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By Richard T. Cotton, National Director of Certification, American College of Sports Medicine

NEW CREDENTIAL BRIDGES GAP BETWEEN FITNESS PROS AND PHYSICIANS ENCOURAGING PHYSICAL ACTIVITY TO PATIENTS

There is no bigger decision in managing a certification program than deciding to create a new credential. I use “credential” quite intentionally, because not every credential needs to be a certification. In fact, in the case of the new Exercise is Medicine® (EIM) Credential, offering a new certification was not the answer because three out of the five core ACSM certifications (HFS, CES, CSEP) address the knowledge and skills related to working with special populations, and our personal trainer and group exercise instructor certifications somewhat address special populations, as well. However, in order to meet the level of proficiency the EIM Credential Committee felt was appropriate for referral by physicians, a credential demonstrating specialized knowledge which can enhance any certification was the solution.

Our team headed into this adventure with a number of objectives:
• Create a credential that will provide physicians with the confidence that the fitness professional being referred has ability to safely and effectively address the needs of the referring physician’s patients
• Minimize the barriers to entry to earning this credential and at the same time avoid duplicating knowledge and skills already addressed by current ACSM certifications
• Address the need for the enhancement of knowledge and skills in the areas of working within the health care system as well as supporting sustainable behavior change
• Grow the number of EIM credentialed fitness professionals as rapidly as possible

The planning meeting to address these objectives was probably one of the most productive and creative meetings of my entire career. We started by nixing the idea of creating another certification. We knew we had most of the knowledge and skills covered in three of the five ACSM certifications, yet we still wanted the holders of those certifications to be able to earn the EIM credential badge to be able to share with physicians and support the promotion of these important services. Out of this need came the three levels of credential.

I don’t want to get too much into the details of the levels for all of that can be found at: http://certification.acsm.org/exercise-is-medicine-credential. The three levels correspond to both the increasing scope of practice reflected for the most part in the ACSM Certified Personal Trainer/Certified Group Exercise Instructor certification (Level One) to the ACSM Certified Health Fitness Specialist certification with a bachelor’s degree (Level Two) to the ACSM Registered Clinical Exercise Physiologist certification with a master’s degree (Level Three). The ACSM Clinical Exercise Specialist can either qualify for the Level Two or Level Three credential, depending on education and experience.

The required education program is intended to enhance the knowledge and skill of those without bachelor’s degrees in exercise science. The education is provided as follows:
• Working with special populations (60%)
• Working within the health care system (20%)
• Supporting sustainable behavior change (20%)

The exam is composed of 50 questions with the percentage of the questions consistent with the above.

We are quite proud of the work that we have done and feel confident that this new credential can meet the needs of healthcare providers as well as enhance our profession to better integrate with the healthcare system.

INTRODUCING THE EXERCISE IS MEDICINE® (EIM) CREDENTIAL
TIPS FOR TRAINING CLIENTS WHO PLAY GOLF

By Kiran Kanwar, B.S.

Given that more than 25 million Americans play golf, a number projected by the World Golf Foundation to increase to 55 million by 2020, there is a good chance that many of a personal trainer’s typical clientele will include those who play golf — whether to compete at an elite, amateur or professional level, or simply for the enjoyment of the game. Such clients can generally benefit from a fitness program that includes:

• A musculoskeletal screening
• Suggestions for pre-round dynamic warm-up routines
• Suitable exercise regimens

The above three elements will ensure that your client has more efficient ball striking in terms of distance, direction and trajectory, and, at the same time, reduced scope for injury.

Musculoskeletal screening: Screen for neck rotation 80° in either direction; undesirable excessive cervical or thoracic flexion; pelvic rotation (belt buckle turns 45°) along with disassociation from thoracic rotation; trail shoulder external rotation; lead arm horizontal adduction (should be 130° for males, 155° for females); grip strength and wrist flexibility (specifically radial and ulnar deviation). Other tests could include those for hamstrings tightness, calf flexibility, pelvic tilt, leg extension and balance.

Dynamic warmup: A good dynamic warm-up might include pulse-raiser exercises which at the same time work the abductor/adductor muscles of the thigh, the quadriceps and hamstrings, the lateral flexors of the spine and shoulder flexor/extensor muscles.

Exercises: A combination of exercises for improving overall and core strength; flexibility of the spine and upper limb; neuromuscular speed and positional awareness (including plyometrics and uneven surface proprioceptive workouts); cardiovascular fitness for the endurance required to walk 18 holes often carrying a golf bag; balance; and agilities. A new trend is to include exercises which mimic the core movement patterns of crawling, rolling over and running.

The personal trainer also can benefit from a basic knowledge of what aspects of the golf swing deliver better distance, direction and trajectory; as well as an understanding of the regions of, and main causes of pain or injury, either caused or exacerbated by golf.

The ‘modern’ golf swing which most golfers today aspire to make emphasizes a large shoulder turn against a restricted hip turn (termed X-factor), along with a speedy trail-side lateral trunk flexion during the downswing (termed ‘crunch factor’), and both these factors require greater joint stability/mobility respectively, while also resulting in greater chance for injury.

An efficient golf swing produces power and the resulting club speed from a combination of:

• Sequential summation of forces - proximal parts leading the distal ones (that is, legs and hips start the downswing, followed by trunk followed by shoulders, arms and wrists and finally the club)
• Stretch-shortening cycle (muscles which are stretched during the backswing — X-factor — or more importantly during early downswing X-factor stretch — contract more forcefully at impact) and
• Use of ground-reaction forces created by forceful pushing off of the trail foot.

A correct sequence of the downswing — proximal to distal — not only helps to generate greater swing speed, but also delivers the golf club from the correct direction to produce straight ball-flight. Conversely, an incorrect downswing sequence is one in which the upper-body starts the downswing out-of-sequence. Such a downswing is typically termed an ‘over-the-top’ (OTT) one, and usually results from a backswing with excessive flexion of lead side trunk and thus lead knee; excessive thoracic plus hip rotation; internal rotation of trail shoulder; excessive pronation of trail forearm and early extension of trail wrist. [More efficient and safer backswing joint positions which reduce the scope for the OTT downswing and thus for injury, are neutral wrists, semi supine trail forearm, minimal trail elbow flexion, external trail shoulder rotation together with backswing lateral flexion of the trail side trunk].

Injury in the golf swing is mostly microtrauma, caused by poor mechanics among the less skilled and occasional golfers; and by overuse in the more elite ones. Poor-mechanics injury is almost always the result of the over-the-top downswing, which forces greater than normal torques and loads on the spine, the lead knee, as well as on both elbows and the lead wrist.

