Menstrual Dysfunction Screening and Management for Active Females

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Jacalyn J. Robert-McComb and Jennifer J. Mitchell

Abstract

There is a wide spectrum of attitudes among women concerning her menstrual cycle. Most athletes would prefer to not have to deal with the associated hygiene issues. This sets the stage for feeling that lack of menses (amenorrhea) is a good thing. Unfortunately, that is not necessarily the case. The menstrual cycle can be considered a vital sign related to the athlete's overall health. Those athletes not having regular menses are likely exhibiting functional hypothalamic amenorrhea (FHA), a diagnosis of exclusion. This is one component of the female athlete triad. The FHA comes from inadequate energy availability and resultant diminished sex hormones. This also causes changes in bone health and puts the athlete at risk for stress fractures, suboptimal peak bone mass density, and future osteoporosis. Through education of female athletes and those in her circle of influence, it is possible to allow realization that amenorrhea is a medical issue and needs further attention. Determination of optimal screening for this condition has yet to be accomplished, but this chapter describes who should be screened and provides examples of questionnaires, which may be useful in sorting out an athlete's needs. Management can be as simple as improving the athlete's nutrition and/or decreasing her exercise intensity, but it can often be difficult to convince the athlete and her coaches of these steps.

Keywords

Amenorrhea • Menstrual dysfunction • Oligomenorrhea • Functional hypothalamic amenorrhea

J.J. Robert-McComb, Ph.D., FACSM, ACSM P.D. (✉)
Department of Health, Exercise, and Sports Sciences, Lubbock, TX, USA
e-mail: jacalyn.mccomb@ttu.edu

J.J. Mitchell, M.D., F.A.A.F.P.
Department of Family and Community Medicine, Texas Tech University Health Sciences Center School of Medicine, Lubbock, TX, USA
e-mail: jennifer.mitchell@ttuhsc.edu

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8.1 Learning Objectives

Upon completion of reading this chapter, the reader will:

1. Understand the importance of screening for menstrual dysfunction in the active female
2. Be able to describe how insufficient energy availability can impact menstrual function and bone health
3. Be able to list groups of athletes in whom screening for menstrual dysfunction is essential
4. Have a resource of potential screening questions for menstrual dysfunction
5. Understand the first step in management of functional hypothalamic amenorrhea in an athlete to increase energy intake and to improve overall energy availability, in order to restore cyclic menstruation

8.2 Introduction

Screening for menstrual disorders in athletes is more complex that it appears to be. Historically, the simple question was whether the individual is having normal menstrual cycles or periods. If yes, then that was the end of screening. If no, the athlete was referred to the physician. With improved understanding of the female athlete triad and the components involved, screening has become more complex. In addition to menstrual status, those responsible for the health of the female athlete must also evaluate the other two components of the triad; whether the athlete has optimal energy availability, or may have indications of disordered eating or a pathologic eating disorder, and the athlete's bone health. Evaluation of one component of the female athlete triad should not occur in isolation from the other two components.

Terms that are used in this chapter, when discussing menstrual screening or the routine screening of adolescent females by their primary health care provider, include the following: primary amenorrhea, secondary amenorrhea, and functional hypothalamic amenorrhea (FHA). Even though these terms have been described in previous chapters, we will briefly define these terms so that you can more fully understand the recommendations in this chapter.

Amenorrhea is the absence of menstruation or a woman's monthly period. Primary amenorrhea is when a girl has not yet started her monthly periods by age 15 and she has gone through other normal changes that occur during puberty. Secondary amenorrhea occurs when a woman who has been having normal menstrual cycles stops getting her periods for 6 or more months (some sources state 3 months, although 6 months is more common). Note, however, that women who are pregnant, breastfeeding, or in menopause are not considered to have secondary amenorrhea. Functional hypothalamic amenorrhea (FHA) is a reversible form of gonadotropin-releasing hormone (GnRH) deficiency commonly triggered by stressors such as excessive exercise, nutritional deficits, or psychological distress.

The Office on Women's Health, Department of Health and Human Services, suggests that the following physical and behavioral/emotional characteristics as listed in Table 8.1 be used during the routine screening of adolescent and preadolescent patients by their primary care provider for the detection of issues related to the triad.

As will be discussed in Chap. 13, there is not yet an agreed upon optimal timing or method of screening for female athlete triad disorders. An energy deficit in a female athlete may cause a spectrum of menstrual dysfunction, either subtle or obvious, which may then have an impact on bone health. This leads to the realization that a comprehensive menstrual history may be needed in all athletes.

8.3 Research Findings

8.3.1 Why Screen for Menstrual Dysfunction

It is important to screen female athletes for menstrual disorders since a normal menstrual cycle is a key vital sign to one's health. An individual, depending on her level of education and maturity, may not recognize an abnormality in the menstrual cycle. Young girls, just reaching maturity, may look

Table 8.1 A primary care provider reference tool for screening female adolescent and preadolescent patients

Physical behavioral/emotional	
• Primary or secondary amenorrhea	• Recurrent or excessive dieting when not overweight
• Weight loss greater than 10 %	• Eating in secret
• Failure to gain expected weight during the adolescent growth spurt	• Eating large quantities of food in a short period of time
• Overweight	• Excessive concerns about perceived body image that are incongruous with actual weight
• Lanugo hair	• Compulsive or overly rigid exercising
• Hypothermia	• Depression
• Dry hair or skin, dehydration	• Use of self-inducted vomiting, laxatives, starvation, diuretics, or other extreme measures to lose weight
• Weight fluctuation in a short period of time	
• Bloating and abdominal discomfort	
• Damaged teeth	
• Enlargement of lymph or salivary glands	

Source: From Office on Women's Health. Screening for Eating Disorders-Tips for Health Care Providers

upon discussion of menstruation and sexuality as taboo. Others may view amenorrhea as a positive benefit of not having to deal with monthly hygiene issues [1].

An athlete with a menstrual disorder may be manifesting one or more components of the female athlete triad. It now appears that low energy availability is the key factor involved in the triad that then leads to menstrual dysfunction and issues with skeletal health [2]. When the deficit is extreme, the body attempts to reduce the deficit by suppressing physiologic functions essential for growth, development, and health [3].

Energy availability is the amount of energy remaining once exercise energy expenditure is subtracted from energy intake (EA=EI-EEE). It is the amount of energy remaining for all other metabolic processes [4].

The longer a menstrual abnormality is allowed to go on untreated, the greater the long-term consequences [5]. Also, athletes who begin sport-specific training before menarche have been shown to have significantly later menarche [6]. This may have implications related to both reproductive and skeletal health. Prevention and early detection of female athlete triad disorders are of utmost importance for the health of young female athletes [6, 7].

8.3.2 Who Should Be Screened for Menstrual Dysfunction

The main populations to screen include the following groups [1, 8–10]:

1. Adolescents involved in vigorous exercise with primary amenorrhea:
   (a) Normal secondary sexual development but no menarche by 15 years old
   (b) No menarche within 5 years after breast development that occurred less than 10 years old
   (c) Failure of the thelarche (breast development) by 13 years old
2. Athletes with previously regular cycles, at any age, with secondary amenorrhea or the lack of menses for 3 continuous cycles after beginning menses are good candidates for screening.
3. Athletes with oligomenorrhea, less than 9 cycles per year, are candidates for screening.
4. An intensively exercising, reproductively mature woman interested in conception is a viable candidate for screening.

8.3.3 Types of Menstrual Dysfunction

Aside from pregnancy and menopause, causes of secondary amenorrhea are most likely due to:

1. Thyroid dysfunction
2. Elevated prolactin
3. Ovarian failure

4. Polycystic ovarian syndrome (PCOS)
5. Hypothalamic amenorrhea

Thyroid dysfunction and elevated prolactin are easily sorted out by blood testing for thyroid-stimulating hormone (TSH) and prolactin (PRL) levels. An athlete with ovarian failure will have elevated follicle-stimulating hormone (FSH) levels and very low or absent estrogen. PCOS and hypothalamic amenorrhea are typically differentiated based on clinical presentation as they both are likely to have normal FSH levels. The athlete with PCOS will usually be at or above a normal Body Mass Index (BMI) and will likely be hirsute and may show signs of insulin resistance [9, 11, 12].

8.3.4 Functional Hypothalamic Amenorrhea

In athletes, amenorrhea is much more common than in non-exercising controls with prevalence reported from 3 to 69 % compared to 2–5 % in the general population [2, 6, 13].

Prevalence is typically an estimate as it is difficult to gain accuracy due to inconsistencies in studies including various definitions of amenorrhea, selection bias, underreporting, lack of education on what is normal versus abnormal, various competition levels, sports disciplines with varied intensity, and frequency of training [6, 14].

However, it is important to remember the series of events appears to be related to a deficit in energy availability causing menstrual dysfunction and subsequent issues with skeletal health. Exercise does not have an impact on LH pulsatility beyond the impact of its energy cost on energy availability [4, 15–17].

Loucks provides convincing evidence for the energy availability hypothesis related to menstrual dysfunction in athletes. Additionally, she provides evidence against the original theories concerning body composition and exercise stress. The energy availability hypothesis states if the brain energy requirements are not met, an alteration in brain function occurs which disrupts the GnRH pulse generator [15]. Regulation of puberty and reproductive function depends on interactions at specific levels of the hypothalamic-pituitary-ovarian (HPO) axis. The GnRH "pulse generator" neurons in the hypothalamus secrete GnRH every 60–90 min. This hormone causes release of gonadotropins (luteinizing hormone (LH) and follicle-stimulating hormone (FSH)) from the pituitary gland. These, in turn, cause release of progesterone and estrogen from the ovaries. These two end hormones are key to regular, ovulatory menstrual cycles [12, 18, 19].

Deficiency in GnRH pulsatile secretion leads to hypothalamic amenorrhea.

Since hypothalamic amenorrhea in the athlete becomes a diagnosis of exclusion, it is often termed functional hypothalamic amenorrhea (FHA) because it is a functional suppression of reproduction [12]. Because FHA is the typical menstrual abnormality seen in athletes, it will be the focus of discussion concerning treatment of menstrual disorders for this chapter.

8.3.5 When to Screen for Menstrual Dysfunction

The answers concerning when to screen athletes for menstrual disorders are similar for screening of disordered eating (DE) and eating disorders (ED) as discussed in Chap. 13. Evaluation of one component of the female athlete triad should not occur in isolation from the other two components. There is not yet an agreed upon optimal timing or method of screening for any component of female athlete triad disorders [2, 14]. Screening should also be economical and time efficient and should create an environment that will not cause an athlete to minimize or deny certain medical conditions [14].

Options for screening include during pre-participation examinations (PPEs) for competitive athletes, during clinical presentation of the athlete for routine health care (i.e., well woman examination) or for illness or injury, and incidental observation by an athletic trainer, parent, friend, coach, or administrator [2, 7]. Since menstrual dysfunction is often seen as related to sexuality, it can be a very sensitive topic and is not as likely to be incidentally discussed as energy availability might be. This leaves incidental observation the least likely

scenario. Because of this, it is probably best to have a short screening tool utilized by those who interact on a routine basis with the athletes, such as athletic trainers, personal trainers or other gym personnel, and coaches who do not have availability of athletic trainers. The questionnaire tool could be distributed to all female athletes at specific times during the athletic year and would act as a first step to identify a possible disorder in menstruation. It ideally would also contain questions concerning nutrition and bone health. It would be easy to score and if the athlete screens positively with the tool, she would then be referred to a team physician or other designated intervention team for the second stage of screening, an in-depth evaluation.

8.3.6 Screening Questions

No validated tools to screen for menstrual dysfunction exist. Several pre-participation examination forms have from one to six questions included on the form [20, 21]. Tools used to screen for disordered eating and eating disorders may include a few questions about menstrual health. It is likely best to have a supplemental form, apart from the PPE form, in order to effectively screen for menstrual dysfunction. Screening should also include questions related to energy availability and skeletal health. Appendices 1–4 [22] provide examples of tools used to screen female athletes for various components of the female athlete triad. The ideal will be to develop a standardized form to screen for the female athlete triad that is then validated. Any athlete who screens positively would need further evaluation by a physician.

8.3.7 Evaluation of Menstrual Dysfunction Beyond Screening

The in-depth evaluation with the physician or intervention team should include a routine health history, a comprehensive menstrual and obstetrical and gynecologic history, an appropriate examination, and an evaluation of bone mineral density. The physician could obtain the sexual history, in order to avoid an uncomfortable setting for the athlete and her athletic trainer and/or coaches [2, 7, 9, 11, 13, 14]. Some screening tools and PPE forms currently in existence already have a variety of questions concerning menstrual history. However this varies from one question to several to an entirely separate form [20, 21, 23–25].

The question still remains concerning what makes up an adequate screening tool compared to an extensive obstetrical and gynecologic history. None of the existing forms have been validated for menstrual dysfunction screening. In a study done of NCAA Division 1 schools in 2003, 138 of 170 schools responded and 79 % stated they did screen for menstrual disorders (MD). Only 24 % of those used a comprehensive menstrual history questionnaire. A menstrual disorder treatment protocol was used by 33 %. Of the responding schools, 60 % screened for eating disorders (ED). However, less than 6 % used a structured interview or a validated questionnaire. The conclusion from this study was that there exists a pressing need for more standardized ED and MD screening, prevention, and treatment programs among NCAA Division 1 schools. They further concluded, at the very least, that NCAA-member institutions should implement mandatory ED and MD education for all athletes and athletic personnel [5].

A study performed in 2012 involving menstrual irregularity in high school athletes showed a high incidence of menstrual irregularity and an increased number of musculoskeletal injuries than in athletes reporting normal menses. More than half of the athletes reported a change in menses during training or competition. The recommendation from this study was for improved education of high school athletes to improve caloric intake to better balance their energy availability to prevent or correct menstrual irregularity [26].

8.3.8 Management of Functional Hypothalamic Amenorrhea

Once an athlete is identified as having a menstrual disorder, management becomes the next issue. In functional hypothalamic amenorrhea,

there is insufficient energy availability. This then alters GnRH pulsatility in the hypothalamus and LH and FSH release. With limited pituitary secretion of LH and abnormal pulsatility, there is a lack of ovarian stimulation and thus an estrogen deficiency which impacts skeletal health from low sex hormones. There is also altered neuroendocrine function with low levels of insulin, glucose, leptin, triiodothyronine, and insulin-like growth factor-1 and elevated growth hormone and cortisol [18].

In adolescent girls, about 90 % of total body mineral content is accrued by 15½–18 years of age. Delayed puberty can compromise bone mass accumulation and low bone mineral density is a common finding in athletes with functional hypothalamic amenorrhea [18]. Twenty-five percent of bone mass accrual occurs in the 2 years surrounding menarche [13]. Due to this, the athlete becomes at risk for stress fractures, failure to achieve optimal peak bone mass density, and is thus at risk later in life for osteoporosis or delayed stress fractures [11]. Other risks from hypoestrogenism may include cardiovascular disease, dementia, depression, delayed post-exercise recovery, decreased immune function, and other neurodegenerative and psychiatric disorders [7, 13, 17, 19].

Physically active women with functional hypothalamic amenorrhea are able to prevent or reverse menstrual disorders by dietary modification in relation to their needed energy availability of approximately 30 kcal/kg lean body mass/day without any modification of their exercise regimen [4, 15, 17]. Therefore, the initial treatment of choice is improving the athlete's overall energy availability through improved nutrition [27, 28]. Increasing total daily energy intake in moderate increments may be the easiest approach, but the best method remains to be seen. Two small studies have shown that improving energy balance and energy availability in female athletes with amenorrhea resulted in the resumption of menstruation [27]. Treating the cause can lead to ovulatory cycles within 12 months, but up to 30 % may remain amenorrheic [11]. If modifying intake alone is not successful, the athlete may need to decrease her energy expenditure by modifying her training regimen [2]. A newer, interesting approach describes "eating by discipline." Since appetite is an unreliable indicator of energy requirements, the author advises eating specific amounts of particular foods at planned times rather than waiting for hunger and then eating until satisfied [4].

An initial bone mineral density (BMD) study is helpful in determining how long to attempt treatment with either diet alone or diet and exercise modification. If BMD testing is in the osteoporotic range, it is important to initiate hormone therapy immediately to stabilize bone density and prevent further loss [3]. If BMD results are near normal or in the osteopenic range, dietary modification is first line therapy.

If amenorrhea does not respond to dietary and exercise changes and is prolonged, greater than 3–6 months, hormone therapy should be considered in an attempt to protect BMD [7]. However, hormone therapy should not be used in adolescents younger than 16 years old [2, 29].

Hormone replacement therapy, both cyclic and continuous, has been described, but do not provide contraception [11, 12]. Since the majority of athletes with FHA may need to consider contraception, the use of oral contraceptive pills (OCPs) has been recommended. It is important to remember the use of OCPs will not normalize the metabolic factors impairing bone function, health and performance. They are unlikely to fully reverse the low BMD [2, 25, 30, 31]. Estrogen replacement without nutritional rehabilitation will not reverse bone loss [31].

Additionally, an OCP may have a masking effect in the amenorrheic athlete with the female athlete triad. This exogenous cycling can give the athlete a false sense of improvement without any enhancement of energy availability [13]. Transdermal estrogen may enhance bone mineral density more than oral, but may have a twofold risk of venous thromboembolic events related to its use. Another delivery option is etonogestrel/ethinyl estradiol vaginal (NuvaRing), which is preferred to OCPs by several patients, due to convenience and fewer systemic side effects. Some athletes are uncomfortable with the idea of being on a contraceptive. In those cases, it is better to discuss these medications as cyclic hormone regulation (CHR), rather than contraception.

Athletes who desire pregnancy can be treated with clomiphene citrate for ovulation induction. Results are varied with this approach [2, 30, 32]. Because of this, ovulation can be induced with pulsatile GnRH or injected gonadotropins [30]. Future treatment options may include daily subcutaneous injections of leptin analog [13], the use of subcutaneous IGF-1 combined with OCPs [15, 30], and opioid inhibitors such as naltrexone since endogenous opiates have been shown to inhibit GnRH [12, 30, 33]. Calcitonin nasal spray, Miacalcin, may be effective in preventing further decrease in BMD [3].

Bisphosphonates are not recommended in the age groups typically impacted by FHA due to prolonged activity in bones and potential teratogenic effects [2, 3, 13]. Also, selective estrogen receptor modulators (SERMs) have not been tested for safety in premenopausal women so are contraindicated [3]. It is very important to not forget basic therapeutic recommendations such as adequate calcium and vitamin D intake (adolescents: 1,300 mg calcium and 600 IU vitamin D per day; premenopausal: 1,000 mg calcium and 600 IU vitamin D daily), or supplemental, if needed [13]. With proper nutritional education and supervision, it is possible for the active female with functional hypothalamic amenorrhea, to resume normal menstrual cycles [15, 17, 30].

8.4 Contemporary Understanding of the Issues

Athletes are at higher risk than the general population for some type of menstrual dysfunction. The spectrum can range from long cycles, i.e., oligomenorrhea, to short cycles as seen in luteal phase defects, to absence of cycles, classified as either primary or secondary amenorrhea. Screening for primary amenorrhea is the most straightforward. If a female has had normal appearing sexual development, but no menses by age 15, the team physician, primary care provider or gynecologist should evaluate her. Another indicator of primary amenorrhea is no breast development by 13 years of age.

Screening for menstrual dysfunction should not occur in isolation and should include evaluation of the other two components of the female athlete triad, energy availability and skeletal health. Currently, there is no universally agreed upon timing or method to screen athletes for menstrual dysfunction or the other two components of the female athlete triad, energy availability and bone health.

When an athlete does screen positively for menstrual dysfunction, she should have a complete physician evaluation to include past medical history, past surgical history, current medications, social history, family history and a comprehensive obstetrical and gynecologic history. Comprehensive history taking will then guide the physician concerning appropriate physical examination, laboratory testing and radiology studies.

The most common type of secondary amenorrhea seen in athletes is functional hypothalamic amenorrhea. These athletes were having normal cycles at one time but now have not had cycles for 6 months (some sources state 3 months). The definition includes the distinction of absence of menstrual cycles with no other organic etiology found. It is thus a diagnosis of exclusion, requiring a full workup to exclude other causes, before recommendations for management can be formulated. The underlying defect is insufficient energy availability, which causes a deficiency in GnRH pulsatile secretion. This in turn leads to abnormal LH pulsatility and a decrease of sex hormones and other metabolic hormones. These situations lead not only to amenorrhea, but also to abnormalities in bone health. Women in this situation are at increased risk of stress fracture, inability to achieve optimum peak bone mass, future osteoporosis and delayed stress fractures.

When FHA is present, the first technique in management is increased energy intake. If this is not effective then recommendations should be made to decrease the amount of energy expended during exercise. After 3 to 6 months, when the combination of the two is not effective, management with hormone therapy may be considered. However, it is important to understand that causing an athlete to cycle regularly with exogenous

hormones is not addressing the underlying metabolic abnormality and will not do much to improve skeletal health. Additional treatment considerations include intake of adequate amounts of calcium and vitamin D. Education of the athlete and those who care for her is essential to be sure energy intake is increased during times of intense training and competition in order to maintain energy availability and attempt to prevent menstrual dysfunction.

8.5 Future Directions

Future research needs to be directed at refining prevalence numbers for menstrual disorders in active females. Current values are little more than estimates, given inconsistencies in studies to date. Additionally, sport-specific and ethnicity data need to be included to help focus on those athletes at highest risk.

Development of standardized screening procedures would be optimal for not only menstrual dysfunction, but for all three components of the female athlete triad. Rather than trying to incorporate screening questions into a pre-participation exam form, it appears best to develop a supplemental questionnaire with sections exploring each dimension of energy availability, menstrual status and bone health. This form could be used at the time of pre-participation exams or at other designated times during a competitive year or the athlete's career. It could also be used in the setting of health clubs and by personal trainers as part of the intake process for new clients.

Since alteration of GnRH pulsatility is the primary issue in functional hypothalamic amenorrhea, additional studies on factors influencing GnRH pulsatility may provide more strategies for effective prevention and treatment options to reverse menstrual dysfunction. Along with that is a need for applied research to confirm that athletes can and will prevent or reverse menstrual dysfunction by dietary reform without any moderation of the exercise regimen and to identify interventions acceptable to athletes and/or coaches.

Certain athletes will still not be able to increase their energy availability or decrease their energy expenditure to regain normal menstrual function. For those athletes, optimal medical treatment is essential. Studies concerning ideal hormone treatment regimens and use of other metabolic substances such as leptin analogs, IGF-1, and opioid antagonists are important to reverse menstrual dysfunction and improve bone health.

Improved education of the female athlete from early on in her sports involvement and those in her circle of influence (athletic trainers, coaches, family, etc.) is essential for primary prevention of female athlete triad disorders. One proposed model is for multidisciplinary treatment teams with a focus on proper nutrition related to each athlete's specific needs. Ultimately, health care providers working with athletes have a responsibility to become skilled at recognizing disorders associated with the female athlete triad in order to prevent them from occurring and to provide early intervention and treatment to minimize related illness and injury.

8.6 Concluding Remarks

Menstrual dysfunction in athletes should be considered a medical issue needing further evaluation. Amenorrhea in the active female should no longer be viewed as a good thing. In addition to being a medical problem, it can be a symptom related to abnormal skeletal health. At one extreme, it may be the first warning sign of a potentially lethal eating disorder. At the other extreme, it may be a sign of lack of proper nutritional education causing the athlete to exhibit disordered eating, i.e., not taking in enough calories for the level of training.

Prevention and early intervention are key components to minimizing morbidity and mortality. The ideal method and timing for screening have yet to be determined. The best method is likely using a separate questionnaire based screening tool during the pre-participation physical examination.

Screening for menstrual disorders can be a sensitive issue. Therefore, initial screening by athletic trainers or coaches should include basic questions concerning menses, bone health and energy availability. Once the athlete screens positively, she should be referred to medical personnel for a com-

Table 8.2 Questions to ask the patient and/or the parents if an eating disorder is suspected

Questions to ask the patient
Weight history
Has there been any change in your weight?
What's the most you ever weight and when? The least and when?
Are you terrified about being overweight?
History of dieting
Have you ever tried to lose weight?
What kinds of diets have you tried?
Have you ever tried to lose weight or control your weight by vomiting, taking diet pills or laxatives, or excessive dieting?
Are you currently dieting or trying to lose weight?
Emotions and eating
Do you feel extremely guilty after eating?
Do you feel that food controls your life?
Have you gone on eating binges where you feel you may not be able to stop?
Current eating/exercise habits
Are you satisfied with the way you eat?
What did you eat yesterday?
Have you gone on eating binges where you feel you could not stop?
How much do you exercise in a typical week?
Have you ever fainted?
Attitudes about weight and shape
How do you feel about the shape and size of your body?
What do you think your ideal weight should be?
Menstrual history
Are your menstrual periods regular?
When was your last menstrual period?
Questions to ask parents
Does your child make negative remarks about his or her body?
Have you noticed any changes in his or her food-related habits? If so, what?
Are you concerned about your child's weight? Eating habits? Exercise habits?

Source: Adapted from screening tools from the Office on Women's Health and the National Eating Disorders Screening Programs
Note: Confidential on-line screening tools are now available on-line at http://www.mentalhealthscreening.org/programs/workplace/nedsp.aspx)

prehensive evaluation. The sports medicine physician can begin by asking subtle questions related to energy availability and the link to menstrual disorders resulting from unhealthy eating patterns. Table 8.2 offers guidance for questioning. On-line screening tools are also available from the National Eating Disorder Screening Program free of charge.

8.7 Questions

1. Athletes who desire pregnancy but are not ovulating can be treated with:
   (a) Clomiphene citrate for ovulation induction
   (b) Pulsatile GnRH or injected gonadotropins
   (c) Endogenous opiates
   (*d) Both a and b can be used to induce ovulation
2. Which of the following statements is *false* about oral contraceptive pills (OCP)?
   (a) The use of OCPs will not normalize the metabolic factors impairing bone function, health and performance
   (b) OCP are unlikely to fully reverse the low BMD
   (*c) Estrogen replacement without nutritional rehabilitation will reverse bone loss
   (d) All statements are true
3. Hormone therapy should not be used in adolescents younger than _____years old
   (a) 15
   (*b) 16
   (c) 17
   (d) 18
4. Which of the following statements are true with regard to appetite in the female athlete?
   (*a) Appetite is an unreliable indicator of energy requirements
   (b) Athletes should just eat when they are hungry and this will prevent low energy availability
   (c) Athletes should wait for hunger and then eat until satisfied in order to increase energy availability
   (d) All of the statements are true
5. Treating the cause of menstrual dysfunction can lead to ovulatory cycles within 12 months, but up to _____of athletes may remain amenorrheic.
   (a) 50 %
   (b) 70 %
   (c) 40 %
   (*d) 30 %

6. _____ percent of bone mass accrual occurs in the _____ years surrounding menarche.
   (a) 45.4
   (b) 35.3
   (c) 30.1
   (*d) 25.2
7. In adolescent girls, about _____ of total body mineral content is accrued by 15½–18 years of age.
   (a) 60 %
   (b) 70 %
   (c) 80 %
   (*d) 90 %
8. Target groups for menstrual screening should include which group(s) of women?
   (a) A normal secondary sexual development but no menarche by 15 years of age
   (b) Failure of the thelarche (breast development) by 13 years old
   (c) No menarche within 5 years after breast development that occurred less than 10 years old
   (*d) All of the above mentioned groups should be targeted
9. In 2006, National Collegiate Athletic Association Division 1 Schools adopted a standardized eating disorder and menstrual dysfunction screening tool to be used for all female athletes.
   (a) True
   (*b) False
10. Which of the following characteristics is (are) true for an athlete with polycystic ovarian syndrome (PCOS)?
    (a) She will usually be at or above a normal Body Mass Index (BMI)
    (b) She will likely be hirsute
    (c) She may show signs of insulin resistance
    (*d) All of the above characteristics could be possible with PCOS

Appendix 1: Women's Health History Questionnaire

Name: _____

Age: _____

Birth date: _____

Height: _____ Weight: _____

How many years have you been at your present weight? _____

Have you lost _____ or gained _____weight recently?

If you have lost or gained weight recently, how many pounds? _____

Ethnic background: (Check one)

Caucasian, non-Hispanic	_____	Hispanic	_____
American Indian	_____	Black, non- Hispanic	_____
Asian	_____	Other/specify	_____

If you are an intercollegiate athlete, please check the sport/activity, in which you currently participate, if you are not presently an intercollegiate athlete, please skip to the next question (Check one):

Basketball	_____	Golf	_____	Soccer	_____
Tennis	_____	Track	_____	Volleyball	_____
Softball	_____	Other, please specify	_____		

If you play intramural sports, please check the sport/activity in which you currently participate, if you do not presently participate in intramural sports, please skip to the next question (Check one):

Basketball _____ Golf _____ Soccer _____
Tennis _____ Track _____ Volleyball_____
Softball _____ Other, please specify _____

If you belong to a club sport/activity, please check the sport/activity in which you currently participate, if you do not presently participate in club sports/activities, please skip to the next question (Check one):

Dance _____ Theater _____ Soccer _____
Volleyball _____ Running _____ Golf _____
Water-skiing _____ Cycling _____ Other, please specify_____

Please check the type and amount of exercise you usually engage in each week. Be as specific as possible, for example, weight training 1.5 h per week; jogging 4 mph for 1 h two times a week or aerobics 30 min two time a week, or walking 3 mph 4 h each week.

Activity	#Times per week	Hours per week	Miles per week (if applicable)
Aerobics			
Basketball			
Calisthenics			
Cycling			
Dance			
Ballet			
Jazz			
Tap dance			
Modern			
Golf			
Handball			
Jogging			
Racquetball			
Running			
Soccer			
Softball			
Swimming			
Water-skiing			
Track (specify type of event)			
Volleyball			
Weight-lifting			
Other (list)			

How many years (or months) have you been involved in the above activity schedule?
Years _____ months _____
List any injuries you have had or presently have that are related to your participation in these activities.

_____
_____
_____

How is your health? Good _____ Fair _____ Poor_____

Please explain: _____

Has a health care professional ever told you that you have problems with your thyroid glands?
Yes _____ No _____

Has a health care professional every told you that you had problems with your ovaries?
Yes _____ No _____

Has a health care professional ever told you that you had problems with your uterus?
Yes _____ No _____

Has a health care professional ever told you that you had problems with your endocrine system?
Yes _____ No _____

Are you now using or have you ever used birth control pills or other hormones (these are used to prevent pregnancy or regulate menstrual periods)?
Yes _____ No _____

If you have used birth control pills or other hormones, for what reason did you use these?
Regulate menstrual periods _____
Prevent pregnancy _____
Other reason. Please explain _____
_____

If you have used birth control pills or other hormones, how long has it been since you used them?
_____

Within the past year, have you taken steroids for any reason (these are occasionally used to reduce inflammation/swelling, etc. during illness or injury)?
Yes _____ No _____

If you have taken steroids, how long has it been since you took them?
_____

Are you pregnant? Yes _____ No _____
Is there a possibility you could be pregnant? Yes _____ No _____
Have you recently had a pregnancy test? Yes _____ No _____
If you answered yes, when was the test? Date _____
Do you currently smoke? Yes _____ No _____
Would you classify your menstrual cycle as regular? _____ Or irregular?_____
Please explain why? _____
_____
Approximately how many menstrual periods do you have in a year?_____
Do you experience menstrual bleeding every month? _____
Do you have a menstrual period every month that is about the same number of days apart from month to month?
Yes _____ No _____
What was the first day of your last menstrual period? (If you are currently on your menstrual period, please list the first day of your current period). _____
How many days long was your last menstrual period? _____
How many days ago was your last menstrual period? _____
What is the average duration (length in number of days) from the beginning of one menstrual cycle to the beginning of your next menstrual cycle? _____
How old were you when you first began menses? _____

Have you ever had or presently have anorexia nervosa or bulimia that you are aware of? _____

_____

How did you become aware of this? _____

Appendix 2: Menstrual History Log Sheet

Name _____

Directions: Please mark the first day of your menstrual cycle with an X. Continue to mark any days that you experience bleeding

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Jan																															
Feb																															
Mar																															
April																															
May																															
June																															
July																															
Aug																															
Sep																															
Oct																															
Nov																															
Dec																															

Appendix 3: Student-Athlete Nutritional Health Questionnaire

Stress Fracture History

1. Have you ever had a stress fracture or a stress reaction? Yes No
2. Have you ever had x-rays to rule out a stress fracture or a stress reaction? Yes No
3. Have you ever had a bone scan or a bone density test? Yes No
4. Do you talk calcium? Yes No
5. Are you a vegetarian?

Eating/Weight History

1. What is your highest and lowest weight in the past year? Highest weight _____ lbs.
   Lowest weight _____ lbs.
2. What is had any recent changes in weight? Yes No
3. What is your desired weight? Yes No
4. Do you weigh yourself often? Yes No
5. Do you consciously watch your weight? Yes No
6. Would your weight be different if you were not exercising vigorously? Yes No

7. How many times a year do you lose weight intentionally?
8. When your season is over and you stop or reduce training, do you gain or lose weight?
   If "gain," how much weight? _____ lbs.
   If "lose," how much weight? _____ lbs.
   What is your weight in season at the peak of training? _____ lbs.
9. Do you have to restrict your food intake more or less than in the past to be at your competitive weight? (*please circle the appropriate answer*)
   Much less than before Somewhat less than before No change Somewhat more than before Much more than before
10. Are you preoccupied with weight? Yes No
11. Does worrying about weight take up a significant amount of your time? Yes No

Menstrual History (Females Only)

1. At what age did you have your first period? Month _____ Year _____
2. When was your last period? Month _____ Year _____
3. How many periods have you had in the last 12 months. _____
4. Are you on any form of estrogen/birth control? Yes No
   If yes, what form? _____
   How long?_____
   Why? (Control of period, medical prescription, other) _____
   If it has been recommended and you are not taking it, why? _____
5. Have you ever been diagnosed with anemia? Yes No
6. Do you eat red meat? Yes No
7. Do you have heavy menses? Yes No
8. Were you aware of any effect of regular training for sport on the occurrence of your first menstrual period? Yes No
   If yes, briefly explain _____
9. Are menstrual problems such as cramps and irregularity common in your family? Yes No

Appendix 4: Female Athlete Screening Tool

Please answer as completely as possible.
The key is used to quantify and define activity level for further clarification of the questions.

Key[a]:	Exercise = Physical activity ≥20 min
	Practice = Scheduled time allotted by coach to work as a team or individually in order to improve performance
	Training = Intense physical activity. The goal is to improve fitness level in order to perform optimally

1. I participate in additional physical activity ≥20 min in length on days that I have practice or competition.
   (1) Frequently (2) Sometimes (3) Rarely (4) Never

2. If I cannot exercise, I find myself worrying that I will gain weight.
   (1) Frequently (2) Sometimes (3) Rarely (4) Never

3. I believe that most female athletes have some form of disordered eating habits.
   (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

4. During training, I control my fat and calorie intake carefully.
   (1) Frequently (2) Sometimes (3) Rarely (4) Never

5. I do not eat foods that have more than 3 g of fat.
   (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

6. My performance would improve if I lost weight.
   (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

7. If I got on the scale tomorrow and gained 2 pounds, I would practice or exercise harder or longer than usual.
   (1) Frequently (2) Sometimes (3) Rarely (4) Never

8. I weigh myself_____.
   (1) Daily (2) 2 or more times a week (3) Weekly (4) Monthly or less

9. If I chose to exercise on the day of competition (game/meet), I exercise for
   (1) 2 or more hours (2) 45 min to 1 h (3) 30–45 min (4) Less than 30 min

10. If I know that I will be consuming alcoholic beverages, I will skip meals on that day or the following day.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

11. I feel guilty if I choose fried foods for a meal.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

12. If I were to be injured, I would still exercise even if I was instructed not to do so by my athletic trainer or physician.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

13. I take dietary or herbal supplements in order to increase my metabolism and/or to assist in burning fat.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

14. I am concerned about my percent body fat.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

15. Being an athlete, I am very conscious about consuming adequate calories and nutrients on a daily basis.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

16. I am worried that if I were to gain weight, my performance would decrease.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

17. I think that being thin is associated with winning.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

18. I train intensely for my sport so I will not gain weight.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

19. During season, I choose to exercise on my one day off from practice or competition.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

20. My friends tell me that I am thin but I feel fat.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

21. I feel uncomfortable eating around others.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

22. I limit the amount of carbohydrates that I eat.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

23. I try to lose weight to please others.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

24. If I were unable to compete in my sport, I would not feel good about myself.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

25. If I were injured and unable to exercise, I would restrict my calorie intake.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

26. In the past 2 years I have been unable to compete due to an injury
    (1) 7 or more times (2) 4–6 times (3) 1–3 times (4) No significant injuries

27. During practice I have trouble concentrating due to feelings of guilt about what I have eaten that day.
    (1) Frequently (2) Sometimes (3) Rarely (4) Never

28. I feel that I have a lot of good qualities.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

29. At times I feel that I am no good at all.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

30. I strive for perfection in all aspects of my life.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

31. I avoid eating meat in order to stay thin.
    (1) Strongly Agree (2) Agree (3) Disagree (4) Strongly Disagree

32. I am happy with my present weight.
    (1) Yes (2) No

33. I have done things to keep my weight down that I believe are unhealthy.

    (1) Frequently (2) Sometimes (3) Rarely (4) Never

Source: From McNultyKY, Adams CH, AndersonJM, AffenitoSG. Development and validation of a screening tool to identify eating disorders in female athletes. *J Am Diet Assoc*2001;101(8):886-892. With permission.

Scoring Instructions: The FAST is scored on a 4 point Likert Scale. The higher the number the higher the probability (i.e., 4 points = frequently; 3 points = sometimes; 2 points = rarely; and 1 point = never).

Questions 15, 28, and 32 are reversed scored. For questions 32, a response of yes receives 1point and a response of no receives 2 points. In a small group of female athletes (N = 41), sub-clinical scores ranged from 77 to 94 and clinical scores were >94. **Note this is a screening tool**, **not a diagnostic tool**.

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