Oklahoma Heart Institute

VOLUME 7 | NUMBER 2 | FALL 2012

Oklahoma Heart's Top 10 Tips To Help Men Prevent Heart Disease

By Wayne N. Leimbach, Jr., MD, FACC, FSCAI, FCCP, FAHA

Transcatheter Aortic Valve Replacement (TAVR) New Frontiers In Treating Aortic Stenosis

By Kamran I. Muhammad, MD, FACC, FSCAI

Obstructive Sleep Apnea and Type 2 Diabetes Mellitus

By Kevin L. Lewis, MD

Advanced Medical Treatment of Stable Angina

By Anthony Haney, MD, FACC

SPECIAL SECTION

Whole Heart Healthy Foods

by Elaine Burkhardt

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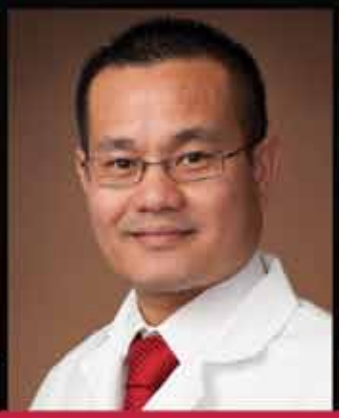

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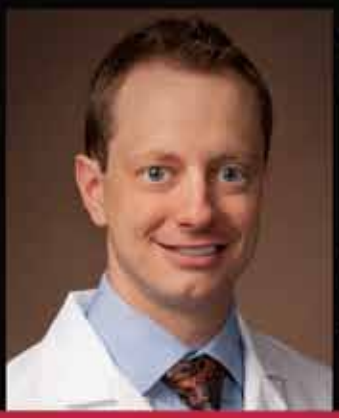

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features

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to our readers

Cardiovascular care now encompasses a broad scope of illnesses and treatments. Physicians must address patients with risk factors and need of preventative therapy, as well as patients with coronary artery disease and anginal symptoms. The field of Cardiology has expanded into sleep medicine and now includes advanced treatments for structural heart disease such as aortic stenosis. Dr. Haney addresses the advanced medical treatment of stable angina. Dr. Muhammad highlights advances and treatment for patients with inoperable severe aortic stenosis. Dr. Lewis focuses on obstructive sleep apnea and type 2 diabetes mellitus. And, a patient education article is provided on the Ten Tips Men Should Know About Heart Disease.

A special section, Whole Heart Healthy Foods, is also featured in this issue. We know that you will find all of the information, tips and recipes entertaining and useful in your quest to live a longer, healthier life.

We hope that you enjoy these articles and welcome any comments or suggestions regarding the magazine content.

Wayne Leimbach

Sincerely,
Wayne N. Leimbach, Jr., M.D.
Editor, Oklahoma Heart Institute Magazine

ON THE COVER
"Tulsa Night Lights" *Photo by John Shoemaker*

Oklahoma Heart's Top 10

Tips To Help Men Prevent Heart Disease

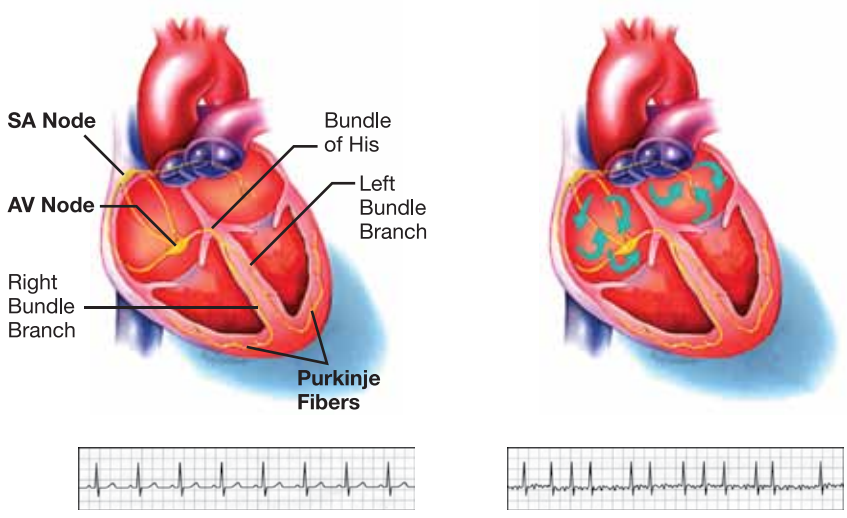
By Wayne N. Leimbach, Jr., MD, FACC, FSCAI, FCCP, FAHA

Cardiovascular disease is the number one cause of death for men. More men die of cardiovascular disease than from all cancers combined. The good news about cardiovascular disease is that much of it is treatable. Even better, the majority of cardiovascular disease is actually preventable.

Check out these 10 tips about cardiovascular disease: they just may help you live longer and/or have a higher quality of life.

Figure A

Normal Sinus Rhythm and Atrial Fibrillation



10 An elderly person diagnosed with inoperable aortic stenosis should get a referral to a cardiac program that does transaortic valve replacements (TAVR).

Aortic stenosis is a narrowing of the main valve through which the heart pumps blood to the body. When the valve becomes severely narrowed, the heart has difficulty getting blood pumped to the body.

The three most common symptoms of severe aortic stenosis are:

- Episodes of exertional chest pain
- Symptoms of heart failure (shortness of breath with activity, inability to lay flat in bed due to shortness of breath, and ankle swelling)
- Fainting or passing out spells

Severe aortic stenosis is commonly diagnosed by an echocardiogram. This procedure uses ultrasound to image the aortic valve to see how severely restricted the valve leaflets are.

Because surgery in the very elderly can be associated with a significant death rate, it is often not performed. However, if aortic stenosis is not corrected in these patients, then mortality rates can be as high as 50 to 65% in two years.

Transcatheter aortic valve replacement is a new procedure that has been approved by the FDA. In this procedure, a stent valve is placed through the femoral artery in the groin and advanced up

to the aortic valve. The stent valve is mounted on a balloon. The balloon is inflated, which pushes aside the old damaged valve. When the balloon is deflated, the new stent valve falls into place. In the majority of cases, patients go home 2-3 days after the procedure, since there is no major surgical incision from which the patient must recover. Studies have shown that only 4 patients with severe aortic stenosis have to be treated in order to save one life in the first 2 years after diagnosis.

9 For patients with heart rhythm problems who are told that they have atrial fibrillation or frequent PCVs (premature ventricular contraction) that cannot be controlled with medications, they should get a second opinion from a large cardiovascular center that does ablation therapy.

Ablation therapy can be done in the cardiac catheterization laboratory without open heart surgery. Using ablation therapy, the majority of atrial fibrillation patients can be treated so that they remain in normal sinus rhythm (Figures A & B).

Most patients with very frequent PVCs can have the irritable focus in the heart isolated with ablation therapy and have resolution of their PVCs. Both of these techniques can significantly improve their quality of life. However, since many cardiologists are not trained to perform catheter ablation procedures for rhythm disorders, and many hospitals do not have the facilities or expertise to provide such ablation therapies, many patients are left with rhythm problems, which significantly decrease their quality of life. For this reason, a second opinion should always be requested.

8 Patients with heart failure from depressed heart pumping function should be considered for an implantable cardiac defibrillator (ICD). When the heart is damaged to the extent that it is unable to pump normal amounts of blood, there is a risk of serious rhythm disorders called ventricular tachycardia and ventricular fibrillation. These rhythm disorders are often associated with sudden death. Studies have shown that implantation of an ICD can prevent sudden death episodes in these patients. A patient whose heart is only pumping 35% or less of the blood with each squeeze of the heart should be considered for one of these implantable cardiac defibrillators. People may remember that former vice-president Dick Cheney had one of these devices while he was in office.

7 For patients with heart failure, consider Aquapheresis. If a patient's doctor tells him that the heart is only pumping 35% or less of the blood with each squeeze and the person also has symptoms of heart failure, then he usually is placed on diuretics commonly known as water pills. These medications make the patient lose the excess fluid and salt in his body. Symptoms of heart failure are frequently shortness of breath with mild activity or at rest. Patients often have swelling of their legs or abdomen. Some patients are told that they are resistant to the diuretics and that they cannot have the extra fluid completely removed. For these patients, a referral to a cardiac center would be of value. Large cardiac programs have Aquapheresis, a machine and filter that effectively and quickly removes excess fluid even in patients who are very resistant to water pills. With the removal of large amounts of fluid, patients feel substantially better.