The most common areas of injury are said to be wrist/hand 37%, low back 24%, shoulder 10%, elbow 7 and knee 7% for professional golfers. For amateur golfers they are low back 35%, elbow 33%, wrist/hand 20% shoulder 12% and knee 9%. Most of these injuries are of the lead side of the body. Avoidance of the OTT downswing could reduce the scope for all these injuries.

A well-balanced fitness plus nutrition and hydration package based on a better basic understanding of golf swing mechanics and injury mechanisms can be an asset to any personal trainer and can add greatly to his/her repertoire of client services.

The following websites offer golf-specific fitness information:

• www.TitlestPerformanceInstitute.com
• www.backtogolf.com
• www.fitgolf.com
• www.chekinstitute.com
• www.back9fitness.com
• www.golfhelp.com

About the Author

Kiran Kanwar, B.S., has been a golf instructor for more than 23 years and has worked with every skill level of golfer. Based on over 17 years of research, she has developed The Minimalist Golf Swing which places all the major golf-swing joints of the body in positions from which they are designed to perform optimally, which increases swing efficiency and decreases scope for injury. (WWW.YOURGOLFGURU.COM AND WWW.KIRANKANWARGOLF.WORDPRESS.COM)

Golf (continued on page 15)
A crippled immune system can impair a training athlete, leaving the body vulnerable to infection and disease, and subsequently can inhibit exercise training and performance. Furthermore, changes in immune functioning can have detrimental effects on physiological systems other than the immune system, including the nervous and metabolic systems. In general, the immune response is divided into the innate immune response (cellular and molecular components that defend against infection in a non-specific manner, e.g., macrophages and neutrophils) and the adaptive immune response (specific cellular and molecular components that defend the body uniquely for each specific antigen, e.g., T-cells and B-cells). Both innate and adaptive responses are affected by exercise, but, how much of an effect does exercise have, and how should these desired responses govern exercise prescription? The focus of this article is dedicated to answering these questions.

INNATE IMMUNE SYSTEM AND EXERCISE

The innate immune response is the first line of defense against pathogens if they pass surface barriers of the body (e.g., mucous, hair, skin). Unlike the adaptive immune response, this system does not adapt to repeated exposures from the same pathogen. Nonetheless, the innate immune system is able to eliminate almost all invaders with a combination of leukocytes (white blood cells derived from multipotent hematopoietic stem cells) and inflammatory mediators (cell-derived messenger molecules that propagate inflammation). Innate immunity relies heavily on four immune cells (neutrophils, macrophages, dendrites, and natural killer cells), with each responding in a unique manner to exercise. Neutrophils constitute 50% to 60% of all circulating leukocytes and typically are the first to respond to immune stimuli including exercise. Immediately following a single aerobic exercise session, circulating neutrophils rapidly increase in number. This initial increase is followed by another delayed rise several hours later. Both increases are dependent on the intensity and duration of the exercise session. However, the increased number of neutrophils is not necessarily indicative of a heightened immune response. Rather, following moderate to vigorous aerobic exercise (65 to 85% \( \text{VO}_2\text{max} \)), mobilized neutrophils are less responsive to bacterial stimuli for several hours post exercise, showing that their function is blunted. In contrast to these results to acute exercise, chronic exercise training appears to leave concentrations of neutrophils unaffected or reduced, while retaining function. Neutrophil response to exercise indicates that while intense acute exercise can leave the body vulnerable to infection, chronic training may have a beneficial anti-inflammatory effect. Essentially, exercise training could cause a more tightly regulated release and sequestering of neutrophils, helping the body control disease and infection.

A single aerobic exercise session (65% to 85% \( \text{VO}_2\text{max} \)) results in temporal increases in circulating monocytes approximately 2-h post exercise. If muscle damage is involved macrophages in the muscle tissue rise approximately 24-h post exercise. Macrophages are monocytes that have left circulation into surrounding tissue and differentiated into phagocytic immune cells. The increase in circulating monocytes is likely linked to cortisol release from the endothelium during exercise. Circulating monocytes typically have two predominant phenotypes, based off of surface receptors (Cluster of Differentiation receptors), CD14\(^+\)/CD16\(^-\) (pro-inflammatory) and CD14\(^-\)/CD16\(^+\) (homeostatic). Monocytes recruited to circulation within the first 24-h post exercise are primarily of CD14\(^+\)/CD16\(^+\) phenotype while the second wave of monocytes (beyond 24-h post exercise) is composed mainly of CD14\(^-\)/CD16\(^+\) phenotype. Though there is substantial evidence regarding circulating monocytes post exercise, relatively little is known concerning differentiated tissue macrophages. Nonetheless, animal studies have examined the influence of acute moderate aerobic exercise on tissue macrophages and found some functions such as phagocytosis and reactive oxygen and nitrogen metabolism are enhanced by exercise.

Unlike macrophages and neutrophils, the role of dendritic cells has been vastly under investigated despite the possible large role they play in the innate and adaptive immune response to exercise. Dendritic cells are named after their resemblance of neuronal dendrites, and serve largely as mediators between the innate and adaptive immune systems. The typical monocytic response to lipopolysaccharide (LPS) than their untrained counterparts. LPS is a component of gram-negative bacteria, and elicits a reputable immune response in mammals. The typical monocytic response to LPS was reduced with exercise training. Additionally, some animal studies show that macrophage infiltration is reduced with exercise training. Once more, the effects of acute exercise on macrophages like neutrophils could leave the body susceptible to infection for up to several days following recovery. Yet, the potential reductions in macrophage infiltration observed with exercise training are seen as beneficial in situations of chronic inflammation (i.e., cancer, obesity, cardiovascular disease, type 2 diabetes).}

"By Benjamin T. Gordon, M.S., CES, CSCS"
cantly increased in dendritic cells. MHC II and IL-12 are heavily involved in the development of T-cells and the adaptive immune response. These investigations support a potentially large dendritic cell role in exercise recovery. Exercise training possibly aids in dendritic function, but additional clinical trials are needed before conclusive statements are made.

Circulating natural killer (NK) cells, much like other innate leukocytes, are rapidly increased in response to exercise. Following a single session of aerobic exercise (65%-95% VO₂ max for up to 4 h) a 50%-100% increase in circulating NK cells has been reported. As is the case with monocytes, the NK cell exercise response is phenotype specific. NK cells can be grouped by their relative expression of CD56, a membrane adhesion molecule. CD56bright and CD56dim are the two common phenotypes of NK cell, and it appears CD56bright NK cells are less responsive to acute exercise than CD56dim. This could indicate that NK cells have a reduced ability to defend against pathogens following acute exercise, because CD56dim NK cells are less cytotoxic. In addition, with prolonged exercise, circulating NK cells decrease, which is likely a result of tissue infiltration. Nonetheless, the health implications following acute exercise-mediated changes in NK cells are unknown, and the effects of exercise training on NK cell functioning are complex. Fairley et al. completed a 15-week clinical trial and found increased NK cytotoxicity. Other clinical trials including a 12-month trial by Campbell et al. found no exercise training effect.1 Inter-study differences such as subject variability may contribute as confounding factors. However, more decisive evidence regarding NK cell functioning in response to exercise training is needed before conclusions are made.

