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The Female Athlete Triad

Prevalence: While 15-62% of female college athletes have disordered eating, only 2-3% meet DSM criteria for anorexia or bulimia. Likewise, 15-65% of female college athletes have some degree of amenorrhea. A high school study has shown that 78% of athletes and 65% of sedentary controls have at least one component of the triad; while the athletes tended to have more menstrual abnormalities, the sedentary controls had a lower bone mineral density.

DISORDERED EATING

While clinical suspicion is often heightened based on history or parental concern, physical exam findings can include: Weight < 85% of that expected for height, hypothermia, tachy/bradycardia, postural hypotension or resting hypotension, thin body habitus, dry skin and hair, hair loss, cold or discolored hands/feet, lanugo, yellow tinge to skin, tooth enamel erosions on back teeth, parotid gland enlargement, bloodshot eyes, knuckle scars.

Lab studies may reveal electrolyte disturbances, hormone level disturbances, abnormal LFTs, elevated ESR or CRP, decreased leptin, increased ghrelin (hormone signal for hunger), EKG findings (increased QTc), + stool guaiac (laxative abuse).

Hospital Admission Criteria are similar to that for anorexia and/or bulimia.

- Bradycardia: heart rate <50 bpm in daytime or <45 bpm at night
- Tachycardia: >110 bpm
- Hypotension: SBP < 90 mmHg
- Postural tachycardia: >20 bpm differential
- Postural hypotension: >10 mmHg differential
- Hypothermia: <96 degrees F
- K+ < 3.2 mmol/L
- Cl- < 88 mmol/L
- QTc > 430 ms or arrhythmia
- Hematemesis / esophageal tears
- Syncope
- Weight loss or failure to gain weight which renders the patient at <75% of ideal body weight
- Refusal to eat and/or drink
- Intractable vomiting
- Suicide risk

MENSTRUAL CYCLE IRREGULARITIES

While amenorrhea can be desirable by a young athlete because they think their performance or training is improved, or because of the convenience, the consequences can be significant. Increased rates of musculoskeletal injuries, decreased bone mass with an increased risk of stress fractures, a decrease in peak bone mass, endothelial dysfunction, an unfavorable lipid profile, and infertility have all been linked to amenorrhea. There has not, however, been any proven asso-

ciation with decreased performance or an absolute increase in the risk of heart disease. As athletic amenorrhea is a diagnosis of exclusion, the physician should be sure to rule out other causes of amenorrhea such as: pregnancy; medications; hypothalamic or pituitary disorders; thyroid disorders; adrenal gland disorders; tumors that secrete hormones; ovarian or uterine disorders; genetic disorders.

LOW BONE MINERAL DENSITY

Can be diagnosed by DEXA scan, and should be classified according to age matched standards. An athlete is osteoporotic if she has a Z score < -2.0-2.5 SD, osteopenic for a Z-score < -1.0-2.5 SD, and has "Low BMD" if she has a Z-score < -1.0 in addition to a history of nutritional deficiencies, hypoestrogenism, and/or stress fracture.

TREATMENT

Treatment of the Female Athlete Triad should include weight gain, activity modifications, and nutritional modifications. Those meeting criteria for anorexia or bulimia should be cared for by a specialty center involving a multi-disciplinary approach. Calcium supplementation to 1200-1500mg per day, divided TID is suggested, although it may not help increase bone mineral density in the presence of amenorrhea or caloric deficiency. Vitamin D to 400-800IU per day is suggested. Hormone replacement therapy in the form of OCPs may be considered, but will not result in increased bone mineral density unless accompanied by weight gain and adequate calcium intake, and should not be considered in children within 3 years of menarche or under the age of 16. OCPs may also mask either the presence of amenorrhea or its resolution.

WHAT PEDIATRICIANS CAN DO

- Promote exercise and sports participation in female patients.
- Recognize risk factors and symptoms and know what steps to take.
- Understand the risks and consequences of the Triad.
- Understand that others may be pressuring athletes to lose weight.
- Review dietary practices, exercise intensity, duration, and frequency, and menstrual history at medical encounters.
- Never consider amenorrhea to be a consequence of exercise.
- Consider disordered eating in patients and know how to treat.
- Be able to provide education and counseling to athletes, parents, and coaches regarding disordered eating, menstrual dysfunction, decreased BMD and adequate energy and nutrient intake.
- Have referral sources for nutritional counseling, and mental health evaluation.
- Be able to establish a range of values for weight and body fat when athletes and coaches want to know what values their athletes should strive to achieve.