Figure B

Balloon Catheter Ablation of Atrial Fibrillation

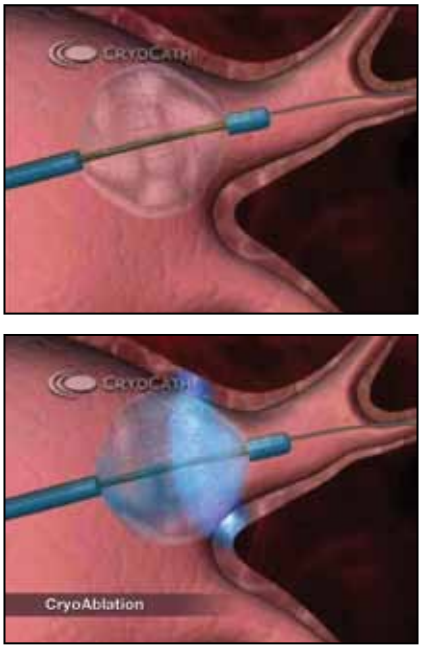
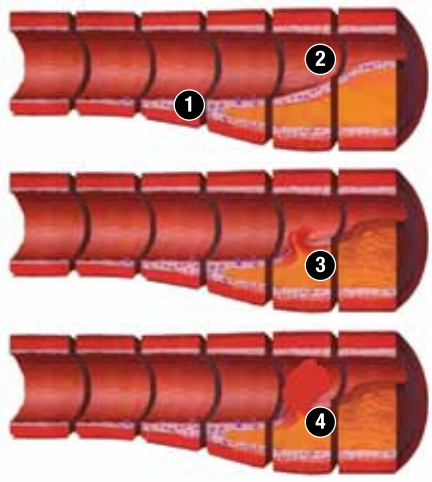


Figure C

Atherosclerosis: The Risk of High Cholesterol



1. Initially, as atherosclerotic plaque builds up in the artery, the vessel wall stretches to maintain the vessel lumen.
2. Eventually, as the plaque builds up, the vessel lumen narrows.
3. Plaque rupture exposes the blood to the plaque contents and promotes formation of a blood clot.
4. If the blood clot that forms on the ruptured plaque is large enough to occlude the vessel lumen, then a heart attack occurs.

6 If you are a man over the age of 40, you should take a baby aspirin (81 mg) a day unless you have an allergy to aspirin or a bleeding problem. In most cases of heart attacks, a blood clot forms in the blood vessels to the heart, which is the final step in causing the heart attack. A simple baby aspirin a day significantly reduces the risk of a large blood clot forming in the blood vessel to the heart and significantly decreases the risk of having a heart attack and of dying from a heart attack (Figure C).

9 MODIFIABLE RISK FACTORS

- Cholesterol
- Smoking
- Diabetes
- Hypertension
- Abdominal Obesity
- Lack of Exercise
- Lack of Daily Fruit and Vegetable Intake
- Psychosocial Factors
- Alcohol Consumption

5 /4/3/2a/2b Know your risk factors for heart attacks and strokes because they can be treated. If you do not make blockages in the blood vessels to your heart, then you can't have the blockages rupture. If you do not have the blockage rupture, then you cannot have a clot formed in the blood vessel to the heart to cause a heart attack. Therefore, if you do not have blockages, you won't have a heart attack. By knowing your risk factors, you can prevent the buildup of blockages in the blood vessels to your heart. The five major risk factors for heart attacks and strokes include smoking, lack of exercise, diabetes mellitus, high blood pressure and high cholesterol. These are all treatable. Cigarette smoking increases the likelihood that a person will make blockages in the blood vessels to the heart, to the brain and in the blood vessels to the extremities. In addition, it accelerates the rate of blockage formation. Smoking cessation is difficult, but it can be done, and it can radically affect quality of life and whether one dies from a heart attack or stroke.

Continued on p. 6

Continued from p. 5

4 Lack of routine physical activity is also a major risk factor for heart attacks and strokes. You don't have to become a jogger or a marathon runner. Studies have shown as little as 10 minutes of walking 7 days a week can produce benefits, and 30 minutes of moderate exercise at least 3-4 times a week produces even greater benefits (Figure D).

3 If your blood sugar after a 10-12-hour fast is greater than 100, then you need to see your doctor about the possibility of having diabetes mellitus. Diabetes mellitus is a major risk factor for heart attacks and strokes. It is one of the treatable risk factors.

2a Blood pressure is another major risk factor for heart attacks and strokes. If your blood pressure is greater than 140/90, then you have an increased risk of having a heart attack or stroke. If you are diabetic or already have heart disease, blood pressure needs to be less than 130/80.

2b Cholesterol is one of the major risk factors for heart attacks and strokes. Cholesterol is broken down into good cholesterol (HDL cholesterol) and bad cholesterol (LDL cholesterol). For most people, the goal is to have the LDL cholesterol less than 130. If one has heart disease or diabetes mellitus, the bad cholesterol (LDL cholesterol) should be less than 100. Studies have shown that if the LDL cholesterol can be decreased to less than 70, and blood sugar and blood pressure controlled, and if the patient does not smoke, blockages in the blood vessels of the heart can actually be reversed.

1 Tip to extend life and improve the quality of life from a cardiovascular standpoint.

If you have chest pains or other symptoms of a heart attack …call 911 .... take an aspirin .... get to the hospital as fast as possible so the heart attack can be interrupted.

Studies have shown that if a person gets to the hospital and has the occluded blood vessel to the heart opened within 90 minutes, the patient will not die from the heart attack and there will be minimal damage. This means the person can get back to a normal activity level. It is absolutely important to get to the hospital promptly with the onset of symptoms of a heart attack. When patients get to the hospital and they discuss going to the catheterization laboratory to open the vessel, the patient should say "yes, get me there as fast as possible".

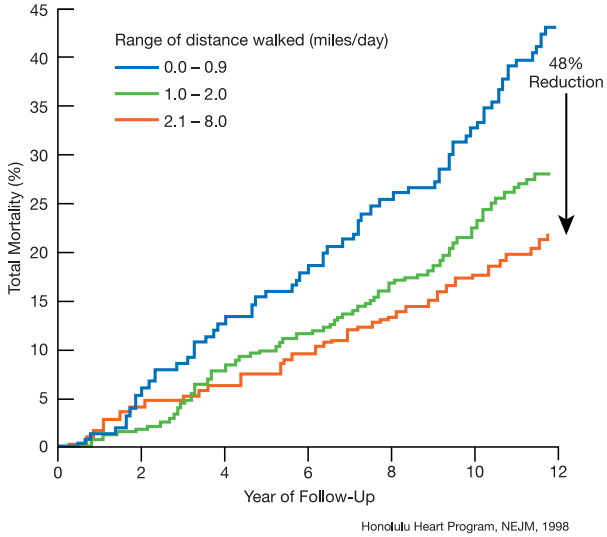
The mortality rates for patients presenting to the hospital with a heart attack have declined from 25-30% in the 1970s to less than 5% today. This is because of the ability of doctors to open blocked blood vessels to the heart.

The exciting thing about the field of Cardiology is that major advances have occurred and are continuing to occur which allow lives to be saved and quality of life to be improved for millions of people. In the field of Cardiology, second opinions are often valuable, and paying attention to risk factors can have tremendous returns. It is better to have health care centered around preventing serious problems than having health care focused on trying to get out of a serious situation.

The good news is that prevention is relatively straightforward and simple and can be done by most everyone.

Wayne N. Leimbach, Jr. is a specialist in interventional cardiology, including cardiac catheterization, coronary angioplasty, percutaneous closure of PFOs & ASDs, and related interventional procedures such as stents, atherectomy, laser, intravascular ultrasound imaging and direct PTCA for acute myocardial infarction.

Figure D
Effects of Walking on Mortality (707 Retired Men)



Honolulu Heart Program, NEJM, 1998

OHI'S TOP TEN TIPS

1. If you have chest pains or other symptoms of a heart attack:
- Call 911
- Take an Aspirin
- Get to the hospital as fast as possible so the heart attack can be interrupted

2a, 2b, 3, 4, 5. Know your risk factors to prevent heart attacks and strokes:
- Smoking, lack of exercise, diabetes
- High blood pressure and high cholesterol levels

6. Over the age of 40 years old — Take Aspirin, 81 mg/ day

7. Heart failure and can't remove the fluid — Consider aquapheresis

8. Heart failure and depressed pump function — Consider an ICD

9. Problems with heart rhythm — Get a second opinion and consider ablation

10. For inoperative aortic stenosis — Get a referral to a TAVR program

The Perfect Date

Ask anyone what's so great about a date, and they'll quickly tell you they're sweet. And rich. Literally, this food is the perfect date.