THE ADAPTIVE IMMUNE SYSTEM AND EXERCISE

Adaptive immunity is the second division of the immune system and uniquely responds to individual pathogens. The adaptive immune system almost always is activated by the presentation of an antigen (any foreign object that provokes the immune system to create antibodies), typically by a member of the innate immune system T helper cells (CD4+). T-cells are lymphocytes like NK cells and neutrophils, but all T-cells are distinguished by T-cell Receptors (TCR). CD4+ cells are not the only T-cells in the immune system. There are several subdivisions of T-cells including, Regulatory T-cells (Tregs), cytotoxic T-cells (CD8*), memory T-cells, and Natural Killer T-cells (NKT). However unlike CD4+ cells, other T-cells do not initiate the adaptive immune response. Furthermore, CD4+ cells are subdivided into type 1 (Th1) and type 2 (Th2) phenotypes. CD4+ cells and have no specific mechanism for defending against pathogens, but may help other immune cells do so. CD4+ cell phenotype is determined by what activates them and what pathways are followed after activation. Th1 cells are activated by the presence of intracellular pathogens such as bacteria or viruses. This activation usually is caused by CD4+ cell detection of infected macrophages. In turn, Th2 cells are activated by the presence of extracellular pathogens and toxins, which typically results in B-cell production of antibodies. Along with their adaptive immune system counterparts, B-cells another lymphocyte, make up the majority of the system and function in immune surveillance. These circulating cells do not fully proliferate without CD4+ cells releasing soluble mediators including cytokines (e.g., IL-4, IL-5, IL-6, and IL-13), which differentiate the B-cells into plasma cells or memory cells. Plasma cells release large amounts of specific antibody (Immunoglobulin, (Ig)) that help mark pathogens in the immune phagocytic destruction process.

A single exercise session substantially changes function of the adaptive immune response. Typically, with moderate to vigorous exercise (60%-85% VO₂ max), T- and B-cells show a biphasic response with a rapid increase in circulation followed by a dip below baseline values a few hours post-exercise. The decrease of T- and B-cells is dependent on how intense and how long the exercise is, meaning with increases in intensity and duration there are larger decreases below baseline. Epinephrine interaction appears to cause much of the mobilization of these cells into circulation via direct and indirect mechanisms. Lymphocytes naturally express a high percentage of adrenergic receptors causing them to react to the release of epinephrine. With exercise, both the activity and density of these receptors are increased. CD4+ cells have the lowest expression of adrenergic receptors with the CD8* expressing the highest. The decrease following initial mobilization of T-cells likely is due to an exaggerated decrease in Th1 cells, whereas exercise seems to have little or no effect on Th2 cells. Most likely the decrease in Th1 cells is a result of redistribution of cells and not apoptosis. Similar to acute exercise studies involving the innate immune system, the decrease in T-cell number may be indicative of immune suppression during exercise recovery. However, T-cell function also must be analyzed.

Without proper functioning T-cells, which can happen with intense acute exercise, the body is susceptible to all types of intracellular invaders. This may explain why intense training and competition (e.g., near maximal effort) leaves athletes temporarily more susceptible to upper respiratory tract infections (URTIs). However, analysis of T-cell activity following exercise is extremely difficult. In addition, T-cell functioning is measured only in vitro from blood samples obtained during recovery. The cell composition of blood samples taken before and after exercise is often dramatically different making analysis more difficult because the ratios of immune cells are not consistent between the two measurements. Nonetheless, T- and B-cell function appear susceptible to increases of greater than 15% per week in training load (duration, intensity, and frequency) of exercise training. T-cell proliferative responses and decreases in stimulated B-cell Ig synthesis have been reported with increases in intensity of exercise training. Further investigations are needed to clarify and fully understand the impact of exercise training upon T-cell functioning.

B-cells, when properly stimulated by CD4+ cells, can differentiate into plasma cells or memory cells. Following differentiation, plasma B-cells generally are localized in lymphoid and mucosal tissue with their main role being the secretion of Ig (antibody). The effects of exercise on plasma cells have been measured through Ig mucosal concentrations in vivo and serum Ig creation following in vitro stimulation. Mucosal Ig concentrations allow for an estimation of plasma cell release of lg, while serum Ig synthesis allows for the analysis of the plasma cells to create lg outside of the body. Mucosal Ig concentrations following a single session of exercise and exercise training remain unchanged. However, lg production following in vitro stimulation increases in response to both a single exercise session and exercise training, showing that B-cell functioning is potentially positively influenced by exercise.
Diabetes mellitus is a chronic disease that is quickly becoming an epidemic. Based on current data, 25.8 million American children and adults (or 8.3% of the United States population) have diabetes. Another 79 million Americans have pre-diabetes.¹ U.S. data released in 2010 predict that 1 in 3 American adults could have diabetes by 2050 if current trends continue.¹ Diabetes is the seventh leading cause of death in the United States, and individuals with diabetes are two to four times more likely to develop cardiovascular disease than those without diabetes.¹ Despite these alarming statistics, there is a great deal that people can do to prevent diabetes and that those with the disease can do to avoid complications and stay healthy.

Type 1 diabetes is a disease of absolute insulin deficiency characterized by beta cell failure; it affects 5% to 10% of individuals with diabetes. Type 2 diabetes involves relative insulin deficiency and is characterized by some combination of three main metabolic problems: 1) decreased beta cell function with reduced insulin production, 2) insulin resistance in the peripheral tissues, and 3) increased hepatic glucose production. Of the people with diabetes, 90% to 95% have type 2.²³

Diabetes treatment components include healthy eating, regular physical activity, medication (if needed), blood glucose monitoring, and education on diabetes self-management.¹³ Medication options for diabetes treatment continue to expand and include oral medications, insulin, and other injectable preparations. Some of these medications may cause hypoglycemia (low blood glucose), particularly when combined with increased activity. The remainder of this article explores the various types of diabetes medications and implications for exercise/fitness professionals to help ensure a safe exercise experience for their clients.

ORAL DIABETES MEDICATIONS

Oral diabetes medications may be used to control blood sugar in persons with type 2 diabetes. The oral medications are divided into six classes based on how they work to affect blood glucose levels. These may or may not increase the risk for hypoglycemia during exercise (Table 1).

