

UNDERSTANDING METABOLIC SYNDROME

Obese athletes and non-athletes alike are at risk and can face undesirable health consequences

By Jackie Buell, PhD, RD, ATC



Metabolic Syndrome (MetSyn) remains to be an issue for athletes and non-athletes alike. Many obese athletes may be at risk for having MetSyn, which increases their risk for diabetes, heart disease, sleep apnea, fatty liver and other undesirable health consequences.

While there may be slight differences in professional guidelines, the National Institutes of Health defines MetSyn as three or more of the following traits, or taking medications for control of these characteristics¹:

- **Large waist circumference:** Waist measurement of at least 35 inches (89 centimeters) for women and 40 inches (102 centimeters) for men
- **Increased blood pressure:** 130/85 millimeters of mercury (mm Hg) or higher
- **Elevated fasting blood sugar:** 100 mg/dL (5.6 mmol/L) or higher
- **High blood triglycerides:** 150 milligrams per deciliter (mg/dL)
- **Low blood high-density lipoprotein (HDL) cholesterol:** less than 40 mg/dL (1.04 mmol/L) in men or less than 50 mg/dL (1.3 mmol/L)

Here are a few action items ATs can follow to facilitate appropriate health screening of athletes.

Waist Circumference

Abdominal adiposity with a high storage of visceral adipose tissue is associated with higher levels of inflammation as well as insulin resistance. Some MetSyn guidelines require the large waist circumference as a prerequisite trait for diagnosis.

Action Items: Measuring the waist is fairly simple and could be easily added to the height and weight station at pre-season physicals. Measure the waist at the level of the umbilicus making sure to follow best practices as you would for any measure on

an athlete. Losing weight will decrease waist size and adiposity. If weight loss is recommended, refer the athlete to a sports dietitian for help deciphering the right amount of food for the MetSyn athlete.

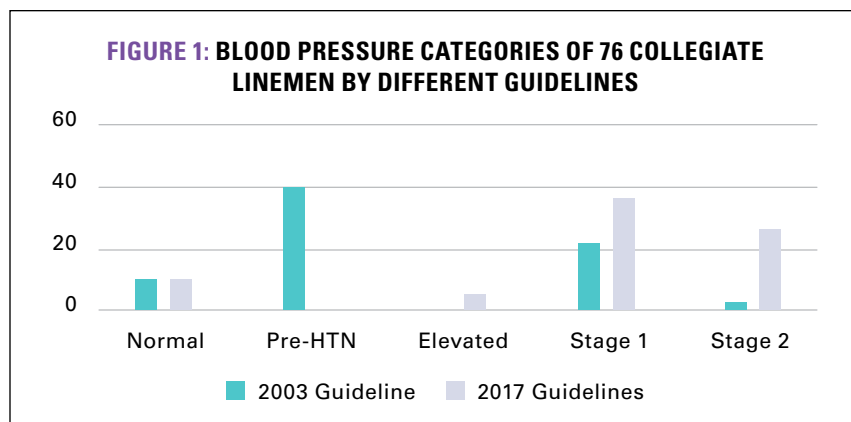
Blood Pressure

MetSyn diagnosis requires a blood pressure where the systolic pressure is greater than or equal to 130 mm Hg or the diastolic pressure exceeds 85 mm Hg. However, the American Heart Association (AHA) and the American College of Cardiology (ACC) published new blood pressure guidelines in November 2017 that may impact qualification for high blood pressure.² The new guidelines now define hypertension at lower thresholds than previously defined:

- Normal: Less than 120/80 mm Hg
- Elevated: Systolic between 120-129 and diastolic less than 80
- Stage 1: Systolic between 130-139 or diastolic between 80-89
- Stage 2: Systolic at least 140 or diastolic at least 90 mm Hg
- Hypertensive crisis: Systolic more than 180 and/or diastolic more than 120, with patients needing prompt changes in medication if there are no other indications of problems, or immediate hospitalization if there are signs of organ damage.

While the new BP thresholds seem low, they are an outcome of the landmark Systolic Blood Pressure Intervention Trial (SPRINT) study released in 2015.³ Studies indicate that the older blood pressure guidelines classified one-third of Americans as hypertensive, and it is estimated that the newer guidelines will re-classify almost one-half of Americans on the hypertensive spectrum.⁴ Accordingly, the guidelines will also affect the screening of athletes. Figure 1 demonstrates the significance of the change in these guidelines in terms of reclassification of football lineman where nearly half of the players qualified for MetSyn. The new guidelines will likely heighten awareness and help focus on lifestyle prevention rather than disease or crisis.

Action Items: Inclusion of blood pressure assessment in a preseason physical exam is a usual standard of care. The new guidelines emphasize lifestyle changes: heart-healthy diets, weight loss and exercise. Sodium has long been a villain in the BP conversation, but not all patients with high BP are sodium-sensitive. It is well-proven that a diet high in potassium, magnesium and calcium will likely help lower blood pressure. The famous DASH diet (Dietary Approach to Stop Hypertension) specifically targets high BP and includes whole grains, fruits, vegetables, lean proteins



such as fish and chicken, low-fat dairy, nuts and seeds. Limiting high-fat meats and highly processed foods with added sugars is also desirable. Athletes should also be focused on hydration practices to keep blood pressure under control. For more information, visit www.acc.org/guidelines/hubs/high-blood-pressure.

