

Evaluating the Need for Physician Assistants in Sport and Exercise Medicine

Capstone Project: a requirement of the University of Manitoba Master of Physician Assistant Studies Program, Max Rady College of Medicine and Faculty of Graduate Studies

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ABSTRACT

INTRODUCTION: Injuries in sport, are a common occurrence. When these injuries occur, it can affect the patient outside of sport. Therefore, the 19.8 week wait time to see a specialist in Manitoba can be more devastating than the injury itself.(1) This paper aims to investigate the impact of implementing a physician assistant within existing sport and exercise medicine teams.

METHODS: A questionnaire was sent off to six sport and exercise medicine physicians to understand the perceived scope of practice of a physician assistant, barriers to hiring a physician assistant, and preferred supervisory relationships. Using various sources, a comparison of each providers scope of practice was completed. A literature review was performed to evaluate physician assistant cost effectiveness and physician assistant's effect on wait times. **RESULTS:**

The sport and exercise medicine physicians showed limited understanding of the physician assistant's full scope of practice. The most commonly expressed barrier to hiring a physician assistant was cost/funding. Only under direct supervision, physician assistants were trusted with the entire scope of practice of the supervising physician. In primary care, surgical and emergency cases, physician assistants have been shown to be cost effective if utilized to their full scope of practice. In the surgical setting, physician assistants showed the most significant reduction in wait times. **CONCLUSION:** Physician assistants have a broad scope of practice enabling them to extend the care of the attending physician and in some cases act as substitutes in the field of sport and exercise medicine. Since Manitoban sport and exercise medicine physicians do not know the entire scope of practice of physician assistants, this limits their ability to improve cost and wait times of the already existing sport and exercise medicine team.

INTRODUCTION

Background and Rationale

Sport Injuries

When we think about sports, we think Major league baseball (MLB), the National Hockey league (NHL), the National Football League (NFL) and other internationally recognized sporting organizations. We think of our favourite athletes, and how we can't wait to celebrate the next big win, these athletes carry us to. But throughout history, sports have also been an avenue for advocacy. In 1947, when Jackie Robinson endured the wrath and ridicule of MLB fans everywhere including his own team's fans; he not only broke the colour barrier in MLB, he also provided inspiration for many young African-Americans across the nation.(2) So whether it's finding joy in a local hero's triumph over an opposing team/athlete or changing the views of a nation, sport and athletes play a significant part in our lives. When these athletes suffer injuries, the impact is felt not only by the athletes, it is also felt by fans, the community, and the economy tied to the athlete/team.

When a professional athlete gets injured, this can create frustration, the decline in skills, and loss of training progress. The amateur athlete experiences additional effects from time spent (or lost) from school/work waiting for appointments with specialists, waiting for diagnostic studies, and waiting for the clearance for a return to activity. (3,4) A report from 2018 showed that Canadians, on average wait 19.8 weeks from the time the general practitioner refers them to receiving assessment and treatment from a specialist. The major contributing factor to this wait time is limited access to these in demand specialists. (1) Reducing wait times is essential as it

decreases strain on the healthcare system, lost time costs, as well as the impact on the athlete's life. (1,5)

Throughout the years, the field of medicine has advanced in technological terms, and the manner the medical system responds to patients. Previously, the medical model consisted of a "jack-of-all-trades" physician whom the community depended on for all their medical needs. Now, medicine requires a team approach with medical and allied healthcare professionals bringing advanced knowledge and training in specific areas of need or specialization to care for the patient. (6) Even with these changes, physicians practice at maximum capacity with perpetually full censuses. Hospital staff feeling overwhelmed, and often time with patients is shorter.

Research conducted to see if nonphysician care providers such as nurse practitioners and physician assistants could alleviate the demand on physicians is supportive and consistent in its findings. In 1992, Ripotellar-Muller et al., (1995) conducted a study showing that in American teaching hospitals nonphysician care providers provide a majority of the patient load. (7) With time and a better understanding of how these nonphysician care providers enhance the healthcare system, these professions have grown tremendously. In Canada, there are now over 2400 practicing nurse practitioners (8) and over 700 PAs (9). These advance care practitioners working to extend physician services or in physician substitution roles have become instrumental in increasing patient access to care as well as expediting the care plans and alleviating stress on physicians. (10)

Sport and Exercise Medicine

There is a major discipline of medicine focused on sport and exercise medicine (SEM). With humble beginnings, the concept of SEM dates back to the 5th century, where the concept of implementing physical training/exercise regimens was utilized to enhance one's physical abilities. The modern understanding of SEM began in 1912, where the *Association International Medico-supportive* was established to provide medical care to Olympic athletes. From this point forward, SEM was focused on athlete injury prevention and injury management in an acute setting. The Canadian Academy of Sports and Exercise Medicine (CASEM) was founded in 1970 and is recognized as the regulatory body for SEM physicians in Canada. CASEM was established in response to concerns brought up regarding medical care for athletes during the 1968 summer Olympics in Mexico. (11,12)

The Sports and Exercise Medical Team

Sports teams have many positions each performing a slightly different task to work towards the overall goal of the team. A SEM clinic has a team as well. Each member works to achieve the goal of returning the athlete/patient safely, back to the field of play post injury. SEM clinics vary their structure and who is on the team. For example, contrasting two SEM facilities in Manitoba, NRG Athletics vs Pan-Am Clinic. NRG Athletics is a private facility with one SEM physician and multiple athletic therapists, physical therapists, massage therapists, acupuncturists and certified strength and conditioning coaches.(13) The Pan-Am Clinic is a public facility which caters to a much larger patient demographic. Within this clinic, there are multiple SEM professionals including SEM physicians, orthopedic surgeons, athletic therapists, physical therapists and Diagnostic imaging technicians. (14) In Manitoba, the duty of sideline coverage at athletic and sporting events is performed by a team of SEM physicians, athletic

therapists and occasionally physical therapists.(12,15,16) In the United States, PAs are also part of this team. These PAs can extend the service of the SEM physician and improve access to emergency medicine across more SEM settings. (17)