INSULIN

Insulin is always used in the treatment of type 1 diabetes, and sometimes in the treatment of type 2 diabetes. All types of insulin can cause hypoglycemia. The peak insulin time is when an individual is at greatest risk for hypoglycemia. It is suggested that exercise be avoided dur-

---

Table 1: Oral Diabetes Medications¹⁴

<table>
<thead>
<tr>
<th>CLASS</th>
<th>HOW THEY WORK</th>
<th>NAMES – Generic &amp; (Brand) Name</th>
<th>RISK OF HYPOGLYCEMIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfonylurea</td>
<td>Stimulate pancreas to make more insulin, both right after a meal and for several hours later</td>
<td>Glimepiride (Amaryl) · Glipizide (Glucotrol, Glucotrol XL) · Glyburide (Diabet, Micronase, Glynase)</td>
<td>Yes</td>
</tr>
<tr>
<td>Meglitinides</td>
<td>Stimulate pancreas to release more insulin right after a meal</td>
<td>Nateglinide (Starlix) · Regaptinide (Prandin)</td>
<td>Yes</td>
</tr>
<tr>
<td>Biguanides</td>
<td>Decrease amount of glucose released from liver</td>
<td>Metformin, metformin XR</td>
<td>Not likely, but possible</td>
</tr>
<tr>
<td>Alpha-Glucosidase Inhibitors</td>
<td>Slow carbohydrate digestion</td>
<td>Acarbose (Precose) · Miglitol (Glyset)</td>
<td>Yes, if used with sulfonylures or insulin</td>
</tr>
<tr>
<td>Thiazolidinediones (TZDs)</td>
<td>Increase insulin sensitivity in muscle and fat tissue</td>
<td>Pioglitazone (Actos) · Rosiglitazone (Avandia)</td>
<td>No</td>
</tr>
<tr>
<td>Dipeptidyl peptidase-4 (DPP-4) inhibitors</td>
<td>Enhance insulin secretion &amp; decrease amount of glucose released from liver after a meal</td>
<td>Linagliptin (Tradjenta) · Saxagliptin (Onglyza) · Sitagliptin (Januvia)</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: Several of these medications are available in combination preparations.

Table 2: Insulin Types and Actions⁵

<table>
<thead>
<tr>
<th>TYPE</th>
<th>NAME Generic &amp; (Brand) Name</th>
<th>ONSET</th>
<th>PEAK</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid-acting</td>
<td>Aspart (NovoLog) · Glulisine (Apidra) · Lispro (Humalog)</td>
<td>5-15 minutes</td>
<td>30-90 minutes</td>
<td>&lt;5 hours</td>
</tr>
<tr>
<td>Short-acting</td>
<td>Regular (regular) · NPH</td>
<td>30-60 minutes</td>
<td>2-3 hours</td>
<td>5-8 hours</td>
</tr>
<tr>
<td>Intermediate-acting</td>
<td></td>
<td>2-4 hours</td>
<td>4-10 hours</td>
<td>10-16 hours</td>
</tr>
<tr>
<td>Long-acting</td>
<td>Detemir (Levemir) · Glargine (Lantus)</td>
<td>2-4 hours</td>
<td>None</td>
<td>24 hours</td>
</tr>
</tbody>
</table>

Note: Several pre-mixed insulin combinations also are available.

Table 3: Carbohydrate Options for Treatment of Hypoglycemia⁶

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>AMOUNT (15 grams carbohydrate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit juice</td>
<td>½ cup</td>
</tr>
<tr>
<td>Milk (skim preferred)</td>
<td>1 cup</td>
</tr>
<tr>
<td>Regular soda pop</td>
<td>½ cup (4 oz.)</td>
</tr>
<tr>
<td>Glucose tablets</td>
<td>3-4 (depends on brand)</td>
</tr>
<tr>
<td>Glucose gel</td>
<td>Check package information for amount equal to 15 grams</td>
</tr>
</tbody>
</table>

Note: High fat foods/drinks slow gastric emptying and carbohydrate absorption and therefore take longer to raise blood glucose levels.
Table 4: Recommended Pre-Exercise Carbohydrate Intake Based on Blood Glucose Levels

<table>
<thead>
<tr>
<th>GLUCOSE PRE-EXERCISE</th>
<th>INTENSITY AND DURATION OF EXERCISE</th>
<th>EXTRA FOOD NEEDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 100 mg/dl</td>
<td>Low (&lt; 30 minutes) Moderate (30-60 minutes) Strenuous (&gt;1 hour)</td>
<td>15 gms carbohydrate 30 gms carbohydrate 60 gms carbohydrate</td>
</tr>
<tr>
<td>101-170 mg/dl</td>
<td>Low Moderate Strenuous</td>
<td>No extra food needed 15 gms carbohydrate 30 gms carbohydrate</td>
</tr>
<tr>
<td>171-300 mg/dl</td>
<td>Low Moderate Strenuous</td>
<td>No extra food needed 15 gms carbohydrate</td>
</tr>
</tbody>
</table>
| Over 300 mg/dl       | **Don’t begin exercise until blood sugar is under better control.**

**Don't begin exercise until blood sugar is under better control.**

Symptoms of hypoglycemia include:

- Sweating
- Dizziness
- Confusion/irritability
- Hunger
- Vision changes
- Shaking
- Headache
- Personality change
- Weakness
- Seizures or loss of consciousness

Hypoglycemia prevention is key to a safe exercise experience for the person with diabetes. Some tips for avoiding hypoglycemia include:

- Administer insulin injections in a part of the body that will not be used actively for exercise. The abdomen is often a good site. Injecting into the subcutaneous tissue near a muscle that is being used during activity may cause hypoglycemia. The increased blood flow to the area causes more rapid insulin absorption with possible resultant hypoglycemia.

- Always check the blood glucose level before, during, and after exercise, at least until the effects of a specific type and duration of activity are monitored for several exercise sessions.

- Watch for delayed post-exercise hypoglycemia in people who take insulin. Because metabolism remains increased for several hours after exercise, people may experience lows several hours after exercise, especially during the night. Advise people to check glucose at bedtime and take a snack of 15-30 grams carbohydrate plus protein if the glucose is <100 mg/dl. A glucose check at 1–2:00 a.m. also is advisable following a day of significantly increased activity.

- Individuals who take a diabetes medication that can cause hypoglycemia should plan for increased activity by either increasing carbohydrate intake or decreasing insulin intake. These guidelines are a helpful starting point for additional carbohydrate prior to exercise. All extra food should be eaten before exercise and is in addition to the regular meal plan (Table 4).

### NON-INSULIN INJECTABLE MEDICATIONS

There are other injectable diabetes medications that are not insulin, but affect glucose control in other ways. These include exenatide (Byetta & Bydureon), lixisenatide (Victoza) and pramlintide (Symlin). These medications do not cause hypoglycemia by themselves, but can do so if combined with other medications that may lead to low glucoses.

### HYPOGLYCEMIA SYMPTOMS AND TREATMENT

Anyone with diabetes who is taking insulin or an oral medication that can cause hypoglycemia should be aware of hypoglycemia symptoms and have rapid-acting glucose available at all times, particularly during exercise. Hypoglycemia is defined as a glucose <70 mg/dl.

Symptoms of hypoglycemia include:

- • Sweating
  - • Dizziness
  - • Confusion/irritability
  - • Hunger
  - • Vision changes
  - • Shaking
  - • Headache
  - • Personality change
  - • Weakness
  - • Seizures or loss of consciousness

If hypoglycemia is suspected, check blood glucose. If blood glucose is below 70 mg/dl, treat the low blood sugar using the Rule of 15. Take 15 grams of carbohydrate, wait 15 minutes, then re-treat with 15 grams of carbohydrate if symptoms have not improved (Table 3). In individuals with either type 1 or type 2 diabetes, exercise is not recommended for blood glucose below 100 mg/dl until a carbohydrate has been consumed, the glucose level has been rechecked, and has increased to a safe level.

Hypoglycemia prevention is key to a safe exercise experience for the person with diabetes. Some tips for avoiding hypoglycemia include:

- Suggested Resources:

**SUMMARY**

Regular physical activity is an essential tool in glycemic control and overall health for everyone with diabetes. Exercise professionals who are prepared to provide advice and assist with hypoglycemia treatment can help to ensure that persons with diabetes have a safe and beneficial exercise experience.

**About the Authors**

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Diabetes Medications (continued on page 14)
This column continues the new format for our Coaching News column. We are exploring a variety of client scenarios, one scenario for each column. I describe a few tips from my science-based coaching toolbox to help you help your clients engage fully in a fit lifestyle that allows them to thrive, whatever thriving means in their lives.

Today we explore how to work with a client who is not engaged in following evidence-based or scientific guidelines, including preventive tests, and is not seeking out reputable sources on the Web and beyond. Instead, s/he hunts down information and recommendations from non-reputable sources, while not listening to your well-informed advice.

It goes without saying that those reading this article honor and respect the scientific method, are skeptical of recommendations that lack a scientific foundation, and stay within the bounds of evidence-based guidelines that are worthy of publication in a peer-reviewed journal or textbook. The construct of evidence-based medicine has been around for about 20 years and is a relatively new, but essential paradigm in exercise program design and implementation. We are taught to refrain from making recommendations that are not firmly rooted in well-designed research studies, the more the better.

However, our clients may not be like us. They may not trust or respect science-based recommendations. Perhaps they think of themselves as right-brain types who didn’t enjoy science courses in their education, and value intuition and creativity more than the scientific method. Maybe they are frustrated with the limitations of the scientific method, which generates recommendations based upon averages and bell curves that don’t seem relevant to their personal circumstances. They may be more interested in what complementary and alternative practitioners have to say because these practitioners treat people who have been failed by conventional medicine.

Some are justifiably concerned about how medical guidelines change dramatically over time.

Lively debates have emerged recently among scientists and in the media about the pros/cons of mammograms, PSA tests for prostate cancer, and the value of annual physicals. Not long ago high carb/low fat diets were the universal recommendation for heart health; this is no longer valid as the evidence for low carb/moderate healthful fat diets is now compelling. The landmark June 2012 JAMA paper on weight loss maintenance by Ludwig et al., has overturned the science-based wisdom that a “calorie is a calorie” when it comes to energy expenditure. It turns out that high carb diets lead to an average of 300 fewer calories expended daily than low carb diets, a critical issue for weight loss maintenance. No wonder our clients may have become cynical about evidence-based guidelines.

So how do we bridge the gap between our science-based wisdom and guidelines and our clients who don’t trust our science-based guidelines and resist our recommendations?

1. Appreciate Without Judgment
   The only way a helping professional can defuse resistance is to get fully onto your clients’ side of the fence. Get down from your expert pedestal and honor your clients’ biological drive for autonomy, to choose their own path. Inquire openly and without even the tiniest whiff of judgment or expectation about how they make decisions on what to do to protect and improve their personal health. What is their approach to investigating options, whose advice do they trust most, how do they weigh up their options and decide? What do they think about evidence-based medical guidelines? Perhaps they will share painful stories about how they or close others have experienced difficulties with recommendations of reputable health care providers. Validate and show respect for their perspectives with authentic sincerity, however uncomfortable that might be.

2. Coach Don’t Preach
   Once your clients trust that you appreciate and respect their viewpoints, bringing down the walls of resistance, you have created an opening to facilitate their finding a new and improved decision-making process. Move into a collaborative coaching conversation where you encourage clients to generate new ideas on how best to make health decisions, and get permission to offer your ideas and wisdom. While it’s tough for our expert minds to give up control of having the right answers, it is human nature for your clients to value what they discover more than what has been imposed. Allowing your clients to discover a better path for themselves will, in fact, dramatically increase your impact and your clients’ success. And the bonus is that they will be more likely to be interested in your best advice.

About the Author
Margaret Moore (Coach Meg), M.B.A., is the founder & CEO of Wellcoaches Corporation, a strategic partner of the ACSM, widely recognized as setting a gold standard for professional coaches in healthcare and wellness. She is co-director of the Institute of Coaching, at McLean Hospital, an affiliate of Harvard Medical School and co-directs the annual Coaching in Leadership & Healthcare Conference offered by Harvard Medical School. She co-authored the ACSM-endorsed Lippincott, Williams & Wilkins Coaching Psychology Manual, the first coaching textbook in healthcare and the Harvard Health Book published by Harlequin: Organize Your Mind, Organize Your Life.

References
RESISTANCE TRAINING AND DIABETES

By Wayne L. Westcott, Ph.D.

Age-related muscle loss is associated with a variety of physiological problems including metabolic decline, fat gain, and diabetes. Studies show muscle mass reductions of 3% to 8% each decade after age 30, and 5% to 10% each decade after age 50, averaging approximately one pound of muscle tissue every year following the fifth decade of life. According to an excellent research review by Flack et al., decreased muscle mass directly influences the risk of developing glucose intolerance and diabetes because muscle tissue is the primary site of glucose deposit and utilization.

MUSCLE GAIN

Numerous studies have shown that gains in lean weight resulting from resistance training are associated with greater glucose tolerance in adults with type 2 diabetes, older adults with type 2 diabetes, men with type 2 diabetes, and women with type 2 diabetes. According to Phillips and Winett, resistance exercise is associated with improved glucose and insulin homeostasis due to increases in lean body mass and muscle cross-sectional area. Flack et al. also found that increased lean body mass was associated with improved insulin sensitivity and glucose tolerance.