Unlike white sugar, which has no fiber, vitamins or minerals, dates are a natural sweetener. Push the sugar aside and use dates in its place to sweeten hot or cold cereal, in cakes, cookies, puddings, muffins, sweet breads, smoothies and salad dressings, as well as chopped into salads. They're also a great replacement for oil in dressings, supporting your heart health and your overall efforts to eat healthier.

Dates make the perfect party guest as well. Delicious hot or cold, look for an assortment of great date recipes on wholefoods.com.

You'll quickly see why the date will be your best new sweetie.

FUN DATE FACTS

- They come from a palm tree.
- They don't need refrigeration.
- They're portable.
- They're a great source of protein.
- They're high in potassium.
- They're a high-energy food.
- They've been used for centuries as a sweetener and for desserts.
- They have a laxative effect, so eat in moderation.

GREAT DATE IDEAS

- Slide a pecan inside a date. Voila! Instant pecan pie! (Very kid friendly too)
- Try dried dates. When fruit is dried, its sugar content quadruples and you eat less. A few dates are so satisfying you won't find yourself overindulging.
- Chopped dates are an excellent substitute for raisins.

COOKIE DOUGH BOY *Makes 24 Cookie Balls*

2 cups pecans
1 cup unsweetened coconut flakes
¼ cup date paste (see below)
8 pitted and chopped dates
1 tsp vanilla
1 tsp cinnamon
Dash of sea salt
1 Tbsp coconut manna, or tahini
½ cup raisins

Place pecans and coconut flakes into food processor using the "S" blade and process until it resembles a flour-like consistency. Add remaining ingredients except for the raisins and pulse until batter sticks together. Remove batter and mix in raisins. Roll into balls and refrigerate or freeze until serving.

Optional: Coat cookies in additional coconut flakes or cinnamon.

DATE PASTE *Makes about 1 cup*

Dates are nature's candy and date paste is a wonderful, versatile sweetener.

1 cup dates, pitted

Soak dates in enough water to cover for 2-4 hours. Add dates along with 1/2 cup of the soaking water to a food processor or blender and process until smooth. Use more soaking water if a thinner paste is desired. Refrigerate any left over date past for future use.

NO-OIL BALSAMIC DRESSING

Makes 1 3/4 cups

Drizzle this tangy dressing over green salads or steamed veggies.

2 cups boiling water
3 tablespoons packed chopped pitted dates
1 cup balsamic vinegar
3 tablespoons reduced-sodium tamari or soy sauce
2 tablespoons Dijon mustard
3 tablespoons nutritional yeast
1 tablespoon onion powder
1 clove garlic, minced

Pour water over dates in a medium heat-proof bowl and set aside to let soak until soft, about 15 minutes. Reserve 1/4 cup of the soaking liquid and then drain dates and transfer to a blender. Add reserved water, vinegar, tamari, Dijon, yeast, onion powder and garlic and purée until smooth.

DOUBLE GREEN SMOOTHIE

Try this surprise smoothie for a quick breakfast packed with nutrients.

1 ½ cups unsweetened non-dairy beverage, such as almond, rice or soy
2 dried apricots or 4 pitted dates
1 banana
2 cups leafy greens, such as baby spinach, collard leaves or chopped kale leaves
½ cup fresh or frozen berries

Combine non-dairy beverage, apricots, banana, kale, spinach and berries in a blender and blend well until smooth.

Menu Planning

Menu planning takes on a whole new meaning when you use ingredients that work well for breakfast, lunch or dinner. Fresh or frozen fruit goes in smoothies for breakfast, salads for lunch or desserts for dinner. Veggies are all-star menu mainstays for breakfast omelets, lunch wraps and dinner stir-frys. Many grains, nuts and seeds can be worked into all three meals. Use fresh or dried herbs to spice it all up!

Make Every Day a Salad Day *Serves 2*

Fresh ideas for satisfying salads

Salads are a simple way to get creative in the kitchen — so many flavorful combinations! Try making your next salad with an array of your favorite greens. Then, add beans, grains, fruit, veggies, seeds, nuts...the possibilities are endless.

Strawberry Fields 2 cups spinach, 1 cup shaved fennel, 1/2 cup strawberries, 1/4 cup red onions, 3 T mint, 3 T white balsamic vinegar

Rocket & Fennel 2 cups arugula, 1/2 cup shaved fennel, 1 cup sunflower sprouts, 1/2 cup sliced pear, 2 T lemon zest, 1 tsp chili flakes and 2 T lemon juice

Chopped Asian Salad 1 cup tatsoi, 1 cup mache, 1/4 cup red peppers, 1/4 cup edamame, 1/4 cup cucumber, 3 T nori seaweed, 1 T toasted sesame seeds, 3 T lime juice, 1 T tamari and 3 T cilantro

Roasted Veggie Salad 2 cups butter lettuce, 1/4 cup roasted cauliflower, 1/4 cup roasted peppers, 1/4 cup roasted cherry tomatoes, 1/4 cup roasted red onion, 1/2 cup roasted sweet potato, 2 T rosemary, 1 t chili flakes and 3 T balsamic vinegar

Hearty Breakfast Bowls

This big breakfast is a great way to start the day.

It's the most important meal of the day, after all, so kick it into high gear with a hearty breakfast bowl. Use the chart below as a quick guide to mixing up a filling, tasty morning meal that's packed with nutrients.

BUILD A BETTER BREAKFAST IN THREE EASY STEPS:

1. Start with a base of whole grains, using water, juice or non-dairy milks to cook.

2. Then consider sweetening with fruits, and give it some texture with nuts and seeds.

3. Don't forget the spice during cooking or as a topping. You can also add a bit more juice or non-dairy milk if you like.

Almond Rice Brown rice, almond milk, chopped dates, toasted almonds, diced bananas and nutmeg

Apple Spice Oats Steel cut oats, apple juice, cinnamon, currants, nutmeg, toasted pecans and diced apples

Mango Quinoa Quinoa, coconut milk, water, frozen mango, vanilla, diced apricots, bananas and mangos

Spiced Millet Millet, soy milk, honey, cinnamon, toasted sesame seeds, toasted sunflower seeds, toasted hemp seeds and fresh berries

Quick Tip:
At the beginning of the week, cook a big batch of your favorite grains and use in multiple meals, including breakfast.

Make a Super Smoothie

A nutrient-dense meal you can sip slow or take on the go. Serves 2

Blend a smoothie for an easy way to pack tons of nutrients into one meal. Start with juice, non-dairy beverages (like soy, rice or almond milk) or water then add your favorite fresh or frozen fruits, greens and spices, and blend until smooth. Smoothies can really hit the spot for a quick breakfast or an after-workout treat, and they're an easy way to pack in a few extra servings of fruits and vegetables.

Cherry Oat Combine 3 cups of oat milk, with 1 cup of frozen cherries, 1/2 cup of dates, 2 cups of greens and 1 teaspoon of vanilla.

Super Green Combine 3 cups of water with 2 bananas, 1 cup of berries, 1/2 cup of kale and 1/2 cup of spinach

Apple Pie Combine 3 cups of almond milk with 2 apples, 1 banana, 1/2 cup of dates, 2 cups of greens, 1 teaspoon of cinnamon, nutmeg and vanilla.

Tropical Green Combine 3 cups of orange juice with 1 cup of frozen mango, 1/2 cup of dried apricot, 1 banana, 1 cup of spinach and 1 teaspoon of ginger.

