

THE FEMALE ATHLETE TRIAD

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ABSTRACT

The female athlete triad is a condition that is exhibited by many female athletes who experience stress fractures, osteopenia or osteoporosis and disordered eating. These three conditions are interconnected in pathophysiology thus in order to provide optimal treatment, they must be addressed with an interdisciplinary approach including physical and psychological health care providers. Team physicians, parents, coaches and athletes can all benefit from education about the signs, symptoms and risk factors for developing and preventing the female athlete triad. This paper discusses a clinical guideline published by the Journal of Medicine & Science in Sports & Exercise addressing the optimal care for female athletes. Due to the physiological differences between males and females, team physicians are suggested to provide gender specific care.

SECTION ONE

Many doctors and athletic trainers treat conditions such as amenorrhea, osteoporosis and low caloric intake as separate and isolated conditions, when they may be more optimally treated as the female athlete triad. When treating these conditions as isolated events, doctors lose sight of the big picture and may ignore the root cause. By addressing all of these problems at once, many potential sequelae will be avoided, leading to less health care expenses and fewer chronic conditions in adult women. In female athletes exhibiting symptoms of the female athletic triad, what is the benefit of providing nutritional education and referrals to sports therapists to potentially reduce complications related to disordered eating, menstrual dysfunction, and osteopenia/osteoporosis?

Title IX was created in 1972 in an attempt to create equal opportunities for female and male athletes, which allowed a one thousand percent increase of female participation in athletics. Overall this change has provided incredible opportunities for females by increasing self-esteem while reducing drug abuse and teen pregnancy. As females gain the right to be treated equally to males, their unique physiological needs have been overlooked. Females' bodies function differently than males' and must be treated with these specific needs in mind. Females face pressure from Western society to conform to an ideal body image that can seldom be met without restrictive eating leading to less than necessary nutrients (Laframboise, Cameron, & Stern, 2013).

The population of interest in addressing this condition is young female athletes who would benefit from education about the care for their bodies in order to prevent chronic conditions such as osteoporosis. The three major disorders leading to the female athlete triad are decreased energy availability, menstrual dysfunction, and decreased bone mineral density. When athletes do not supply their bodies with enough nutrients to sustain their training, they experience a negative energy balance that leads to decreased athletic performance. Eumenorrhea is characterized by 12 menstrual cycles each year, contrasted by the absence of menstruation or menstruation up to every three months called amenorrhea. In order to promote eumenorrhea, females must eat about 45kcal/kg of free fat mass each day. Amenorrhea can be caused by intentional or unintentional limitation of calories. This loss of weight can cause deficient estrogen leading to inadequate bone mass. A decrease in bone mineral density causes osteopenia and osteoporosis, which places an individual at risk for bone breakages. Osteopenia is diagnosed by a bone mass density 1-2.5 standard deviations below the adult mean, while osteoporosis is more

than 2.5 standard deviations below the adult mean bone mass density. (Herring, Bergfeld, Boyajian-O'Neil, Duffey, Griffin, ... Putukian, 2003). As female athletes do not eat enough calories to support their active lifestyle, they begin to experience amenorrhea, and consequently low bone density, which increases the risk of stress fractures (Laframboise, Cameron, & Stern, 2013).

Female athletes may be pressured to alter their body weight for the purpose of enhancing their athletic performance. For this reason, referrals to sports therapists may be beneficial in influencing the athlete's self-perception. As discovered by Scoffier, Maiano, and d'Arripe-Longueville (2010); perceived athletic ability is a leading cause of disturbed eating attitudes. These patterns can ultimately negatively impact their future reproductive and bone health. Many of these athletes do not seek medical attention until they receive a stress fracture because they do not identify the absence of menses for three or more months as dangerous (Ducher, Turner, Kukulian, Pantano, Carlson, ... De Souza, 2011).

Athletes obtain specific character traits that may make them more susceptible to developing disordered eating. Many exhibit a determination to win at all costs and the desire to please controlling parents and coaches. The female athlete triad is most prevalent in sports with an emphasis on endurance, low body weight, prepubertal participation, weight categories, revealing or tight clothing, and subjective scoring. Those who come in contact with female athletes should be educated on the signs and symptoms of the female athlete triad in order to prevent the medical problems that can be caused by amenorrhea, osteoporosis and low caloric intake. (Laframboise, Cameron, & Stern, 2013).

Laframboise, Borody and Stern (2013) present a case series of four patients who presented with symptoms of the female athlete triad to chiropractors. The first patient was a 27 year-old female runner who was experiencing right-sided lateral ankle pain. There was no particular time of onset for the injury and she described sharp pain upon palpation. The radiographs showed she had a recent stress fracture, and was diagnosed with the female athlete triad because of this fracture in conjunction with her hypothalamic amenorrhea. She was sent to a nutritionist to increase her caloric intake. After three weeks, the injury showed improvement on the radiographs. Case two was a 27-year-old recreational athlete who had experienced 10 preceding fractures. She was diagnosed with the female athlete triad and provided with education to increase her caloric intake. The third case was a 23-year-old female who was a professional dancer experiencing left foot pain. She had suffered from previous stress fractures and was diagnosed with non-cognitive disordered eating which lead to her diagnosis of the female athlete triad. Case four was a 16-year-old national ice dancer with pain in her left ankle. She had not reached menarche and was consuming insubstantial calories. While she was referred for a physical examination to diagnose the female athlete triad, the chiropractor managed her left ankle pain (Laframboise, Cameron, & Stern, 2013).

Medicine and Science in the Sports and Exercise Journal produced a guideline in 2003 addressing the unique physiologic needs of female athletes. This guideline was created for team physicians and describes the gender-specific approaches that should be taken for specific conditions such as stress fractures, osteopenia and osteoporosis, disordered eating and selected menstrual dysfunction (Herring, Bergfeld, Boyajian-O'Neil, Duffey, Griffin, ... Putukian, 2003). Adopting these practices into the treatment provided by team physicians is necessary in providing the best care for female athletes.

SECTION TWO

Those who suffer from female athletes' triad frequently present to health care providers, often chiropractors, with musculoskeletal pain that cannot be properly treated without a multidisciplinary approach (Laframboise, Cameron, & Stern, 2013). By increasing awareness and education about the manifestations of the female athlete triad, more appropriate treatment and early interventions can be provided for these patients. Untreated and undiagnosed, the female athlete triad can lead to debilitating long-term sequelae that result in an increase of health care

bills for the patient. By taking the appropriate measures as the female athlete triad first presents, chronic illnesses can be prevented resulting in saving the United States in health care costs.

In one study, it is reported that orthopedic surgeons suspected eating disorders in 59% of their patients although only addressed this issue in 31% of their patients. Family physicians, who suspected eating disorders in 84% of their patients, reported having conversations with 80% of their patients. (Ducher, Turner, Kukulian, Pantano, Carlson,... De Souza, 2011). Doctors must be aware of the importance in addressing low caloric intake to decrease the prevalence of stress fractures, osteoporosis and amenorrhea in young female athletes. By addressing the root cause of bone deficiencies, female athlete may be able to avoid invasive treatment such as surgery.

The guideline produced by Herring et al. (2003), instructs team physicians in how to provide gender specific care for female athletes presenting with stress fractures, osteopenia and osteoporosis, disordered eating and menstrual dysfunction. In every condition specific section of this guideline the physician is advised to recognize the danger of potentially developing issues that can be identified during the pre-participation evaluation. This is a pivotal opportunity that can lead to the prevention of these illnesses before they intensify during active athletic participation. Physicians are strongly suggested to provide education for the female athlete, their parents, coaches, administrators and healthcare providers because of the multicausality related to these conditions and their signs, symptoms and risk factors. The team physician is advised to practice a regular screening program for the specific female athlete triad risk factors to promote early detection and prevention.

The onset of a stress fracture can be due to a single acute trauma, but can also be linked to chronic medical and psychosocial conditions. This guideline instructs physicians to be thorough in their evaluation of the cause of stress fractures. The individualized care for these patients must be coordinated with other disciplines in order to provide the best outcome for these female athletes. Some of the medical factors that may cause stress fractures are osteopenia and osteoporosis, menstrual dysfunction and inadequate caloric intake. If the female athlete triad is addressed and these issues are treated appropriately, the medical factors can be eliminated, therefore greatly reducing the occurrence of stress fractures. Physicians are instructed to identify underlying risk factors and understand the options for treatment, including operative and non-operative alternatives. It is imperative the team physician is aware of the multiple risk factors that cause stress fractures in order to treat current fractures and prevent future recurrences.

Osteopenia and osteoporosis do not only exist as long term complications experienced by older adults, but they are faced by young people lacking in bone mass. Bone mineral density is strongly dependent upon the bone mass that is accumulated before young adulthood. The two other conditions in the female athlete triad, low caloric intake and amenorrhea, are risk factors that can cause osteopenia and osteoporosis. While assessing at risk athletes, physicians are advised to inquire about menstrual status, nutritional intake and to measure bone mass density. In order to treat osteopenia and osteoporosis from a multidisciplinary perspective, the athlete may first have to restore eumenorrhea, balance activity and caloric intake and seek psychological therapy.

Athletes, who are at a higher risk for disordered eating than nonathletic females, should receive education and appropriate intervention from their team physician about the effects of low caloric intake on their athletic performance and bone mineral density in order to create a desire for a change in their behavior. Athletes have a strong desire to improve their performance, but are not aware of the detrimental effects of caloric restriction. Less than required nutritional intake may cause a decrease in bone density as seen in osteoporosis causing stress fractures. Because of the wide range of manifestations of eating disorders, health care providers must be vigilant to the subtle behaviors of a female athlete. Some of the motivations for female athletes that develop disordered eating are improving aesthetics and endurance. Physicians must be observant to the changes in mood related to low caloric intake due to their link with psychiatric problems such as depression, anxiety and suicide. Parents, coaches and health care providers must be aware of the female athletes' pressure to perform and coping skills related to

this. Early intervention related to the mental health discipline must be utilized in the treatment of disordered eating in order to ensure the best long-term outcomes and successes.

Athletes experience menstrual dysfunction two to three times more frequently than non-athletes and commonly do not seek treatment (Herring, et al., 2003). Menstrual dysfunction can range from menarche after 16 years old to absence of ovulation, to cycles longer than 35 days. As with all factors of the female athlete triad, menstrual dysfunction can depend on many factors such as body weight, psychosocial health, nutrition and activity. When the energy spent is greater than the energy available through caloric consumption, menstruation can be disturbed. Due to the disruption of menstruation, female athletes can experience insufficient estrogen and progesterone resulting in decreased bone mineral density, an increase risk for stress fractures and infertility. These consequences can be prevented by proper education, psychological referrals, early intervention and treatment. Team physicians are suggested to provide treatment including increasing caloric intake, decrease activity levels, supplementing hormones and referrals to psychotherapy.

SECTION THREE

The scope and purpose of the female athlete injury guideline produced by the *Medicine & Science in Sports & Exercise Journal* are very clearly described as aiding in providing education and treatment for female athletes. Because female athletes are susceptible to specific injuries related to their unique physiological makeup and activity level, it is the goal of this guideline to help team physicians to make gender specific care available for this demographic. The guideline describes in detail the specific conditions experienced most frequently by female athletes, such as anterior cruciate ligament injuries, patellofemoral joint injuries, shoulder conditions, stress fractures, osteopenia and osteoporosis, disordered eating, selected menstrual dysfunction, pregnancy and contraception. Each of these problems is addressed with specific consideration to the female athlete.

The characteristics and criteria of a female athlete are not specifically described in this guideline, but would be beneficial in applying this guideline to practice. Due to the wide variety of athletic participation, the guideline should more specifically describe the criteria necessary in order for the guideline to apply to an individual athlete. The guideline is also missing the age categories at which these interventions are most applicable. Because of the sections related to menstrual dysfunction, pregnancy and contraception, the guideline seems to apply to any premenopausal female athlete. More explicitly describing characteristics of a female athlete and providing age specifications would enable team physicians to more appropriately use this guideline to provide optimal specialized care.

The guideline contains insight and suggestions from individuals in many of the appropriate disciplines to ensure that the care is supported by evidence based practice in each specialty. The guideline was created through the collaboration of the American College of Sports Medicine, American Academy of Family Physicians, American Academy of Orthopedic Surgeons, American Medical Society for Sports Medicine, American Orthopedic Society for Sports Medicine, and American Osteopathic Academy of Sports Medicine. It is editorially independent from the funding body and any conflicts of interest to the guideline development members are not addressed. All these organizations have contributed to ensure that the team physician will provide optimal medical care for female athletes. The authors that were involved in the creation of this guideline were medical doctors and doctors of osteopathy. The benefit of including doctors of osteopathy is their specific training is focused on muscular and skeletal systems. A health area that is missing from this assembly of authors is a consult from the mental health discipline. Contribution from a mental health care provider is paramount especially in the care of athletes with disordered eating. Disordered eating cannot be addressed without treating many of the underlying conditions listed in the guideline such as low self-esteem, poor coping skills, perceived loss of control, perfectionism, obsessive compulsive traits, depression, anxiety and history of abuse. (Herring et al., 2003).

This guideline was published by the *Journal of Medicine & Science in Sports & Exercise*, which is appropriate to educate the population who will optimize the care given to sports teams. The target users of this guideline are team physicians, but it is also suggested for the education of athletes, coaches, parents, administrators and other health care providers who would potentially be in contact with female athletes. Educating the team physicians is the first step in providing accurate information to eventually spread to parents and athletes. The patients' views and preferences about the care of the female athlete triad have not been discussed in the document.

This guideline does not include any systemic methods for collecting data or evidence to support their suggestions. There is an extensive list of resources at the end of the guideline, which is organized according to the individual injuries discussed. Many of these resources are reviews of literature, evidence and clinical trials. The guideline does not include any information about experts conducting external reviews before publishing. No procedures for updating the guideline have been included. The plans for providing optimal care for female athletes are clear and well organized. Each injury protocol has a reader friendly lay out with headlines such as epidemiology, physiology, pathophysiology, evaluation, treatment, and prevention; ensuring the team physician or athlete has a deeper understanding of the illness. The recommendations are specific to the injury that the individual is experiencing and allow the physician to specialize care. Many of the interventions overlap because of the interconnected nature of osteoporosis, stress fractures and decreased caloric intake.

The guideline does not provide supporting tools for application of the interventions and is lacking the suggestions for incorporating these interventions into daily practice. The authors did not address the organizational barriers that may be faced when applying the guideline. There is no discussion related to the potential cost implications that make it difficult for the team physician to provide this optimal care. Once interventions have been applied, the key review criteria for monitoring the female athlete is not laid out so that physicians can follow up on their care ensuring it is preventing future complications.

This guideline should be recommended for use in practice with some provisions and alternations. The most significant area in which this guideline is lacking is the domain of methodology and the systematic research that defends their suggested interventions. The plan of care would be enhanced by including criteria that was used for selecting the evidence supporting their suggestions to team physicians. By conducting studies, these authors can describe the benefits, side effects and risks to applying this care for patients. The process of external review is important for guidelines to defend the validity and demonstrate the importance of their suggested procedures used in caring for female athletes. Another major weakness that this guideline exhibits is the lack of applicable instructions on how to begin treating female athletes by these recommended standards. Once the team physician reads this guideline and desires to adapt the suggested interventions as part of the care regimen, there are no clear and concise next steps for applying these methods. The authors do not address the potential barriers that may be faced when adapting care, such as financial, and resource obstacles. This guideline should include realistic steps by which to apply optimal medical care before recommending it for practice.

SECTION FOUR

Female athletes will benefit from the enhanced awareness of their nurses to this prevalent diagnosis by lowering family health care costs and returning to optimal athletic participation more rapidly. These athletes will avoid seeing a wide range of doctors that give numerous diagnoses, and will be spared the frustration this causes. Awareness of physical and psychosocial factors that are addressed in the guideline especially related to disordered eating, will bring appropriate care and early intervention for psychiatric components. As Scoffier, Maiano, and d'Arripe-Longueville (2010) discussed, the quality of relationships greatly impacts the development of eating disorders). By providing optimal care, female athletes may receive therapeutic interventions for these potentially harmful relationships, providing benefits not only for physical illnesses but also psychosocial conditions.

The implementation of this guideline and providing further education for health care workers would impact nursing care by ensuring female athletes with more appropriate diagnosing and treatment. Due to the interconnected nature of osteoporosis, disordered eating, and amenorrhea, treatment can be optimized when all three conditions are managed according to the most recent evidenced based practice. Nurses will be equipped to advocate for patient care and suggest appropriate tests and imaging in order to determine the severity of injuries and more appropriately protect the patient from returning to athletics prematurely. The familiarity and use of imaging techniques, such as standard x-ray and magnetic resonance imaging (MRI), is essential in diagnosing and treating these ailments. As researched by Nattiv, Kennedy, Barrack, Abdelkerim, Goolsby, ... Seeger (2013), the appropriate imaging equipment and knowledge of specific risk factors such as nutrition and menstrual factors, are necessary in the recovery of bone stress injuries in athletes. It is the role of the nurse to have the most accurate and recent knowledge on these imaging and screening techniques to advocate for the best possible outcomes for their patients.

Most nurses will come in contact with female athletes in an outpatient setting when they receive their pre-participation evaluation. Nurses are instrumental in providing education to their parents about the signs, symptoms and risk factors to be vigilant for in their daughters as they begin or continue in their athletic career. By providing this education prior to participation in athletics, many of the risk factors related to developing the female athlete triad can be prevented with early interventions. Nurses may see female athletes in a surgery facility where they received surgical treatment for an athletic injury. An inpatient setting is also instrumental in encouraging females to enhance their nutritional status and receive psychological interventions when appropriate prior to resuming athletic participation.

REFERENCES

Ducher, G., Turner, A. I., Kukulian, S., Pantano, K. J., Carlson, J. L., Williams, N. I., & De Souza, M. (2011). Obstacles in the optimization of bone health outcomes in the female athlete triad. *Sports Medicine*, 41(7), 587-607. Retrieved from <http://ezproxy.tcnj.edu:2189/Direct.asp?AccessToken=6V2LLL989H99OOLFHJ2CH3CKM2XO8CCCL&Show=Object>

Herring, A. S., Bergfeld, J. A., Boyajian-O'Neil, L. A., Duffey, T., Griffin, L. Y., Hannafin, J. A., Indelicato, P., Joy, E. A., Kbler, W. B., Lebrun, C. M., Pallay, R., & Putukian, M. (2003). Female athlete issues for the team physician: a consensus statement [corrected] [published erratum appears in MED SCI SPORTS EXERC 2003 Dec;35(12):2122]. *Medicine & Science in Sports & Exercise*, 35(10), 1785 - 1793..

Laframboise, M.A., Cameron, B., & Stern, P. (2013). The female athlete triad: a case series and narrative overview. *National Center for Biotechnology Information*, 57(4): 316-326. *The Journal of the Canadian Chiropractic Association*, Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3845471/>

Nattiv, A., Kennedy, G., Barrack, M. T., Abdelkerim, A., Goolsby, M. A., Arends, J. C., & Seeger, L. L. (2013). Correlation of MRI grading of bone stress injuries with clinical risk factors and return to play: A 5-year prospective study in collegiate track and field athletes. *American Journal of Sports Medicine*, 41(8), 1930-1941. doi:10.1177/0363546513490645

Scoffier, S., Maïano, C., & d'Arripe-Longueville, F. (2010). The effects of social relationships and acceptance on disturbed eating attitudes in elite adolescent female athletes: the mediating role of physical self-perceptions. *International Journal of Eating Disorders*, 43(1), 65-71. doi:10.1002/eat.20597