Sport and Exercise Medicine Physicians

SEM physicians are nationally certified family physicians (general practitioners) under the *College of Family Physicians of Canada* with an additional certified additional competency (CAC) of Sport and Exercise Medicine, earning the credentials of CCFP-SEM. These physicians have specialized knowledge and training in advanced musculoskeletal assessment, lifestyle management, joint and fracture reduction/management, joint/soft tissue injections, interpretation of diagnostic imaging, nutrition, concussion/ head injury, sport psychology, orthotics/bracing and pre-participation assessments. With this specific training, SEM physicians work in clinics, perform surgeries, work in hospitals and on the sideline of sporting events providing athletes/participants access to medical services. The care and medical services provided by an SEM physician during sporting events are referred to as ***sideline medicine***. (12)

The two most common areas where the expertise of an SEM physician is used is orthopedic injuries and concussions. In the 2016-2017 hockey season alone, youths playing hockey received 9000 orthopedic injuries, (16,17), and in the same time period, there were 46,000 concussions diagnosed across all Canadian youth sport.(7) With the specialty training in these areas, SEM physicians competently diagnose, assess and manage these injuries. The utilization of SEM physicians reduces the strain on the emergency departments, walk-in-clinics and family practice clinics where these injured athletes/patients frequently seek assessment and care. (19)

Physician Assistants

Physician Assistants (PAs) are the focus of this paper. PAs are utilized in nearly every medical specialty and subspecialty. PAs are trained as medical generalists over a 2-year program. During this program, where one year is focused on didactic studies and the second year, the PA trainees accumulate 2000 hours of clinical experience. (20,21) As medical generalists, PAs receive additional knowledge in the specialty discipline they are employed. This generalized foundation in medicine allows for lateral migration between different disciplines. Hooker, Cowley and Lienweber, call it “flexibility”. This flexibility and adaptability allow PAs to respond to shortages in specific areas of healthcare with staffing shortages or immediate need. There is an economic benefit to the supervising physician or healthcare system, allowing task substitution to address demands on physicians and medical residents. (22,23)

PAs, work semiautonomous with the supervising physician under either direct supervision, where the supervising physician is physically present during the encounter or with indirect supervision where the supervising physician is not physically present, rather they are available via some form of communication should a clinical question arise. (23,24) This is usually outlined within the contract of supervision which outlines what a physician can expect from the PA (medical documentation, competencies, communication, and referrals to the physician, etc.). It also indicates what a PA can expect from the supervising Physician (access to the physician for clinical questions, professional development opportunities, willingness to take over complex care) which all PAs have with their employing/supervising physician(s). (25)

Athletic Therapists

Athletic therapists (ATs) are a current member of the SEM team. These individuals have a narrow scope of practice which focuses on sport specific injuries and patient evaluation. The AT goes through four years of undergraduate level training consisting of both didactic and clinical/on field learning. This training is focused on how to perform injury prevention interventions (e.g. ankle taping and brace fitting) as well as medical training to stabilize a patient on the field of play and either refer to physicians for management or activate emergency medical services for critical patients. The AT is a separate entity from the SEM physician covering the sporting event/clinic but is compensated on an hourly basis. The majority of ATs are working on side line assessments/care with some working in a clinic alongside SEM physicians.(26–28)

Purpose and Goals

The primary purpose of this study is to investigate if there is justification for PAs to be a part of the multidisciplinary SEM team. This is done by investigating the current attitude that SEM physicians in Manitoba have about hiring PAs. This knowledge will guide a discussion on the suitability of PAs in the SEM setting, focusing on:

- 1) Scope of practice
- 2) Cost-effectiveness
- 3) Wait time reduction

Methods

The primary goal of this project was to identify if there is a need for PAs in SEM. By combining published research in PA scope of practice, cost-effectiveness, and reduction of

patient wait times; with the results of a survey constructed to understand the SEM physician's attitude toward working with PAs, the question of whether there is a place for PAs in SEM can be answered. The principal methods of research included an electronic survey tool distributed by email to Manitoba SEM physicians to identify barriers to hiring PAs. And, a literature search conducted of peer-reviewed articles to clarify the education, scope of practice and roles of the interprofessional team members involved in sports and exercise medicine.

Survey

A survey using the internet-based survey generator SurveyMonkey was created to identify the attitude SEM physicians hold towards PAs working in sports medicine and barriers sports medicine physicians felt towards hiring PAs. It consisted of seven questions; three questions were in a checkbox format and were dedicated to obtaining background information on the physician (how many years they have practiced? Which midlevel care providers have they worked with before? What sports medicine setting do they work in?), three questions (two of which, were percentage ranking questions) relating to how comfortable physicians were with PAs working within their full scope of practice and one question (checkbox) inquiring about barriers faced in hiring PAs. In addition to the questions, the survey invite email also included a link to the CAPA website for participants to learn more about PAs. The survey was constructed and released via email to six SEM physicians selected at random from a Manitoba SEM physician mailing list. The response rate was 66% with 4 of the 6 SEM physicians responding and completing the survey. The estimated response rate was 50%.

A limited sample size of six physicians was used in this survey as a privacy agreement with the principal contact and mentor limited the number of participation emails that could be

sent. The survey was open for four weeks. No statistical analysis was needed based on the style of questions being asked.

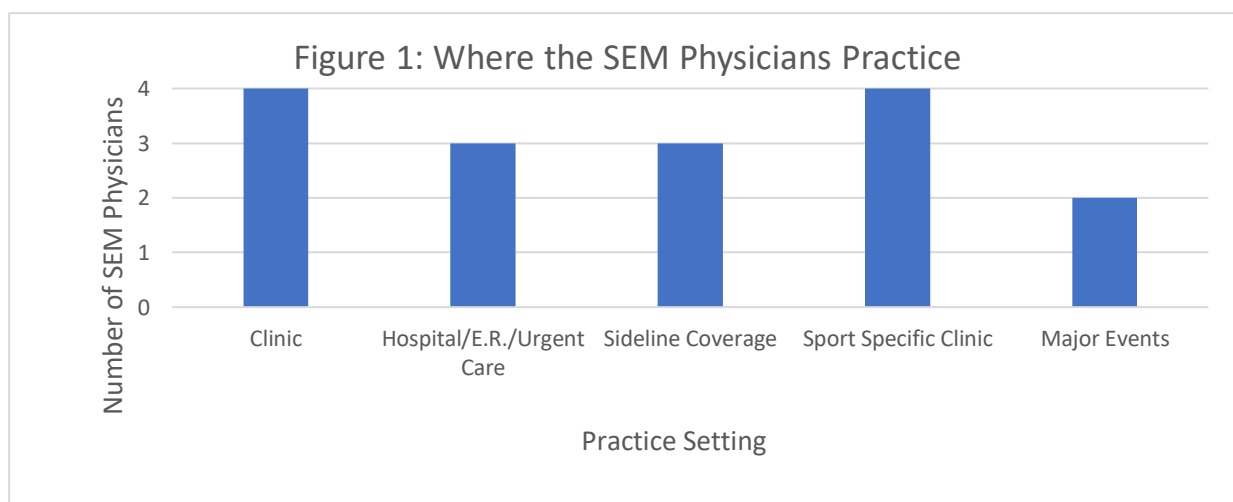
RESULTS

Survey

The primary questions of this survey were the questions aimed at identifying the barriers of hiring a PA and the type of supervisory relationship SEM physicians would trust a PA in. This information could be used to supplement the information regarding PA scope of practice, cost savings and wait time reductions, to answer the question: is there a need for PAs in SEM? Of the 6 sport and exercise medicine physicians that were emailed, 4 (66%) of them responded and completed the survey in full. No partially completed surveys were returned. All completed responses were included in the analysis.

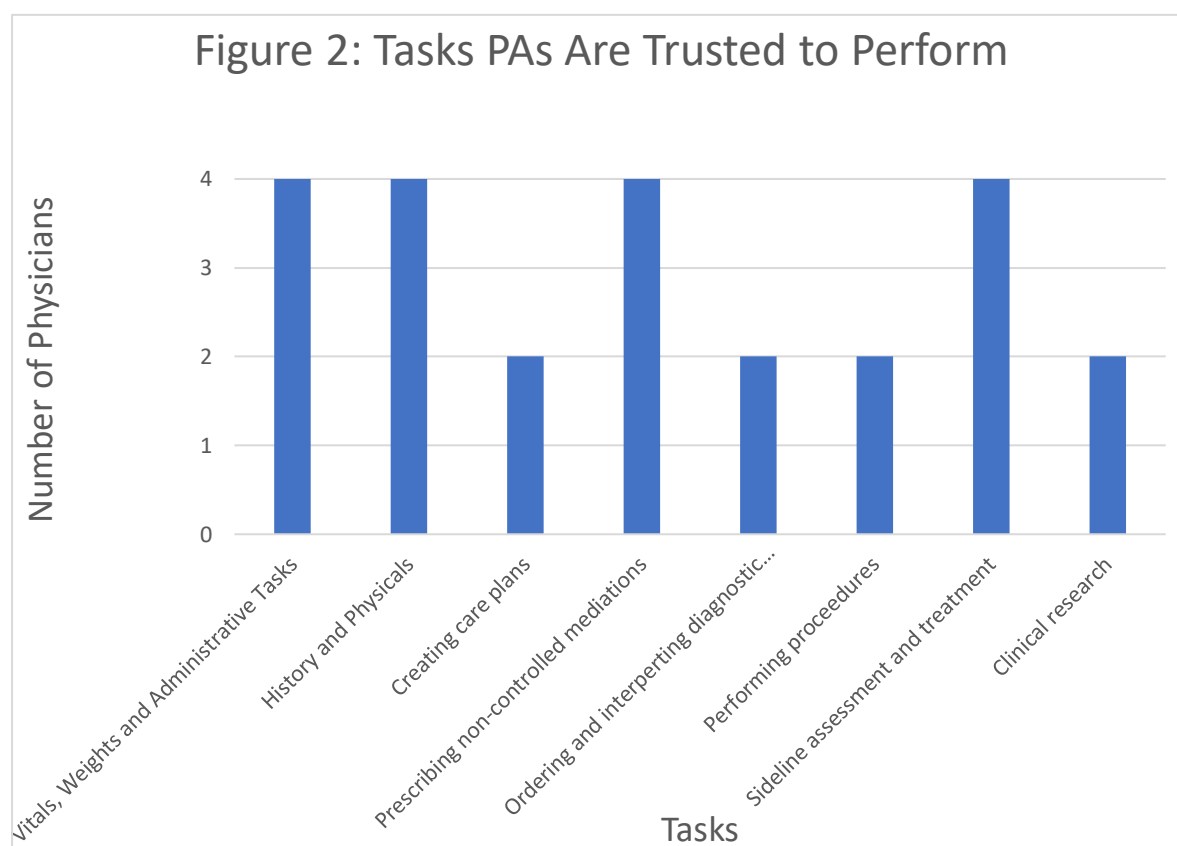
Demographic Data,

Of the 4 physicians that responded, 1 has been in practice for under 5 years and the other 3 have been in practice 21-25 years. None of them have worked with a PA before and only 1 has worked with an NP and all have worked with ATs. The SEM physicians interviewed worked in multiple settings as seen in Figure 1.



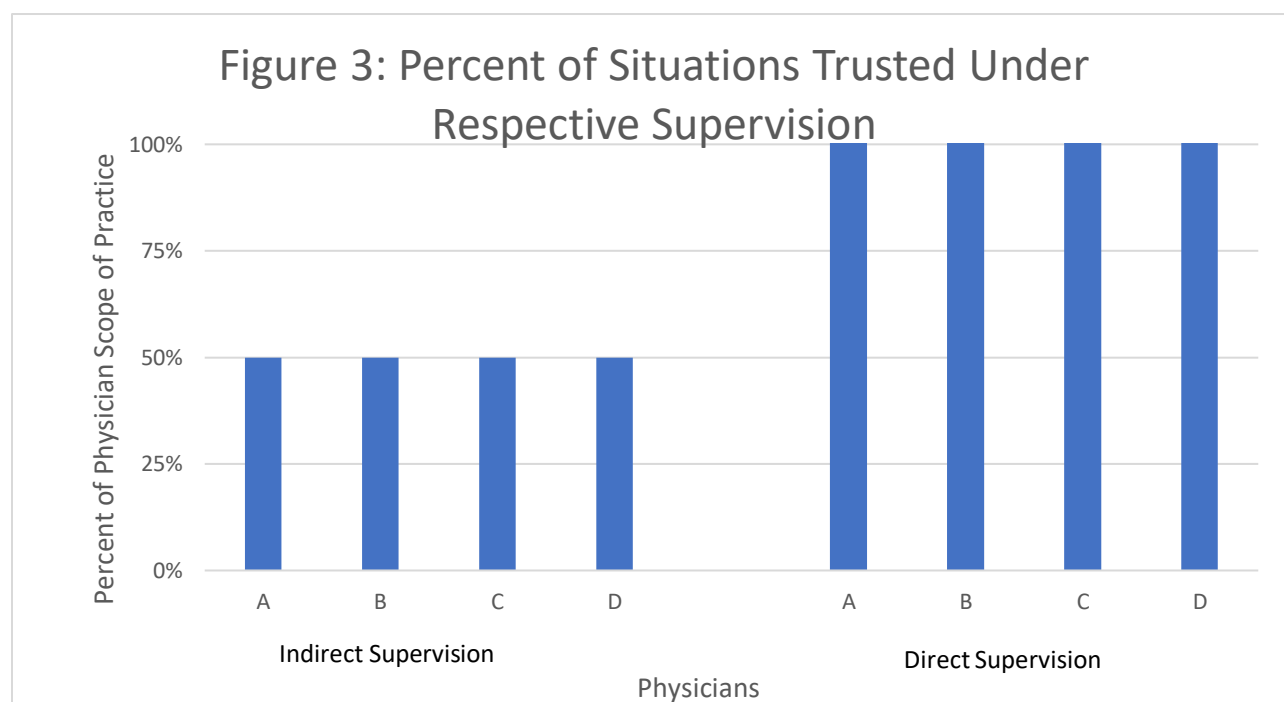
How PAs would be utilized

The SEM physicians were asked, "If you were to hire a PA, what tasks would you feel comfortable with them working under either direct or indirect supervision?" The question was framed in such a way that it included both supervisory relationships to decrease confusion. The results (Figure 2) show that all SEM physicians (100%) would utilize PAs in: taking vitals, weights and administrative tasks, taking histories and physicals, prescribing non-controlled substances, and sideline assessment and treatment of injuries. While only half (50%) of the SEM physicians would trust PAs with the tasks of: creating care plans, ordering and interpreting diagnostic imaging, performing procedures and clinical research.



Supervisory Relationship

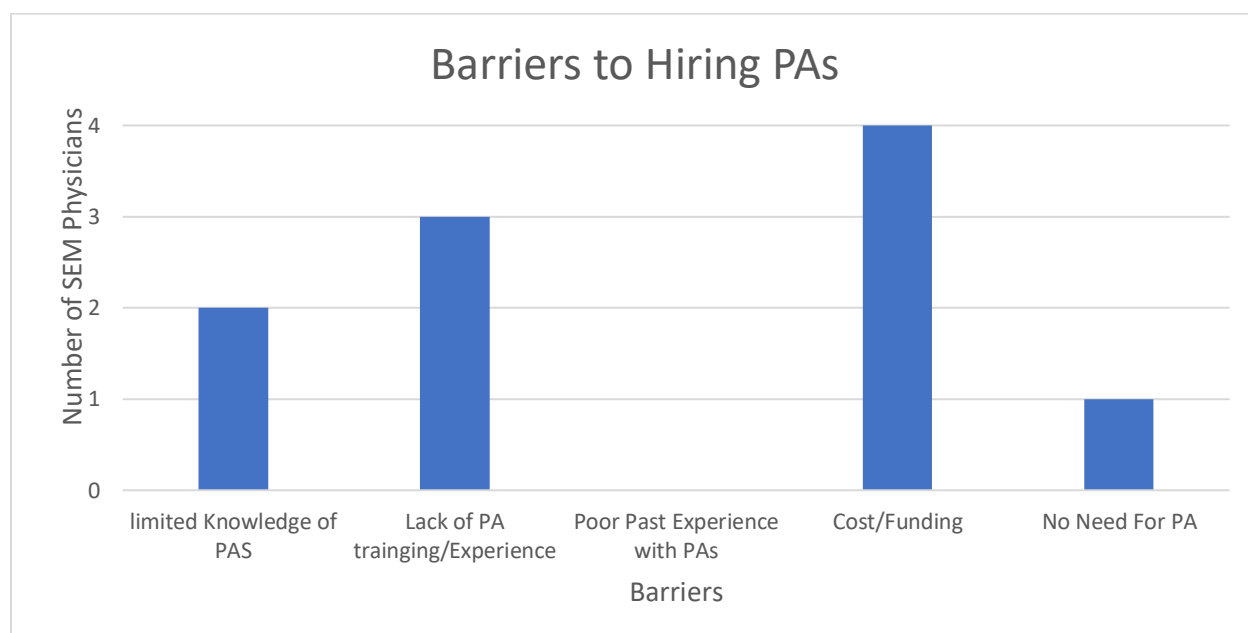
To assess this relationship, the questions asked physicians how comfortable they were with PAs working under indirect supervision and direct supervision. Both terms were defined within the question. For comfort working with PAs under indirect supervision, all physicians answered they would “trust the PA in 50% of the situations involved within the physician’s scope of practice”. For working with PAs under direct supervision, all physicians responded they “would trust the PA in 100% of the situations involved within the scope of the physician’s practice”. These results are depicted in Figure 3, utilizing letters to anonymously represent each SEM physician's response to each level of supervision.



Barriers to hiring a PA

When asked about the barriers to hiring PAs (Figure 4), the major barrier shared by all who participated in the survey was the cost/funding associated with hiring a PA. With 75% of

the respondents reporting a lack of knowledge about PAs and limited experience working with PAs as barriers to hiring PAs. Only one respondent said they would not have a need for a PA.

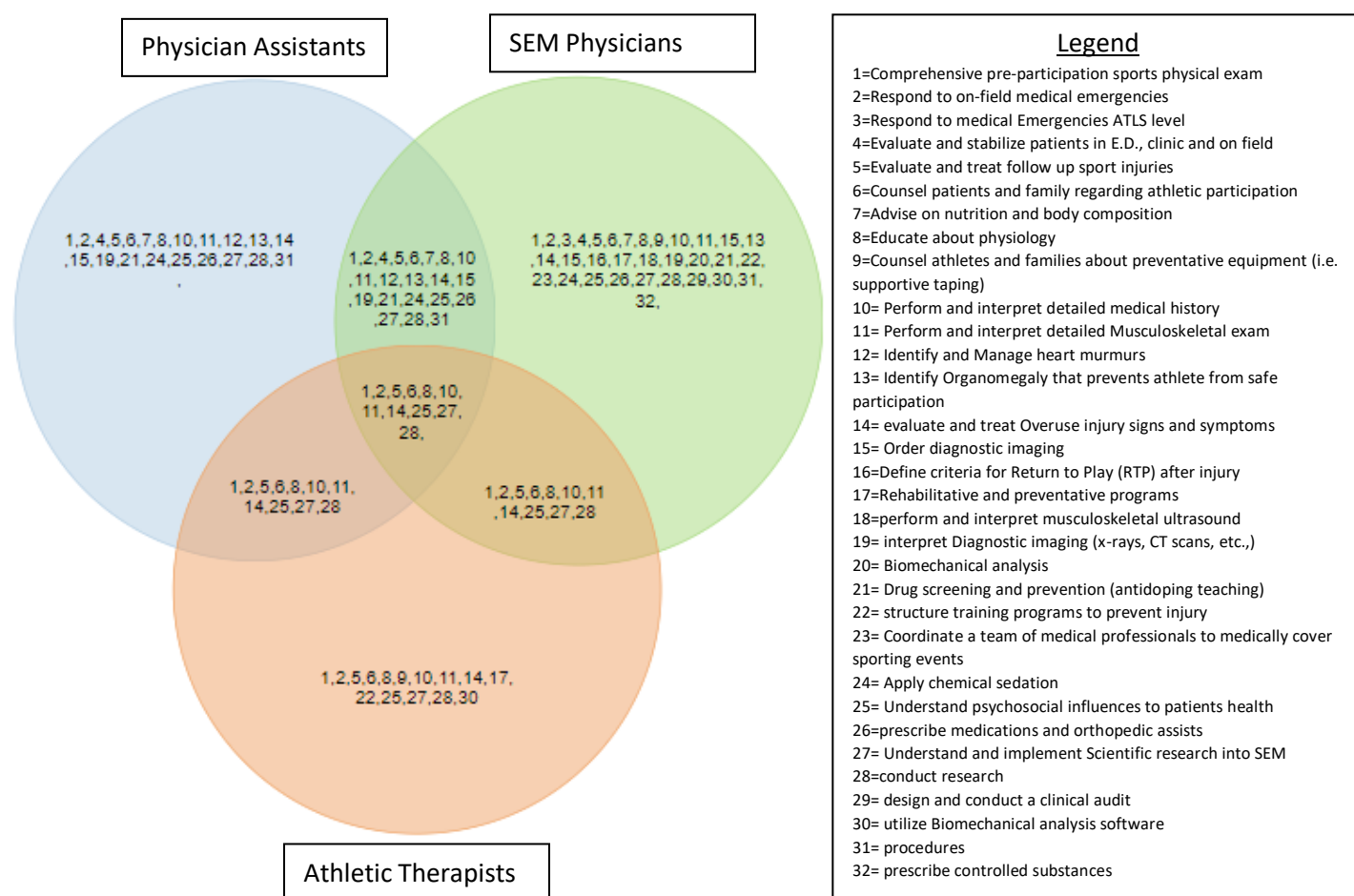


Literature Review

Scope of Practice

Physician Assistants are trained as medical generalists. This means they do not receive formal specialized training within their two-year education program. PAs receive on the job training for most specialties they enter which allows them to quickly adapt to their work environment. As a result, PAs receive education and training to manage most patients seen in SEM settings however, they receive no specific SEM training. ATs on the other hand receive SEM specific training throughout their four-year undergraduate degree. This allows them specialty skills such as taping and brace fitting which is not shared by SEM physicians and PAs. A comparison of the competencies possessed by SEM physicians,(12–16,19,29) ATs, (13,26–28) and PAs (10,30–33) can be found in Figure 5.

Figure 5: Competencies within SEM



Economics

PAs are compensated through a different method than physicians. Where a physician operates under a fee for service model, the PA is compensated on an hourly basis. There have been previous studies which look at the cost-effectiveness of employing a PA. The costs associated with using a SEM physician include: \$50-\$100 per pre-participation history and

physical, \$100-\$200 hourly rate for event coverage, or \$500 for covering a day long (6 hour) event.(29)

According to Neuvo.com (a salary database) the average PA in a SEM setting (or any setting) would cost \$39.30 per hour no matter how many or what procedures were performed.(34)

The research conducted on PA cost-effectiveness to the healthcare system shows variable results. In Hooker, 2002 a cost analysis was performed which compared the cost of managing four common diagnoses (including provider salary, overhead, imaging, medication and laboratory costs) between 550 physicians and 75 PAs in a united states primary care setting. Of these diagnoses the diagnosis and management of, shoulder tendinitis is a diagnosis which would be seen in a SEM clinical setting. Hooker found a statistically significant ($P < 0.001$) total cost difference between PAs and physicians managing the same shoulder tendinitis. PAs were found to cost the healthcare system less, and Hooker concluded that compared to physicians, PAs, reduce labor demand, do not increase the amount of referrals to specialists, and do not consume more resources than physicians managing the same case.(35) A report conducted by Woodin et al., also compared the cost-effectiveness of general physicians to PAs (American trained) in a primary care setting, this time in England. The results were mixed. PAs did show to reduce the cost of care. However, these cost savings, were offset by the increased time it took PAs to perform the consultation. The study concluded that the cost-effectiveness of PAs was inconclusive due to the differences in cost-effectiveness between cases/consultations.(36) The National Standards Committee in 2007 conducted a study in a Manitoban Orthopedic surgical setting where general physicians acting as surgical assists were replaced with and replaced them with clinical assistants (analogous in surgical assist duties to PAs). During the course of this study, the health agency responsible for compensating the medical professionals (Manitoba

Health) saved \$270 227. This amount was found to cover the cost required to hire the clinical assistants during the one year study period.(37) Sigurdson (2006), performed a retrospective analysis looking back 10 years at the implementation of PAs in surgical settings. He found that the PA must, in order to be cost-effective, increase the productivity of the surgeon by at least 37% allowing the surgeon to perform more procedures since the PA can perform tasks such as managing the post-operative patient care needs, closing and performing minor procedures on their own. This study showed that PAs can be cost-effective in an indirect manner, by making other members of the healthcare team more cost-effective.(23)

Table 1. PA Cost-Effectiveness

Authors and year	Type of study	Setting of Study	Sample size	Major research question	Results	PAs benefit to healthcare Economics
Hooker, 2002	Quantitative: Cost analysis of 4 diagnoses	United states of America 1998 (Primary care setting)	<ul style="list-style-type: none"> • 500 physicians • 75 PAs • 80 NPs • 12 nurse midwives • 5000+ other healthcare employees 	<ul style="list-style-type: none"> • Cost Analysis of 4 common diagnoses: urinary tract infection, Shoulder tendinitis, Acute Bronchitis, Otitis Media • Analysis differences between PAs and physicians when patients have different demographics/attributes. 	<ul style="list-style-type: none"> • Significantly lower cost for all diagnoses except bronchitis (PAs only \$10.60 less) • No significant differences in analysis of patients with different attributes between PAs and physicians 	PAs are cost-effective: no increased referrals, no extra resources needed, reduce labour required by physician
National Standards Committee, 2007	Qualitative and Quantitative: Cost effectiveness of replacing general physicians with surgical PAs	Canada 2006 (Surgical setting)	<ul style="list-style-type: none"> • 3 PAs 	<ul style="list-style-type: none"> • How do PAs effect orthopedic surgery: wait times, Cost savings, Opinion of surgical team members (nurses, residents), opinion of patient, wait times 	<ul style="list-style-type: none"> • PAs free up 200 hours per year for supervising surgeon • Wait times decreased 32% when PAs utilized 	PAs are cost-effective: reduce healthcare expenditure, increase patient flow, increase surgeon's capacity
Sigurdsson, 2006	Retrospective evaluation: PAs in surgical setting	North America (surgical setting)	N/A	<ul style="list-style-type: none"> • Do PAs increase the efficiency (time and cost) of surgeons? 	<ul style="list-style-type: none"> • 37% increase in efficiency is breakeven point for hiring a PA in surgery • \$1.4 million savings to healthcare system if PA increases surgeon's efficiency by 70% 	PAs are cost-effective: PAs can indirectly create cost savings by improving efficiency of surgeon
Woodin et al., 2005	Qualitative and quantitative: effects of introducing PAs in emergency departments	England (emergency department setting)	6 PAs	<ul style="list-style-type: none"> • Are PAs accepted by their colleagues and patients in emergency department? • Data on PA care provided: number of consultations/week, number of days working/week, number of each chief complaint managed 	<ul style="list-style-type: none"> • Positive feedback from patients • Challenges with supervision understanding • PAs managed a wide variety of chief complaints • Wide variety in working schedule and number of consults per week 	PA cost effectiveness Inconclusive: Due to wide variability unable to determine cost-effectiveness

Wait Time Reduction

One of the key concerns in medicine today is wait times. Wait times for diagnostic imaging, wait times for access to specialists, wait times for surgical interventions. A significant amount of time and effort has been put into researching these wait times and how different interventions can assist in reducing them. PAs have been shown to reduce wait times in emergent settings such as emergency departments. Ducharme et al., conducted a quantitative evaluation of how the implementation of PAs (and NPs) affects the wait times, and length of stay within the emergency department. The results showed that utilizing a PA made it 1.6 times more likely to be seen by a medical provider within provincial healthcare standard times and the length of stay in the emergency department was reduced by 30.3% when PAs were utilized. These results show that the addition of PAs (and NPs) to a traditional emergency department medical team (physicians, nurses, health care aids and diagnostic and laboratory teams) reduced the number of patients who left the emergency department due to unacceptable wait times while maintaining high quality patient care. (4) The National Standards Committee (mentioned in the economics section) also looked at the effect PAs have on wait times to see surgical specialists. It found that PAs reduce wait times by up to 32%. In 2006 the wait time between referral and seeing a surgeon for a surgical intervention was 44 weeks. This means that with PAs being implemented in the process of coordinating and managing patient flow, the wait time will be 30 weeks. (37) One study which looked at the impact PAs have on the productivity of the clinic they are employed in was conducted by Farmer et al., in 2009. Farmer et al., performed a qualitative study assessing American trained PAs being implemented in Primary care setting in Scotland. The results showed that there was overlap with the scope of practice of other members of the primary care team and this overlap lead to inefficiency. Farmer et al., commented that since PAs

were a new member of the healthcare team, the patients were less inclined to work with them thus contributing to a reduction in patient interactions and physicians in Scotland didn't know how to utilize PAs therefore did not use the PAs to their full potential. (38)

Table 2. PA Effect on Wait Time Reductions

Authors and year	Type of study	Setting of Study	Sample size	Major research question	Results	PA Benefit to Wait Times
Ducharme et al., 2009	Quantitative: Wait time reduction with NP and PA integration to emergency departments	Canada (Emergency department Setting) 2006	<ul style="list-style-type: none"> 6 hospitals (minimum of 6 PAs and 6 NPs) 	<ul style="list-style-type: none"> How are wait times affected when NPs or PAs are added to the emergency department team 	<ul style="list-style-type: none"> PAs: patients are 1.6 times more likely to be seen by provincial standard time, length of stay was reduced 30.3% NPS: patients are 2.1 times more likely to be seen by provincial standard time, length of stay was reduced 48.8% 	<ul style="list-style-type: none"> PAs reduce wait times in emergency department and expedite care in emergency department
National Standards Committee, 2007	Qualitative and Quantitative: Cost effectiveness of replacing general physicians with surgical PAs	Canada 2006 (Surgical setting)	<ul style="list-style-type: none"> 3 PAs 	<ul style="list-style-type: none"> How do PAs effect orthopedic surgery: wait times, Cost savings, Opinion of surgical team members (nurses, residents), opinion of patient, wait times 	<ul style="list-style-type: none"> PAs free up 200 hours per year for supervising surgeon Wait times decreased 32% when PAs utilized 	PAs reduce wait time for surgical interventions
Farmer et al., 2009	Qualitative: evaluating PAs in primary care setting	Scotland 2009 (primary care setting)	<ul style="list-style-type: none"> 5 PAs 20 patients 	<ul style="list-style-type: none"> What is the Scope of practice of PAs in various roles? PA acceptance by patients? Do PAs improve clinic efficiency? 	<ul style="list-style-type: none"> PA Scope of practice was reduced in Scotland compared to USA due to limited knowledge of PA scope of practice All Patient respondents would be willing to have a PA treat them on their next visit PAs have considerable overlap of scope of practice with other healthcare professionals and therefore did not significantly improve clinic efficiency. 	<p>PAs did not improve wait times: PAs have the potential to reduce wait times.</p> <p>PAs reduce cost and Physician labor</p>

DISCUSSION

Lack of Understanding

The survey reached a very small proportion of Manitoban SEM physicians, the majority of which, had a similar level of experience (21-25 years). The data collected may be representing physicians who have little understanding of PAs and PA scope of practice. Evidence of this throughout the survey was that (figure 4) half of the respondents reported *Limited knowledge of PAs* as a barrier to hiring a PA and Figure 2 shows that PA scope of practice was poorly understood by the study participants whom showed great variability in their response to the question: *What tasks are PAs trusted to perform?* The results of this survey are contradictory to the findings of Farmer et al., (2009) who reported that PAs have a comparable competency profile to a 2nd year medical graduate (resident). (38) Although these competencies are speaking superficially of competencies held by general practitioners, figure 5 shows the SEM specific competencies PAs, ATs, and SEM physicians possess. This figure (figure 5) shows that PAs share 21 of the 32 Sem specific competencies shared by SEM physicians. However, based on Farmer et al., (2009) PAs in SEM may not be fully able to practice these competencies. Farmer et al., found that PAs starting in a new location with limited exposure to PAs, are not fully utilized. Since there are currently no PAs working specifically in SEM in Manitoba, it is likely that the first PAs in SEM will experience a similar reduced scope of practice as the PAs in Farmer et al., study who started work in Scotland where there was no past experiences in working with PAS. If PAs are not going to be used to their full capacity, they will not have significant improvement to the efficiency of the supervising SEM physician.

Efficiency

Sigurdson reported that PAs must at least improve the supervising physicians efficiency by 37% in order to meet a breakeven point where the cost associated with employing a PA is equal to the economic benefits the PA can bring. (23) When considering the addition of a PA to a SEM team, the roles of the current members of that team must be assessed. The PA may overlap in some competencies that the AT and SEM physician are already doing in the clinic or on the sideline performing on field assessments. Farmer Et al., (2009) reported that efficiency and scope of practice reductions occur when there is significant scope of practice overlap. A definitive comparison between ATs and PAs was not used but the overlap in competencies (see figure 5.) may result in PAs not improving efficiency by the necessary 37%. (23,38) Combining this information, in large multidisciplinary SEM teams, the addition of a PA will not enhance the efficiency of the team. From the research done by Sigurdson (2006), and the National Standards Committee (2007), it can be seen that PAs can significantly enhance efficiency in a surgical setting. While Part of SEM involves surgery, much of SEM takes place in clinics and on side line assessments. By looking at the comments made in the previously mentioned studies to understand how PAs increase efficiency in surgical settings, it can be determined if these same concepts can be extrapolated to the clinic and sideline assessment. The general consensus is that PAs can perform ward duties, manage surgical clinics and perform minor procedures on their own.(23,37) By performing these tasks, it frees the attending surgeon to perform more surgeries, essentially, going beyond just extending the service of the physician but in these cases substituting for the physician by working under indirect supervision. PAs in SEM can work under indirect supervision to see a full slate of patients in clinic for the supervising SEM physician and allow the physician to perform cover multiple sporting events at once if the PA is

working under indirect supervision. This can create improved access to SEM physicians and reduce wait times however, if the participants in the survey were an accurate representation of the SEM physicians in Manitoba, this indirect supervision model is not likely to benefit since the results of the survey (figure 3) shows that SEM physicians are only comfortable allowing PAs to only see half of the cases (referring to complexity not work load) the physician would see in a day.

The validity of the study is called into question when considering the responses to the question: *What percentage of situations would you trust PAs in for each level of supervision.* As previously mentioned, all SEM physicians within the survey responded that they would only trust PAs in half of the situations they see on a day to day basis. This doesn't explain which situations they would trust PAs in, but it announces that the SEM physicians are not comfortable with indirect supervision. Numerous studies have commented on the quality and competency of PAs and other papers have explained the advancement of PAs in healthcare. Woodin et al., (2005) commented on challenges of clarifying supervision with the supervising physician as a barrier to PAs being improving cost-effectiveness of the healthcare system.(36) In response to these challenges, a new trend in the PA profession is the push for increased autonomy for PAs, (39) removing "rigid collaborative practice and supervision agreements" when these agreements are not necessary to allow for greater mobility of the PA to better meet healthcare demands;(40) removing contract agreements between a PA and a single physician to allow more access; (41)and even replacing primary care providers in some settings since PAs have shown they are capable of taking on these responsibilities. (42)

Economics

Considering the results from the survey (Figure 4.), that indicate the most common barrier to hiring a PA in SEM is the cost associated with this. Since SEM is a large and diverse branch of medicine, it is important to understand the cost-effectiveness of implementing a PA into a SEM team in each of the predominant areas within SEM. The studies by Sigurdson (2007) and The National Standards Committee focused their research on PAs in a surgical setting. They both agreed that PAs can greatly increase efficiency and reduce the cost to the healthcare system by allowing the supervising physician (surgeon) to spend more time in the operating room.(18,37) Since there is a component of SEM that involves surgery and there have been multiple studies evaluating the benefits of introducing PAs into surgical settings, it can be concluded that adding PAs to the surgical side of SEM would improve the efficiency and economics of the SEM team.

SEM also has a clinical component which it could potentially use PAs in. Studies have shown that PAs only cost the primary healthcare setting 53% of what a physician in the same setting would. (43) Also, the idea has been put forward to increase PA utilization and autonomy in order to reduce healthcare costs in the primary care setting. (44) When looking at PAs in primary care style SEM clinics, the study by Hooker (2002) shows a clear cost-effectiveness benefit for PAs working in clinics. In this study, it showed specifically that PAs treating a SEM injury (shoulder tendinitis) can be considerably cost effective. (35) Injuries managed by SEM clinics can be both acute injuries but also chronic ones as well. Morgan et al., (2008) found that when PAs are involved in a patients care, there is on average 16% less repeat visits per year, compared to utilizing physicians alone. (45) Looking at these studies, it can be seen that PAs can

significantly improve the cost-effectiveness by increasing efficiency and reducing unnecessary follow ups in primary care clinics including SEM primary care clinics.

One crucial area in SEM where there is no research involving PAs is sideline medicine/assessments. The costs associated with using a SEM physician include: \$50-\$100 per pre-participation history and physical, \$100-\$200 hourly rate for event coverage, or \$500 for covering a day long (6 hour) event.(29) For that same 6 hour event (funding from provincial healthcare budget), a PA will only cost the healthcare system \$235.80.(34) These numbers show that PAs are cost-effective if they were to replace a physician when covering a sporting event. However, if a physician is needed to be called with a clinical question regarding an event they are indirectly covering, according to the Canadian Academy of Sport and Exercise Medicine (CASEM) the physician would also need to be compensated for their time and thus, the healthcare system is now paying two medical professionals instead of just the SEM physician. (12,29) Considering the competencies of the AT, PA and SEM physician (figure 5), it can be seen that the AT has sufficient competencies to manage a sporting event even with severe injury, the AT is trained to stabilize the injury and activate emergency medical services (EMS). (26,28,33) in summary, a PA in these cases would not contribute enough to the existing SEM team during sideline medicine at sporting events due to the fact that there is a team member (ATs) who can adequately manage athlete injuries at a lower cost than SEM physicians, and as Farmer's study pointed out, this scope of practice overlap with existing team members does not allow for improved efficiency. (38)

Wait Times

Wait times are a common complaint in many settings from emergency departments to waiting to see a specialist. SEM physicians are considered specialists. Although no data could be

found regarding wait time to see a SEM physician in Canada, extrapolations can be made between other similar fields of medicine and SEM wait times. Of the studies conducted in Canada, it was found that PAs reduce wait times in both emergency departments and also reduce wait time for specialists such as orthopedic surgeries.(4,23,37) interestingly, the area where PAs show great economic benefit, in the primary care setting, Farmer et al., (2009) used qualitative data to conclude that PAs do reduce wait times in this setting. This research was conducted in Scotland in a community which was naïve to PAs at the time; this may have limited the full utilization of PAs in the primary care setting as suggested within the study. By evaluating these studies, PAs have the most significant effect in reducing wait times in the surgical setting. Since waiting for surgery can significantly delay an athlete from returning to sport, and when PAs are involved in the surgical care team the wait time reduces 32%, it can be understood that PAs make an excellent addition to the surgical SEM team.

CONCLUSION

After reviewing the results of the survey and briefly reviewing literature regarding the implementation of PAs in different areas of medicine, some common themes arose. Based on the scope of practice of a PA, PAs can most certainly be competent care providers within SEM settings. However, in assessing the need for PAs in SEM, goes beyond just being competent in SEM. From the survey, it can be seen that SEM physicians have limited understanding of the role of PAs and do not fully trust PAs to manage all patient care under indirect supervision. As per the discussion within Framer et al., (2009) this limited knowledge of PAs scope of practice and limited trust in PAs to fully carry out their scope of practice can inhibit the PAs ability to improve efficiency and cost-effectiveness in SEM settings. PAs can improve cost-effectiveness both directly by the hourly compensation model compared to the physician's fee-for-service

model and indirectly by freeing up the supervising physician to perform more tasks which they are more specialized in training to perform. The area where PAs provide the most significant reduction in wait times and cost-effectiveness is in the surgical setting. A large part of SEM is the sideline medicine which it was deemed adding a PA would not improve cost-effectiveness or efficiency since ATs are already adequately trained to manage injuries on the field and require less financial compensation. In evaluating PA Scope of practice, economics and wait times, although PAs are qualified to work in SEM, and that in North America, utilizing PAs is a cost-effective method for increasing efficiency in surgery and in primary care SEM; PAs are not a necessary addition to a SEM team which already includes SEM physicians, ATs, nurses and support staff.

Limitations

Although time and effort were put into this project there are many limitations to this study. For the survey, there was a very limited sample size of only 6 participants due to challenges regarding privacy which arose when trying to contact more SEM physicians. With this small sample size, the results likely will not represent the thoughts of a majority of the SEM physicians in Manitoba. Although the participants were chosen at random, all but 1 of the participants had been in practice for 21-25 years. This limits the understanding of how sports and exercise medicine physicians of various experience levels feel regarding PAs in sport and exercise medicine. The delivery of the survey introduced response bias. (46) The email invitation to the survey included a link to learn more about PAs and nothing about ATs and NPs. This response bias likely led participants to inherently answer more favorably toward PAs than they would have genuinely been had the delivery be more neutral.

For the literature review, the data may not truly reflect the Canadian/Manitoban SEM environment or trends in medicine since the studies being utilized were conducted in the United States of America, Europe and only one was a Canadian study. General concepts within these studies were used in this project rather than specific details, in hopes that this would minimize the effect that different locations may have on the validity of the arguments made within this project. Since PA is a growing profession, there is becoming a growing body of knowledge surrounding it, however, from my literary searches did not find any information on PAs specifically in SEM. Due to this, arguments within the discussion section had to be extrapolated from other similar fields of medicine and may not truly reflect SEM trends.

Finally, although I tried to remain as objective as possible when evaluating the benefits of PAs in SEM, I am a Master of Physician Assistant candidate and therefore, inherently I possess subjective bias in favor of PAs. Steps were taken to minimize this bias such as using objective data, including studies which showed PAs have benefits and do not have benefits to SEM as well as having the project reviewed by neutral parties before it was submitted.

FUTURE DIRECTIONS

PAs are a growing member in modern medicine, as mentioned in the discussion, there is a push to increase the use of PAs as well as increase PA autonomy.(39) Future research needs to follow this progression in the PA profession and assess if PAs are still operating in a safe manner as autonomy and scope of practice advances. Should PAs start working in SEM in Manitoba, it would also be interesting to have a study to investigate what motivating factors for PAs to switch roles and start in SEM are present, but also what barriers they face as SEM PAs. Since ATs are the primary midlevel care provider in SEM settings, it would be interesting to evaluate the education and training ATs have to understand if there are competencies which ATs could

develop within their undergraduate training program to enhance their efficiency and help reduce wait times within SEM. One area that could also be reevaluated is the approach to surgical patients, considering the significant wait times experienced by patients awaiting referrals or for surgical interventions, an evaluation into the current practices within medicine is warranted.

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