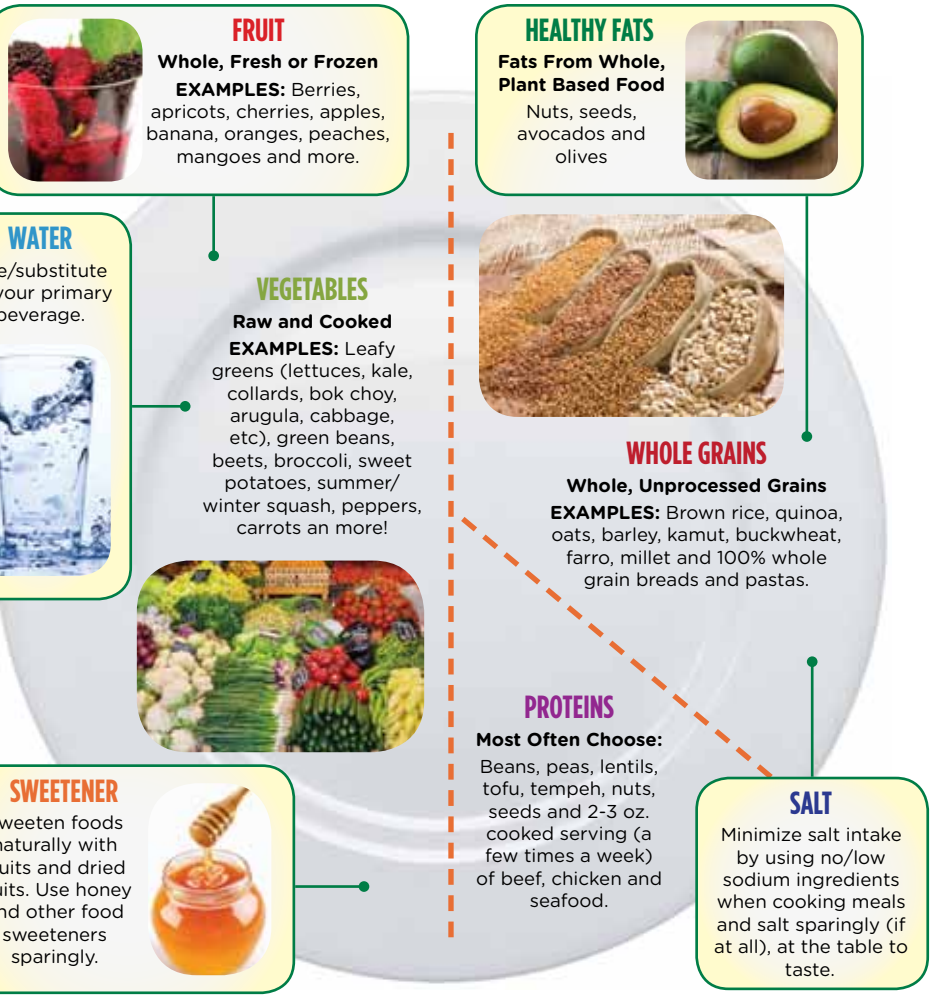
Other options: Also consider adding 2-3 tablespoons of avocado, nut or seed butter, ground flax seeds, chia seeds, hemp seeds, unsweetened cocoa powder or wheat germ.

Quick tip:
Using frozen fruits and veggies helps keep your smoothie frosty and thick.

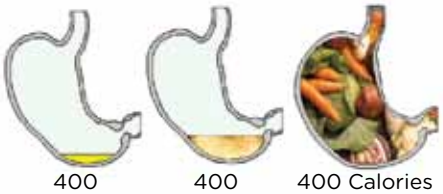
How-to Build a Healthy Meal

Sometimes it can be heavy lifting when you try to plan meals with the freshest, most nutritious ingredients. So you throw in the apron and head for the drive thru.

Instead, try using the four pillars of health and the plate method. It's surprisingly simple to build a healthy meal if you begin with that solid foundation. You'll quickly find your plate piled high with lean beef, chicken or seafood, seasonal fruits and colorful vegetables, delicious whole grains, beans, nuts and seeds. On top of that you'll be living a healthier, more energetic and longer life.



FILL UP ON NUTRIENT RICH FOOD



400 Calories of Oil | 400 Calories of Chicken | 400 Calories of Spinach, Beans and Eggplant

BISON CHILI

Serves: 4 to 6

This chunky, veggie-packed chili is just the thing for cold-weather comfort or watching the game. A surprise ingredient—cauliflower—adds even more flavor.

1/2 pound ground bison
1 large onion, finely chopped
1 large carrot, finely chopped
1/2 head cauliflower, stemmed and cut into small florets (about 3 cups)
1 medium green bell pepper, finely chopped
3 large garlic cloves, finely chopped
2 teaspoons ground cumin
2 tablespoons no-salt-added chili powder
1 tablespoon apple cider vinegar
1 can no-salt-added diced tomatoes
1 can no-salt-added crushed tomatoes
1 can no-salt-added kidney beans, drained and rinsed
1/2 cup loosely packed cilantro leaves, chopped

Heat a large Dutch oven or pot over high heat. When the pot is very hot, add bison and brown it, stirring often for 5 minutes. Add onion and carrot, and cook, until both begin to soften, about 5 minutes. Add 1/2 cup water to deglaze the pan, scraping brown bits from the bottom of the pan as the water evaporates. Add cauliflower, bell pepper and garlic and cook until vegetables begin to soften, about 5 minutes. Add cumin, chili powder, vinegar, tomatoes and beans along with 1 cup water. Bring to a boil; reduce to a simmer, cover and cook, stirring occasionally, until vegetables are fork tender, about 45 minutes. Serve garnished with chopped cilantro.

Healthy Eating Principles

WHOLE FOOD

Choose foods that are whole, fresh, natural, organic, local, seasonal and unprocessed.

Eliminate the consumption of refined, highly processed foods and foods void of nutrients, such as artificial flavors, colors, preservatives, sweeteners and hydrogenated fats.

HEALTHY FATS

Get your healthy fats from plant sources, such as nuts, seeds and avocados.

Minimize extracted oils and processed fats.

Choose leaner meats and seafood as well as low-fat dairy products.

PLANT-STRONG™

Reconfiguring the Plate: No matter what type of diet you follow including those that incorporate dairy, meat and/or seafood — eat more plants, like raw and cooked vegetables, fruits, legumes and beans, nuts, seeds and whole grains.

Eat a colorful variety of plants to ensure you're getting the best nutrients for your body, which leads to feeling satisfied.

NUTRIENT DENSE

Choose foods that are rich in nutrients when compared to their total caloric content — also known as foods with high density.

Build your menus around plant-based foods to ensure highly micro-nutrient-dense meals.

Choose foods with a wide spectrum of vitamins, minerals, phytonutrients and antioxidants.

Healthy Eating with Whole Foods

AT WHOLE FOODS MARKET, shoppers often ask why the store smells so good.

"It's because everything in here is so fresh," says Sharon Stroud, Healthy Eating Specialist at Tulsa's Whole Foods Market.

At Whole Foods Market you won't find any of these ingredients — artificial colors or flavorings, artificial sweeteners, hydrogenated oils, high fructose corn syrup, or synthetic preservatives in our foods. All the meat, dairy, and eggs at WFM exceed the animal welfare standards.

From the dairy to the deli, you will find many fresh, fragrant, and nutritious foods at Whole Foods Market.

"We want people to live healthy lives. That means cooking with natural ingredients and foods that fuel you, rather than deplete you," says Stroud.

"We carry natural and certified organic produce," says Stroud. "In our bulk section, we carry many unprocessed foods including whole grains, beans and legumes, raw nuts and seeds, and dried fruits.

Whole Foods Market carries safe and efficacious supplements. The Premium Body Care symbol on many of our body care products means these products are free from harmful chemicals and are safe for us and the environment. We even carry many natural cleaning products.

"That's what differentiates us from other grocery stores," Stroud says. "Our standards are the highest in the industry."

HOMEMADE CHAI TEA *Serves 4*

Making this tea from scratch is easier than you might think. Enjoy hot or iced.

1 cinnamon stick
6 whole green cardamom pods
6 whole cloves
1 (1-inch) piece ginger root, peeled and thinly sliced
4 whole black peppercorns
3 cups water
2 single-serve black tea bags or 1 tablespoon loose black tea
2 tablespoons raw honey
1 cup unsweetened coconut milk

Ingredient Options: Use non-dairy milk for a vegan version. Place cinnamon, cardamom, cloves, ginger, peppercorns and water into a small pot and bring to a boil. Cover, reduce heat and simmer for 5 minutes. Remove from heat and set aside to let steep for 10 minutes. Return pot to the heat and bring to a boil. Remove from heat, add tea, cover and set aside to let steep for 3 to 5 minutes. Strain through a fine mesh sieve, discarding solids, then return liquid to the pot. Stir in sugar and milk and heat over low heat for 1 minute. Pour into cups and serve.

Stocking your pantry

REMOVE

Refined sugar White sugar, cane sugar, brown sugar, corn syrup, alternative sweeteners (agave, maple, brown rice syrup)

Refined salts All forms of white refined table salt

Extracted oils Canola oil, olive oil, vegetable oils, nut & seed oils, spray oils

Refined grains, flours and pastas White rice, white flours, white and refined pastas

INCLUDE

Sweetness from fruits Fresh fruits, dried fruits, fruit juices, honey, minimally processed concentrates

Minimal salts Low sodium shoyu/tamari, miso, seaweeds

Fats from whole food plants only Avocado, olives, capers, nuts, seeds, etc

100% Whole grains, flours and pastas Examples include quinoa, millet, amaranth, whole rice, farro, hulled barley, kamut

Spices impart flavor to stimulate the digestion.

