

8. Enter the average number of SEM patients you see PER HOUR:

9. Indicate the following health professionals that you collaborate with in a typical year (e.g. receive or send referrals, select all that apply):
   - Family Medicine/General Practice
   - Internal medicine
   - Dietitian
   - Orthopedics
   - Rheumatology
   - Massage therapist
   - Plastic Surgery
   - Physiotherapist
   - Podiatrist / chiropodist / orthotist
   - Emergency Medicine
   - Athletic therapist
   - Fitness professionals
   - Psychiatry
   - Chiropractor
   - None of the above
   - Pediatrics
   - Psychologist
   - Other (please specify):

10. From whom do you receive SEM referrals (select all that apply)?
    - Self-referral by patient (i.e. not referred)
    - Physicians
    - Non-physician health professionals (e.g. physiotherapist)
    - Team/organization
    - Other (please specify): ________________

11. From whom do you receive the MOST SEM referrals (select one)?
    - Self-referral by patient (i.e. not referred)
    - Physicians
    - Non-physician health professionals (e.g. physiotherapist)
    - Team/organization
    - Other (please specify): ________________

12. Enter the average number of PHYSICIAN REFERRED consults you see PER WEEK:

13. In DAYS, enter the average wait time for a new patient with an ACUTE injury (injury occurring <21 days ago) to see you:
    Number of DAYS: ________________

14. In DAYS, enter the average wait time for a new patient with a SUB-ACUTE OR CHRONIC problem (problem lasting ≥ 21 days in duration) to see you:
    Number of DAYS: ________________
15. Indicate the investigational services that:
   a) are AVAILABLE to you
   b) you provide the INITIAL INTERPRETATION (e.g. interpret a X-ray before radiology report is available)

Select all that apply in BOTH columns

<table>
<thead>
<tr>
<th>Service</th>
<th>AVAILABLE</th>
<th>INITIAL INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiopulmonary testing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory investigations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MRI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrasound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-ray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None of the above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. Indicate the group(s) that you teach SEM to in a typical year (select all that apply):

- Medical Students
- Residents and/or Fellows
- Independent Licensed Physicians
- Non-physician Health Professionals
- Athletes/Teams/Organizations (outside of individual patient visit)
- Public (outside of individual patient visit)
- Do not teach / Non-teaching practice
- Other (please specify): ________________

17. Indicate the group size(s) of learners that you teach SEM to in a typical year (select all that apply):

- Individual (1-2 learners)
- Small group (3-20 learners)
- Large group (>20 learners)
- Do not teach
- Other (please specify): ________________

18. Indicate your current level(s) of affiliation with post-secondary institutions (select all that apply):

- Lecturer / instructor
- Professor
- Assistant professor
- Associate professor
- No faculty position or affiliation with a post-secondary institution
- Other (please specify): ________________

19. Does your primary SEM clinic have the ability to electronically collect data on your practice (e.g. electronic medical records, electronic billings)?

- Yes
- No
- Unsure

20. In the past 5 years, have you performed quality improvement or assurance projects for your primary SEM practice (e.g. projects that analyze and evaluate standards of patient care)?

- Yes
- No
21. In the past 5 years, have you participated in SEM research that requires approval from a research ethics board?
☐ Yes ☑ No

22. Indicate the type(s) of SEM conferences that you have attended in the past 5 years (select all that apply):
☐ Regional ☐ International
☐ Provincial ☐ Do not attend SEM conferences
☐ National ☐ Other (please specify): ______________

23. Indicate the following levels of SEM organizations that you are currently:
   a) Aware of
   b) Member of

Select all that apply in BOTH columns

<table>
<thead>
<tr>
<th></th>
<th>Aware of</th>
<th>Member of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Provincial</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>National</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>International</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
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24. Indicate the member services of SEM organizations that you have used in the past 5 years (select all that apply):

☐ Journal access ☐ Event coverage services
☐ Continuing Medical Education funding ☐ Do not use member services
☐ Research grants ☐ Other (please specify): ______________
☐ Job listings
## Appendix B: regression modeling

### Clinical Teaching Regression Modeling

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6. Predictors: (Constant), Other, PRF, ASO, LCT, AST, Population, Mdyr, Specialty, Gender, ON, NL, MB, QC, NB, SK, NS, AB, BC

LCT = lecturer, AST = assistant professor, ASO = associate professor, PRF = professor, Other = other affiliation; “No affiliation” Mdyr = number of years with a medical doctorate degree. BC = British Columbia, AB = Alberta, MB = Manitoba, SK = Saskatchewan, ON = Ontario, QC = Quebec.
Non-clinical Teaching Regression Modeling

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LCT = lecturer, AST = assistant professor, ASO = associate professor, PRF = professor, Other = other affiliation; “No affiliation” MDyr = number of years with a medical doctorate degree. BC = British Columbia, AB = Alberta, MB = Manitoba, SK = Saskatchewan, ON = Ontario, QC = Quebec.
Event Coverage Regression Modeling

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Research Regression Modeling

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4. Predictors: (Constant), Other, PRF, ASO, LCT, AST, Population, Mdyr, Specialty
5. Predictors: (Constant), Other, PRF, ASO, LCT, AST, Population, Mdyr, Specialty, Gender
6. Predictors: (Constant), Other, PRF, ASO, LCT, AST, Population, Mdyr, Specialty, Gender, ON, NL, MB, QC, NB, SK, NS, AB, BC

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Appendix C: interview guide

1. This question explores the promoters and barriers to providing sport and exercise medicine (SEM) education to medical trainees.
   a. Are you involved in SEM education?
      
      If so, what is your current involvement? What motivates you to be involved? What are the barriers that limit your involvement in SEM education?
      
      If not, what are the reasons for not being involved (i.e. barriers that prevent involvement)?
   
   b. What factors would encourage you to become involved (or more involved) in SEM teaching?
   
   c. Other opinions/comments:

2. This question explores the promoters and barriers to providing sport and event coverage.
   a. Do you provide sport or event coverage?
      
      If so, what is your current involvement? What motivates you to be involved? What are the barriers that limit your involvement?
      
      If not, what are reasons for not being involved?
      
   b. What would encourage you to provide (or to provide additional) sport or event coverage?
   
   c. Other opinions/comments:

3. This question explores the promoters and barriers to involvement in research relating to SEM.
   a. Are you involved in research relating to SEM?
      
      If so, what is your current involvement? What motivates you to be involved? What are the barriers that limit your involvement in research?
      
      If not, what are reasons for not being involved?
b. What would encourage you to become involved (or more involved) in SEM research?

c. Other opinions/comments:

4. This question explores how **SEM organizational bodies** (e.g. CASEM, provincial SEM boards, etc) affect your practice of SEM.

a. How have SEM organizational bodies benefited or contributed to your practice of SEM (please provide examples if applicable)?

b. Are there other areas in which you think an SEM organization can help you or your practice?

c. Other opinions/comments: