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## Clinical Care of Masters Athletes: A Health Needs Assessment

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## Abstract

Little is known about the current state of clinical care that Masters Athletes (MAs) receive, their perceptions, and whether they meet their health needs. A 22-item online health needs assessment (HNA) survey was conducted to investigate the characteristics of clinical care received by MAs and determine their perceived health needs. 80 MAs completed our survey. In assessing three key categories of care, less than 40% of MAs reported receiving Pre-Participation Evaluation (PPE), Medical Monitoring, and Injury Management as part of their standard routine care. Dissatisfied MAs reported unmet needs due to a lack of educated clinicians, lack of accessibility to resources, poor clinician attitudes and limited support. MAs perceived health needs were cited to be education for their clinicians, increased accessibility to resources, individualized care, improved clinician attitudes, collaborative care, and frequent health assessments and preventive strategies. These findings identify and priorities factors to improve future clinical care in MAs.

**Keywords:** Masters Athletes, Older Athletes, Clinical Care, Health Needs, Injury Risk, Recommendations

## Keywords

**Masters Athletes:** A subgroup of athletes aged 35 and up who continue to train and compete in athletic competitions.

**Health Needs Assessment:** An iterative systematic tool used to gather information about a target population and the issues they face.

**Health Needs:** Factors that can benefit from health care or from wider social and environmental changes.

**Successful Aging:** The ability to maintain physical, cognitive, and social connections in older age in the absence of disease.

**Injury Risk:** Risk of death, personal injury, or illness.

**Clinical Characteristics of Care:** The criteria established for the identification and assessment of care.

**Standard Clinical Guidelines:** Recommendations on how to diagnose and treat a medical condition.

**Pre-Participation Screening (PPE):** Evaluation tool used to screen for injuries, illness or other factors that increase an athlete's risk for injury and illness.

**Medical Monitoring:** Repeated assessments with the intention to detect significant changes in patient.

**Injury Management:** Aiding individuals to remain injury free or return from injury through clinical care from time of injury.

**Return to Play:** The process of returning an injured or ill athlete to training or competition.

**Activity Modification:** Changes in activities to prevent future or further injury.

**Resources Allocation:** the identification of resources available for a given project/organization and allocation them into areas for the best possible outcomes

## Summary for Lay Audience

Masters athletes (MAs), also known as older athletes aged 35 and up, continuously train and engage in athletic competitions in greater numbers every year. Due to their age, MAs face distinct health risks and injury patterns during sports participation that are uniquely different from younger athletes. Therefore, to support their sustained participation in sport without injuries and health risks, it is important that the clinical care directed at MAs be tailored to their aging bodies. This study seeks to investigate the current clinical care that MAs receive and identify if they have any unmet needs. Eighty MAs in various organizations in London, Ontario participated our online survey that assessed the characteristics of clinical care they received, their level of satisfaction and perceptions of said care. In assessing three key categories of care, Pre-Participation Evaluation, Medical Monitoring, and Injury Management, results revealed that less than 40% of MAs reported receiving these standard clinical care services, and that most MAs have unmet health needs. Dissatisfaction with their clinical care that were perceived to contribute to these unmet needs were revealed to be 1) a lack of educated clinicians on MAs, 2) lack of accessibility to resources, 3) poor clinician attitudes and 4) limited support for MAs. To potentially address these barriers, MAs expressed wanting more education for their clinicians, increased accessibility, and availability to resources, using an individualized approach for their care, improving clinician attitudes, prompting more collaborative care, and implementing more health assessments and preventive strategies. Results of this study can help develop standard clinical guidelines tailored to meet the needs for MAs and improve their quality of care for healthy and injury free sport participation.

## Co-Authorship Statement

Both P. A. Ulona, and J. S. Thornton, contributed to the design of the study with input from K. Firth, A. Ambrose, S. Wanlin and K. W. Kirkwood. All data was collected P. A. Ulona and A. Ambrose and analyzed by P. A. Ulona. The original manuscript and thesis were written by P. A. Ulona with feedback and review from the co-authors.

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# Chapter 1

## 1 Introduction

### 1.1 Background

Countries around the world have seen a rapid increase in their aging population in recent decades (United Nations, 2019). The United Nations (2019) estimates a global population of 703 million people aged 65 and older with this number projected to reach 1.5 billion by 2050. In Canada, a recent census from 2016 to 2021 found an 18.3% increase in Canadians aged 65 years and older, to 7 million (Statistics Canada, 2021). Contributing to this surge in population, is the steady rise in life expectancy that increased up to 6 years between 2000 and 2019 due to technological advancements, improved healthcare, healthy lifestyles, and hygiene (Brown, 2015; United Nations, 2019). Despite the added longevity, quality of life has not improved proportionately as older adults experience increased illnesses, degenerative diseases, and disability during those years (Brown, 2015). Furthermore, the burden on the Canadian healthcare system increases as more older adults become reliant on health and home care services (Brown, 2015; United Nations, 2019).

Aging is often regarded synonymously with disease as it is associated with physiological declines and loss of autonomy. However, recent studies have found that several factors contribute to declines independent of aging, including sedentary behavior as a significant risk factor for many age-associated chronic diseases (De Rezende et al., 2014; Hamer & Stamatakis, 2014). Older adults exhibit the highest rates of sedentary behaviors when compared to other age groups, which are correlated with multiple adverse health outcomes (De Rezende et al., 2014). With a wealth of studies in the past decade warning against physical inactivity and demonstrating the necessity of healthy active living, a record number of older adults are turning towards physical activity and sports to reap its benefits for successful aging (De Rezende et al., 2014; Huebner & Ma, 2022).

The concept of ‘successful aging’, coined by Rowe & Kahn (1987), describes individuals that maintain high cognitive and physical functioning in the absence of

disease and disability while maintaining active engagement in their communities. Although criticized over the years due to its failure to depict the dynamic developmental process of aging over time (Stowe & Cooney, 2015), it continues to be a widely accepted model of aging especially due to its emphasis on physical functioning (Stones & Leo, 2021). It implicates inactivity and disuse as the main contributors to age-related physiological decline, which has led to the promotion of physical activity geared towards older adults (Stones & Leo, 2021; Stowe & Cooney, 2015). Older adults who periodically engage in sustained physical activity benefit from improved physical functioning, mental and emotional wellbeing, and reduced risk for chronic illnesses such as heart diseases, diabetes, strokes and even cancer (Stones & Leo, 2021; Stowe & Cooney, 2015). With strides made in health promotion initiatives targeting physical activity in older adults, more than twice the number of Canadian adults aged 18-79, are now meeting the physical activity guidelines when compared to 2009-2017 (Statistics Canada, 2021). This surge highlights a subgroup of older adults that far exceeds the minimum recommended physical activity guidelines and share a collective devotion to sports known as masters athletes (MAs) (Tayrose et al., 2015; Trappe, 2001).

MAs are individuals at least 35 years old that continuously participate in athletic competitions, usually consisting of those who were high level competitors previously or began in older age after periods of sedentary living (Tayrose et al., 2015; Trappe, 2001). Although the age requirements for MAs differ across literature due to various sports related requirements, 35 is typically used as the age benchmark as the risk of a cardiovascular event become more prevalent in adults over this age (Tayrose et al., 2015; Trappe, 2001). Increased participation of MAs in athletic competitions are well documented (Akkari et al., 2015; Brun, 2016; Tayrose et al., 2015). For example, despite COVID-19 restrictions and increasing qualifying requirements, the number of participants in the 2022 National Senior Games totaled 12,065, approximately five times the number of competitors in the first Games in 1987 (NSG, 2022). Additionally, according to Marathon Canada, over half of marathon runners in 2022 were over the age of 35 (Marathon Canada, 2022). With the number of MAs in athletic competitions increasing exponentially, steady improvements in their

performances are observed, with many MAs often outperforming younger athletes, regularly achieving high ranking placements at various events, and seeing an increase in the number of marathon finishers every year (Akkari et al., 2015).

Despite the constant physical activity that this population regularly engages in, MAs still face inevitable physiological changes associated with age, exacerbating their risk for sport-related injuries (Tayrose et al., 2015; Trappe, 2001). One of these changes is a decrease in cardiovascular functioning, leading to a steady state decline in maximal aerobic capacity and an increased risk for cardiovascular disease (CVD) (Reaburn, 2021). MAs also undergo a marked decrease in skeletal muscle mass, which is a large contributor to the reduced muscle strength and power output when compared to younger athletes (Reaburn, 2021; Stones & Leo, 2021). Additionally, the quality of muscle declines as a result of reduced muscle and tendon elasticity, making them more susceptible to strains and sprains (Reaburn, 2021; Stones & Leo, 2021). Age-related decreases in skeletal muscle mass in older adults are also more prevalent in lower extremities than in upper extremities --75% of injuries reported in MAs are located particularly in the knee, foot, and ankle (Brun, 2016; I. Janssen et al., 2000). In addition, bone mineral density and joint space decline with age increasing the risk of osteoporosis and arthritis, both of which are linked with a higher likelihood of fractures in MAs (Reaburn, 2021). Together, these factors are major contributors to declines in endurance, strength, and power in MAs and may give rise to higher incidences of sports-related injuries (Reaburn, 2021; Stones & Leo, 2021).

Regardless, studies found that MAs show no greater risk of sport-related injuries than that of younger athletes, notwithstanding the risk for a cardiovascular event (Ganse et al., 2014a). Though the reasons for this are speculative, it demonstrates the physiological differences between MAs and younger athletes as they face different risks and experience different patterns of injuries in their athletic career. An injury to an MA can have ramifications to their ability to maintain their training volume and intensity due to their reduced healing capacity and can spell the beginning of the end of their athletic career (Tayrose et al., 2015). Therefore, the clinical care of MAs must be well informed with the most updated research and customized to meet their unique

needs to ensure that their time to play is extended (Ganse et al., 2014; Vriend et al., 2017).

## 1.2 The Gap

For any athlete to maintain peak performance and remain injury-free, sports medicine clinicians should optimize their physical functioning and overall wellbeing (Almquist et al., 2008). Current literature on the appropriate clinical care for all athletes largely focuses on guidelines that target youth and elite athletes, which include preparticipation screening, periodic medical monitoring, injury prevention strategies and rehabilitation interventions with an emphasis on return-to-play (Adamkin, 1978; Almquist et al., 2008). Guidelines exist regarding the necessary clinical care required by athletes to participate in sport, promote safety and foster a healthy competitive environment with an emphasis on the collaboration of a multidisciplinary primary care team for all participants (Adamkin, 1978; Almquist et al., 2008). However, literature on the clinical care that MAs require to continue their participation in sport and physical activity is limited. A team of physicians, acknowledging the need for customized care for aging athletes, released a consensus statement in 2010 which examined the most common conditions seen in MAs. This was to act as a guide for sports medicine facilities that attend to MAs, bringing awareness to the physiological considerations at play when treating aging athletes (Team Physician Consensus Statement, 2010). Additionally, Tayrose et al. (2015) conducted a clinical review which discussed what medical care is best for MAs. Both studies discuss the need for preparticipation screening (PPE), periodic medical monitoring specifically to ensure cardiovascular health, a basic understanding of age-related physiological changes and how they predict injuries, and appropriate injury risk management (Tayrose et al., 2015; Team Physician Consensus Statement, 2010).

Despite this, the literature on the standardized clinical care for MAs is currently lacking. This is an added issue for medical professionals who are tasked with providing care for MAs as they may not possess the understanding, nor the resources required to treat them appropriately. Thus, it becomes a significant barrier to aging athletes as inadequate and uninformed care can lead to the premature end of an



athletic career. With these gaps in the literature in mind, it is hypothesised that MAs have unmet needs with their current clinical care. The current state of clinical care for MAs across sport medicine facilities is unknown, and even less understood are MAs' perspectives of the clinical care services that they receive. This study seeks to conduct a health needs assessment to assess the characteristics of care that MAs receive under their current clinical care and determine what their perceived health needs are to sustain sport participation injury free for longer.

### 1.3 Research Questions

1. What are the clinical characteristics of care that MAs receive from their sports medicine facilities and providers?
2. What are the perceived health needs that MAs require to prevent injury and extend their time to play?

## Chapter 2

### 2 Literature Review

#### 2.1 Exercise, Physical Activity and Sport

Exercise, physical activity, and sport are often used interchangeably but have distinct differences that are important to define for the purpose of this study. Caspersen et al. (1985) defines physical activity as “any bodily movement produced by skeletal muscles that results in energy expenditure”. It is not planned or structured and often involve activities of daily living (ADLs) such as transport, occupational tasks, and leisure time activity (Caspersen et al., 1985; Sancassiani et al., 2018). It acts as an umbrella term that encompasses both exercise and sport (Sancassiani et al., 2018). Exercise is a type of physical activity that is defined as “planned, structured and repetitive bodily movement, the objective of which is to improve or maintain physical fitness” (Caspersen et al., 1985). Sport is also a subset of physical activity, but a fundamental difference is that it is bound by a set of rules, expectations, and a goal to work towards either individually or as part of a team (Khan et al., 2012; Sancassiani et al., 2018). This study will focus on sport as it pertains to the target population.

#### 2.2 Who are Masters Athletes?

Masters athletes (MAs) are an increasing subset of older adults who continue to participate in sport and usually consist of those who were high level competitors in their early life or took up sports later in life after periods of sedentary living (Tayrose et al., 2015; Trappe, 2001). The age from which adults are considered MAs vary across literature due to sport specific requirements, but for the purposes of this study, MAs are defined as individuals older than 35 years of age (Tayrose et al., 2015; Trappe, 2001).

The prevalence of MAs has increased exponentially in the last three decades and continues to be on the rise, making them a population of note that requires further understanding. Lepers & Cattagni (2012) reported that 40% female finishers and 50% of male finishers at the New-York marathon were MAs.

Additionally, at the World championship Ironman triathlon in Hawaii, Lepers et al. (2013) saw that 55% of male triathletes and 45% of female triathletes represented MAs. This population has been seen to represent almost half of the total participants at many major sporting competitions like the ones mentioned previously, with many of them securing high ranking placements (Lepers & Stapley, 2016; Tanaka et al., 2020). This not only indicates their rising population but their ability to maintain and improve optimal performance later in age.

It has been well documented that participating in physical activity and sport is a significant determinant of health as it reduces the risk of diseases, all-cause mortality and maintains physical functioning (Lepers & Cattagni, 2012; J. Loudon & Parkerson-Mitchell, 2022; Pickering et al., 2021). This is even more important in older adults as aging is characterized by physiological changes that cause muscle atrophy, functional decline, and loss of strength (Korhonen et al., 2006; Tarpenning et al., 2004). As life expectancy increases, higher numbers of older adults are turning to physical activity and sport to be able to improve their quality of life and physical functioning (Lepers & Stapley, 2016). It is typical to begin to observe physiological changes in sedentary adults at the onset of age 30 with a gradual decline in physical functioning and an accelerated decline at age 60 most notably seen in muscle function and integrity, cardiovascular health, aerobic capacity, and bone health (Maharam et al., 1999; Reaburn, 2021). Due to their continuous participation in sport, MAs see a delay of the onset of these characteristics of aging and observing a less exaggerated decline when compared to their sedentary counterparts (Maharam et al., 1999; Pickering et al., 2021).

This aligns with McKendry and colleagues (2018)'s systematic review and meta-analysis that demonstrated that the body composition and physical functioning of MAs are more comparable to that of untrained young adults. The results emphasised the importance of consistent exercise training as a pre-emptive method of preserving health and protecting against comorbidities (Mckendry et al., 2018). With that in mind, MAs have become a model for "successful aging" in the eyes of many researchers, a theoretical framework developed by Rowe and Kahn (1987) that defines "successful aging" as the ability to maintain physical,

cognitive, and social connections in older age in the absence of disease (Rowe & Kahn, 1987; Stones & Leo, 2021).

## 2.3 Training Habits of Masters Athletes

MAs are consistently engaging in chronic exercise and athletic competitions at increasingly later ages (Tayrose et al., 2015; Trappe, 2001). It is generally accepted that the performance of MAs decreases as they age, however, recent literature has found that MAs have seen improvements in their performance, surpassing their “peak” achieved in their younger years (Tanaka et al., 2020). They far exceed the recommended physical activity guidelines provided by the American College of Sports Medicine (ACSM) and follow specific and structured training regimes like that of younger athletes (Piacentini et al., 2013; Tanaka et al., 2020). However, MAs often train without the guidance of coaches, especially one trained for their population (Macgregor et al., 2018). They lack the same support and resources that younger athletes have and often must train with busy schedules because of occupational and familial commitments (Macgregor et al., 2018; Piacentini et al., 2013). Despite this, efforts are made by MAs to modify their training regimes to meet their needs by decreasing their volume of training, increasing recovery time and diversifying training through cross-training which can optimize performance and reduce injury-risk (J. Loudon & Parkerson-Mitchell, 2022; Tanaka et al., 2020). Loudon & Parkerson-Mitchell (2022)’s retrospective survey on 68 female master runners reported that participants ran an average of 10 to 20 miles dispersed over three days per week, with a small percentage running over 40 miles. This volume is considerably lower when compared to younger runners, but beneficial due to the reduced risk of injuries while continuing to receive the benefits of training (J. Loudon & Parkerson-Mitchell, 2022). However, other studies report longer distances per week than younger runners (McKean et al., 2006). This was reported in McKean et al. (2006) study that investigated the differences in injury patterns and risk factors in younger and masters runners, and in a cohort of 2886 participants (34% of which were masters runners), and they found that MAs ran over 30 miles per week and

trained 6 or more times in the span of said in comparison to younger runners. This may have been due to this study recruiting runners at an international relay competition which may be the reason for such high training volumes.

Despite high rates of cross-training, 70.8% of MAs in one study reported experiencing more than one injury over their running history (J. Loudon & Parkerson-Mitchell, 2022). It indicates that much of the understanding of MA training is limited and emphasises the need for further awareness and education of current trainers in this field as well as accessibility to injury prevention resources and healthcare.

The structure of training for MAs has been informed by the combination of existing physical activity guidelines for older adults and training structures developed for younger athletes as both structures have been proven effective when implemented within their intended audience (Piacentini et al., 2013). Adequate training modifications can be implemented by coaches and medical professionals with the knowledge of the changing physiology of MAs (Piacentini et al., 2013). Piacentini et al. (2013)'s study demonstrated that a well-structured program similar to programs for younger athletes can increase the performance of MAs as long as the volume of training is controlled to reduce opportunities for injuries, maximize compliance and with consideration of pre-existing medical comorbidities.

## 2.4 Risk Factors for Injury in Masters Athletes

Frequent exercise and participation in sport increases the likelihood of sports-related injuries to occur and are often attributed to sudden damaging events (Trappe, 2001; Vriend et al., 2017). It has been documented that MAs are at a heightened risk for sports-related injuries and it is speculated that this is due to age-related physiological changes (Gabbe et al., 2006). However, emerging studies have found that age and injury are not significantly correlated (J. Loudon & Parkerson-Mitchell, 2022) and MAs are no more susceptible to sport-related injuries than younger athletes who compete at the same level (Brun, 2016; Gabbe et al., 2006; Ganse et al., 2014b; Maharam et al., 1999; Stathokostas et al.,

2013). When compared to their sedentary counterparts, they experience significantly more injuries (Maharam et al., 1999), yet this is likely related to exposure from their physical activity. Current evidence on injury in MAs is contradictory (Borges et al., 2016); what is known is that the pattern and mechanism of injuries that MAs experience in sports differ and result in higher burden (Stathokostas et al., 2013) when compared to younger athletes. These are due to risk factors unique to MAs that will be explored in this review.

#### 2.4.1 Body Composition

The changes in body composition that MAs experience as they age is a significant risk factor for injury (Brun, 2016; Gabbe et al., 2006; Mckendry et al., 2018; Wright & Perricelli, 2008). This is a common characteristic of aging observed in older populations and consists of an increase in body fat percentage due to adipose infiltration of skeletal muscle mass (Gabbe et al., 2006; Mckendry et al., 2018). This process is associated with the likelihood of decreased physical functioning, dependence on support services and all-cause mortality (Mckendry et al., 2018). While the body composition and physical function of MAs are comparable to those of untrained young adults, when compared to younger, trained individuals, they have significantly higher body fat percentage (Mckendry et al., 2018). Studies on MAs have found that these changes in body composition is a predictor of declining performance which in turn can increase their risk of injuries (Brun, 2016; Wright & Perricelli, 2008). It is speculated that this is because of the reduced muscle quality in MAs from the adiposity, rather than the quantity of muscle fibres, that directly affects their performance as strength and power output are on the decline (McKean et al., 2006; Mckendry et al., 2018). This was seen in Gabbe et al. (2006)'s study on a cohort of 126 community-level amateur football players and 222 elite football players over a period of 12 months to determine the predictors of injury in Australian football players. They were able to discern that age was a risk factor for hamstring injury and they speculated that it may be attributed to the decreased skeletal muscle mass noted in older athletes which has been found to decrease by 40% between age 20-40,

contributing to an estimated 10-15% reduction in muscle strength per decade (Gabbe et al., 2006).

## 2.4.2 Chronic and Overuse Injuries

Chronic and overuse injuries have been documented to be the highest predictor for injury in MAs (Borges et al., 2016; Brun, 2016; Burns et al., 2003; Chen et al., 2005; Gabbe et al., 2006; Loudon & Parkerson-Mitchell, 2022; McKean et al., 2006; Stathokostas et al., 2013; Wright & Perricelli, 2008). These injuries are often attributed to repetitive microtrauma to targeted muscles or joints. By 70 years of age, overuse injuries are associated with the most common muscle and joint degenerative diseases seen in athletes such as osteoarthritis and Achilles/rotator cuff tendinopathy (Chen et al., 2005; Maron et al., 2001). As a majority of MAs are endurance athletes participating in events such as marathons and triathlons, the bulk of overuse and chronic injuries occur in the lower extremities; particularly the hip/gluteal area, knee, ankle and foot (Burns et al., 2003; Loudon & Parkerson-Mitchell, 2022; McKean et al., 2006). According to Loudon & Parkerson-Mitchell (2022), 70% of endurance runners are estimated to sustain injuries which force them to alter their training habits. This was corroborated by Burns et al. (2003)'s study looking at the factors associated with triathlon-related overuse injuries. Authors found that 75% of all injuries sustained during triathlon training occurred in the lower limb. One study on injury rates on female master runners found that 89% of MAs experienced a sports-related injury and 68% of them were attributed to repetitive overuse movements (Loudon & Parkerson-Mitchell, 2022). Some of the most common injuries that arise from chronic and overuse injuries are plantar fasciitis, hamstring injuries and Achilles injuries which are all lower body dominant (Gabbe et al., 2006; McKean et al., 2006). This has been postulated to be due to the frequencies at which MAs perform repetitive high impact loading like running (Burns et al., 2003; Chen et al., 2005) and the resultant accumulation of repetitive loading on the musculoskeletal system (Burns et al., 2003; Loudon & Parkerson-Mitchell, 2022).

### 2.4.3 History of Injuries

Having a previous history of injury has been found to be a risk factor for MAs (Burns et al., 2003; Chen et al., 2005; Gabbe et al., 2006; Loudon & Parkerson-Mitchell, 2022; Stathokostas et al., 2013). This has been speculated to be due to the “accumulation of chronic and acute injuries” throughout their athletic careers that results in greater comorbidities affecting their flexibility, joint strength, and muscle integrity (Stathokostas et al., 2013). This is especially true for MAs who were competitive athletes in their youth, increasing the likelihood for injury to occur over years (Chen et al., 2005). This infers that the more experienced an MA is, the higher likelihood of sustaining injury, though it has been speculated that their experience may also be what prevents their injury rates from surpassing younger athletes (Loudon & Parkerson-Mitchell, 2022). Prior injuries may also not fully heal, leaving musculature and bone integrity weaker, and predisposing to future injury or joint disease (Burns et al., 2003; Chen et al., 2005). Gabbe et al. (2006) found that one of the highest predictors for hamstring injury in the older cohort of athletes was a history of previous injury and age. It has been since disproved that age is not the main contributor to risk of injury but rather the age-related changes in body composition that contributed to the higher rates of hamstring injury likely seen in this study.

Similarly, Loudon & Parkerson-Mitchell (2022)’s study investigating the injury rates of master female runners found that 89% of MAs had experienced at least one sports related injury since turning 50 years of age and 45% of MAs reported a recurring sports-related injury and more than one injury occurring. Furthermore, 88% of the athletes that reported previous injuries expressed that it resulted in the modification of their training or even ending their running career (Loudon & Parkerson-Mitchell, 2022). Kallinen & Markku (1995) observed that 20% of injuries in MAs typically last more than 2 years. This will predispose most MAs to further reinjury.



#### 2.4.4 Training Intensity/Volume

The risk of sport-related injuries in MAs has been found to be related to the intensity and volume of training (Borges et al., 2016; Loudon & Parkerson-Mitchell, 2022; McKean et al., 2006; Piacentini et al., 2013; Wright & Perricelli, 2008). MAs who trained at a higher intensity and volume per week reported to experience more injuries than MAs that did not (Loudon & Parkerson-Mitchell, 2022). High training volume decreases the amount of time MAs have to recover from intense bouts of exercise, in addition to their already reduced healing capabilities, decreasing performance and increasing their risk for injury due to their fatigued muscles (Borges et al., 2016; Wright & Middleton, 2018). Sudden changes to the volume of training have also been found to be associated with injuries (Webborn, 2012). Multiple studies have recommended limiting the volume and intensity of training that MAs partake in, instead focusing on the quality of training and providing more variety to their regime to accommodate the physiological changes in muscle and bone health and provide adequate recovery time (Loudon & Parkerson-Mitchell, 2022; Piacentini et al., 2013; Wright & Middleton, 2018). This is a point of contention as MAs typically undertake sports that require high volume training such as marathons and triathlons while younger athletes are more likely to undertake sports that require shorter bouts of energy expenditure (Borges et al., 2016; McKean et al., 2006; Piacentini et al., 2013).

Increased training volume and intensity has also been shown to reduce the compliance and motivation to train in MAs which can lead to undertraining, another risk factor that affects performance and provides opportunities for injuries (Piacentini et al., 2013). Current evidence is lacking with respect to the optimal volume and intensity of training but it is speculated to be individual.

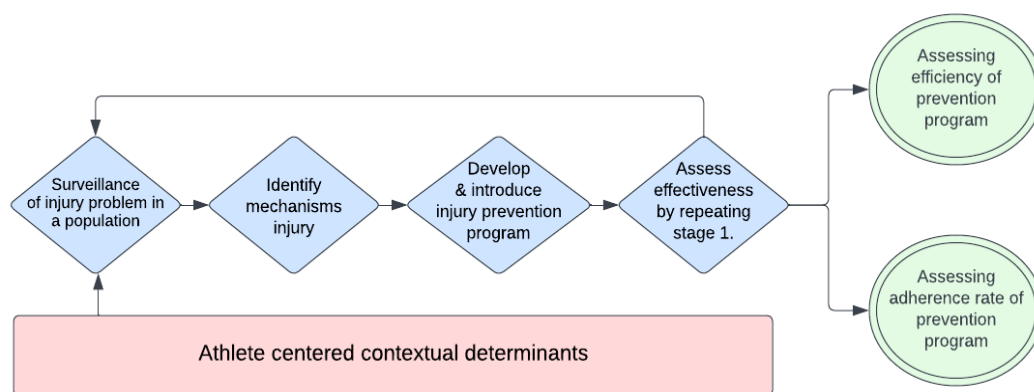
### 2.5 Injury Prevention in Sport and Physical Activity

Continued participation in sport and physical activity has been established to be associated with both multiple health benefits and an increased risk of sport related injuries (Emery & Pasanen, 2019; Gabriel et al., 2019; Goossens et al., 2019; Klügl et al., 2010; van Reijen et al., 2016; Webborn, 2012). Particularly,

risk of a musculoskeletal injury has been found to be exponentially increased with the amount of sport and physical activity an individual partakes in (Gabriel et al., 2019; Webborn, 2012). The impacts of these injuries have been shown to be a significant strain both on the participants and the health system due to the considerable time it may take for rehabilitation, accounting for missed days of work or training, and the associated costs of treatment (Gabriel et al., 2019; Webborn, 2012). Based on the severity of the injury, at best, it is likely to decrease their likelihood to return to sport due to the increased risk for persisting comorbidities or permanently ending their athletic careers at worst (Klügl et al., 2010; van Reijen et al., 2016; Webborn, 2012). It is imperative that preventative strategies in sport be implemented to mitigate the potential risk for injuries that their respective sports may present (Klügl et al., 2010). Injury prevention through policy has shown some success in the improvement athlete performance in its implementation (Klügl et al., 2010).

Most sport injury prevention programs in recent decades have been developed and implemented using van Mechelen et al.'s (1992) four stage model as a framework (Figure 1). The first stage involves the surveillance of a target population to identify common trends and extent of which the burden of injury is significant (Klügl et al., 2010; Van Tiggelen et al., 2008). In stage two, patterns of injury are identified with the accompanying risk factors that contribute to injury (Klügl et al., 2010; Van Tiggelen et al., 2008). Stage three and four involves using the data collected from the previous stages to develop and introduce an injury prevention program and determine its feasibility in addressing the problem by repeating the first stage, usually in a controlled setting (Emery & Pasanen, 2019; Klügl et al., 2010; Van Tiggelen et al., 2008). These stages are repeated until a successful intervention program has been developed. Years later, Finch (2006) revised this framework to add two additional stages to address the psychosocial considerations that impacts program implementation and adherence known as the Translating Research into Injury Prevention Practice (TRIPP) framework (Finch, 2006). This framework (stage 5 and 6) uses a public health approach to assess factors that may hinder the adoption of preventative programs and its overall

effectiveness in a real-world setting (Finch, 2006). In 2018, Bolling and colleagues sought to further revise this framework in order to contextualize injury prevention programs, ensuring a more accurate alignment with the athletes' needs. Rather than adding additional stages, it modifies the first stage of the van Mechelen et al. (1992) framework to also include the identification of the problem as it relates to the injured athlete in question (Bolling et al., 2018). Using a socioecological standpoint, the athletes and various external factors simultaneously acting on them, are central to the development of an injury prevention program when following the sequences of stages. This addition emphasises the importance of the input and perspective of athletes' and the 'contextual determinants' it provides in the development of interventions meant to meet their needs (Bolling et al., 2018).



**Figure 1** Sequence of injury prevention using van Mechelen (1992) four stages framework (blue), Finch (2006) TRIPP modification (green) and athlete centered contextual determinates as proposed by Bolling et al. (2018).

A review of the literature has found that most sport injury prevention programs currently in use fall into three categories: 1) training interventions, 2) activity modification, and 3) rule regulation and policy changes (Emery & Pasanen, 2019; Gagnier et al., 2013; Goossens et al., 2019; Klügl et al., 2010). Training interventions focus on targeting musculoskeletal integrity by implementing sport specific exercise programs to strengthen high injury risk areas

such as strength, resistance, endurance, balance and agility training, either carried out before or after participation in sport (Goossens et al., 2019; Klügl et al., 2010). Activity modification involves the addition of protective sport specific equipment (bracing, sports gear) or a change of the external environment to reduce the incidence of injury (Emery & Pasanen, 2019; Klügl et al., 2010). Finally, through rules and regulatory changes, injury prevention is executed from an educational standpoint, aiming to increase awareness and efforts to reduce high-risk behaviours (Emery & Pasanen, 2019; Gagnier et al., 2013; Klügl et al., 2010).

To date, the use of injury prevention programs in sports setting has been shown to significantly reduce the incidence of injury in their target population (Klügl et al., 2010). For example, a randomized control trial (RCT) was conducted by Sakata et al. (2019) to determine if a throwing injury prevention program would reduce the incidence of common shoulder and elbow injuries among 237 youth baseball players (9-11 years). They found that the intervention group that adhered to the injury prevention program, which included flexibility and balance training, over a 12-month period were 48.5% less likely to be at risk for injuries when compared to the control group (Sakata et al., 2019). It is also noteworthy to mention participants and coaches were provided educational materials on the program which many have contributed to the study's high compliance rate (73.4%) (Sakata et al., 2019). Similarly, Janssen et al. (2014) conducted a three arm RCT on 384 athletes (18-70 years) to determine the effectiveness of bracing, neuromuscular training (NMT) and both in combination as an injury prevention program to mitigate recurrent ankle sprains. The study reported that participants that used a semirigid ankle brace during athletic participation over a 12-month period saw an additional 47% reduction in risk of ankle injury, compared to the 8-week NMT prevention program and a combination saw a 77% reduction in recurrent ankle sprain (Janssen et al., 2014). The results of these studies are supported by numerous systematic reviews and meta-analyses that evaluates the effectiveness of injury prevention programs in sport settings. A systematic review that evaluated 25 RCTs focused on training

injury prevention in a sport setting reported that a majority of training programs saw significant injury reduction in their studies but particularly, programs that utilized strength training was found to reduce overuse injuries by almost 50% (Lauersen et al., 2014). Similar findings regarding the use of training programs for injury preventions have been reported in a systematic review conducted by Gagnier et al., (2013). The review specifically investigated the use of NMT and education to reduce the risk of anterior cruciate ligament (ACL) injuries in adolescents and adults which saw reduced the incidences of ACL injuries by 50%.

It is evident that the role of injury prevention in sport and physical activity is paramount for the continued health and physical functioning of participants (Webborn, 2012). Much of the literature on injury prevention in a sport setting consist of reviews or commentaries rather than implementation studies with an increasing bias towards training interventions (Klügl et al., 2010). This implies that there is a lack of research focusing on the practical application and execution of effective prevention programs. This is interesting to note given that Finch (2006) revised the framework, TRIPP, to address this gap and yet it continues to be underutilized (Klügl et al., 2010). Additionally, the length of time that it takes to for the knowledge translation of injury prevention studies to trickle down to coaches, clinicians and athletes is vast and can take up to 17 years (Bekker et al., 2017). Lack of consideration for ecological validity could impact the development and execution of such programs, as they are only successful when athletes and coaches are willing to adhere to them (Emery & Pasanen, 2019; Klügl et al., 2010).

## 2.6 Injury Prevention Programs/Strategies for Masters Athletes

The impacts of sport-related injuries in MAs are exacerbated due to their unique physiology and the decrease in healing abilities (Reaburn, 2021). By recognizing the differences in injury mechanisms based on age, the risk of injuries can be effectively managed through injury prevention programs, developed, and implemented using the same theoretical framework conceptualized by van

Mechelen et al. (1992), Finch (2006), and Bolling (2018) to cater to the needs of MAs (Webborn, 2012). To date, studies that have investigated the injury prevention programs available for MAs are limited, with a majority being reviews and commentaries with very few implementation studies. The most common injuries are musculoskeletal injuries (Maron et al., 2001), therefore the scope of this review will focus on musculoskeletal injuries.

The injury prevention programs currently implemented for MAs in a sport setting mainly belong to the training intervention category (Klügl et al., 2010). These programs specifically target the physiological and functional changes associated with aging, which contribute to commonly surveyed injuries and synonymously enhances performance (Ganse et al., 201); this is known as preventive performance enhancement (Eizaga Rebollar & García Palacios, 2023). Strength training (Baumert et al., 2016; Llopis et al., 2021), resistance training (Baker et al., 2019; Baumert et al., 2016; Prugsawan & Horisberger, 2016; Tayrose et al., 2015) and plyometric training (Baumert et al., 2016; Ganse et al., 2014; Llopis et al., 2021; Loudon, 2016; Pickering et al., 2021) has been the most documented and successful intervention in reducing the incidence of injuries in MAs. They strengthen and maintain muscle integrity in MAs to lessen the rate of muscle degradation, particularly in the lower extremities, enhance bone health (Loudon, 2016), and prevent falls (Llopis et al., 2021). Balance training and flexibility training was also reported to be an intervention important in reducing injuries in MAs by improving strength, maintaining postural stability, and improving mobility in MAs (Loudon, 2016; Rogers et al., 2013). An article by Rogers and colleagues (2013), proposed the use of sensorimotor training (SMT), a rehabilitation program often used in geriatric research as a balance training intervention, to prevent injury in MAs by improving postural stability. At present, this article is one of the few that has suggested an injury prevention training program for MAs rather than commentaries or reviews, however, no subsequent studies have been conducted using MAs to determine the feasibility of executing such a program (Rogers et al., 2013). Recent publications have cited the use of cross training as an effective injury prevention program for MAs (Baker et al.,

2019; Reaburn, 2021). Cross-training is the incorporation of several modes of training to enhance overall fitness, which can involve a combination of two or more of the training programs discussed above as it encompasses various forms of physical activity (Reaburn, 2021). This enables MAs and coaching personnel to diversify their training regime and reduce the repetitive stress of regular training (Baker et al., 2019). The use of this mode of training has been found to reduce the incidences of acute, chronic and overuse injuries in MAs by 37% (Reaburn, 2021), which has been well documented to be a significant risk factor for injury in MA (Brun, 2016).

Activity modification, in the form of increased recovery time (Brisswalter & Nosaka, 2013; Reaburn, 2021) compensatory behaviours (Huebner & Ma, 2022; Delvecchio et al., 2016; Powell & Williams, 2018)), and equipment, is an injury prevention strategy that, though used to a lesser extent, has been found to be an effective method of reducing in MAs (Loudon, 2016; Powell & Williams, 2018). Activity modification through compensatory behaviours include adjustments to various aspects of training such as volume, technique, and intensity, to prevent chronic overuse injuries (Loudon, 2016; Powell & Williams, 2018). MAs require adequate recovery, often in conjunction with warm up/cool down, to attenuate for the reduced capability for healing after high intensity training (Reaburn, 2021). Although research has found that MAs do not experience higher levels of fatigue when compared to their younger counterparts, they report greater perceived levels of fatigue (Pickering et al., 2021). This may contribute to their likelihood for injury as fatigue is cited as a high-risk factor for injury (Alahmad et al., 2021). With the knowledge of previous injury history, training can be adapted to meet the individualized needs of MAs, prevent future injuries, and optimize performance (Huebner & Ma, 2022; J. K. Loudon, 2016). MAs have been reported to use equipment to reduce their risk of injuries such as the type of footwear to support them or changing the external environment in which they train such as avoiding hard surfaces (Reaburn, 2021).

Very little studies have explored injury prevention programs for MAs through the route of rules and regulatory changes, especially from an educational

standpoint. Moreover, given the lack of implementation studies, little is known about the rate of compliance to adhere to an injury prevention program in real sport setting according to the TRIPP framework, though Baker et al. (2019) suggests that the rate of compliance may decrease as they age. It is clear that the progress made in injury prevention in MAs has not advanced beyond stage one of the van Mechelen framework of risk assessment surveillance. This indicates a gap in the literature and calls for further investigation to educate clinicians and coaches on how to manage injury risk for MAs, promote injury prevention behaviours among the athletes themselves and inform the clinical guidelines regarding injury management.

## 2.7 Clinical Considerations of Masters Athletes

MAs experience unique health challenges, injuries and have risk profiles that make them more prone to medical conditions that may hinder their ability to participate in sports and athletic competitions. It is expected that sport medicine clinicians should be able to meet their complex needs and provide them with well-informed care. The current clinical considerations and guidelines in place for MAs in literature are minimal but this review will cover three main components: Pre-Participation Evaluation (PPE), Medical Monitoring, and Injury Management/Return to Play recommendations.

### 2.7.1 Pre-Participation Evaluation (PPE)/ Before Participation in Sport

The PPE is the screening process that assesses the health and well-being of an athlete before sport participation and identifies high risk profiles for further evaluation or disqualification (Powell, 2005). As instrumental and well-advised this measure is for MAs given what is known about their physiology and heightened cardiovascular risk (Morrison et al., 2018), the distinct lack of resources available for MAs and masters sport in general, has limited its use and accessibility to participants (Maron et al., 2001) with only a reported (24.6-51.5%) of MAs that undergo a PPE (Morrison et al., 2018). When implemented, the PPE in Masters sport prioritises the evaluation of cardiorespiratory health as



its primary goal, and musculoskeletal, and neurological health, as those pose the highest risk to MAs when participating in high-intensity vigorous physical activity; this is conducted in conjunction with a thorough health history assessment (Maron et al., 2001). The initial appraisal is started with a health history screening, both personal and familial (Maron et al., 2001; Wright & Middleton, 2018). This includes a history of illnesses, reports of cardiovascular events such as heart murmurs, hypertension, syncope and dyspnea, familial history of heart diseases or premature death (sudden death before 50 years of age often due to a cardiac condition) (Brun, 2016; Wright & Middleton, 2018) past musculoskeletal injuries that disqualified them from sport and or required intensive treatment and rehabilitation, and past head injuries that may predilect neurological conditions (Maron et al., 2001).

The screening protocol for cardiorespiratory health in MAs involves the evaluation of cardiac output, VO<sub>2</sub>max, blood pressure and vital capacity in addition to their level of risk for a cardiovascular event (Maron et al., 2001; Pigozzi et al., 2005). Informed by an individualized health history and physical examination, the 12 relevant points of the American Heart Association (AHA) preparticipation screening recommendation for cardiovascular health is found to be an effective approach to assess MAs before sports participation, though it has been found that the screening recommendation protocol being used may differ based on the region (Brun, 2016; Maron et al., 2001; Wright & Middleton, 2018). The standard 12 lead exercise electrocardiogram (ECG) test is a practical tool highly recommended for cardiovascular evaluation in MAs as it identifies the risk of exercise induced myocardial infarction or sudden cardiac death in MAs (Maron et al., 2001). This is particularly important for MAs with moderate to high-risk profiles which consist of men >40 years old and post-menopausal women >50 years old with one or more cardiovascular risk factors and are symptomatic or any athlete over 65 years old (Maron et al., 2001; Wright & Middleton, 2018). Brun (2016) and Maron et al. (2001) demonstrated that grounds for refusal to participate in masters sport based on the PPE cardiorespiratory assessment and physical examination is if MAs show signs of left ventricular ejection fraction less

than 50%, myocardial ischemia, ventricular arrhythmia and systolic hypotension caused by exercise.

Limitations of this tool arise due to its poor accuracy and reliability when used to evaluate low-risk, asymptomatic MAs (Maron et al., 2001; Morrison et al., 2018), a point of contention as they make up most of this population (Maron et al., 2001; Morrison et al., 2018). This suggests that despite the exercise ECG test being the standard tool for cardiovascular PPE, its low clinical significance examining asymptomatic low risk MAs indicates its lack of specificity for MAs and requires further modification for future implementation (Maron et al., 2001; Morrison et al., 2018). This also poses a problem as up to 80% of cardiac events like sudden cardiac death has been reported occur in asymptomatic low risk MAs (Pigozzi et al., 2005). A cross-sectional study evaluating the use of PPE in Canadian MAs supported this notion as they found of the 798 participants screened, 11.4% and 8.5% of MAs fell into the high-risk category for cardiovascular diseases and cardiovascular risk respectively, while 73% were low risk and asymptomatic. It was determined that the screening tools that they utilized (AHA and ECG exercise test) produced inaccurate, false positive results when low-risk MAs were evaluated (Morrison et al., 2018).

PPE screening for musculoskeletal health of MAs involve assessing for risks of common sport specific injuries, over 70% of which occur in the lower extremities (ankles, knees and hips) (Brun, 2016) and evidence of acute and chronic injuries induced by previous history of injuries as mandated by their chosen sport (Team Physician Consensus Statement, 2010). This can be done using a gait, arms, legs, and spine (GALS) screen (Brun, 2016). It identifies potential signs of osteoarthritis, sarcopenia, osteoporosis, Achilles and rotator cuff tendinopathy (Team Physician Consensus Statement, 2010; Wright & Middleton, 2018). Neurological PPE screening involves assessing balance, reflexes, and history of head injury (Team Physician Consensus Statement, 2010). At present, research emphasises the need to incorporate an individualized approach when assessing MAs safety in a sporting context are detected (Team Physician Consensus Statement, 2010).

Other general considerations for PPE in MAs include assessing for current medication use as it is reported that over 60 % of older adults are taking multiple medications at any given time (Brun, 2016). Common medications that may give rise to potential risks when initiating moderate to vigorous physical activity in MAs are cardiovascular medications, nonsteroidal anti-inflammatory drugs (NSAID), beta-blockers and diuretics (Brun, 2016). Despite this being standard practice for younger athletes, studies have shown that implementing PPE for MAs individually and on a large scale at masters sporting events is not feasible due to the lack of resources and support available (Maron et al., 2001). This often places the burden of screening on MAs to initiate contact with allied healthcare professionals (Maron et al., 2001). This presents an issue given how a majority of MAs are asymptomatic and are unaware of their own risks as it makes sense only MAs with presenting symptoms would take the effort to seek clinical care (Maron et al., 2001). Future research must employ an individualised approach with the knowledge of MAs and develop more effective evaluation measures to ensure the overall health of MAs.

### 2.7.2 Medical Monitoring

Medical monitoring of the MAs involves the periodic evaluation of the individual to ensure their safety and optimal health when training and participating in an athletic event (Ting & Wallis, 2007). It is recommended to periodically monitor the fluctuating health of MAs, especially those that are asymptomatic, and manage symptoms in those that are symptomatic (Maron et al., 2001). Often it involves the implementation of a PPE as needed with the advice of a multidisciplinary clinical team (Maron et al., 2001; Ting & Wallis, 2007). As the implementation of PPE in MAs initially is low, regular monitoring of MAs to assess for potential risk factors happen even less. For adequate medical monitoring for MAs, clinicians must have sufficient knowledge and understanding of the physiology of MAs, the common mechanisms, or patterns of injuries they experience, and the risk factors that can predispose them to a major health event during moderate to vigorous physical activity (Wright & Middleton,

2018). This will enable the identification of situations in which participation must be restricted. Wright & Middleton (2018) recommends that MAs with abnormal results exhibiting symptoms should be followed and be reevaluated every 2 months until results are normal while Maron et al. (2001) recommends that otherwise asymptomatic MAs requires annual medical monitoring to ensure optimal health. Identification of all major signs and symptoms must be addressed (Team Physician Consensus Statement, 2010). This also requires adequate knowledge of the diagnostic assessments for risk factors and common health mentioned previous. Appropriate medical monitoring of MAs requires the access to the diagnostic equipment attuned to the needs of MAs to assess the determinants of risk readily available in clinical settings and sporting events (Team Physician Consensus Statement, 2010). There needs to be standards baseline for MAs to determine their current physical health and decide if there are any improvements that needs to be made.

### 2.7.3 Injury Management/ Return to Play

Injury management with the goal to return to play is essential to employ by specialized clinicians and allied professionals to athletes in general, but particularly for MAs who require customized care and considerations due to their reduced healing capacity exacerbating injury events ultimately requiring longer recovery time (Reaburn, 2021). Adequate injury management for MAs involves the identification of an increased risk for injury and the appropriate modification necessary for continued sports participation (Maron et al., 2001). This is important as studies have reported that in the event of an injury or increased risk profile, most MAs not only do not receive medical advice, but they also do not make changes to their training habits to reduce the risk of further re-injury (Arlis-Mayor, 2012). This also involves being able to discern the clinical presentation of injuries and medical conditions commonly seen accurately and quickly in MAs for effective and efficient care to be provided (Maron et al., 2001). A review of the literature assessing injury management in MAs revealed that the decisions made regarding their care typically falls under three categories: activity

modification, operative care, and non-operative care. Activity modification has been previously expanded on as a form of injury prevention. Non-operative care is provided to MAs that are reported to experience mild to moderate symptoms in their clinical presentation of injury or the presence of elevated risk factors which may include the use of pharmaceuticals, physical therapy, or therapeutic training (Team Physician Consensus Statement, 2010). Operative care, which is the most drastic of the three given its invasiveness, is typically employed when MAs are reported to experience moderate to severe symptoms and involves surgical procedures (Team Physician Consensus Statement, 2010). A basic understanding of understanding of age-related physiological changes of MAs, health history of the MAs receiving care and appropriate screening is necessary for allied healthcare professionals to make an informed decision as to which option would be best fit for the needs of the MAs.

To date, current research on the clinical guidelines with the considerations of MAs in mind are limited, with most health care professionals using guidelines meant for the care of younger athletes. The reviews and considerations published emphasize the need for a multidisciplinary health care team, specialized to meet the health needs of MAs, to conduct PPEs, monitor their health periodically and managing current injuries while preventing future incidences of adverse health outcomes or events. However, there is little research on how these prospective strategies and considerations have been implemented in the clinical care that MAs currently receive or how effective they are in meeting their needs.

## Chapter 3

### 3 Methods

#### 3.1 Study Design

A cross-sectional, health needs assessment (HNA) was conducted, via an anonymous electronic survey. The objectives were to determine the characteristics of clinical care that MAs receive in their sport medicine facilities by their providers, and to identify the gaps in clinical care based on the perceived health needs of MAs. Hosted on Qualtrics software, Version (August 2023), this survey was designed by the research team, informed by pre-existing standard medical guidelines for younger athletes and adapted for MAs (Adamkin, 1978; Almquist et al., 2008; Ting & Wallis, 2007). This survey was active from June 2023 to August 2023. Informed consent was provided by participants prior to completing the electronic survey. The study was approved by the University of Western Ontario's Health Science Research Ethics Board (HSREB ID# 121988) (Appendix A).

An HNA is a systematic tool used to gather information about a target population and the issues they face (The Michener Institute of Education, 2018; Watkins et al., 1998). It is a process designed to *identify* and *prioritize* needs of current and future clients/patients to ensure that the characteristics of care they receive are optimal (Lockyer, 2012; Watkins et al., 1998). This HNA assessed the gaps between the current care that MAs receive and compare it to what is collectively desired by them to compete in athletic competitions longer and injury free. This HNA uses a patient-centered approach as it focuses on exploring the target populations' perception of their priorities regarding health-related behaviors (Gillam SJ & Murray SA, 1998; Stevens & Gillam, 1998; J. Wright et al., 1998). The theoretical framework used to inform this HNA was Witkin's Three Phases of Needs Assessment conceptualized in 1984 and further revised by Altschuld and Watkins in 2010. This 3-phase model provides an organizational framework that provides a systematic approach to gather the necessary information. The steps are: 1) *Pre-Assessment*, 2) *Assessment*, and 3)

*Post-Assessment.* An HNA framework (Appendix E), was conceptualized and used to inform this process.

To achieve the objectives of this study, it was determined a mixed methods approach would be best suited rather than using a purely quantitative or qualitative methodology. This involved the gathering and integration of both closed- and open-ended questions to answer a research question using “the combined strengths of both sets of data” (Creswell, 2014, p. 2). In this study, we quantitatively assessed the characteristics of clinical care received in their sports medicine clinic and by their providers by using Likert scales to measure their level of satisfaction (Unsatisfied, Somewhat Unsatisfied, Neutral, Somewhat Satisfied, Satisfied) and frequency (Never, Almost Never, Enough, Somewhat Often, Often). To provide a more comprehensive understanding on this problem, qualitative data was gathered using open-ended questions to capture the participant perceptions of the care that is being received. This embedded mixed method design allowed both sets of data to be gathered and analyzed simultaneously. This design was chosen as it allows for the qualitative data to supplement the quantitative data, and vice versa, to gain a well-rounded understanding of the clinical care that is currently in use for MAs and whether it meets their health needs, thereby centering the participants in the research design.

## 3.2 Eligibility Criteria

Eligible participants were MAs who met three additional inclusion criteria :1) Aged 35 and up, 2) Planning on training and /or competing in an athletic competition, 3) Able to read and communicate in English. Convenience sampling was used to recruit participants, a common non-probability sampling method that allowed the research team to recruit eligible participants locally that were willing to participate in the study.

To participate, individuals must self-identify as an athlete based on the working definition according to medical and health science research (Araújo & Scharhag, 2016). This is meant to differentiate between those who are ‘athletes’ and those who

are simply just active. According to this definition, to be considered an athlete, an individual must meet four minimum criteria: 1) currently participating in athletic competitions; 2) training with the aim for performance/result improvement in their respective sports; 3) prioritize and devote most of their time to athletic competitions and subsequent training; and 4) part of a local, regional, or national sport federation (Araújo & Scharhag, 2016).

### 3.3 Recruitment

Eligible MAs were recruited from Fowler Kennedy Sport Medicine Clinic (FKSMC), a facility based at the University of Western Ontario, via appointment reminder emails. We accessed the TELUS electronic health records (EHR) version of patients in FKSMC, and in the reminder emails already being sent to patients for their upcoming appointments using OceanMD software (Version 2023), the healthcare database used by FKSMC for secure communication to patients, we included a brief study overview and the Qualtrics link (Appendix C). Recruitment posters and advertisement with a link and QR code to the survey were also shared on FKSMC social media accounts (Appendix C). Additionally, we reached out to three community sport organizations in London, Ontario that are frequented by MAs: Thames Athletic Club, London Western Track and Field Club and the Canadian Center for Activity and Aging. The administrative staff in each organization were provided with recruitment posters and advertisement to share on their social media accounts and newsletters (Appendix C).

Sample size was calculated based on the number of patients aged 35 and up that came in to FKSMC in 2022 and the expected outreach of the community organizations we anticipated. According to the TELUS EHR database, the number of patients aged 35 years and older was 10,800 in the 2022. This survey was projected to be open for 3 months for data collection, so this annual number was divided by 4 which leaves 2700 potential MAs aged 35 and up. According to the Canadian Center for Ethics in Sports (CCES) 2022 sport report, 27% of adults participate in sports, which can be applied to the projected participants as not all patients aged 35 years and up fit our definition of an athlete. When this statistic was applied to this current



sample at FKSMC, it provided an estimate of 729 potential MAs. The study anticipated a 10% response rate from the 729 potential participants based on previous studies, which lead to a rounded sample size of  $n=73$ . Additionally, we aimed to reach out to an additional 300 eligible participants (100 per organization listed above), which, with an anticipated 10%, increased our sample size to  $n=103$ . In response to an influx of participant responses from social media outreach, our sample size was increased to  $n=150$  which enabled us to have margin for error when assessing the quality of the response during analysis.

### 3.4 Data Collection

This 22-question survey consisted of 19 closed ended questions to gather characteristics of care and three open ended questions to gather participant perspective. Demographic data, including age, gender, race, and ethnicity was collected. Partial birth date (year of birth) was asked to confirm participant eligibility and was not used for data analysis.

Questions inquired about the level of care that MAs receive at any sports medicine facility as an active athlete encompassing the availability, accessibility and frequency of clinical care, coaching, and other resources. Clinical care is comprised of three categories: 1) Pre-Participation; 2) Medical Monitoring; and 3) Injury Management and Return to Play. We adapted these guidelines to fit the clinical needs of MAs based on the existing literature on the recommended care that should be provided to this population. Open ended questions allowed participants to express their level of satisfaction with the current care being received. Furthermore, this allowed participants to discuss what they would like to see in their future clinical care guidelines.

### 3.5 Data Analysis

Data analysis was performed using IBM Statistical Package for Social Sciences (SPSS) (Version, 27), and Microsoft Excel (2018). Quantitative data was analyzed using descriptive statistics (i.e., means, frequencies and standard deviation).

Demographic data gleaned from this survey was used to develop a profile of locally existing MAs. Frequencies were also used to investigate level of satisfaction and frequency of outlined clinical care services in the Likert scale.

The qualitative analysis portion encompassed the analysis of the participants answers to the open-ended questions which provides insights into their perceptions of the quality of the clinical characteristics of care. Three open ended questions were linked with a multiple-choice question (Yes, No, Not sure) and respondents were asked to “Explain why”. They were analyzed using Microsoft Excel and their answers aggregated using qualitative narrative analysis. Three open ended questions were purely qualitative, and data was conceptualized, coded, and categorized (Creswall, 2014) to identify the common themes throughout participants’ responses and responses were narratively analyzed (Table 1).

**Table 1** Quantitative and Qualitative Data Analysis Outcomes

Research Question	Quantitative	Qualitative
1) What are the clinical characteristics of care that MAs receive for their sports medicine facilities?	Descriptive statistics and frequencies among multiple choice questions and satisfaction and frequency Likert scale	Patient perception towards clinical care responses
2) What are the perceived health needs that MAs require to prevent injury and extend their time to play?	Descriptive statistics and frequencies among multiple choice questions	Patient perception towards care responses Gaps in clinical care responses

## Chapter 4

### 4 Results

#### 4.1 Demographics

A total of 80 MAs that met the eligibility criteria and completed at least 75% of the survey were included in the analysis. This survey saw an 8% response rate. Participant demographics are displayed in Table 1. Of the 80 participants, 42 (52.5%) identified as female and 38 (47.5) identified as male. MAs in this study were mostly white (90%; n=72), married 59 (73.8%) and highly educated, with 42 (52.5%) holding graduate degrees and 26 (32.5%) bachelor's degrees. Most of them fell between the age ranges of 35- 45 (36.3%; n=29) and 46-65 (50%; n=40).

#### 4.2 Sport and Physical Health History

As displayed in Table 1, all participants participated in a wide array of sports. Most participants were runners (marathoners included) (40,50%) and triathletes (10,12.5%). Many of the MAs in this study participated in sports and athletic competition for over 30 years (42.5%; n=34), with many averaging between 5-6 (30%; n=24) and 7-8 hours (26.3%; n=21) of weekly training. When training, only 39 (48.8%) participants reported to have done so with a trainer/coach, with 18 (46.2%) of them having trainers specialized for MAs. In the last two years, most participants took part in either 3-5 (37.5%; n=30) or 6-10 (33.8%; n=27) competitive events, with only a minority (6.3%; n=5) having not competed. Within this time frame, 59 (73%) had reported experiencing sport-related injury/injuries, such as sprains or strains (66.1%; n=39), recurring/multiple injuries (33.9%; n=20), or ongoing pain (25.4%; n=15), with most reporting more than one.

**Table 2** Demographic and Sport and Physical Activity History (n=80)

Demographics	<i>n</i>	%
Gender		
Female	42	52.5
Male	38	47.5
Age range (years)		
35-45	29	36.3
46-65	40	50
66-80	11	13.8
Race/Ethnicity		
White	72	90
Black (of African Descent)	2	2.5
Other	6	7.5
Marital Status		
Married	59	73.8
Single	10	12.5
Common law/Domestic partnership	7	8.8
Separated/Divorced	2	2.5
Widowed	2	2.5
Highest education level		
Graduate degree	42	52.5
Bachelor's degree	26	32.5
College diploma	5	6.3
High school diploma	4	5
Trade school	2	2.5
Prefer not to state	1	1.3
Main Sport		
Running	40	50
Triathlon	10	12.5
Track and Field	6	7.5
Rowing	6	7.5
Cycling	3	3.8
Hockey	3	3.8
Soccer	3	3.8
Swimming	2	2.5
Other	7	8.8
Length of sport/athletic competition participation (yr)		
Under 5	2	2.5
5-10	12	15
11-15	11	13.8
16-20	7	8.8
21-29	14	17.5
30+	34	42.5
Competitive events participated in the last 2 years		
1-2	7	8.8

3-5	30	37.5
6-10	27	33.8
11+	11	13.8
None	5	6.3
Average weekly training (hours)		
1-2	3	3.8
3-4	6	7.5
5-6	24	30
7-8	21	26.3
9-10	10	12.5
11+	16	20
Do you train with a trainer/coach?		
Yes	39	48.8
No	39	48.8
Not sure	2	2.5
If Yes, are they specialized for Masters Athletes?		
Yes	18	46.2
No	14	35.9
Not sure	7	17.9
Have you experienced sport-related injuries?		
Yes	59	73.8
No	21	26.3
If Yes, Type of Injuries (in last 2 years)*		
Sprain or Strain	39	66.1
Recurring/Multiple Injuries	21	33.9
Ongoing Pain	15	25.4
Scrape or Bruise	14	13.7
Broken or Fractured Bones	12	20.3
Concussion	4	6.8
Cut or Puncture	3	5.1
Other	10	16.9

(\*Participants may report more than one type of injury)

### 4.3 Clinical Characteristics of Care and Level of Satisfaction

Three categories of clinical care guidelines were assessed: Before Participation in Athletic Competition (PPE), Medical Monitoring, and Injury Management. Frequency of care and level of satisfaction with care was assessed in tandem. This can be seen displayed in Table 3.

### 4.3.1 Before Participating in Athletic Competition (PPE)

**Health History and Medical Examination.** 22 (27.5%) of the 80 respondents reported that their sports medicine facility and sport personnel conducted comprehensive health history and medical examinations to assess their ability to participate in their chosen sport. Most of the participants that received these services reported either being satisfied (72.7%) or somewhat satisfied (18.2%) with this care.

**Current Physical Activity Assessment.** 29 (36.3%) of the 80 respondents reported that their sport medicine facility and sport personnel regularly assessed their current physical activity participation to put into consideration as part of their PPE. Respondents were satisfied (65.5%) or somewhat satisfied (24.1%) with the rate and quality of assessments received from their facility.

**Collaborative Care.** 24 (30%) of respondents reported their sports medicine facility and sport personnel regularly collaborates with them to have a discussion about the risks associated with vigorous physical activities and provide health recommendations based on their desired exercise intensity, and volume. Those that received this care were highly satisfied (79.2%) with what was provided.

### 4.3.2 Medical Monitoring

**Regular Health Screening Assessments.** 25 (31.3%) of the 80 respondents reported that they regularly received health screening assessments to ensure continued safe participation when requested. Their sports medicine facilities and providers received a 72% satisfaction rate from the 25 respondents that received this service.

**Monitoring of Risk Factors.** 16 (20%) of the 80 respondents reported that their sports medicine facilities and providers regularly monitor indicators of risk factors for specific issues commonly seen in MAs. Only 50% of them were satisfied with this care, with 25.1% being somewhat satisfied, 18.8% being neutral and 6.3% being somewhat dissatisfied.

### 4.3.3 Injury Management and Return to Play

**Timely Assessment of Injury.** 53 (66.3%) of the 80 respondents reported to have received timely assessments in the event of a sport-related injury. 56.6% of the 53 were satisfied with the speed at which their injuries were assessed. 15.1% were somewhat satisfied and 18.9% were neutral.

**Adequate Care.** 47 (58.8%) of the 80 respondents reported that their sport medicine facility and providers prescribed appropriate treatments which may have included exercise, therapeutic modalities, and functional activities specific to their injuries and medical history. 55.3% of participants were satisfied with this care, and a further 21.3% were somewhat satisfied.

**Return to Play.** 37 (46.3%) of the 80 respondents reported that their facilities and providers promoted injury management with the goal of safely returning to play. 67.6% of these participants were satisfied with this care and 18.9% were somewhat satisfied with their care.

**Prevent Injury.** 32 (40%) of the 80 respondents reported that their providers regularly discuss solutions that can minimize the risk of re-injury as they continue to train and compete. Among them, 78.1% of these respondents reported a positive satisfaction rate, while 18.8% of participants were somewhat satisfied with this service.

**Meets Health Needs.** Of the 80 respondents, 46 (57.7%) reported that their sports medicine facilities and providers treated their injuries to meet their health needs. 67.4% of them were satisfied with the delivery of this care and 10.9% were somewhat satisfied.

**Table 3** MAs reported clinical characteristics of care and level of satisfaction

My Clinical Care Providers:	n(%) of participants that reported YES (n=80)	Level of Satisfaction				
		Unsatisfied	Somewhat unsatisfied	Neutral	Somewhat Satisfied	Satisfied
<b>Before Participating in Athletic Competitions (PPE)</b>						
Conducts a comprehensive health history and medical examination to assess your ability to participate in your chosen sport.	22(27.5)	0%	4.5%	4.5%	18.2%	72.7%
Assess your current physical activity participation.	29(36.3)	0%	6.9%	3.4%	24.1%	65.5%
Collaborates with you to discuss risks and health recommendation based on your desired exercise intensity and volume.	24(30)	0%	0%	6.9%	10.3%	79.2%
<b>Medical Monitoring</b>						
Conducts health screening assessments to ensure continued safe participation if requested.	25(31.3)	4%	0%	12%	12%	72%
Monitor indicators of risk	16(20)	0%	6.3%	18.8%	25.1%	50%



factors for  
specific issues  
commonly seen  
in masters  
athlete.

Injury Management and Return to Play						
Provides timely assessment of acute injury.	53(66.3)	1.9%	7.5%	18.9%	15.1%	56.6%
Prescribes appropriate treatment which may include exercise, therapeutic modalities, and functional activities specific to your injury and medical history	47(58.8)	0%	4.3%	19.1%	21.3%	55.3%
Promote Injury management with the goal of you safely returning to play	37(46.3)	0%	2.7%	10.8%	18.9%	67.6%
Discusses solutions that can minimize the risk of re-injury as you continue to train	32(40)	0%	3.1%	6.3%	18.8%	78.1%
Treats your injuries to meet your needs	46(57.7)	0%	6.5%	15.2%	10.9%	67.4%

## 4.4 Frequency of Characteristics of Clinical Care

Nearly 50% of MAs reported their primary clinical care providers rarely (31.6%) or never (17.1%) had adequate knowledge about issues specific to MAs. Frequency of information sharing about resources and referrals to multidisciplinary health professionals by clinicians largely varied across MAs (Table 4).

**Table 4** Frequency of characteristics of clinical care in MAs (n=80)

<b>Based, on your experiences, how often do your healthcare providers:</b>	<b>Frequency (%)</b>				
	<b>Never</b>	<b>Almost Never</b>	<b>Enough</b>	<b>Some what Often</b>	<b>Often</b>
Have adequate knowledge about the issues you present specific to being a masters athlete	17.1%	31.6%	10.5%	18.4%	22.4%
Share information about resources that can aid in injury prevention and injury management	21.1%	25%	17.1%	7.9%	28.9%
Refer you to multidisciplinary healthcare professionals (e.g. Orthopedic surgeon, Chiropractor, Physiotherapist, Massage therapist) as appropriate.	21.1%	14.5%	21.1%	10.5%	32.9%

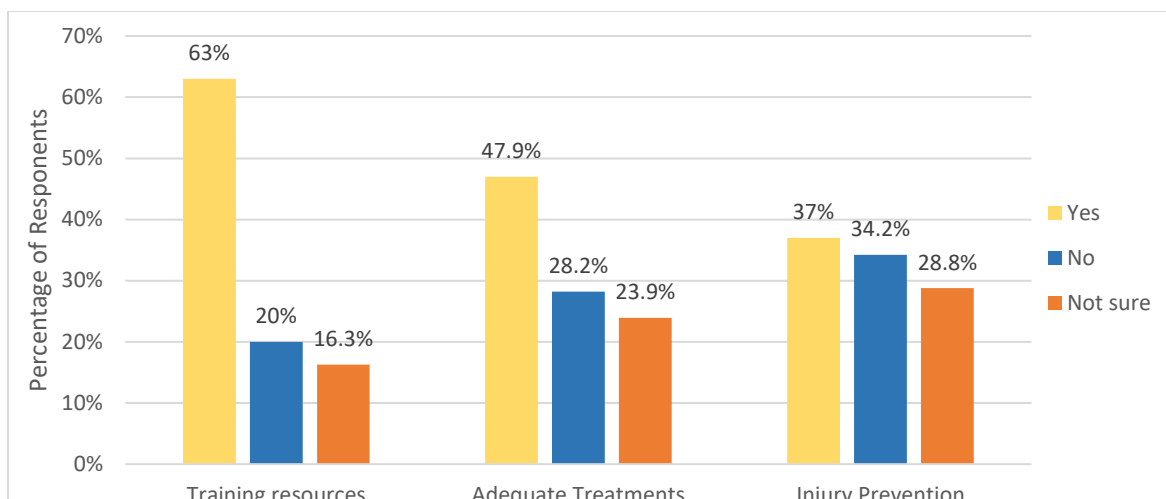
## 4.5 Patient Perception of Clinical Care

Participants were asked to consider the characteristics of clinical care that they are currently receiving in their sports medicine facilities and their providers and provide their experiences (Table 5). Approximately one third of participants reported they had no training resources (20%) or were unsure (16.3%) of the resources available. When inquired about the injury prevention strategies in place for MAs, 25 (34%) indicated that this was not a part of the clinical care they received and 21 (28.8%) were unaware of what they were. Over 50% of respondents reported their health needs unmet with their current treatments (28.2%) or were unsure of their sufficiency (23.9%). Percentage of

respondents that received characteristics of clinical care can be observed in Figure 2. When asked to elaborate on these, MAs identified barriers to resources, injury prevention strategies and treatments such as a lack of accessibility, a lack of clinicians educated to care for MAs, negative attitudes towards MAs and a general lack of support.

**Table 5** Summaries of open-ended responses assessing characteristics of clinical care and participant perception of training resources, injury prevention strategies and clinical treatments.

<b>Perception of Clinical Care</b>	<b>Frequency n(%)</b>	<b>Sample excerpt</b>
<b>Do you think that training resources (equipment, facilities, sport personnel, medical care) are readily accessible to you? If No, why?</b>		
No	16/80 (20%)	<i>“Most coaching/resources are aimed at the development of potential college/university athletes.”</i>
<b>Are the injury prevention strategies in place for you as an athlete sufficient? Why or why not?</b>		
Yes	27/73 (37)	<i>“[My] running plan develops directly from an injury prevention perspective.”</i>
No	25/73 (34)	<i>“This is not even a thing.”</i>
Not Sure	21/73 (28.8)	<i>“Not sure what they are.”</i>
<b>Do you believe the treatments prescribed are meeting your needs? Why or why not?</b>		
Yes	34/71 (47.9)	<i>“Yes, pain is eliminated, increased mobility and strength, and fully recovered within the timeframe explained by following medical advice”</i>
No	20/71 (28.2)	<i>“Does not consider my training needs, return to sport or training while injures.”</i>
Not Sure	17/71 (23.9)	<i>“Not quite. Some persistence in symptoms &amp; recurring injury.”</i>



**Figure 2** Percentage of respondents reflecting participants' views on whether the characteristics of clinical care provided by their sport medicine facility and providers meet their needs.

Participants reported experiencing equally positive and negative experiences in their sports medicine facilities which may have impacted their ability to train and compete (Table 6). Factors that contributed to their positive experiences were cited to be receiving individualized and well-informed care (22%), having supportive clinicians that took them seriously (13%), access to multidisciplinary health care (20%), receiving training advice (17%) and injury preventive strategies (28%). In contrast, negative experiences were perceived to be due to lack of support (33%), inaccessibility to clinical care (26%), uninformed clinical care that did not meet their needs (25%), non-collaborative care (10%), and clinicians' negative attitudes towards MAs (6%). MAs reported that their clinicians would mostly advise them to rest (30.3%) or to modify their current activity (42.4%) when faced with their sport-related injuries (Table 7).

**Table 6** Summaries of open-ended responses about the positive and negative experiences that MAs perceive to have impacted their ability to train and compete

<b>MAs experiences at their sports medicine facilities that have impacted their ability to train and compete</b>	<b>n(%)</b>	<b>Sample Excerpt</b>
Positive	25/51 (49)	<i>“[My clinician] took my status in my sport very seriously and understood how to treat me considering conditions that effect a masters athlete...”</i>
Negative	26/51 (51)	<i>“The doctor I saw assumed I was in acute pain because of my MRI report. He asked no questions about my activity, level competition, my activity, level of competition, what my goals for treatment were. His first advice for me was to sit on a pillow when I drive to alleviate pain. I have no pain when sitting”</i>

**Table 7** Summary code, frequencies and sample excerpts of most frequent advice MAs receive from their primary clinician

<b>Clinician advice for Masters Athletes</b>	<b>n(%)</b>	<b>Sample excerpt</b>
Rest	20/66 (30.3)	<i>“Take time off sport to heal.”</i>
Activity Modification	28/66 (42.4)	<i>“Return to training slowly, lower [training] intensity, lower [training] volume.”</i>
Referral to Allied Professionals	12/66 (18.2)	<i>“Refer to other medical professionals with no set plan in place unless you instigated it.”</i>
Seek Resources	7/66 (10.6)	<i>“I never go to my primary physician for this. For a recent injury, I self-referred myself to a physiotherapist who specializes in my sport.”</i>
Stop	4/66(6)	<i>“Stop running. Find some other activity.”</i>
Inconsistent	3/66 (4.5)	<i>“I have received advice that is very generic, not specific to myself and my symptoms and level of activity.”</i>

## 4.6 MAs Desired Changes in Future Clinical Care

When asked about changes in the clinical care that they would like to see in the future, MAs identified wanting more **Education for Clinical Care Providers** (22%) on the intricacies of caring for MAs.

*[I would like] more experts on the matter of older athletes. They treat injuries like they would with younger people.” [survey response]*

They also reported wanting to have more **Accessibility to Available Resources** (28%) to improve the quality of care they experience as athletes.

*“Trying to find primary physicians who understand athletes is always a challenge. It would be great to have an active peoples’ clinic with trained sports med physicians and ancillary services...” [survey response]*

**Individualized Care** (16 %) was expressed to be a standard norm to improve the quality of treatments they receive and meet their health needs.

*“I would really appreciate being given a training plan specific to my body to help me continue to train and compete” [survey response]*

**Collaborative Care** (8%) with multidisciplinary health care providers and the inclusion of MAs throughout the course of their care were indicated by respondents to be beneficial to their clinical care. Respondents also called for **Improvements in Clinician Attitudes** (14%) towards MAs, citing it as a recurring barrier to positive health outcomes.

*“Coaching and organization wise, older athletes are looked down upon. Even when they are still better than the younger athletes or [are] in a sport with a lot of longevity like marathons and throwing events” [survey response]*

Finally, MAs noted the need for more **Comprehensive Assessments** (8%) and **Preventive Strategies** (4%) to monitor and prevent high risk comorbidities and injuries specific to them. Summary of future changes desired by MAs can be observed in Figure 3.16%



**Figure 3** Participants' perceptions of future changes to the quality of care in their clinical characteristics of care.

## Chapter 5

### 5 Discussion

To our knowledge, this is the first study that investigate the characteristics of clinical care in MAs and seeks to understand their perceptions of said care, utilizing an HNA to assess clinical standard practices, level of satisfaction and frequencies, and identify the gaps in clinical care that lead to unmet health needs. This study offers a novel perspective regarding the care of MAs by centering their experiences within their current clinical care systems to inform the development of future clinical guidelines tailored to their needs. It is notable to observe that only about 40% of MAs reported receiving standard clinical care within their current system. Despite high overall satisfaction rates, dissatisfied MAs cited several underlying issues in their clinical care that negatively impacted their ability to train and compete.

#### 5.1 Clinical Characteristics of Care for MAs

##### 5.1.1 Pre-Participation Evaluation (PPE)

MAs reported low rates (less than 40%) of PPE screening before training or competition. This indicates that over than 60% of participants do not obtain clearance based on their health history and risk profile to ensure their continued safety during high intensity activity. Findings were consistent with Abbatermarco et al. (2016)'s study that showed only a modest percentage 24.6%-51.5% of MAs (n=1457; Mean age: 44.5) underwent PPE screening in accordance to the 2001 Masters guidelines. Additionally, in Maron et al.'s (2001) advisory recommendations for PPE screening in MAs, it was cited that screenings for this population have been found to be "limited, inconsistent or non-existent". Low rates of PPE have been implicated to impact clinical care decision-making and recommendations for MAs as they may not be adequately informed (Abbatermarco et al., 2016).

A possible contributor to these rates were observed in Abbatermarco and colleagues (2016) study. They noted that the biggest drivers for PPE referrals by clinicians in MA were significantly older age and endurance sporting events as they pose



the highest risk (Abbatemarco et al., 2016). This becomes a concern for younger MAs, aged between 35- 65, who are considered low risk despite making up a majority of existing MAs as seen in both the demographics of this study (86.3%) and previous research (Abbatemarco et al., 2016; Morrison et al., 2018). This suggests a need to further educate clinicians on the importance of implementing PPE screening for MAs, regardless of age, given their unique physiology and heightened risk profiles for cardiovascular events, cumulative injuries, and pre-existing health conditions (Maron et al., 2001; Team Physician Consensus Statement, 2010; Wright, 2012).

While there appears to be consensus in the literature that PPE in clinical care of MAs is best practice (Abbatemarco et al., 2016; Brun, 2016; Maron et al., 2001; Tayrose et al., 2015; Team Physician Consensus Statement, 2010; Wright, 2012), there are no validated PPE screening tools available for this population. Current PPE screening tools have been found to have low diagnostic value and limited applicability as they are not adapted for MAs (Abbatemarco et al., 2016; Maron et al., 2001; Tayrose et al., 2015). Therefore, further research is required in the development of validated and effective PPE screening tools for MAs to increase its frequency of implementation in clinical care and its accuracy when assessing potential health risks before sports participation. Given its infrequencies in implementation, it is unclear if its high satisfaction rates are due to MAs simply being pleased to receive the service rather than to do with the effectiveness of the PPE.

### 5.1.2 Medical Monitoring

Medical monitoring was notably the lowest reported characteristics of clinical care received by MAs, with just over 30% of participants responding positively. Not unlike a PPE, it necessitates regular risk appraisals to ensure the continued health of MAs and manage recurring health conditions (Wright, 2012). Unsurprisingly, outside of consensus recommendation from various studies (Maron et al., 2001; Ting & Wallis, 2007; Wright, 2012), minimal studies are available to provide additional insights on the typical rate at which medical monitoring occurs for MAs within other clinical spaces. However, the experiences of the participants suggests that this may be due to the limited

accessibility to clinical services for regular follow ups to be feasible, and the potential lack of knowledge among their clinicians.

Maron et al. (2001) states that much of the responsibility to receive regular assessments primarily falls on the MAs to reach out to their local facilities and providers. This presents a significant barrier for MAs as much of the respondents in this study expressed difficulties being able to access sports medicine facilities, providers and other relevant resources. From their perspective, facilities that offer medical monitoring are few and far between, though this may be because most of the MAs in this study were recruited from London Ontario, which is surrounded by rural towns. Additionally, in the event that they can access a facility, they expressed negative feelings regarding the length of time it takes to secure an appointment and see a clinician. This can potentially lead to negative health outcomes as it can delay necessary diagnosis for adverse health conditions that may arise during athletic performance. Finally, costs to access these medical services have been cited to be a contributing factor to their lack of accessibility.

Nearly 50% of MAs reported their clinicians lacked adequate knowledge when it came to their care as older athletes, a recurring theme from respondents during the appraisal of their clinical care. This is consistent with Shapero et al. (2016) study that found that MAs who were dissatisfied with their healthcare indicated that the lack of knowledge exhibited by their clinicians regarding caring for MAs was a significant contributing factor. Therefore, it is likely that clinicians are unaware of the need for regular medical monitoring for MAs and the necessity for consistent follow up over a long period of time. These findings suggests that in order to make regular medical monitoring for MAs a part of their clinical care, more efforts should focus on improving the accessibility of clinical resources and providing more education for clinicians, alleviating the burden of MAs to continuously advocate for their care.

### 5.1.3 Injury Management and Return to Play

MAs reported the highest rates of injury management in clinical care from their sports medicine facilities but also exhibited some of the highest rates of dissatisfaction. MAs typically experience high rates of sport-related injuries, with higher burdens, which

was seen in this study's demographic where 73.8% of participants reported suffering at least one sport-related injury within the last 2 years. This is consistent with findings in existing literature (Ganse et al., 2014; Huebner & Ma, 2022; Kallinen & Markku, 1995; Tayrose et al., 2015) but notably in Loudon & Parkerson-Mitchell (2022) study which estimated that 89% of MAs have a history of sport-related injuries. Therefore, it is presumed that the primary reason for clinical utilization in MAs would be for injury management contributing to these higher rates.

Respondents identified several underlying issues within their clinical care that may have contributed to their dissatisfaction. Aware of the burden of injuries due to their age (Litchfield et al., 2022; Palumbo et al., 2023), MAs in this study frequently expressed concerns mitigating their injury risk and management in the aftermath of injuries. Yet, it is perceived that clinicians do not share the same level of concern when providing care to MAs. This became evident to them when some of most common advice received from their clinicians were to refrain from sport participation (30.3%) for an extended period of time and sometimes to stop (6%) altogether. This contrasts findings in existing literature which has shown that inactivity following a sports-related injury in MAs was found to be counterproductive to their recovery and ability to return to play (Kallinen & Markku, 1995; Tayrose et al., 2015). Respondents in this study identified recurring themes of poor clinician attitudes, a lack of adequate knowledge and limited support for MAs to be contributing factors towards this issue. Poor clinician attitude was cited by MAs to negatively impact their ability to train and compete. One participant expressed that because of 'my gender and my age [I'm] not taken seriously' by clinicians. Litchfield et al. (2022) suggests that this is the result of perpetuated ageist stereotypes which may cause clinicians to be dismissive over MAs health concerns and refuse to involve them in the course of their clinical care. Existing research has also demonstrated that varying attitudes towards patients by clinicians based on demographics or socioeconomic status can negatively impact quality of their care (Haywood et al., 2011).

These prevailing narratives associated with ageing have played a significant role in the patient-clinician mismatch that MAs face within their clinical care system. Despite being viewed as excellent examples of healthy, active living, sport participation in high

intensity levels have often been seen as deviating from age-appropriate behaviors by health care professionals (Bowness, 2020). Numerous studies have demonstrated how commonly seen biases and attitudes towards older patients in healthcare spaces have been largely rooted in internalized ageist stereotypes (Bowness, 2020). Therefore, when faced with MAs, who straddle the intersection between aging and sport and exercise, clinicians are at a higher risk of providing inadequate care. This more than likely contributed to the negative experiences expressed by this study participants. To address this, it was proposed by Litchfield et al., (2022) that more research emphasizing the lived experiences of MAs can play a key role in the deconstruction of existing stereotypes and improving the patient-clinician relations between MAs and their providers.

The perceived lack of education was expressed by MAs through their appraisal of the quality of their treatments, injury prevention strategies and available resources in their sports medicine facilities. Over 50% of MAs reported that the treatments they received were not sufficient, frequently citing that they lacked personalization to their physiology as older athletes as well as their personal health history and goals. It was expressed that much of the treatments available seemed geared either towards younger athletes, or sedentary adults. This was emphasized by a participant who expressed that there was a 'lack of personnel experienced in caring for older athletes. Similarly, injury prevention strategies available for MAs were demonstrated to be largely non-existent, which have been expressed to lead to increasingly self-directed behaviors as MAs struggle to continue their sports participation injury free. This not only suggests a lack of education, but it also implies a general lack of support provided to MAs from their clinical care system, with an exasperated MAs stating 'I feel like I'm left to sort it out on my own. It may be fine for me, but for others with fewer resources or less education, it may be really problematic'. Additionally, their clinicians seem to be unaware of the available resources for MAs, as it was reported by almost 50% of respondents that their clinician's rarely, if ever, shared information about resources that could support the prevention of injuries and injury management. Again, this suggests that further education is required for clinicians in order to provider more individualized and adequate care to meet the needs of MAs, improve accessibility towards resources and provide more support towards their training and athletic goals.

These findings align very closely with Shapero et al.'s (2016) study as they reported that MAs cited dissatisfied with their healthcare were due to the dismissal of their concerns due to their age and their sporting activities, and lack of knowledge amongst their clinicians regarding unique issues faced by MAs. As suggested by their study, the identification of these barriers within their current clinical care system uncovers a strained patient-clinician relationship that must be addressed by educating clinical care providers, conducting further research centering athletes' voices and increasing the support available for MAs at all levels of care to allow them to keep moving (Shapero et al., 2016).

## 5.2 Perceived Health Needs of MAs and Future Recommendations

When developing standard clinical guidelines to improve better health outcomes, clinicians must recognize the barriers that are faced by MAs using athlete centered contexts and prioritizing their experiences (Bolling et al., 2018). Assessment of the characteristics of clinical care in MAs identified barriers impeding participants from receiving standard care and addressing their health needs. Main barriers were revealed to be a lack of education in clinicians, lack of accessibility to resources, poor clinician attitudes, and limited overall support. To effectively address these, MAs were asked to identify changes that they would like to see in the future of their care, which are demonstrated through a series of recurring themes. These identified barriers and expressed health needs must serve as a foundation for future clinical guidelines tailored to meet their needs. The following recommendations for standard clinical guidelines for MAs, was informed by the information gathered above, in accordance with phase 1 and 2 of a HNA, to improve the health outcomes of MAs in order of prioritization.

### 5.2.1 Recommendations for Clinical Care Guideline Development aimed at MAs

#### *Increase Accessibility to Resources*

Increased accessibility to resources (28%) is proposed to aid in optimizing performance and improving health outcomes in MAs. From a clinical care standpoint,

accessibility is concerned with the availability of services and resources for populations that require them (Gulliford et al., 2002). For MAs, this involves the allocation of resources accessible to them which include sports medicine facilities, clinicians educated about MAs, multidisciplinary health care providers, coaches, and training resources. With how often literature can be contradictory when it pertains to older athletes, it is essential to provide access to valid and reliable resources to avoid misinformation and increased health risks. Their clinical care providers and coaches must take on the primary role to improve this gap as proclaimed, ‘gatekeepers to mobility’ (Wright & Middleton, 2018) and as it’s been reported that MAs seeking resources on their own can be difficult and costly. This stands to increase the rates of clinical utilization in MAs, improve their health outcomes, and promote good training habits.

### ***Educate Healthcare Providers***

Addressing the knowledge gap evident in clinicians and allied health care providers must be prioritized when looking to meet the health needs of MAs (22%). This involved familiarizing clinicians on the age-related physiological changes commonly observed in MAs and how frequent high intensity training may impact their health (Brun, 2016; Tayrose et al., 2015; Wright, 2012). This will provide MAs with experts that are able to efficiently identify the clinical presentation of injuries, underlying health conditions, and risk factors that predict adverse health outcomes in MAs (Team Physician Consensus Statement, 2010). Further research on MAs would prove invaluable in this endeavor. For example, the team physician consensus statement on issues for the MAs (2010), provided an overview of commonly seen injuries and illness in this population and outlines general considerations clinicians must take when caring for them, which include clinical presentation, treatment options and return to play strategies. This stands to positively impact the quality of treatment, training recommendations, the injury prevention strategies, and available resources for MAs.

### ***Provide Individualized Care***

Individualized care (16%) must be prioritized and implemented in the future clinical care of MAs. This stands to improve the quality of treatments, recommendations,

and health outcomes of this population. Individualized care puts the athletes' contextual determinates, needs and preference at the forefront of the clinical decisions and interventions (Can, 2021). It's well documented that this approach to care is associated with increased satisfaction and health outcomes (Can, 2021), therefore, MAs stands to benefit greatly when applied to them. As MAs present different risk profiles for various health conditions and health history, clinical care providers must conduct all necessary health assessment, such as PPE and regular medical monitoring, and incorporate the athletes training goals to make well informed decisions regarding their clinical care.

### ***Improving Clinician Attitudes***

Clinician attitudes (14%) towards MAs need to be changed to improve the clinical care that is received by them. It has been discussed in depth the ramifications of poor clinician attitudes towards MAs, and the significant barrier it poses to their quality of care. Further research emphasizing the lived experiences of MAs can play a key role in improving clinician attitudes (Litchfield et al., 2022). Additionally, the increased education in clinicians stands to improve the attitudes as a by-product of their knowledgeability.

### ***Collaborative Care***

The increased incorporation of collaborative care is required in the on-going clinical care of MAs (8%). Often led by the primary clinician, this involves the corporation of multidisciplinary health care providers when making decisions regarding aspects for care such as diagnosis, treatments, and subsequent follow ups (Brun, 2016; Tayrose et al., 2015). This includes, but not limited to, physical therapists, registered massage therapist, chiropractor, coaches, and sports medicine specialist. Numerous studies (Brun, 2016; Tayrose et al., 2015; Team Physician Consensus Statement, 2010; Wright & Middleton, 2018) have implicated that the collaborative efforts of a multiciliary health teams in clinical care can underscore improved health outcomes in MAs. It is proposed to address gaps that arise from a lack of education as certain aspects of MAs care may fall outside the scope of their training and expertise (Tayrose et al., 2015; Wright & Middleton, 2018).

### ***More Health Assessments and Preventative Strategies***

Assessments (8%), such as PPE (4%) screening and medical monitoring, and preventive strategies for MAs have been reported to be few and far between despite its documented benefit for this population (Baumert et al., 2016; Ganse et al., 2014; Llopis et al., 2021; Reaburn, 2021). The integration of these aspects of clinical care is required to manage the risk of injuries and health conditions commonly seen in this population. This would require clinical care providers to be aware about the existing assessments and preventative strategies available for MAs, be trained on how to administer them, and extrapolate relevant information to inform their clinic care. It is suggested that the development of validated assessments and injury prevention strategies tailored to meet the needs of MAs could address this gap and ensure frequent utilization in future clinical care.

## **5.3 Strengths**

The strength of this study lies in its emphasis of the lived experiences of MAs within their clinical care system. Open-ended responses were used to provide further context in the assessment of the characteristics of clinical care that they receive. This enabled us to identify barriers and develop recommendations based on their expressed desires for clinical that will address their health needs.

## **5.4 Limitations**

Several limitations were identified within this study. Firstly, the homogeneity of participant demographics limits the external validity of the results. Participants were mostly white, married and highly educated which may have impacted how they perceived their accessibility to available clinical care and training resources because of their socioeconomic status. Additionally, this study lacked participants aged 80+ and MAs that identified as non-binary/third gender as they either were not recruited or excluded based on missing data. Moreover, data collection was limited based on geographic location. Participants were recruited from organization within London, Ontario, which is surrounded by rural communities, this may have impacted their perspective as resources



are less available for them than MAs in metropolitan areas. This study did not investigate associations between characteristics of clinical care and health outcomes, nor associations between participants demographics and how it may impact the quality of their care. As a result, definitive conclusions could not be made about factors that predict positive health outcomes and met health needs in MAs. It can also limit the strength of recommendations made to inform future clinical guidelines for MAs using the results of this study.

## 5.5 Clinical Implications

This study has implications for improved patient care, resource allocation, and evidence-based policy and program development for MAs. The findings of this study indicate that the current clinical care system must improve to be able to meet the health needs of MAs. The administration of a HNA provides evidence of unmet health needs within the underreported population of MAs. By centering the voices of MAs, recommendations for changes to improve their characteristics of clinician care are outlined to be implemented at all stages of care to promote injury resilience and avoid adverse health outcomes. It is imperative that sports medicine facilities and clinicians prioritize care of MAs in the same way they would younger and elite athletes through standard routine guidelines. This must be done utilizing an individualized approach, with the necessary modifications in place to address their aging physiology.

As needs have been identified and prioritized, sports medicine facilities and clinicians must allocate the resources to improve the clinical care gaps and implement the above recommendations to inform standard clinical guidelines for MAs. The allocation of clinical care resources for MAs ensures the delivery of equitable and efficient care within the finite resources available (Appendix E). This has been documented to improve accessibility of care, patient perceptions towards clinical care and quality of clinical care in a cost-effective way, which are barriers that MAs currently face (Appendix E). To address MAs priorities in clinical care outlined above, it is recommended that resources be allocated to the development of education initiatives aimed at clinicians about MAs, the development of MAs specific tools such screening/diagnostic assessments and injury prevention programs and funding more MAs research that emphasizes their lived experiences.

As is the purpose of a HNA, the result of this study should act as the first step in the development of evidence-based policies and programs aimed at the clinical care guidelines tailored to MAs. Evidence-based policies should include mandatory PPE screening and frequent medical mentoring of MAs of all ages and risk profiles. This should also serve to inform the education programs geared towards clinicians on the adequate care of MAs, improved clinician attitudes, and standard routine guidelines for MAs. Future studies should investigate the demographic and medical correlates of MAs that predict characteristics of clinical care and improved health and performance outcomes. Additionally, future research should further investigate the gender specific disparities within the clinical care system for MAs, particularly in female MAs that may deal with compounding issues associated with perimenopause, post-menopausal effects, RED-S, and their increased rate of age-related musculoskeletal and bone density loss in comparison to male MAs (Loudon & Parkerson-Mitchell, 2022).

## Chapter 6

### 6 Conclusion

This HNA is the first known study that investigates the characteristics of clinical care that MAs receive as well as their perceptions and level satisfaction towards their care. Across three key categories of care, less than 40% of MAs reported to have received PPE and regular medical monitoring as part of their clinical care and a little over 50% of MAs reported the same sentiment about their injury management. Despite high overall satisfaction rates, MAs experienced dissatisfaction due to 1) a lack of education in clinicians, 2) lack of accessibility to resources, 3) poor clinician attitudes, and 4) limited overall support which were perceived to be barriers to that impacted their quality of care. These findings are evidence of unmet health needs in MAs. This points to the need for an improvement of current clinical care guidelines geared towards them as not only are a majority of them not receiving standard care, what they do receive does not cater to their unique needs or health concerns. MAs identified a series of changes to be seen in the future of their clinical care which include educating their clinicians, increasing accessibility towards resources, utilizing an individualized approach, improving clinician attitudes, promoting more collaborative care, and increased implementation health assessments and preventive strategies. By integrating the voices of MAs, these recommendations stand to address their unmet health needs by informing future research that seeks to develop clinical guidelines, policies, and programs to improve their quality of care and support their athletic endeavors.

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# Appendices

## Appendix A: Ethics Approval Form



**Date:** 17 May 2023

**To:** Dr Jane Thornton

**Project ID:** 121988

**Review Reference:** 2023-121988-79627

**Study Title:** Clinical Care of Masters Athletes: A Needs Assessment Survey

**Application Type:** HSREB Initial Application

**Review Type:** Delegated

**Full Board Reporting Date:** 6/June/2023

**Date Approval Issued:** 17/May/2023 11:27

**REB Approval Expiry Date:** 17/May/2024

Dear Dr Jane Thornton

The Western University Health Science Research Ethics Board (HSREB) has reviewed and approved the above mentioned study as described in the WREM application form, as of the HSREB Initial Approval Date noted above. This research study is to be conducted by the investigator noted above. **All other required institutional approvals and mandated training must also be obtained prior to the conduct of the study.**

**Documents Approved:**

Document Name	Document Type	Document Date	Document Version
Needs Assessment Recruitment Poster 2_PU (1)	Recruitment Materials	21/Apr/2023	2
Recruitment Email 2023 PU	Email Script	21/Apr/2023	2
Research Protocol Health Needs Assessment_PU (1)	Protocol	14/Apr/2023	2
Recruitment Flyer MAs 2023_PU	Recruitment Materials	21/Apr/2023	2
Recruitment Materials - Recruitment Email for Community Organization	Email Script	04/May/2023	1
Needs Assessment Survey 2023_PU	Online Survey	11/May/2023	3
Letter-of-Information-and-Consent MA 2023 PU	Written Consent/Assent	11/May/2023	3

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Electronically signed by:

Nicola Geoghegan-Morphet, Ethics Officer on behalf of Dr. Emma Duerden, HSREB Vice-Chair, 17/May/2023 11:27

**Reason:** I am approving this document

## Appendix B: Letter of Information

**LETTER OF INFORMATION AND CONSENT**

**Study Title:** Clinical Care of Masters Athletes: A Health Needs Assessment

**Name of Principal Investigator**

Dr. Jane Thornton

Fowler Kennedy Sport Medicine Clinic, Western University

3M Centre 1151 Richmond Street London, ON N6A 3K7

██████████ | ██████████

**Co-Investigators**

Princess Ulona (MSc. Candidate) | ██████████

**Introduction**

You are reading this information because you scanned one of our study posters' QR codes or received a link within your Fowler Kennedy Sport Medicine Clinic appointment reminder. You are invited to participate in an online survey, conducted by researchers from Western University, assessing the health needs of masters athletes and the clinical care they receive. To be eligible for this study, you must be over 35, be planning to train or compete in an athletic competition and can read and communicate English.

This letter contains information to help you decide whether or not to participate in this research study. It is important for you to understand why the study is being conducted and what it will involve. Please take the time to read this carefully and feel free to contact the study team to ask questions if anything is unclear.

**Background/Purpose**

Masters athletes are individuals 35 years and older that continuously participate in sports and athletic competitions, usually consisting of those who were high level competitors previously or took up sports in older age. As athletes continue to age, they experience inevitable physiological changes such as a decrease in cardiovascular functioning, and a reduction in skeletal muscle mass, bone density, and tendon elasticity. As a result, these changes predispose masters athletes to be at risk for specific injuries and illnesses not commonly seen in younger athletes. For this population to be able to maintain their desired level of performance and physical functioning, they require customized sports medicine care from their facilities and healthcare providers who are equipped to meet the needs of their complex and changing physiology. Despite this, little is known about the medical care that masters athletes receive currently in their sports medicine facilities and if they meet their health needs as athletes. Therefore, the purpose of this study is to

determine the characteristics of clinical care that master athletes receive in sports medicine clinics and assess if their health needs are met.

### **How can I participate?**

If you meet the eligibility criteria above, you can consent to participate. To participate, please click the link below that will take you to the survey which you can complete at your leisure. The survey will take approximately 5-8 minutes of your time. You will be asked about your level of satisfaction with the typical clinical care that you currently receive as an athlete from your sport medicine facility, sports medicine clinicians and other allied healthcare professionals (e.g. specialist physicians, chiropractor, physiotherapist or massage therapist). You will also be asked to give your perceptions on your healthcare and what you would like to see change. It is through your voluntary participation in this survey that we can understand and address perceived gaps, if any, between the clinical care that you receive and the care that you would like to receive moving forward. You can skip any questions that you do not wish to answer without penalty. You may choose to stop this survey at any point. It is expected to see 150 participants enroll in this study.

### **What are the potential benefits?**

Participants will not experience any benefits as this is an anonymous survey.

### **What are the risks to participating?**

There is always a potential risk of data breach with any survey conducted online. We plan to uphold research integrity to the highest standard to prevent this from occurring. You will not be asked to identify yourself on the survey at any point. All data from the survey data will be stored on a secure Western University network server.

### **How will we keep your information safe during and after the study?**

No identifying information will be collected during the study. This online survey uses Qualtrics and collects only indirect identifiers such as your age, ethnicity, and gender. Qualtrics servers are located in Ireland and their privacy policy is found [HERE](#). Please note that nothing on the internet is ever 100% secure but the research team will follow institutional guidelines to protect your data and remove data from this 3rd party platform at the conclusion of the study for long term retention on institutional servers. Data from the study will be password-protected and stored on encrypted servers. When communicating study results in publications or presentations, only aggregate data will be presented, and no identifying information will be mentioned. The REB has access to study information for monitoring, legal, and/or regulatory purposes only. Lawson Quality Assurance and Education Program may require access to study records for quality assurance purposes. Survey data will be kept electronically in aggregate format for fifteen years after study completion, as per Lawson Health Research Institute's data retention policy.

### **Can I withdraw from the study?**

Participation in this study is voluntary. You may refuse to answer any survey question if you do not feel comfortable doing so. Your decision of whether or not to participate will not impact current or future care with your physician. If you exit the survey before clicking “submit” on the final page, no data will be collected. When you have clicked “submit” on the final page, it will be at this point you would no longer be able to withdraw your information because your responses are anonymous. After submission of the survey, should you decide, you would like to remove your data, you can contact the study researchers to locate your data (based off time of submission, age range and/or other answers) to remove your entire submission. Once the data is published, it will no longer be possible to withdraw your information from this study.

### **What are the alternatives to being in the study?**

An alternative to the procedures described above is to not participate in the study and continue on just as you do now.

### **What are the costs and or reimbursement involved in the study?**

There are no costs or reimbursements for participants to partake in the study.

### **Who can I contact about the study?**

If you have questions or concerns, please contact Dr. Jane Thornton [REDACTED] or [REDACTED]. If you have any questions about concerns that may be raised by participating in the study or questions that may be raised by being a research participant, please contact our Research Coordinator, Ashley Ambrose, at [REDACTED]. If you have any questions about your rights as a research participant or the conduct of this study, you may contact the Patient Relations Office at LHSC at [REDACTED] or [REDACTED]. You can also access the online form at: <https://apps.lhsc.on.ca/?q=forms/patientrelations-contact-form>.

### **Consent**

If you choose to participate, consent will be implied upon starting the survey.

### **Link**

[https://uwo.eu.qualtrics.com/jfe/form/SV\\_87gp0KdFeynaynY](https://uwo.eu.qualtrics.com/jfe/form/SV_87gp0KdFeynaynY)



# Calling all Masters Athletes!

## Clinical Care of Masters Athletes: A Needs Assessment Survey

Researchers at the Fowler Kennedy Sports Medicine Clinic are performing a study to assess if your healthcare needs as Masters athletes are being met!



### ELIGIBLE PARTICIPANTS MUST

- ✓ BE AGED 35 AND UP
- ✓ BE PLANNING TO TRAIN OR COMPETE IN AN ATHLETIC COMPETITION
- ✓ BE ABLE TO READ AND WRITE IN ENGLISH



**TO COMPLETE OUR ANONYMOUS ONLINE SURVEY, SCAN THE QR CODE HERE!**

For more information, contact Princess Ulona, at  
| PI: Jane Thornton,



## **Clinical Care of Master Athletes: A Needs Assessment Survey**

### **ARE YOU A MASTERS ATHLETE?**

We are looking for athletes who are 35 years and older to take part in a study to help us understand how your sports medicine clinic and sports medicine clinicians provide care for you.

To participate you must meet these criteria:

**35 years or older**

**Be planning on training and/or competing in an athletic competition**

**Can read English**

Your participation involves completing a survey which will take 5-8 minutes of your time. You can do so by scanning the QR Code below!



Or by using this link below!

[https://uwo.eu.qualtrics.com/jfe/form/SV\\_87gp0KdFeynaynY](https://uwo.eu.qualtrics.com/jfe/form/SV_87gp0KdFeynaynY)

For more information about this study, or to volunteer for this study, please contact:

**Princess Ulona | Co-Investigator at [REDACTED] or**

**Jane Thornton | Principal Investigator at**

**[REDACTED]**  
Version 2 Date: 21/April /2023

## Email Script for Recruitment

### **Subject Line: Reminder for your upcoming appointment**

Hello,

This is a reminder that you have an appointment at our clinic: @apptDate at @apptTime located at Western University – 3M Centre. Please arrive 10 minutes prior to your appointment with appropriate clothing based on your injury (shorts for lower body injuries: tank top/short sleeve for upper body injuries).

Mask wearing is currently optional. If you are experiencing symptoms of illness including new or worsening sore throat, new or worsening cough, shortness of breath or difficulty breathing, temperature equal to or more than 38°C, feeling feverish, chills, fatigue or weakness, muscle or body aches, please call to re-book your appointment. If you are recovering from any symptoms or illness, we strongly recommend wearing a mask. Our staff may be wearing a mask for their protection and yours. Please be respectful of everyone's choice

Please click on the link below to confirm your appointment and complete your COVID screening: [weblink]

### IMPORTANT NOTE ABOUT CANCELLING YOUR APPOINTMENT

If you need to cancel your appointment, we request a minimum of 24 hours' notice. Please call 519-661-3011 to speak with one of our staff or after hours please leave a message, noting your: full name, date of birth, and the date/type of your appointment.

The clinic reserves the right to apply a fee for missed appointments and late cancellations. Note: This is an outgoing email only. Please do not reply to this email. If you have any questions or concerns, please contact the office in the usual manner.

RESEARCH OPPORTUNITY! Are you a Masters athlete? Masters athletes are individuals 35 and up that continuously train and engage in sport. If this sounds like you, you are invited to participate in our quick 5-8 minute survey to assess your perception on the healthcare you receive! To view the Letter of Information and Consent and access the survey, [[CLICK HERE](#)].

Thank you,

Lisa Beck

Administration and Education Coordinator

Fowler Kennedy Sport Medicine Clinic

Western University- 3M Centre

Email: [REDACTED]

## **Email Script for Recruitment Through Community Organizations**

### **Subject Line: Request to recruit participants- Online Survey!**

Hello,

I hope this email meets you well! I am writing this to let you know about the proposed research study that we wish to conduct through your organization. This prospective study is primarily a masters student project with Dr. Jane Thornton as the principal investigator (PI) and supervisor and Princess Ulona, masters student and co-investigator. To give some context, the objective of this study seeks to conduct a health needs assessment on all eligible masters athletes (MAs) locally to determine the characteristics of clinical care that they receive at the clinic and to identify the unmet health needs they may have under their current clinical care. Given the scope of this study, I believe this could be of great interest to your audience of older athletes.

MAs are individuals older than 35 years that continuously train for and participate in athletic competitions. As they are a relatively new but rapidly growing subset of athletes, they face many barriers to sport due to the age-related physiological changes that they experience which contribute to declines in performances and increases in the incidence of sports-related injuries. With this, it is unclear if sports medicine facilities have the adequate knowledge and understanding to meet their needs as aging athletes. There is a lack of studies that expand on the standardized clinical care that MAs receive and how their current care meets their needs which fuels the rationale of this study.

This study will be administering a 27-question anonymous survey hosted on Qualtrics that will take participants 5-8 minutes to complete. As part of our recruitment strategy, I would like to request your assistance in promoting this study to your audience as this would be an invaluable opportunity to reach a wider audience. More specifically, I would like to explore the possibility of sharing this proposed study on your website or newsletter if possible.

Please let me know if this is something that you would be interested in, and If so, what the next steps would be to make that happen. I would be happy to provide any additional information or materials that you may need to make a decision. Thank you for your consideration, and I look forward to hearing from you soon.

Kind Regards,

Princess Ulona, BKIN | She/Her/Hers  
MSc Student, Health and Rehabilitation Science  
University of Western Ontario  
1151 Richmond Street, London, ON N6A 3K7

## Appendix D: Survey

## Needs Assessment: Characteristics of Clinical Care that Masters Athlete Receive

*Demographic:* (Put an X on your answer)

1. What is your gender?
  - Man
  - Woman
  - Non-Binary/ third gender
  - Prefer not to state
  - Prefer to self-identify
  - \_\_\_\_\_
  
2. In what age range do you belong?
  - 35-45
  - 46- 65
  - 66- 80
  - 80+
  - Prefer not to state
  
3. What best describes the racial or cultural group(s) to which you belong (Please select all that apply)?
  - White
  - Black (of African descent)
  - South Asian (e.g. East Indian, Pakistani, Sir Lankan)
  - Southeast Asian (e.g. Vietnamese, Cambodian, Malaysian, Laotian)
  - West Asian (e.g. Iranian, Afghan)
  - Chinese
  - Latin American
  - Arab
  - Korean
  - Japanese
  - Filipino
  - Prefer not to state
  - Prefer to self-identify
  - \_\_\_\_\_
  
4. What is your marital status?
  - Single
  - Married
  - Common Law/ Domestic Partnership
  - Separated/Divorced
  - Widowed
  - Prefer not to state

5. What is the degree/ level of education you have completed
- Some high school
  - High school Diploma
  - College Diploma
  - Bachelor's degree
  - Graduate Degree
  - Trade School
  - Prefer not to state
6. How long have you participated in sports/athletic competition (years)?
- 
7. What sport do you mainly participate in?
- 
8. On average, how many hours per
9. week do you train for your sport?
- 
10. How many competitive events outside of training sessions have you participated in the last 2 years?
- a. None
  - b. 1-2
  - c. 3-5
  - d. 6-8
  - e. Other
- 
11. Do you train with a trainer/ coach?
- a. Yes
  - b. No
  - c. Not Sure
12. If yes, are they specialized in training for older athletes?
- a. Yes
  - b. No
  - c. Not Sure
13. Do you think that training resources (equipment, facilities, coaching personnel, medical help) are readily accessible to you?
- a. Yes
  - b. No
  - c. Not sure
14. If No, why do you think so? Why might you think that resources such as equipment, training facilities coaching personnel, or medical help, are not readily available? (Display logic if "No")
- 
15. Have you ever experienced injury related to your sport within the last 2 years?
- a. Yes

- b. No
16. If yes what type of injury experience
- a. Recurring/multiple injuries
  - b. Broken or fractured bones
  - c. Sprain or strain
  - d. Cut or puncture
  - e. Scrape or bruise
  - f. Concussion
  - g. Ongoing pain
  - h. Other: \_\_\_\_\_

17. Below are characteristics of care that your health care provider may provide to you as an athlete.

Please indicate if the characteristic of care was provided, and if yes, your level of satisfaction with that care from your health care provider:

*Using skip logic, if survey respondents answer “Yes” to any of the items below, they will be asked “How satisfied were you with the care received?” and will respond using a 5-point Likert scale (unsatisfied, somewhat unsatisfied, neutral, somewhat satisfied, satisfied)*

#### Before Participating in Athletic Competitions

My health care provider:

- a) Conducts a comprehensive health history and medical examination to assess your ability to participate in your chosen sport.
  - a. Yes
  - b. No
  - c. Not Sure
- b) Assesses your current physical activity participation
  - a. Yes
  - b. No
  - c. Not Sure
- c) Collaborates with you to discuss risks and health recommendations based on your desired exercise intensity and volume.
  - a. Yes
  - b. No
  - c. Not Sure

## Medical Monitoring

My health care provider:

- a) Conducts health screening assessments to ensure continued safe participation if requested.
  - a. Yes
  - b. No
  - c. Not Sure
- b) Monitor indicators of risk factors for specific issues commonly seen in masters athletes (e.g. Cardiovascular diseases, Osteoarthritis).
  - a. Yes
  - b. No
  - c. Not Sure

## Injury Management

My health care provider:

- a) Provides timely assessment of acute injury.
  - a. Yes
  - b. No
  - c. Not Sure
- b) Prescribes appropriate treatment which may include exercise, therapeutic modalities and functional activities specific to your injury and medical history.
  - a. Yes
  - b. No
  - c. Not Sure
- c) Promotes injury management with the goal of you safely returning to play.
  - a. Yes
  - b. No
  - c. Not Sure
- d) Discusses solutions that can minimize the risk of re-injury as you continue to train.
  - a. Yes
  - b. No
  - c. Not Sure
- e) Treats your injuries to meet your needs.
  - a. Yes
  - b. No
  - c. Not Sure



Unsatisfied	Somewhat Unsatisfied	Neutral	Somewhat Satisfied	Satisfied

18. Based on your experiences, how often do your healthcare providers:

Have adequate knowledge of about the issues you present specific to being a MAs.	Never	Not often	Enough	Somewhat often	Often	N/A
Share information about resources that can aid in injury prevention and injury management.	Never	Not often	Enough	Somewhat often	Often	N/A
Refer you to other allied healthcare professionals (ex. Specialist physician (e.g., orthopaedic surgeon), chiropractor, physiotherapist, massage therapists) as appropriate	Never	Not often	Enough	Somewhat often	Often	N/A

19. When coming to a healthcare professional with your sport-related injury/injuries, what is the most common advice you receive?

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20. Are the injury prevention strategies in place for you as an athlete sufficient? Why or why not?

21. Do you believe the treatments prescribed are meeting your needs? Why or why not?

22. What are some experiences that you have had (positive or negative) at your sports medicine facility that you think impacted your ability to train and compete as an athlete?

23. What are some changes you would like to see in quality of clinical care, coaching and training resources that are available to you to continue to support you as an athlete?

## Appendix E: Conducting Needs Assessments: A Guide

### 1. *What is a Health Needs Assessment?*

A health needs assessment is an iterative systematic tool used to gather information about a **target population** and the issues they face (Michener Institute of Education, 2018; Quality Improvement and Innovation Partnership, 2009; Watkins et al., 1998). This process provides an effective way for primary health-care providers, service managers, and planners to assess the needs of a population with meaningful data that can act as a basis for future programs and interventions and optimize the clinical characteristics of their care (Quality Improvement and Innovation Partnership, 2009). This includes identifying gaps in target populations knowledge, skills, performance, and health outcomes (Steven & Gilliam, 1998). What differentiates a health needs assessment from other qualitative research methods is that it is specifically designed to *identify* and *prioritize* needs (Quality Improvement and Innovation Partnership, 2009; Watkins et al., 1998). This process analyzes current practices and performance and compares it to what is desired by the population in any given institution to gain an understanding of the gaps that need to be addressed (Lockyer, 2012; Quality Improvement and Innovation Partnership, 2009). Identifying the most essential and reparable care practices optimize the management of resources and time therefore improving the health outcomes of its beneficiaries (Quality Improvement and Innovation Partnership, 2009). Its main purpose is to improve the health outcomes of the target population by gathering information about their perceived needs and unperceived needs which can be used to develop future interventions and actions plans (Lockyer, 2012; Quality Improvement and Innovation Partnership, 2009; Watkins et al., 1998).

### 2. *Who would benefit from a Health Needs Assessment and Key things to Keep in Mind*

Steven & Gilliam (1998) described four categories of people that benefit from the efficient reallocation of resources:

- Individuals who do not receive beneficial healthcare interventions
- Individuals who receive **ineffective healthcare**
- Individuals who receive **inefficient healthcare**
- Individuals who receive **inappropriate healthcare**

Changes in health outcomes occur “within the context of finite resources”; this means that with the rising cost of health care and the limited resources available, needs assessments are essential in determining where to allocate resources to prevent inequitable access to appropriate healthcare (Stevens & Gilliam, 1998; Wright et al., 1998).

As the allocation of resources is the driving force for beneficial health gains and improved healthcare outcomes of the target population, a health needs assessments must be constructed in such a way that can accurately gather to identify and prioritize needs with key things in mind (Stevens & Gilliam, 1998). First, the individuals being assessed must be an accurate representation of the target population (Gilliam & Murray, 1998; Stevens & Gilliam, 1998). Secondly, a health needs assessment can still be effective regardless of whether unmet needs were found or there are no beneficial health gains to be had (Gilliam & Murray, 1998; Stevens & Gilliam, 1998). Finally, beneficial health gains can encompass all stages of health care beyond treatment such as prevention,

diagnosis, continuing care, rehabilitation, and palliative care and include families and caregivers of the target population (Gilliam & Murray, 1998; Steven & Gilliam, 1998).

3. *When to do a Health Needs Assessment*

A health needs assessment is performed when there is an implicit assumption that there are a series of unmet needs among a particular population that must be prioritized and addressed in current healthcare practices (Michener Institute of Education, 2018; Quality Improvement and Innovation Partnership, 2009). This includes identifying the target populations **perceived or unperceived needs** (Michener Institute of Education, 2018) and can be performed at all levels of health care and by any primary healthcare provider, as stated earlier (Quality Improvement and Innovation Partnership, 2009). When the common clinical guidelines and tools that are typically referred to no longer fit its intended population, a health needs assessment is implemented to keep up with an institution or community's evolving needs (Quality Improvement and Innovation Partnership, 2009). A health needs assessment can also be used to gather information about a population about which little is known (Wright et al., 1998). This data can inform decisions concerning how to improve health outcomes and provide the quality care to necessary parties that might otherwise be overlooked (Wright et al., 1998). Finally, it can also be administered for applications that requires the documentation of needs, such as those directly influencing public health and policy priorities (Berkowirz & Nagy, n.d; Wright et al., 1998). This ensures that funding is secured for the allocation and **supply** of resources (Berkowirz & Nagy, n.d; Wright et al., 1998).

4. *Who can Conduct a Health Needs Assessment*

Depending on the approach, a health needs assessment can be carried out by any primary health care team (Quality Improvement and Innovation Partnership, 2009; Wright, 1998) Because 70% of patients come in contact with at least one health care provider annually, health care providers are ideal individuals for carrying out a health needs assessment (Gilliam & Murray, 1998). These assessments can also be performed by hospital administration staffs, health authorities, service management, and the government (Quality Improvement and Innovation Partnership, 2009; Wright et al., 1998). Given the overlap with qualitative methods, health promotion researchers can also administer health needs assessments (Gilliam, 1992; Stevens & Gilliam, 1998). Depending on the administrator and their expertise, the purpose and desired outcomes of a health needs assessment will differ (Quality Improvement and Innovation Partnership, 2009).

5. *Theoretical Framework*

***Witkin's Three Phases of Needs Assessment (1984, 2010; Altschuld & Kumar, 2010)***

Witkin's three-phase model provides a framework that guides the administrator to advance from one level to the next while gathering the necessary information. These phases are: 1.) *Pre-assessment* 2.) *Assessment* 3.) *Post-assessment*.

*Pre-Assessment*

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In the first phase, the administrators must determine the feasibility of the needs assessment. This includes identifying if there are need(s) that must be further researched in an institution or community. Additionally, an in-depth review of the literature and existing information sources should be conducted to identify what is known, what needs to be cross-examined, and what gaps warrant further exploration. Establish a research question.

#### *Assessment*

The second phase involves collecting data from the target population. To do so, the administrator must determine what methodology, this is where the methodology for a needs assessment is chosen and implemented depending on the research question that was established during the pre-assessment. Common methods include surveys/questionnaires, focus groups, and interviews. These methods collect data that can be analyzed to identify what unmet needs should be prioritized in the target population.

#### *Post-Assessment*

The final phase synthesizes the literature review from the pre-assessment and the data collected during the assessment phases. Insights drawn from these data can facilitate subsequent decision-making. Additionally, action plan determinations such as benchmarking, the prioritization of needs, assessment evaluations, and potential solutions are developed during this phase. If further information is needed, the administrator can return to the assessment phase to gather additional data.

#### ***Kirkpatrick's Four Level Training Evaluation Approach (1959, 1996)***

This theoretical framework was conceptualized by Kirkpatrick in 1959. This model is often used as a basis for the evaluation of interventions (Watkins et al., 2014). It evaluates the outcomes of an intervention or assessment to determine its effectiveness. This is often done through the comparison of prior practices with current results. Watkins et al. (2014) discussed how this comparative approach can be applied when performing needs assessments as it provides a method to compare the results of the assessment to prioritize needs, comparing current practices with previous me practices before the needs assessment. This is a framework that can be utilized in Phase 3 of Witkins Three Phase Model for Needs Assessments. Although needs assessment differs in the fact that it seeks to identify and prioritize needs, they overlap in its comparative approach that compares past practices.

The 4 levels are as follows:

**Reaction:** How did the participants react to the intervention/training? Did they believe it was needed?

**Learning:** What did the participants learn or understand during the intervention/training?

**Behaviours:** What were the changes in behaviour in the individuals that were involved with these training/interventions?

**Result:** Were there beneficial outcomes of the intervention/training? Were they both effective and cost-effective?

#### 6. *Different Approaches to Health Needs Assessment*

There are 4 main approaches that one can take to inform the development and administration of a health needs assessment (Gilliam, 1992; Gilliam & Murray, 1998; Stevens & Gilliam, 1998; Wright, 1998):

Table 1. Different Needs Assessment Approaches

<b>Needs Assessment Approach</b>	
<b>Practice Based Approach</b>	This approach involves primary healthcare teams gathering data from existing registries and health records across different practices to build a profile of a community and its health needs. Using this information, the healthcare teams can respond more effectively to the identified health needs.
<b>Comparative Approach</b>	This approach compares the effectiveness and efficiency of services received by the target population with those received in other areas. This provides an opportunity for the improvement of high-quality primary care by informing current standards of care with data gathered from the assessment of health needs.
<b>Patient Centered Approach</b>	This approach is used to explore the target populations' perception of their priorities regarding health-related behaviours. For example, it could explore why some patients are more willing to adopt healthier lifestyles than others and what primary healthcare providers can do to encourage these changes.
<b>Epidemiological Approach</b>	Also known as the cost-centered approach, this approach assesses health needs to determine what services are effective and for whom. Understanding this identifies how cost-effective interventions are and summarizes the services currently in place to address health needs.

#### 7. *Potential Challenges*

Conducting a health needs assessment can be a challenge, as there are many components that must be aligned to guarantee a smooth and timely process. First, this process can only be performed for existing healthcare services, as it involves comparing desired healthcare with what is currently in place (Quality Improvement and Innovation Partnership, 2009). Therefore, if the subject matter that you seek to investigate is not already in use in general healthcare practices a needs assessment may not be the right investigative tool. Additionally, you may face challenges when recruiting individuals for your needs



assessment team, as many healthcare professionals are too busy to commit to this process. Other challenges include procuring the funds and the time to conduct the needs assessment. If there are not enough resources, it may hinder the ability to recruit participants due to lack of incentives, secure the arrangements necessary to proceed with the assessment, and compensate the health care team. Finally, and most importantly, if it cannot be used effectively in the planning process of future interventions, the assessment becomes redundant; the information must be relevant to the necessary practices and actionable change (Quality Improvement and Innovation Partnership, 2009).

#### 8. *How to do a Health Needs Assessment*

As recommended by Steven & Gilliam (1998), a health needs assessment must be administered with the goal of improving the health outcomes of the target population. Broadly, this is done by 1.) Identifying the **needs** of the target population 2.) Determining the **strategies** and **interventions** that can efficiently and cost-effectively address these needs and 3.) Allocate the **resources** and **supplies** for the determined interventions (Stevens & Gilliam, 1998; Murray & Gilliam, 1998; Quality Improvement and Innovation Partnership, 2009). This is as shown in Figure 1.

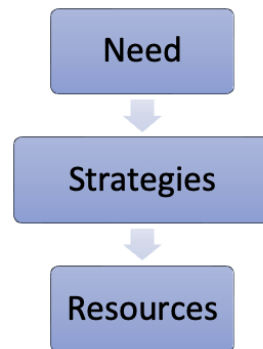


Figure 1: Main process of improving health outcomes.

This three-step process will guide the development and administration of a health needs assessment. This guide is informed by Witkin et al. (DATE)'s Three Phases of Needs Assessment, Sharma et al., (2000)'s "Community Assessment Guide", and the Office of Migrant "Comprehensive Needs Assessment" (2001).

#### **Phase 1: Pre-assessment**

Before beginning, the purpose of your needs assessment must be well-defined and **specific** (Community Assessment Guide, 2000; Comprehensive Needs Assessment, 2001). Establishing the purpose of your needs assessment will give you an understanding of the **time**, and **resources**, and **personnel** required (Quality Improvement and Innovation Partnership, 2009). This also involves determining the **period of time** available. If you are facing a constrained timeline, this will influence your available

strategies in Phase 2. Additionally, you must consider how many people on your health care team are available to perform various tasks and identify the resources readily available to your team (Berkowitz & Nagy, n.d; Lockyer, 2012; O'Donnell, 2022). Once that is done, you can establish what your research question(s) is/are, what health needs outcome warrants further investigation, and these outcomes are important, and what your goals are. Next, research your target population and elaborate as to why you are choosing them (Berkowitz & Nagy, n.d; Lockyer, 2012; O'Donnell, 2022). After answering these preliminary questions, your needs assessment team can proceed to doing an in-depth literature review. This is where you categorize what is known about your research question, what is unknown, and the gaps that need to be addressed to potentially benefit your target population. During this process, you should ask yourself whether this population has the capacity to benefit.

Table 2. Pre-Assessment Checklist

### Phase 2: Assessment

Once your needs assessment team has identified a gap in the literature that must be further investigated, the needs assessment can begin. As you choose your approach, keep in mind the needs and goals of potential stakeholders, including clients, organizations, and other individuals who will be receiving the results of the assessment. (Watkins et al., 1998)

#### *Choose your strategy*

Depending on your purpose and goals, there are three main strategies that can be used to conduct a health needs assessment:

- 1.) Surveys/ Questionnaires,
- 2.) Interviews
- 3.) Focus Group.

Each strategy can be used in conjunction with existing primary data, such as literature reviews, health records of the participants, and informal/formal meetings with their primary caregivers (ex. Health records, databases, or clinical guidelines) (CITE). Table 3 provides additional details concerning the different strategies available.

+ Table 3: Health Needs Assessment Strategies

Strategies	What is it?	How to use?
Survey/Questionnaires	<ul style="list-style-type: none"> <li>• A quick, reliable, and inexpensive method that can assess the needs of a target group or organization.</li> <li>• Can assess perceived and unperceived needs.</li> <li>• Can be used when there is limited time,</li> </ul>	<ul style="list-style-type: none"> <li>• Keep your surveys short (they should take no more than 5-10 minutes to finish)</li> <li>• Decide your sample population and how you are going to access them.</li> <li>• Create questions with your objectives and goals in mind.</li> <li>• Decide on the formatting that will answer the questions the best (multiple choice, yes/no, written answers).</li> <li>• Use clear, concise language (no scientific terminology).</li> </ul>



<p><b>Interviews</b></p>	<p>resources, and manpower.</p> <ul style="list-style-type: none"> <li>Used when gathering information from a large sample size.</li> <li>Allows the assessor to gather rich data about the target populations perceived needs.</li> <li>Requires more time and resources available.</li> <li>Can be done in person, over the phone, and via zoom or other video conference options</li> </ul>	<ul style="list-style-type: none"> <li>If possible, consult a representative of your target population to determine if questions are appropriate.</li> <li>Usually best administered before treatment (while they are waiting).</li> <li>Additional resources are available in Appendix A.</li> <li>Identify key individuals that are able to express the needs of the target population for interview</li> <li>Create questions with your objectives and goals in mind</li> <li>Use clear, concise language (no scientific terminology).</li> <li>Ensure that client privacy and confidentiality are maintained.</li> <li>Additional resources are available in Appendix A</li> </ul>
<p><b>Focus Groups</b></p>	<ul style="list-style-type: none"> <li>Involves gathering a small group of participants that are representative of your target population to discuss their perceived needs</li> <li>The purpose is to not come to a conclusion but is used to get a wide range of perspective and opinions on a topic</li> </ul>	<ul style="list-style-type: none"> <li>Can have up to 5 focus group sessions with up to 6-10 participants. A session can go up to 2 hours.</li> <li>Each participant in your sample population must represent your target population</li> <li>There must be a facilitator that steers the discussion (someone on the needs assessment team), a note taker and an audio recorder</li> <li>Develop questions that prompt discussions that aid in the identification of needs.</li> <li>Ensure that client privacy and confidentiality are maintained.</li> <li>Additional resources are available in Appendix A</li> </ul>

### *Before Administration*

Before your health needs assessment is administered, decide where and how you are going to access your participants, ensuring that they are representative of the target population. This can be from one or more sources, depending on the time and resources available. Consider potential contacts or gatekeepers that you must approach to connection with your participants, as this will increase participant response rate (O'Donnell, 2022).

Once a connection is established, determine what method you will use to recruit participants. This could be in the form of flyers, emails, or through their healthcare provider. Draft a letter of information that can be used to precede your needs assessment that not only explains the purpose of your study and instructions on how to complete it accurately, but also expresses gratitude for their participation, outlining any compensation if provided. Finally, if possible, send your assessment to subject matter

experts as well as a sample representative of your target population to provide feedback - and aid in improving your assessments-accuracy and relevance in the context of your target audience. For example, when considering questions for a focus group, having a representative provide input can allow for the development of questions that delve into nuances in the community that may have not occurred to you or your team.

#### *After Administration*

Following this, collect and aggregate all responses from your chosen strategy. Thank your participants for their time and compensate them. If possible, get feedback from the participants for future reference.

#### **Phase 3: Post Assessment**

Information that is gathered in Phase 1 and Phase 2 can now be analysed to identify and prioritize the health needs of your target population. Decide how you will analyze the information you have just gathered, keeping in mind the intended clients and beneficiaries of this information. Your results must be summarized in ways that can be understood by your intended audience. For this reason, recruiting the right experts in your needs assessment team can be crucial to the analysis and reflection of your results (Watkins et al., 1998). It is recommended that Kirkpatrick's 4 Level Evaluation Approach (1996)

be used in this phase as a categorical method of organization, as it is easily understood by most practitioners (Watkins et al., 1998). For this purpose, Kirkpatrick's framework is modified to compare the current healthcare outcomes and desired future healthcare outcomes *before* an intervention is introduced. Normally this framework is often used to compare previous and future outcomes *after* an intervention is introduced; it will not be utilizing the 4 levels of evaluation. Based on your goals, specify the characteristics of health care that directly affect the health outcomes being evaluated and compare what is currently known in existing literature to what is now known based on your assessment. This model allows for the **identification** of gaps and needs in your target population.

With the gaps in healthcare and desired future outcomes established, the next step for your needs assessment team is to rank the **priorities** of needs. To decide where the need falls on the scale of priority, examine potential causes and effect of the health discrepancies. These potential causes can be composed of any barriers or malpractices that can lead to inappropriate, inefficient, and ineffective healthcare (Stevens & Gilliam, 1998). The outcomes reflect the consequences of these potential causes and how they negatively affect the health of your target population. The greater the influence of the outcomes the higher the priority of need is. Additionally, keep in mind the frequency and emphasis your participants expressed for each need in your assessment when classifying the priority.

With all the information organized, you can begin to interpret your findings. This is where you summarize and interpret what was discerned from your assessment in the form of a report or deliverable, making sure you accomplished the purpose of your assessment and the goals you established. You can present your information through a series of graphs, tables, or narratively (Berkowitz & Nagy, n.d; Lockyer, 2012; O'Donnell, 2022). If possible, receive feedback from representatives of your target population to ensure the results resonates with them and they feel involved in the process as it pertains to them.

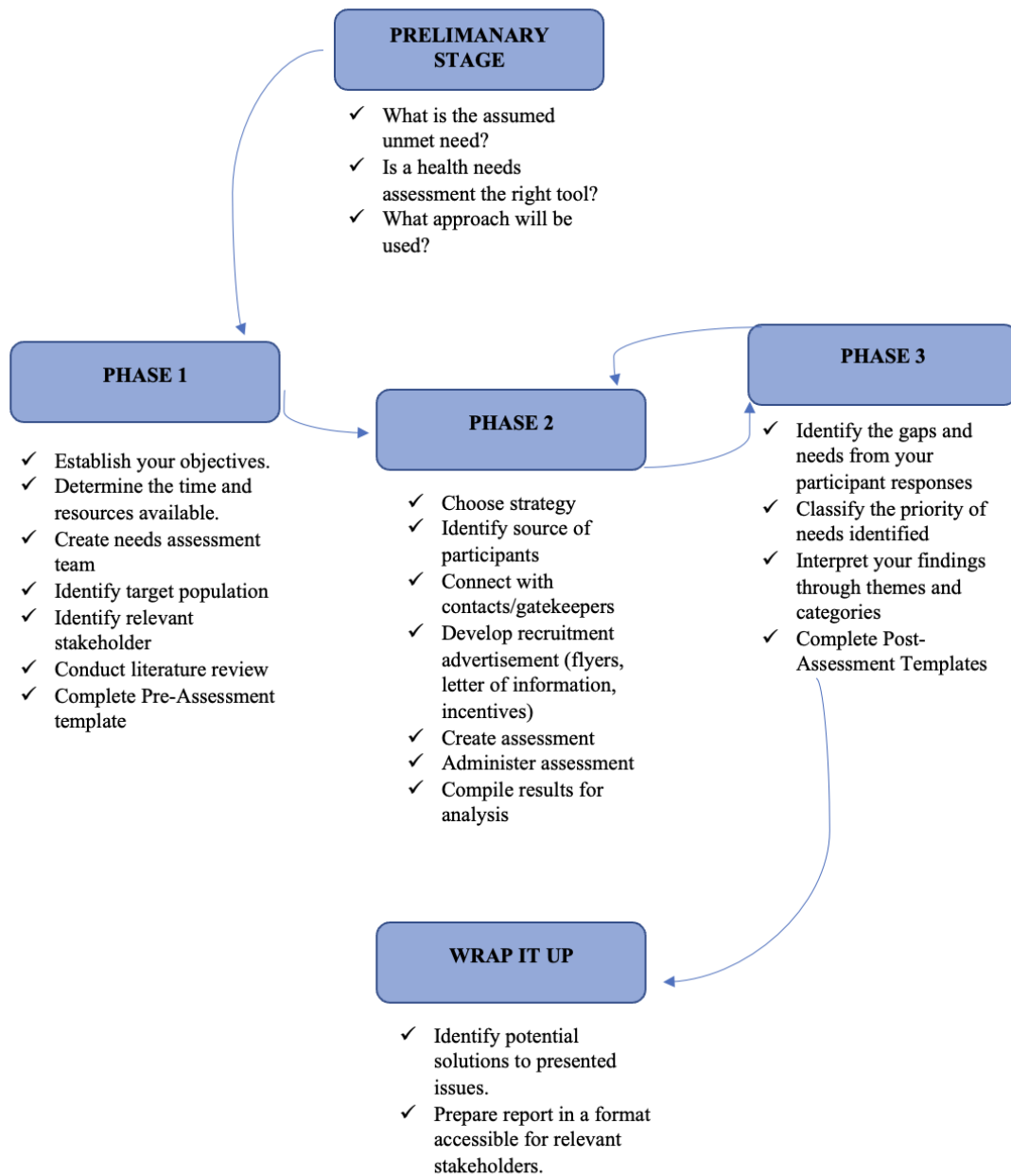
### *Wrapping it up*

The final step for this phase is to consider how you will use the information for future interventions. Identify potential solutions to presented issues that are both effective and cost-effective based on the data that you have summarized and analyzed, focusing on high priority needs. Prepare your report in a format accessible to relevant parties and decision makers so that they know how to allocate resources to your target population.

Your final report should have the following information:

- **Introduction:** Introduce the health problem (i.e., the purpose of your needs assessment) and why it is relevant. This is where you state your goals and what health outcomes you seek to improve.
- **Literature Review:** A brief outline of what is currently known in the existing literature. This will aid in the final comparative phase, which will demonstrate the differences in current care practices and desired future practices.
- **Methodology:** Outline each step that was taken throughout the needs assessment including the preliminary information gathering, all three phases, and the development of the final reports
- **Participant demographic:** Present the necessary information of the target population and how your participants are an accurate representation of them.
- **Summary:** Include an aggregate of your participants answers (survey, focus group or interview answers) through a series of themes and categories.
- **Prioritized Needs:** Present the needs that were expressed by your participants based on priority.
- **Proposed action plan:** Based on the information presented, propose a potential solution/ action plan that would warrant the allocation of resources to improve the health outcomes of your target population.

Figure 2: How to Conduct a Health Needs Assessment Summary



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