Relative Energy Deficiency Syndrome

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AOASM
Disclosures

None
Background

Family Medicine/Sports Medicine
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Consulting Team Physician University of San Diego
Overview

- Discuss components of Relative Energy Deficiency in Sport (REDS)
- Discuss etiology of REDS
- Review how to approach diagnosis of REDS
- Review the initial treatment of REDS
Objectives

By the end of the lecture, the participant will be able to:

- Describe the components of REDS
- Delineate a diagnostic approach to REDS
- Initiate a treatment plan for REDS
- Understand the long term health consequences of REDS
REDS

- Relative Energy Deficiency Syndrome

- Energy Availability (EA) = Energy Intake (EI) - Energy Output (EO)

- When EA is consistently low for weeks to months, athletes will exhibit signs and symptoms of REDS
Health Consequences of Relative Energy Deficiency in Sport (RED-S) showing an expanded concept of the Female Athlete Triad to acknowledge a wider range of outcomes and the application to male athletes (*Psychological consequences can either precede RED-S or be the result of RED-S).

Potential Performance Effects of Relative Energy Deficiency in Sport (*Aerobic and anaerobic performance).

REDS: Disordered Eating

- REDS *may* be a sign of disordered eating
- Disordered eating is a continuum
  - Balance between appropriate eating and exercise
  - Ranges from ‘healthy dieting’ to extreme weight loss methods such as restrictive diets
  - *Clinical eating disorders*
- Many athletes are at risk
REDS: Disordered Eating

- Prevalence of disordered eating is about 20% and 13% among adult and adolescent female elite athletes.
- Prevalence is about 8% and 3% among adult and adolescent male elite athletes.
- Prevalence differs significantly among sports.
REDS: Hormonal Imbalance

- Menstrual cycle ranges 21-45 days in adolescents, 21-35 days in adults
- Primary amenorrhea is no menarche by age 15
- Secondary amenorrhea refers to the absence of 3 consecutive cycles post menarche
- Oligomenorrhea is a cycle greater than 45 days
REDS: Hormonal Imbalance

- Secondary amenorrhea prevalence is estimated between 2-5% in collegiate women, and as high as 69% in dancers, 65% in long-distance runners.

- Primary amenorrhea in collegiate athletes is 7% overall, 22% in cheerleading, diving, and gymnastics.
REDS: Hormonal Imbalance

- Reduction in EA may disrupt the LH pulsatility
- Disruption in LH pulsatility leads to alteration of GNRH which leads to altered menstrual cycle

*Functional Hypothalamic Amenorrhea*
- Can occur over even as short as 1 month period of low EA
- Most commonly I see it 2-3 months after onset of low EA, takes up to 3-6 months to return to normal menses after improvement in EA
REDS: Hormonal Imbalance

- Low EA can affect the following hormones:
  - Insulin
  - Cortisol
  - Growth Hormone
  - Insulin-like growth factor-1 (IGF-1)
  - T3
  - Grehlin
  - Leptin

- *Think of this complex interplay of hormones and why so many systems are affected*
REDS: Nutrition

- Athletes should consume a minimum of 45 kcal/kg/FFM/day
  - For example a 150 lb (68kg) athlete with 20% body fat has a free fat mass (FFM) of 120 lbs (54.5kg)
  - This athlete should consume 45 kcal x 54.5 each day = 2,452 kcals/day
- Those who consume < 30 kcal/kg/FFM/day are at risk for REDS
  - In this patient example that would be: 1,635 kcals/day
REDS: Nutrition

- Don’t try to calculate FFM and kcals/day on the first visit!
- Start with a diet log – get an idea of the athlete’s knowledge of nutrition
  - This will also show if the athlete is ready to commit to change
  - It will also show eating patterns, which can help determine if disordered eating is present
- Depending on your resources refer to a nutritionist who is capable of caring for athletes
REDS: Adverse Health Consequences

- Anemia
- Chronic Fatigue
- Weakened Immune System
- CV
- GI
- Endocrine
- Reproductive
- Skeletal
- Renal
- CNS
REDS: Metabolic Consequences

- Lower metabolic rate
- Decrease in growth hormone production
- Irregular or absent menses may have significant emotional impact creating anxiety
- Bone: Peak bone mass occurs around 19 in women and 20.5 in men
- Estrogen increases uptake of Ca++ into bone
- Even silent estrogen/progesterone imbalance can lead to negative effects in bone
REDS: Metabolic Consequences

- Low Testosterone can lead to poor bone formation in men
- *Bones of athletes with chronic amenorrhea benefit less from osteogenic effects of exercise*
- Low EA is recognized as independent factor of poor bone health
- Bone loss in athletes may be irreversible
RED5: Metabolic Consequences

- Change in bone structure leads to increased risk of stress fracture
- Functional impairment associated with low EA include greater prevalence of viral illness, injuries, reduced responsiveness to training and subsequent performance
REDS: Recognizing Symptoms

- Initial PPE
  - Screening questionnaire for eating habits
  - Screening questionnaire for mood
  - Vital signs including BMI
- Annual follow up
  - Check for major changes in weight/BMI
- Athlete self-report
- Coaching report
REDS: Treatment

- Increase in energy intake
- Decrease in energy output
- Increase oral intake by 300-600 kcal/day on average
REDS: Treatment

- OCP
  - May mask signs of low EA
  - May perpetuate bone loss
- Weight gain
  - *Hard to get athletes to agree to total weight gain*
- Vit D 2000 iu/day
- Calcium 1500mg/day
<table>
<thead>
<tr>
<th>High risk: no start, red light</th>
<th>Moderate risk: caution yellow Light</th>
<th>Low risk: green Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating disorder</td>
<td>Prolonged abnormally low body fat % Substantial weight loss Attenuation of expected growth</td>
<td>Healthy eating habits with normal EA</td>
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<tr>
<td>Other serious physiologic (psychological or physical) abnormalities related to low EA</td>
<td>Abnormal menses Menarche &gt; 16 yo Hormonal abnormalities in men</td>
<td>Normal metabolic and hormonal function</td>
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<tr>
<td>Extreme weight loss techniques</td>
<td>Physiologic abnormalities associated with low EA (abnormal EKG e.g.)</td>
<td>Healthy BMD and MSK system</td>
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<td>Prolonged REDS Disordered eating behavior Lack of progress/non-compliance</td>
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REDS: Psychological Treatment

- Athlete resistance to treatment increases with severity of the eating problem
  - Refer to a mental health professional skilled in discussing eating disorders
- Consider comorbidities such as depression, anxiety
REDS: Summary

- Identify signs and symptoms
- Rule out primary metabolic and eating disorders
- Initiate nutritional intervention and exercise restriction
- Monitor for and treat psychological symptoms
- Don’t forget to consider academic implications
- Team approach to care
Questions?

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References