Stocking your fridge

REMOVE

Non lean meat, seafood Processed meats, barbecued meats, luncheon meats, bacon

Non lean, processed cheese American cheese

Liquid dairy (full fat, low fat and nonfat) Dairy milk, cream, butter

Eggs Remove all eggs

INCLUDE

Leaner meats and seafood, plant-based options 2-3 oz. portion or less of meats and seafood, or instead use plant proteins such as beans, tofu, or tempeh

Leaner cheese

- 1 oz portion or less, use as a garnish
- Examples include feta, goat cheese, and low fat/part skim mozzarella

Non-dairy alternatives Soy milk, almond milk, rice milk, oat milk, etc

Egg alternatives for baking Silken tofu, Ener-G egg replacer, applesauce, flax seeds, bananas, soy yogurt, tapioca/potato starch

Plenty of fresh and frozen vegetables and fruits!!!

Desserts

Chocolate Mousse. Banana Ice Cream. Blueberry Cobbler. You've got to love the glorious sweet stuff, right?

Almost everyone has a sweet tooth. But, dessert doesn't necessarily have to mean sugar highs and gluten gluttony. By replacing refined flours and sugars with more nourishing ingredients like raw honey, applesauce, dates and nuts, spices and dried fruits, you can have your cake and eat it too!

Try these irresistible dessert recipes from Whole Foods Market's Health Starts Here program. They fall into the 4 pillars of healthy eating - whole unprocessed foods, plant strong, healthy fats from whole foods, and nutrient dense. Finally, the delectable tastes you crave without all the guilt. Sweet!

A FEW SWEET FACTS

- Overindulgence in sweet foods such as cakes, cookies, candy, soft drinks, and other sweet treats will crowd out the important nourishment from your diet. This can result in nutritional deficiencies as well as promote obesity.
- Our sweet tooth was given to us to help us seek out the nourishing fruits that provide vitamins, minerals, antioxidants, and fiber. Replacing the desserts made with refined flours and sugars with more nourishing ingredients is easy and the desserts are really delicious.

DATES VERSUS WHITE SUGAR AND FLOUR

Refined carbs like white sugar and flour are empty calories, which rob us of our valuable stores of vitamins and minerals. And, when we eat too much of them causing wild blood sugar swings, we need more and more to satisfy our cravings. Consuming sugar has been linked to fatigue, nervousness and headache, as well as obesity.

That's why natural sweeteners like dates are better for us. They're a great energy booster and provide nutritious sources of vitamins and minerals.

Use them in desserts, oil free salad dressings and as a snack by themselves

CHOCOLATE MOUSSE

Your guests will never suspect what secret ingredients are in this dairy-free chocolate mousse. Make the day before and chill in individual serving glasses.

3/4 cup raw cashews
1 cup packed pitted dates (about 20)
1 (15-ounce) can pureed organic butternut squash
3/4 cup unsweetened coconut milk beverage, more if needed
1/4 cup unsweetened cocoa powder
1 teaspoon vanilla extract
Fresh raspberries (optional)
Grated coconut (optional)

Place cashews and dates in a medium bowl and cover with very hot water. Let soak for 2 hours to soften. Drain well.

Place drained cashews and dates, butternut squash and coconut milk in a high-powered blender or food processor and process until smooth (this may take 1 to 2 minutes). Add cocoa and vanilla. Process again, adding a bit more coconut milk if needed to make a smooth, mousse-like texture. Chill at least 1 hour or until ready to serve. Garnish with raspberries and coconut.

BANANA ICE CREAM

Peel some ripe bananas and break into several pieces. Wrap in waxed paper and put in a freezer bag. Freeze overnight. These can be used for smoothies and banana ice cream.

To make ice cream in a Champion Juicer, put blank in shaft cover rather than the juicing screen. Push frozen banana pieces through the juicer and the machine will homogenize to the consistency of ice cream. Serve immediately. Top with chocolate sauce if desired.

To make ice cream in a food processor, put small chunks of bananas in the processor with the S blade and add small amounts of lite coconut milk and process to ice cream consistency. Serve.

RAW CHOCOLATE SAUCE

1/2 cup raw cacao
1/2 cup raw honey
1/2 cup raw smooth cashew butter
1 tsp. vanilla

Place all ingredients in the food processor and process into a thicker sauce – about 2 minutes.

BLUEBERRY CREAM PIE

Crust

1/4 cup dates, pitted, soaked
1/2 cup walnuts
1/4 cup shredded coconut

Filling

2-3 medium bananas
1 lb. fresh blueberries of choice (or frozen)
1/2 cup dates, pitted

1. In a food processor, using the "S" shaped blade, blend the crust ingredients well.

2. Press mixture firmly into the bottom and sides of a pie plate, forming a crust.

3. Slice the bananas into 1/4 rounds, leaving 1/4-1/2 of one banana for the creamy filling. Cover the bottom of the pie shell with a layer of banana pieces.

4. In a food processor, blend one cup of blueberries with the remaining piece of banana and 1/2 cup of dates. Mix in the remaining blueberries (whole). Pour this over the sliced bananas in the pie shell. Garnish with walnuts, other berries, etc. Chill and serve.

****Blueberries have pectin in them, so when you chill the blended blueberries they will set and make a firm pie.*

YUMMY NO BAKE CHOCOLATE CAKE

2 cups raw walnuts
1/2 cup chopped, pitted dates
3/4 cup cacao powder
3 tbsp. raw clover honey
1 tsp. vanilla extract
1/4 tsp. Himalaya pink salt
1 tbsp. Coconut butter
Sliced strawberries

In a food processor, chop the walnuts for about 20 seconds until a sandy consistency is achieved. Do not over process or the cake will be oily. Add the pitted dates and pulse 4 or 5 times to mix the dates and the walnuts. Add the cacao, coconut butter, vanilla extract, honey, and salt and process for about 15 seconds or until the mixture comes together in a ball.

Lightly press into an 8" square baking dish to form a cake. Top with sliced strawberries. For a more decadent cake top with the Cashew Vanilla Frosting.

CASHEW VANILLA FROSTING

1/4 cup cashew butter
1-1/2 tsp. raw honey
1-1/2 tsp. coconut butter
1/4 tsp. vanilla extract

Place all ingredients in a blender bowl. Blend all ingredients until smooth. Refrigerate to cool and thicken if necessary.

Try using half of the water to start out and add more if needed to get the nice frosting consistency.

Store cake in the refrigerator.

POWER FLOURS

- **WHOLE WHITE WHEAT FLOUR** A whole grain flour from a softer wheat berry that grinds up quite a bit finer than the regular whole wheat flour (hard red winter wheat). It makes an excellent substitute for white flour in recipes.
- **WHOLE GRAIN SPELT FLOUR** An ancient wheat, the very first wheat that was cultivated. Spelt has a nice nutty flavor and has a higher protein and fiber content than the hard red winter wheat (which is typically used in breads). It can be used for traditional wheat flour in most recipes 1 to 1.
- **BARLEY FLOUR** Substitute up to 1/3 the amount of flour in cookie, bread, and muffin recipes. It has a slightly nutty taste.
- **QUINOA FLOUR** A complete protein and rich in minerals. This grain does not contain gluten. So it cannot be substituted in baking recipes for wheat flour. Substitute several tablespoons of quinoa flour for wheat in your recipe for added nutrition and protein.
- **CHOCOLATE OR CACAO** Chocolate has long been treasured as a rare and luxurious treat and in small amounts is actually good for your health (not to be confused with the milk chocolate candy that is high in fat and sugar, and has none of the benefits of dark chocolate).

  Studies have found dark chocolate is rich in antioxidants that may support healthy blood pressure and healthy cholesterol levels. Raw cacao powder and cocoa powder are subtly different. Raw cacao can be used in place of cocoa in recipes. Raw cacao is a dietary supplement as well as a food ingredient that some people use in an attempt to better their health.