Fat Loss

The primary result of resistance training is muscle gain, which appears to have a positive impact on factors related to diabetes risk. However, a secondary outcome of resistance exercise is fat loss, which also may be advantageous with respect to diabetes risk. Although the duration of activity time in standard resistance exercise sessions is relatively low compared to standard aerobic exercise sessions, the training intensity is relatively high. A standard circuit strength training workout (typically 10 to 15 exercises arranged so that participants perform one set of an exercise then move quickly to an exercise for a different muscle group with minimal non-activity time) uses approximately 6.7 to 8.5 calories per minute, or up to 170 calories for a 20-minute exercise session. However, post-training muscle tissue remodeling processes appear to be responsible for increasing resting energy expenditure by 5% to 9% for 72 hours following the strength workout. Using an average 7% increase in resting energy expenditure and a resting energy expenditure of 1,600 calories/day, this would represent about 110 additional calories used on a daily basis for people who perform at least two resistance training sessions/week.

Consequently, the cumulative calorie-burning benefit of regular resistance exercise could total about 4,800 calories/month (8 training sessions x 170 calories/session + 31 days x 110 calories/day = 4,770 calories). The increased resting energy expenditure may be largely responsible for the approximately 4-pound reduction in fat weight reported following 10 to 12 weeks of regular strength training.

More specifically, resistance exercise has been shown to decrease intra-abdominal fat in older men and women and in people with diabetes. This is important because research has revealed an association between abdominal fat and insulin resistance. Based on their 2010 meta-analysis of related studies, Strasser et al. concluded that “resistance training reduces total body fat mass and visceral adipose tissue independently from dietary restriction.” Based on their 2011 review of related research, Flack et al. concluded that “resistance training alone may reduce abdominal and visceral fat, which is known to increase with advancing age and influence insulin resistance.”

RESISTANCE TRAINING RECOMMENDATIONS

The American College of Sports Medicine (ACSM) guidelines for resistance exercise provide a sound basis for strength training that is appropriate for most people who are capable of performing muscular activity. The general recommendations call for doing 8 to 10 exercises per session, performing 2 to 4 sets of exercise for each muscle group, using a resistance that permits 8 to 12 repetitions, emphasizing complete movement range and controlled movement speed, and training 2 or 3 non-consecutive days a week (page 172). This could be accomplished by performing two to four sets of a single exercise for a given muscle group (e.g., three sets of bench presses for the pectoralis major muscles), or by performing one set of two to four exercises for the same muscle group (e.g., one set each of bench presses, incline presses, and dumbbell flies for the pectoralis major muscles). The resistance training guidelines for older adults are similar, but recommend beginning with a resistance that permits 10 to 15 repetitions at a lower effort level (page 172). With respect to glycemic control, Strasser et al. report that improvements have resulted from a range of training volumes (4 to 9 exercise sets per muscle group per week) and training intensities (50% to 85% of maximum resistance).

The American Diabetes Association (ADA) supports resistance exercise for people with type 2 diabetes, and recommends a training protocol consistent with the ACSM guidelines. The ADA encourages resistance training for all the major muscle groups, progressing to three sets of 8 to 10 repetitions, performed at high intensity, three times a week. Upon examining the strength training research and recommendations, Flack et al. have proposed a progressive program of resistance exercise for older diabetic and prediabetic individuals. They suggest beginning with low intensity and low volume workouts (one set of 10 to 12 repetitions performed two days a week), with gradual increases in the training variables (intensity, volume, and frequency). All of these suggested resistance training protocols appear to be appropriate for people with diabetes, and, therefore, may be recommended for the prevention and management of type 2 diabetes.

Resistance Training (continued on page 14)
The first two heart sound articles, in this series of three, reviewed the anatomical positions to listen to the different valves of the heart, correct use of the stethoscope and the rationale for common heart sounds. To recap briefly, systole (S1) “lub” and diastole (S2) “dub” are the typical healthy heart sounds. Less common sounds that should be considered include (S3), caused by rapid ventricular filling and (S4), the onset of atrial contraction. The third heart sound may be an innocent normal variant in younger populations and in pregnancy; however, as with a fourth heart sound it may be associated with cardiac pathologies and would need further evaluation.

This third article in the heart sound series will describe the sounds associated with the more common valvular diseases that produce murmurs. Murmurs are longer duration sounds that are attributed to turbulent blood flow. The two common valvular abnormalities are stenosis and regurgitation. Stenosis is reflective of a partially obstructive valve that causes blood to be ejected through a smaller orifice than normal. Regurgitation is reflective of a valve that allows blood to flow in a “retrograde” or opposite direction. Identifying the murmurs associated with the possible presence of stenosis or regurgitation is based on determining where to best listen on the chest wall (previously described) and the ability to determine when they occur in the cardiac cycle.

**Aortic Stenosis**

Blood is being ejected through a smaller than normal opening in the aortic valve, which creates a higher than normal pressure in the left ventricle (LV). This creates a “nozzle” effect during systole. The sound is greatest immediately following S1 and decreases to S2 (decrescendo murmur). The turbulent blood flow against the aortic walls is responsible for causing the vibration and loud murmur (Figure).

**Aortic Regurgitation**

The murmur is heard during diastole (between S2 and S1). The murmur is caused by turbulent blood flow traveling retrograde from the aorta through the aortic valve into the blood in the left ventricle. This murmur has been described as a “blowing” high pitch sound, but typically not as loud as aortic stenosis due to a lesser pressure difference.

**Mitrail Stenosis**

There is an increased challenge in blood flow from the left atrium (LA) to LV due to stenosis of the mitral valve. Typically, this is a lower pitch sound in diastole because of a decreased pressure in the LA, which usually doesn’t exceed 35mmHg. Because there is very little blood in the LV at the onset of LA contraction, a vibration sound may not occur until the LV is partially full. The increased amount of blood in the LV will stretch the LV, which allows a vibration sound to be produced when blood is ejected into the LV. Therefore, mitral stenosis may not be heard until 2/3 of the way through diastole. Because mitral stenosis produces lower pitch sounds, using the bell side of the stethoscope may be helpful to hear this abnormality.

**Mitrail Regurgitation**

Blood flow will travel retrograde through the mitral valve during systole, and will be heard as a “blowing” swishing sound in the LA. However, the LA is very deep in the chest wall and difficult to hear, and, therefore, it is best to identify this sound through the LV, at the apex of the heart. The murmur sound is produced by turbulent blood being pushed back through the mitral valve into the blood in the LA or against the atrial wall. This sound is very similar to aortic regurgitation; however it occurs during systole versus diastole, making it very important to recognize where the sound is heard in the cardiac cycle.