Fasting Blood Sugar

Desirable fasting blood glucose is another marker of preventive health that has been lowered through time in favor of raising awareness for people with insulin resistance and pre-diabetes. Insulin resistance means the cells of the body that require insulin are not importing and disposing of glucose as they should. Instead, the glucose stays in the blood and begins to glycosylate the hemoglobin resulting in a high HgbA1c test. High fasting blood glucose (more than 100 mg/dL) is often a first warning sign for potential diabetes and a key component of MetSyn.

Action Items: The dietary change for athletes with elevated fasting blood glucose is tricky because carbohydrate is desirable for the athlete, yet the insulin-resistant athlete needs to be cautious with how much carbohydrate they consume. In general, the insulin resistant athlete should focus on good quality carbohydrates such as whole grains and fruits while limiting added sugars and highly processed carbohydrates. It is important to check what the athlete is drinking as some beverages can add a lot of sugar to the athlete's diet.

Triglycerides

Increased triglycerides (TGs) are considered a component of the lipid profile. Ninety-five percent of the fats we eat and storage fat in our bodies are triglycerides. When we consume dietary fat or make fats in our liver from extra calories, our body transports the fats in the form of triglycerides to the adipose tissues. These are normally cleared from the blood within a few hours. A blood level higher than 150 mg/dL blood indicates we aren't metabolizing the fats as we should. High triglycerides increase the risk for heart disease and stroke.

Action Items: TGs are tested as part of the lipid profile. While it is associated as a blood lipid, TG is likely the outcome of over-consuming sugars and refined carbohydrates. More than seven servings of alcohol per week has also been associated with increased TGs. It is intuitive then that the primary treatment

for high triglycerides is to reduce consumption of sugar, refined carbohydrates and alcohol. This creates a challenge for athletes trying to increase carbohydrate for performance on a student athlete budget. Training tables might afford to provide wholesome foods to avoid fueling this fire.

HDL Cholesterol

Having high HDL cholesterol has also been recognized to support good health. It is desirable for males to have HDLs higher than 40 mg/dL (1.04 mmol/L) and higher than 50 mg/dL (1.3 mmol/L) in females. HDL is known as a cholesterol scavenger in the body as it is able to pick up stray cholesterol from the blood vessels and transport it back to the liver for disposal and recycling.

Action Items: Athletes who perform a lot of aerobic work are already stimulating higher HDLs; however, the athletes who seemingly most like to avoid aerobic work are the larger athletes who may need it the most. There are also foods that can help to improve HDL cholesterol such as nuts and seeds, fish and olive oil.

Level of Suspicion and Follow Up

Athletes can be screened during preseason physicals. If an athlete has a high BP as well as large waistline (according to the MetSyn guidelines), the sports medicine staff should consider further testing in an effort to protect the future health of athletes. The PowerPoint provided by AHA and ACC as a resource for practitioners suggests the testing found in Figure 2 in follow up to primary hypertension.⁵ These same tests would also screen for other characteristics of metabolic syndrome.

While we often value the large somatotype in sports where size determines strength

and success, we should also consider helping athletes learn more about how to take care of their specific body for future prevention of chronic diseases. §

About the Author: Jackie Buell, PhD, RD, ATC, is an expert in sports nutrition at Ohio State University. She holds the advanced practice CSSD credential, and currently sees athletes from the community as part of the OSU Jameson Crane Sports Medicine Center. She teaches medical dietetics in the College of Medicine, and her current research program includes nutrition and bone density studies in athletes as well as metabolic issues in larger athletes.

WORKS CITED

1. National Heart, Lung, and Blood Institute; National Institutes of Health; U.S. Department of Health and Human Services. Metabolic Syndrome. NIH: National Heart, Lung and Blood Institute. www.nhlbi.nih.gov/health-topics/metabolic-syndrome.
2. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. *Journal of the American College of Cardiology*. 2018;71(19):e127. doi:10.1016/j.jacc.2017.11.006
3. A Randomized Trial of Intensive versus Standard Blood-Pressure Control. *N Engl J Med*. 2015;373(22):2103-2116. doi:10.1056/NEJMoa1511939
4. Muntner P, Carey RM, Gidding S, et al. Potential U.S. Population Impact of the 2017 ACC/AHA High Blood Pressure Guideline. *Journal of the American College of Cardiology*. 2018;71(2):109-118. doi:10.1016/j.jacc.2017.10.073
5. American College of Cardiology Foundation and American Heart Association, Inc. Slide Set | 2017 Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults (Updated May 2018). American College of Cardiology. www.acc.org/education-and-meetings/image-and-slide-gallery/media-detail?id=CF4EBD8CC6F343B98989AB1793ADCF19. Published May 7, 2018.

FIGURE 2: *direct measure of metabolic syndrome trait

Basic testing	Fasting blood glucose*
	Complete blood count
	Lipid profile*
	Serum creatinine with eGFR
	Serum sodium, potassium, calcium
	Thyroid-stimulating hormone
	Urinalysis
	Electrocardiogram
Optional testing	Optional testing
	Echocardiogram
	Urinary albumin to creatinine ratio