Oklahoma Heart Institute

Services of Oklahoma Heart Institute

Interventional Cardiology

- Cardiac Catheterization
- Coronary Angioplasty
- Multivessel Angioplasty and Stenting
- Atherectomy
- Rotablator Atherectomy
- Thrombolytic Therapy
- Coronary Stents
- Carotid Stenting
- Fractional Flow Reserve
- Intravascular Ultrasound
- Myocardial Biopsy
- Pericardiocentesis
- Peripheral Angioplasty
- Peripheral Stents
- Percutaneous ASD Closures
- Percutaneous PFO Closures
- Impella Circulatory Support
- Therapeutic Hypothermia for Cardiac Arrest Patients
- Transcatheter Aortic Valve Replacement (TAVR)
- Venous Ablation

Noninvasive Cardiology

- CT Angiography
- CT Heart Scan
- Cardiac and Vascular Screening Services
- Nuclear Cardiology
- Echo and Doppler Studies
- Nuclear and Echocardiographic Exercise and Pharmacological Stress Testing
- Retinal Imaging
- Thyroid Ultrasound
- Transesophageal Echocardiography, Arterial Venous Peripheral Vascular Imaging and Doppler Studies
- Peripheral Arterial Doppler and Duplex Imaging
- Cardiovascular Magnetic Resonance Imaging
- External Counterpulsation (ECP) Therapy
- Transcranial Doppler
- Aquapheresis Therapy

Electrophysiology

- Electrophysiology Studies
- Ablation Therapy
- Pacemaker Implantation
- Pacemaker and Lead Extraction
- Pacemaker Programming
- Pacemaker Monitoring and Clinic
- Implantable Cardioverter Defibrillator (ICD) Replacement
- ICD and Hardware Removal
- ICD Programming
- ICD Monitoring and Clinic
- Holter Monitoring and Interpretation
- 30 Day Cardiac Event Monitors
- Implantation and Interpretation of Long-Term Heart Monitors
- Signal Averaged EKGs and Interpretation
- Head Up Tilt Testing and Interpretation
- Direct Current Cardioversion
- Antiarrhythmic Drug Loading and Monitoring

Metabolic Disorders

- Diabetes
- Thyroid
- Hypertension
- Other Endocrine Problems

Specialty Clinics

- Advanced Center for Atrial Fibrillation
- Dysrhythmia and Pacer Clinic
- Hypertension Clinic
- Adolescent and Adult Congenital Heart Clinic
- Lipid and Wellness Clinic
- Heart Failure Clinic
- Same Day Appointment Clinic
- Pre-Operative Clinic
- Center for the Treatment of Venous Disease
- Sleep Care

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THE DOCTORS OF OKLAHOMA HEART INSTITUTE

Wayne N. Leimbach, Jr., MD, FACC, FSCAI, FCCP, FAHA

Dr. Leimbach is a specialist in interventional cardiology, including cardiac catheterization, coronary angioplasty, percutaneous closure of PFOs & ASDs and related interventional procedures such as stents, atherectomy, laser, intravascular ultrasound imaging and direct PTCA for acute myocardial infarction. He is Director of the Cardiac and Interventional Laboratories at Oklahoma Heart Institute Hospital and also is past Chief of Cardiology. Dr. Leimbach is Co-Founder of the Lipid and Wellness Clinic at Oklahoma Heart Institute. He is Director of the James D. Harvey Center for Cardiovascular Research at Hillcrest Medical Center, as well as Director of the Oklahoma Heart Research and Education Foundation. He also serves as Clinical Associate Professor of Medicine at the University of Oklahoma College of Medicine – Tulsa. Dr. Leimbach completed a Clinical Cardiology Fellowship and a Research Fellowship at the University of Iowa Hospitals and Clinics. He also completed his Internal Medicine Internship and Residency programs at Iowa, where he was selected Chief Resident in Medicine. He received his medical degree from Northwestern University in Chicago and his Bachelor of Science degree from the University of Michigan.

Board certified in Internal Medicine, Cardiovascular Disease and Interventional Cardiology

Robert C. Sonnenschein, MD, FACC, ASE, RVT, RPVI

Dr. Sonnenschein specializes in echocardiography and noninvasive peripheral vascular imaging. He is past Director of Peripheral Vascular Ultrasound Imaging at Hillcrest Medical Center and Oklahoma Heart Institute and serves as Clinical Associate Professor of Medicine at the University of Oklahoma College of Medicine – Tulsa. He completed his Cardiology Fellowship at the State University of New York Upstate Medical Center in Syracuse, where he also completed his Internal Medicine Internship and Residency programs. Dr. Sonnenschein received his medical degree from Rush Medical College in Chicago and his Bachelor of Arts degree from the University of Pennsylvania.

Board certified in Internal Medicine, Cardiovascular Disease, and Adult Echocardiography Registered Vascular Technologist

Robert E. Lynch, MD, FACC

Dr. Lynch is a specialist trained in noninvasive and invasive cardiology with a special interest in the prevention of cardiovascular disease. He is former Chief of Cardiology at Hillcrest Medical Center, where he also has served as Chief of Medicine and President of the medical staff. Dr. Lynch is former Co-Director of the Lipid and Wellness Clinic at Oklahoma Heart Institute and Director of the Executive Health Program. Dr. Lynch is also a Clinical Assistant Professor at the University of Oklahoma College of Medicine – Tulsa. He completed his Cardiology Fellowship, as well as his Internal Medicine Internship and Residency, at the University of Oklahoma Health Sciences Center. Dr. Lynch received his medical degree from the University of Oklahoma School of Medicine and his Bachelor of Science degree from the University of Tulsa. Before establishing his practice in Tulsa, he served as Chief of Medicine at the U.S. Army Hospital, Bangkok, Thailand.

Board certified in Internal Medicine and Cardiovascular Disease

James J. Nemec, MD, FACC

Dr. Nemec is a specialist in echocardiography, stress echocardiography and nuclear cardiology. He serves as Director of Nuclear Cardiology for Oklahoma Heart Institute. Dr. Nemec has served as Assistant Professor of Internal Medicine, Division of Cardiology, at Creighton University and as Assistant Professor, Department of Radiology, also at Creighton University. He completed his Clinical Cardiology Fellowship at the Cleveland Clinic Foundation and his Internal Medicine Internship and Residency at Creighton University. Dr. Nemec also completed a year of training in pathology at the University of Missouri, Columbia, MO. He received his medical degree from Creighton University, where he also received his Bachelor of Arts degree.

Board certified in Internal Medicine, Cardiovascular Disease and Nuclear Cardiology

Gregory D. Johnsen, MD, FACC, FSCAI

Dr. Johnsen is an interventional cardiologist with expertise in cardiac catheterization, angioplasty and related interventional procedures, such as stents and atherectomy. He is Director of Cardiac Rehabilitation at Hillcrest Medical Center and Director of the Hillcrest Exercise and Lifestyle Programs. He completed his Clinical Cardiology Fellowship at the University of Oklahoma – Oklahoma City, where he then finished an extra year of dedicated training in interventional cardiology. He completed his Internal Medicine Internship and Residency training at the University of Oklahoma – Oklahoma City, where he also received his medical degree. Dr. Johnsen received his Bachelor of Science degree from Oklahoma State University.

Board certified in Internal Medicine, Cardiovascular Disease and Interventional Cardiology

Alan M. Kaneshige, MD, FACC, FASE

Dr. Kaneshige is a noninvasive cardiologist with expertise in adult echocardiography, stress echocardiography and transesophageal echocardiography. He is Chief of Cardiology at Oklahoma Heart Institute, where he is Director of the Congestive Heart Failure C.A.R.E. Center and the Adolescent and Adult Congenital Heart Clinic. He is past Chief of Cardiology at Hillcrest Medical Center. Dr. Kaneshige completed his Internal Medicine Internship and Residency at Creighton University School of Medicine, where he also received his medical degree. He received a Bachelor of Science in chemistry at Creighton University. Dr. Kaneshige completed his Clinical Cardiology fellowship at Creighton, where he also served as Chief Cardiology Fellow for two years. He completed an additional Cardiac Ultrasound Fellowship at the Mayo Clinic in Rochester. Dr. Kaneshige served as Assistant Professor of Medicine at Creighton University School of Medicine, where he was Director of the Noninvasive Cardiovascular Imaging and Hemodynamic Laboratory.

Board certified in Internal Medicine, Cardiovascular Disease, Adult and Transesophogeal Echocardiography

Edward T. Martin, MS, MD, FACC, FACP, FAHA

Dr. Martin is a noninvasive cardiologist with specialty expertise in non-invasive imaging. He is Director of Cardiovascular Magnetic Resonance Imaging at Oklahoma Heart Institute and Hillcrest Medical Center. In addition, he is a Clinical Associate Professor of Medicine at the University of Oklahoma College of Medicine – Tulsa. Dr. Martin has specialty training in Nuclear Medicine, as well as additional training dedicated to Cardiovascular Magnetic Resonance Imaging. He completed his Cardiology Fellowship at the University of Alabama. Dr. Martin's Internal Medicine Internship and Residency training were performed at Temple University Hospital in Philadelphia. He received his medical degree from the Medical College of Ohio. Dr. Martin completed his Master of Science degree in mechanical engineering at the University of Cincinnati and his Bachelor of Science degree in physics at Xavier University. Dr. Martin is a founding member of the Society of Cardiovascular Magnetic Resonance and is an editorial board member of the Journal of Cardiovascular Magnetic Resonance.