**Personal Note**

Becoming proficient at recognizing different heart sounds in your Clinical Exercise Physiology (CEP) academic training can be challenging. Hopefully, the concepts of detecting heart sounds are being introduced here (continued on page 15).
EXERCISE AND BARIATRIC SURGERY

By Kelly Drew, M.S., ACSM RCEP

BACKGROUND

Bariatric surgery is becoming more and more prevalent as the number of obese and morbidly obese adults increases. Currently, 35.5% of adult men and 35.8% of adult women are considered obese (have a body mass index (BMI) greater than or equal to 30.0 kg/m²). 5 When surgical treatment of obesity is contemplated, obesity and clinically severe obesity need to be differentiated. Clinically severe obesity (or morbid obesity) is defined by the American Society for Metabolic and Bariatric Surgery (ASMBS) as a disease of excess energy stores in the form of fat, correlating with a BMI of 40 kg/m² or greater or with being 100 pounds over ideal weight. 1 The physical, emotional, and financial burden of obesity is now being recognized. 1 Well-documented consequences of obesity include cardiac and pulmonary problems, metabolic disease, endocrine disorders, digestive problems, orthopedic issues, and an increased rate of developing some cancers. However, the most alarming consequence is the direct increase in mortality due to an increase in weight. In a 12-year follow-up study of approximately 750,000 men and women, mortality rates for those who were 50% over their average weight were twice as high as those who were an average weight. 7

Surgical treatment for obesity has become medically necessary for the morbidly obese as being the only proven method of long-term weight control. 1 Surgical treatment is not a form of cosmetic surgery but a tool to help reduce a person’s weight and improve or eliminate the associated co-morbidities. There are several different types of bariatric surgery, all decreasing the size of the stomach pouch, with or without some sort of malabsorption. The changed anatomy from surgery makes life-long vitamin treatment necessary for bariatric patients. The most popular procedure is the gastric bypass, with laparoscopic adjustable gastric banding as the second most popular procedure. 4 More detailed information about the specific surgeries can be found through ASMBS (www.asmbs.org).

Candidates for bariatric surgery include patients who have a BMI over 40 kg/m² and have a decreased quality of life due to obesity. Less obese patients who have BMI between 35 and 40 kg/m² may be considered for surgery if they have high risk co-morbid conditions related to their obesity. All patients must clearly understand the procedure and life-changes that are necessary and must undergo psychological evaluation of readiness for surgery. They must prove they have tried and failed at other weight loss attempts. They also usually go through some form of supervised weight loss with the bariatric team, which includes the surgeon, registered dietitian, exercise physiologist, and behavioral coach, for a period of between 2 and 6 months prior to being cleared for surgery. 2

As exercise professionals, we have to understand the bariatric patient and how exercise intervention can not only help with weight loss and weight maintenance, but also help improve the quality of life for these patients. We also must be compassionate and understanding, not judgmental, towards these individuals. A 2009 study of exercise science students showed that the students endorsed attitudes that “fat people” are lazy, physically unattractive, buy too much junk food, and could lose weight if they really wanted to. 3 This perception must change if an exercise professional is to be successful at working with bariatric patients. As more bariatric centers are employing exercise physiologists as part of the multidisciplinary teams, and more clients that have undergone bariatric surgery present at fitness centers, we need to understand how to best manage these patients and help them on the path to improved fitness.

THE PRE-OPERATIVE BARIATRIC PATIENT

Working with a bariatric patient pre-operatively can be a challenging task. These patients usually have tried and failed at many weight loss attempts, including diet and exercise, and, therefore, may have a very negative view of the efficacy of an exercise program. They also present with a myriad of co-morbidities that need to be addressed by the exercise physiologist. These include, but are not limited to, orthopedic problems, metabolic diseases, pulmonary disease such as asthma or COPD, cardiac conditions and risk factors, and sleep apnea. Common barriers to exercise for the pre-operative patient include lack of motivation, pain with exercise, feeling uncomfortable while exercising, and severe deconditioning. The goal for the exercise intervention is to establish a consistent habit (3-5 times per week) of performing some sort of very low intensity physical activity (35%-40% of heart rate reserve or VO₂ reserve). Patients should be encouraged to engage in at least 10 minutes of continuous aerobic exercise in the pre-operative phase, with a goal of achieving 30 minutes of aerobic exercise per session. Weight bearing exercise such as treadmill walking is preferred if tolerated, but due to the physical limitations of morbidly obese patients, non-weight bearing exercise may be the best option.

POST-OPERATIVE EXERCISE PRESCRIPTION

The exercise prescription for the post-operative bariatric patient is consistent with the recommendations for obesity by the American College of Sports Medicine’s (ACSM) Guidelines for Exercise Testing and Prescription, eighth edition. Increasing caloric expenditure and fat loss, as well as managing co-morbid conditions, is the main goal of exercise for these patients.

CARDIORESPIRATORY

The primary mode for cardiorespiratory exercise for these patients should be aerobic activity that involves large muscle groups, with walking being the most common mode utilized. Usually weight bearing exercise is tolerated to some degree by most patients after a modest weight loss, but non-weight bearing options should be considered. The goal for bariatric surgery (continued on page 12)
Bariatric Surgery (continued from page 11)

should be a frequency of 5-6 days per week of moderately intense (40%-60% heart rate reserve or VO2 reserve) cardiorespiratory activity, with fat loss being a primary goal. Duration is emphasized over intensity, with a minimum goal of 150 minutes per week and a long term objective of achieving 300 minutes per week.1 A typical progression is presented in Table 1.

### Table 1: Cardiorespiratory Exercise Progression

<table>
<thead>
<tr>
<th>Time Post Surgery</th>
<th>Frequency</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2 weeks</td>
<td>Several times per day</td>
<td>as tolerated</td>
</tr>
<tr>
<td>2-4 weeks</td>
<td>5-6 days per week</td>
<td>20-30 minutes in 10 minute increments</td>
</tr>
<tr>
<td>4-6 weeks</td>
<td>5-6 days per week</td>
<td>30-40 minutes</td>
</tr>
<tr>
<td>6+ weeks</td>
<td>5-6 days per week</td>
<td>40-60 minutes</td>
</tr>
</tbody>
</table>

### RESISTANCE

It has been observed that during a significant weight loss, fat-free mass is lost,2 which can be detrimental for long term success of weight maintenance by bariatric patients. Exercise, especially resistance training, can help preserve fat-free mass after bariatric surgery. Bariatric patients also show a higher incidence of bone mineral deficiency post-surgery due to the malabsorptive nature of certain bariatric procedures, specifically Roux-en-Y gastric bypass,3 and resistance training is recommended to reduce the risk of developing osteoporosis.