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Sports Shorts is provided by the Home and School Health Committee of the Ohio Chapter, American Academy of Pediatrics.*

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The Female Athlete Triad

WHAT IS THE FEMALE ATHLETE TRIAD?

A combination of three interrelated conditions associated with athletic training in girls, all thought to be influenced by an athlete's desire to maintain a low body weight:

- Disordered eating
- Menstrual cycle irregularities
- Loss of bone density

DISORDERED EATING

Any pattern of eating that does not supply an adequate amount of calories to support a girl's activity level.

- **Anorexia** – girls who refuse to maintain a weight above 85% of that expected for their height, are scared of gaining weight, see their body image as fat when others see them as too thin, and have missed at least three periods in a row.
- **Bulimia** – girls who will have eating binges (eating more food at one sitting than is thought reasonable) and then purge to rid body of food or calories.
- **Disordered Eating (NOS – Not Otherwise Specified)** – the diagnosis for girls who do not get enough calories in their diets, but do not meet full criteria for the above two diagnoses – includes girls who accidentally don't eat enough during the day, those who will stop eating for a short time (dieters), and those who are trying to eat too healthfully.

CONSEQUENCES OF DISORDERED EATING

Irritability/depression; decreased concentration; loss of muscle and bone mass and increased risk of injury; prolonged recovery from injury; irregular periods; gastrointestinal disorders; fluid and electrolyte disorders; cardiac disorders; death

Girls who tend to be more likely to have eating disorders may have some of the following characteristics:

- Compulsive, rigid, perfectionist, very hard working
- Anxious, depressed, socially withdrawn
- Girls who exercise when injured or outside of practice
- Participation in sports with revealing attire (gymnastics, swimming), that are subjectively scored (figure skating), that have weight limits (rowing, martial arts), or where a low body weight can mean improved performance (cross-country running or skiing)

Treatment varies depending on the degree of disordered eating. While anorexia and bulimia can be very difficult and intensive to treat, most girls have disordered eating NOS and respond very well to meeting with a dietitian who specializes

in sports nutrition. Girls can learn how many calories they need. They can learn how to eat at different times of the day to boost their performance and improve their energy levels.

MENSTRUAL CYCLE IRREGULARITIES

- Primary amenorrhea (lack of a period) girls who have not had a period by the age of 15
- Secondary amenorrhea – girls who used to have periods, but have now lost them
- Oligomenorrhea – girls who have irregular periods or skip periods

When associated with athletic training and disordered eating, a girl will lose her periods, or they will become irregular, when her body has not taken in enough calories to supply her daily activities and her sport over time. This is a starvation response by the body to keep a girl from getting pregnant when there's not enough food available. Tests may be ordered to ensure that a girl has not lost her periods for a hormonal reason, a thyroid condition, a structural reason, or even because she's pregnant, before diagnosing her with amenorrhea due to the Female Athlete Triad.

Treatment involves increasing the number of calories in a girl's diet, while perhaps cutting back on her activities. A girl's periods will typically not come back until she gains 4-5 lbs., and even then it can take up to a year to return.

LOSS OF BONE DENSITY

A girl's bone density continues to increase until about the age of 20, at which time it stabilizes until about age 30. After 30, bone density starts to decrease, regardless of calcium intake or activity level. Loss of enough bone density can make the bones fragile and more prone to fractures. When a girl does not get enough calories, calcium, or vitamin D in her diet, she may not increase her bone density enough during adolescence and may even lose bone density. This can make her more prone to stress fractures and injury fractures.

Treatment may include calcium and vitamin D supplementation, and an increase in the amount of calories in a girl's diet. While birth control pills will start a girl's periods up again, they will not solve the problem and will not help a girl gain her bone mass back again unless her diet is addressed.

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