Board certified in Internal Medicine and Cardiovascular Disease

Roger D. Des Prez, MD, FACC

Dr. Des Prez is a noninvasive cardiologist with specialty expertise in echocardiography, nuclear cardiology and cardiac computed tomography. He is Director of Cardiac Computed Tomography at Oklahoma Heart Institute Hospital, at Hillcrest Medical Center and Bailey Medical Center. Dr. Des Prez received his medical degree and Bachelor of Arts degree from Vanderbilt University. He completed his Residency in Internal Medicine and Pediatrics at University Hospital of Cleveland. Dr. Des Prez practiced for six years as an internist with the Indian Health Services in Gallup, NM. He returned to Vanderbilt University as a member of the Internal Medicine Faculty, at which time he also completed his cardiology training.

Board certified in Internal Medicine, Cardiovascular Disease, Echocardiography, Pediatrics and Nuclear Cardiology

Christian S. Hanson, DO, FACE

Dr. Hanson is a specialist in Endocrinology, Metabolism and Hypertension at Oklahoma Heart Institute with expertise in diabetes, lipids and hypertension. He also serves as Clinical Associate Professor of Medicine in the College of Osteopathic Medicine – Oklahoma State University. He completed a Fellowship in Endocrinology, Metabolism and Hypertension at the University of Oklahoma in Oklahoma City. Dr. Hanson's Internal Medicine Residency and Rotating Internship were completed at Tulsa Regional Medical Center. He received his medical degree from Oklahoma State University and his Bachelor of Science degree from Northeastern Oklahoma State University in Tahlequah.

Board certified in Internal Medicine, Endocrinology and Metabolic Diseases

David A. Sandler, MD, FACC, FHRS

Dr. Sandler is a cardiologist with subspecialty expertise in electrophysiology, complex ablation, and atrial fibrillation management. Dr. Sandler is Director of Electrophysiology at Oklahoma Heart Institute Hospital. He completed his Cardiac Electrophysiology Fellowship and his Cardiovascular Medicine Fellowship at New York University Medical Center, New York, NY. Dr. Sandler performed his Internal Medicine Internship and Residency at Mount Sinai Medical Center, New York, NY. He earned his medical degree from Georgetown University School of Medicine in Washington, DC. Dr. Sandler received his Bachelor of Arts degree at the University of Pennsylvania in Philadelphia.

Board certified in Internal Medicine, Cardiovascular Disease and Cardiac Electrophysiology

Raj H. Chandwaney, MD, FACC, FSCAI, FSVM

Dr. Chandwaney is an interventional cardiologist with expertise in cardiac catheterization, coronary angioplasty and related interventional procedures such as coronary stents, atherectomy, intravascular ultrasound and peripheral vascular interventional procedures. Dr. Chandwaney is Director of the Chest Pain Center and Cardiology Telemetry Unit at Oklahoma Heart

Institute Hospital. He completed his Clinical Cardiology Fellowship at Northwestern University Medical School in Chicago, IL., where he also completed an Interventional Cardiology Fellowship. Dr. Chandwaney's Internal Medicine Internship and Residency were performed at Baylor College of Medicine in Houston, TX. He received his medical degree from the University of Illinois at Chicago. Dr. Chandwaney completed his Master of Science degree at the University of Illinois at Urbana-Champaign, where he also received his Bachelor of Science degree.

Board certified in Internal Medicine, Cardiovascular Disease, Interventional Cardiology and Endovascular Medicine

D. Erik Aspenson, MD, FACE, FACP

Dr. Aspenson is a subspecialist in Endocrinology, Metabolism and Hypertension at Oklahoma Heart Institute, with expertise in diabetes, lipids, hypertension and thyroid diseases. He completed a fellowship in Endocrinology at Wilford Hall Medical Center, Lackland AFB, Texas. Dr. Aspenson's Internal Medicine Internship and Residency were completed at David Grant Medical Center, Travis AFB, California where he served as Chief Resident. He received his medical degree from the University of Oklahoma and his Bachelor of Science degree at Oklahoma State University.

Board certified in Internal Medicine, Endocrinology and Metabolic Diseases

Frank J. Gaffney, MD, FACC

Dr. Gaffney is an interventional and noninvasive cardiologist with subspecialty expertise in transesophageal echocardiography, nuclear cardiology, and coronary angiography. He completed his Cardiovascular Medicine Fellowship at Scott & White Memorial Hospital in Temple, Texas. Dr. Gaffney completed his Internal Medicine Internship and Residency at Brooke Army Medical Center in San Antonio. He then remained on staff at Scott & White Memorial Hospital for several years, before entering his Fellowship in Cardiovascular Medicine. Dr. Gaffney earned his medical degree from New York Medical College, Valhalla, New York, and he received his Bachelor of Arts degree at Hofstra University in Hempstead, New York.

Board certified in Internal Medicine, Cardiovascular Disease and Nuclear Cardiology

Eric G. Auerbach, MD, FACC

Dr. Auerbach is a general cardiologist who is particularly interested in preventative cardiology and cardiovascular risk reduction. He completed his cardiology fellowship at the University of Miami/Jackson Memorial Hospital in Miami, FL, following which he obtained additional subspecialty training in cardiovascular MRI, nuclear cardiology, and cardiac CT imaging. His areas of expertise also include echocardiograpgy, transesophageal echocardiograpgy, stress testing, and management of lipid disorders. Dr. Auerbach's Internal Medicine Internship and Residency were performed at the University of Miami/Jackson Memorial Hospital. He earned his medical degree at the University of Miami, Miami, FL, and his Bachelor of Arts degree at Princeton University, Princeton, NJ.

Board certified in Internal Medicine, Cardiovascular Disease, and Nuclear Cardiology

Kelly R. Flesner, MD

Dr. Flesner is a subspecialist in Endocrinology, Metabolism and Hypertension at Oklahoma Heart Institute, with expertise in diabetes, lipids, hypertension and thyroid diseases. Prior to joining Oklahoma Heart, she was at St. John Medical Center in Tulsa. She completed her fellowship in Endocrinology at the University of Texas at Galveston. Her Internal Medicine Internship and Residency were completed at the University of Texas in Houston, where she also received her medical degree. She earned her Bachelor of Science degree at Texas A&M University in College Station, TX.

Board certified in Internal Medicine, Endocrinology, Diabetes and Metabolic Diseases

Robert L. Smith, Jr., MSc, MD, FACC, FSCAI

Dr. Smith specializes in interventional cardiology including cardiac catheterization, coronary angioplasty, and related interventional procedures such as coronary stents, atherectomy, intravascular ultrasound, and peripheral vascular interventional procedures. He completed an Interventional Cardiology Fellowship at the University of Florida College of Medicine in Jacksonville, FL. Dr. Smith performed his Clinical Cardiology Fellowship at Vanderbilt University School of Medicine in Nashville, TN and Tulane University School of Medicine in New Orleans. He received his medical degree from the University of Oklahoma College of Medicine in Oklahoma City and then completed his Internal Medicine Internship and Residency at Emory University School of Medicine in Atlanta, GA. Dr. Smith received his Bachelor of Arts, Bachelor of Science and Master of Science degrees at the University of Oklahoma in Norman, OK.

Board certified in Internal Medicine, Cardiovascular Disease, Interventional Cardiology and Nuclear Cardiology

Craig S. Cameron, MD, FACC, FHRS

Dr. Cameron is a specialist in cardiac electrophysiology, including catheter ablation of arrhythmia, atrial fibrillation management, pacemakers, implantable defibrillators, and cardiac resynchronization devices. He completed his Cardiac Electrophysiology Fellowship and his Cardiovascular Disease Fellowship at Baylor University Medical Center in Dallas, TX. Dr. Cameron's Internship and Internal Medicine Residency were performed at Baylor College of Medicine in Houston. He earned his medical degree from the University of Kansas School of Medicine in Kansas City, KS. Dr. Cameron received his Bachelor of Science degree at Pittsburg State University in Pittsburg, KS.

Board certified in Internal Medicine, Cardiovascular Disease and Cardiac Electrophysiology

Eugene J. Ichinose, MD, FACC

Dr. Ichinose specializes in interventional cardiology including cardiac catheterization, coronary angioplasty and related interventional procedures such as coronary stents, atherectomy, intravascular ultrasound and peripheral vascular interventional procedures. He completed his Interventional and Clinical Cardiology Fellowships and his Internal Medicine Residency at the University of Massachusetts Memorial Health Care Center in Worcester, MA. Dr. Ichinose received his medical degree from Louisiana State University in New Orleans. He earned his Bachelor of Science degree from Texas Christian University in Fort Worth, TX.