Resistance training should not be started until clearance from the surgeon is obtained, which can be anywhere from 6 weeks to 6 months post bariatric surgery. After clearance, higher repetition exercise is usually better tolerated. A typical progression is provided in Table 2.

### Table 2: Resistance Exercise Progression

<table>
<thead>
<tr>
<th>Resistance Training</th>
<th>Repetitions</th>
<th>Frequency</th>
<th>Muscle Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 weeks</td>
<td>1 set of 20</td>
<td>2-3 days per week</td>
<td>8-10</td>
</tr>
<tr>
<td>4-8 weeks</td>
<td>2 sets of 15</td>
<td>2-3 days per week</td>
<td>8-10</td>
</tr>
<tr>
<td>8+ weeks</td>
<td>3 sets of 12-15</td>
<td>2-3 days per week</td>
<td>8-10</td>
</tr>
</tbody>
</table>

### FLEXIBILITY

Flexibility training increases or maintains joint range of motion, which can alleviate aches and pains associated with obesity.2 Stretching exercises should be incorporated after a brief warm-up or after an exercise session when muscles are warm. The recommendation by ACSM’s Guidelines for Exercise Testing and Prescription, eighth edition, is 2-4 days per week and holding each stretch for at least 15 seconds.2

### SPECIAL CONSIDERATIONS

Exercise professionals should pay special attention to exercises that require balance (e.g., unsupported lunges, squats) in the first year after surgery due to a changing center of mass associated with rapid weight loss. Many patients are not able to get on the floor to do resistance exercises due to body habitus or musculoskeletal issues associated with obesity, so care and tact must be taken by the exercise professional to ensure the patient is doing a safe routine that they are comfortable completing. Other considerations should include ensuring the equipment used has a sufficient weight limit to accommodate larger patients, and that exercise machines have larger seats. If bariatric chairs are not available, make sure you offer chairs with no arms. If you are doing exercise on the floor, make sure to use a thicker and wider mat to make sure the patient is more comfortable.

### NUTRITIONAL CONSIDERATIONS

A brief overview of the diet a bariatric patient follows will be discussed, with understanding that as exercise professionals we should not offer dietary advice to bariatric patients due to the specific nature of the post-operative diet. We do, however, need to be aware of what the patient is experiencing so we can tailor an exercise program to fit within their nutritional status.

The diet progression post-surgery is as follows: clear liquids, full liquids, soft/puree diet, then very small portions of protein-focused meals.1 The length of time and contents of this diet can be found within the ASMBS guidelines. This restrictive caloric intake should be considered by the exercise professional in terms of energy levels and exercise timing. The patient should exercise after a meal or snack. Due to the limited calories consumed, reasonable expectations as far as muscle gains should be acknowledged. Another exercise consideration should be the hydration status of the individual. Because the stomach pouch is much smaller after surgery, staying hydrated can be difficult for the patient.1 This is of concern if they are participating in an exercise program. Having the patient take small sips of water during an exercise session can help prevent dehydration. We need to encourage the patient to stay hydrated, and discontinue exercise if severe dehydration is present.

### SUMMARY

Working with bariatric patients is both a rewarding and challenging undertaking. It is our responsibility as exercise professionals to understand the bariatric patient, both physically and emotionally, so we can help them achieve a healthy lifestyle. Remember the surgery is only a tool; the lifestyle changes made are the best predictors of success!

### ABOUT THE AUTHOR

Kelly Drew, M.S., ACSM RCEP, is a clinical exercise physiologist with Community Bariatric Surgeons at Community Health Network in Indianapolis, IN. Kelly is currently a member of ACSM RCEP Practice Board.

### REFERENCES


Bariatric Surgery (continued on page 15)
Exercise Immunology (continued from page 5)

EXERCISE FOR IMMUNE HEALTH

While some general aspects of the immune response to exercise are known, more discoveries need to be made regarding specific events following exercise. Mechanisms for leukocytosis (elevated concentrations of neutrophils and monocytes, NK cells, dendritic cells, T-cells, and B-cells), which occurs directly following a single exercise session and reasoning for decreased concentrations of leukocytes following leukocytosis 24 h after exercise needs elucidation. This depression could be a result of leukocytes leaving circulation to differentiate in surrounding tissue, and not actual apoptosis (cell death). Regardless of the mechanism, following acute exercise the body appears vulnerable to infection because of depression in leukocyte number and function. However, if the immune system is allowed complete recovery following each exercise session, there are no long term detrimental effects of exercise training upon the system. Moreover, with moderate intensity (moderate is relative to the individual and the range for this value can vary with characteristics of the individual) exercise training beneficial anti-inflammatory effects and improvements in immunosurveillance are achieved.18

Regular exercise and physical activity will, in most cases, positively influence immune function.16,21 While exercise training does influence the immune system, other lifestyle behaviors, such as proper sleep and nutrition, also are influential and must be considered. In addition, overtraining can deplete the immune system. When starting an exercise program, moderate intensity and low exercise volume is recommended. Between-athlete variability makes it difficult to predict how hard any individual athlete can train before immune function is compromised. However, the more physically fit an individual is the more likely they will be able to endure high exercise volume and high intensity (near maximal effort) workouts. Regardless of fitness level, there should be a heightened awareness during times of increased risk (e.g., high intensity training, competition, and recovery periods immediately following competition) with an emphasis on good hygiene, rest, and recovery. If trainers and coaches actively monitor these criteria, the likelihood of having a healthy immune system is enhanced.

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References
Resistant Training (continued from page 9)

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References

Exercise Immunology (continued from page 13)


Diabetes Medications (continued from page 7)

References
duced into your didactic training. Integrating your didactic experience with your clinical rotations is critical in developing proficiency at recognizing heart sounds. An important tip in learning heart sounds is to listen to the heart sounds of someone with a known heart valve abnormality or other heart condition. While doing so, try to identify and describe the sounds that you are hearing, the location of where they are best heard and when they occur in the cardiac cycle. Hospital (Phase 1) settings as well as diagnostic exercise settings allow the learner opportunities to listen to normal heart sounds, heart sounds associated with cardiac disease and heart sounds that may change in relationship to exercise. Making these correlations is the key in developing a clear understanding of the disease process and its impact on the individual.

Becoming knowledgeable about and proficient in the assessment of heart sounds enables the clinician to identify significant findings, communicate findings to the health care team, and create appropriate exercise treatment plans that best contribute to the improvement of the health of the patient. This process demonstrates to members of the health care team the valuable contribution that the CEP can make toward patient recovery and helps to further develop a respect of the role of the CEP in a variety of clinical settings.

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Golf (continued from page 3)

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