Board certified in Internal Medicine, Cardiovascular Disease, Interventional Cardiology and Nuclear Cardiology

Cristin M. Bruns, MD

Dr. Bruns is a specialist in Endocrinology, Diabetes and Metabolism at Oklahoma Heart Institute, with expertise in diabetes, thyroid disease (including thyroid cancer) and polycystic ovary syndrome. She completed her Internal Medicine Internship and Residency and Endocrinology Fellowship at the University of Wisconsin Hospital and Clinics in Madison, WI. Dr. Bruns earned her medical degree from Saint Louis University School of Medicine in St. Louis, MO and her Bachelor of Arts and Bachelor of Science degrees in biology from Truman State University in Kirksville, MO. Prior to joining Oklahoma Heart Institute, Dr. Bruns worked as a clinical endocrinologist at the Dean Clinic in Madison, Wisconsin.

Board certified in Internal Medicine, Endocrinology and Metabolic Diseases

Gregory A. Cogert, MD, FACC, FHRS

Dr. Cogert is a cardiologist who specializes in electrophysiology, including catheter ablation of arrhythmia, as well as the implantation and management of cardiac pacemakers, defibrillators, and cardiac resynchronization devices. He completed his Cardiac Electrophysiology Fellowship at Mayo Clinic in Rochester, MN and his Cardiovascular Fellowship at Cedars-Sinai Medical Center in Los Angeles, CA. Dr. Cogert's Internal Medicine Internship and Residency were completed at UCLA Medical Center in Los Angeles. He earned his medical degree from the University of California in Irvine and received his Bachelor of Science degree in microbiology and molecular genetics from the University of California in Los Angeles.

Board certified in Internal Medicine, Cardiovascular Disease, Echocardiography, Nuclear Medicine and Cardiac Electrophysiology.

John S. Tulloch, MD

Dr. Tulloch is a noninvasive cardiologist with expertise in adult echocardiography, peripheral vascular imaging, nuclear cardiology, cardiac computed tomography and MRI. Dr. Tulloch is Director of the Cardiac and Vascular Ultrasound Department of Hillcrest Medical Center's Cardiovascular Diagnostics. He completed his Cardiovascular Fellowship at the University of Kansas Medical Center in Kansas City, KS. Dr. Tulloch's Internal Medicine Internship and Residency also were completed at the University of Kansas Medical Center. He earned his medical degree from Ross University School of Medicine in New Brunswick, NJ and received his Bachelor of Science degree in biology from Avila University in Kansas City, MO.

Board certified in Internal Medicine, Cardiovascular Disease, Cardiovascular Tomography, and Nuclear Cardiology

Anthony W. Haney, MD, FACC

Dr. Haney is a noninvasive cardiologist with expertise in nuclear cardiology, echocardiography, peripheral vascular imaging and MRI. He also performs diagnostic cardiac catheterization. He completed his Cardiovascular Fellowship at the Medical College of Virginia in Richmond. Dr. Haney's Internal Medicine Internship and Residency were completed at the Mayo Clinic in Scottsdale, AZ. He earned is medical degree from the University of Oklahoma School of Medicine.

Board certified in Internal Medicine, Cardiovascular Disease and Nuclear Cardiology

Ralph J. Duda, Jr., MD, FACP, FACE, FASH

Dr. Duda is a specialist in Endocrinology, Diabetes and Metabolism at Oklahoma Heart Institute, with expertise in diabetes, lipids, hypertension and thyroid diseases. He completed his Fellowship in Endocrinology and Metabolism at the Mayo Graduate School of Medicine, where he also completed his Residency in Internal Medicine. Dr. Duda received his medical degree from Northwestern University School of Medicine in Chicago, IL. He earned his Bachelor of Science degree from Benedictine University in Lisle, IL.

Board certified in Internal Medicine, Endocrinology, Diabetes and Metabolism, Clinical Lipidology, Clinical Hypertension, Clinical Bone Densitometry and Thyroid Ultrasonography

Douglas A. Davies, MD, FACC

Dr. Davies is a hospital-based cardiologist who provides continuity of care for patients admitted to Oklahoma Heart Institute – Hospital. He completed a Clinical Cardiology Fellowship and additional training in nuclear cardiology at the Medical College of Virginia, where he also completed his Internal Medicine and Residency programs. Dr. Davies received his medical degree from Johns Hopkins University School of Medicine in Baltimore.

Board Certified in Internal Medicine, Cardiovascular Disease, Nuclear Cardiology and Cardiovascular Computed Tomography Angiography

Kevin L. Lewis, MD

Dr. Lewis is a sleep specialist and a leading researcher and expert on the diagnosis and treatment of sleep disorders. He is Director of Sleep Care Services for Oklahoma Heart Institute, as well as Medical Director of Oklahoma Heart Institute Sleep Care of Hillcrest Medical Center. Dr. Lewis completed Fellowship training in Sleep Care, Pulmonary, and Critical Care at the University of Missouri Hospitals and Clinics in Columbia and the University of Kentucky Medical Center in Lexington. He completed his Internal Medicine Residency programs at the University of Nebraska Medical Center in Omaha and the Oklahoma University College of Medicine in Tulsa. Dr. Lewis earned his medical degree from the University of Texas Health Science Center in San Antonio.

Board certified in Internal Medicine, Pulmonary Diseases, Critical Care and Sleep Medicine.

Neil Agrawal, MD

Dr. Agrawal is a noninvasive cardiology specialist with expertise in adult echocardiography, nuclear cardiology, cardiac computed tomography and MRI. He completed his Cardiovascular Fellowship at the University of Vermont. Dr. Agrawal's Internal Medicine Internship and Residency were completed at the University of Louisville, and he earned his medical degree from St. George's University in Granada, West Indies. Dr. Agrawal completed his Bachelor of Science degree in biochemistry at the University of Texas at Austin.

Board certified in Internal Medicine

Kamran I. Muhammad, MD, FACC, FSCAI

Dr. Muhammad is a subspecialist in interventional cardiology with expertise in cardiac catheterization, coronary intervention (including angioplasty, stent placement, atherectomy, intravascular ultrasound), peripheral vascular intervention (including carotid intervention) as well as interventional therapies for structural heart disease, including PFO, ASD and valvular disease. In addition to his clinical experience, Dr. Muhammad has authored many peer-reviewed articles and textbook chapters on important cardiology topics.

Dr. Muhammad completed his Interventional Cardiology Fellowship at the Cleveland Clinic in Cleveland, Ohio, which included an additional year of dedicated training in peripheral vascular and structural cardiac intervention. His Clinical Cardiology Fellowship was also conducted at the Cleveland Clinic. Dr. Muhammad completed his Internal Medicine Internship and Residency at Yale University in New Haven, Connecticut, where he was selected and served as Chief Resident. He earned his medical degree from the University of Massachusetts Medical School in Worcester, Massachusetts. Dr. Muhammad earned his Bachelor of Science degree in computer science from the University of Massachusetts in Amherst, Massachusetts.

Board certified in Internal Medicine, Cardiovascular Disease, Nuclear Cardiology and Interventional Cardiology

Morakod Lim, MD

Dr. Lim is an interventional and noninvasive cardiologist with subspecialty expertise in cardiac catheterization, angioplasty, stents and atherectomy, as well as echocardiography, nuclear cardiology and coronary angiography. He completed his Interventional Cardiology Fellowship at the University of Medicine and Dentistry of New Jersey/Robert Wood Johnson Medical School in New Brunswick, NJ. His Clinical Cardiology Fellowship was conducted at the Albert Einstein College of Medicine in the Bronx, NY.

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Dr. Cheng joins Oklahoma Heart Institute after serving as cardiology faculty at Cedars-Sinai Medical Center and assistant professor at the University of California in Los Angeles for the past four years. He is a specialist in noninvasive heart and vascular imaging, particularly in cardiac computed tomography (CT), a topic on which he has published numerous original research publications addressing quality, clinical use, and novel applications.

Dr. Cheng's training included a Clinical Cardiology Fellowship and Advanced Cardiac Imaging Fellowship at Cedars-Sinai Medical Center, and an Internal Medicine Internship and Residency at the University of California in San Francisco. Dr. Cheng received his medical degree from Northwestern University in Chicago, IL and his Bachelor of Science degree from Northwestern University in Evanston, IL.

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Dr. Loveless is a sleep specialist, with expertise in the diagnosis and treatment of sleep disorders. Prior to joining Oklahoma Heart Institute, Dr. Loveless was with Nocturna of Tulsa, Warren Clinic and Springer Clinic.

She completed her Internal Medicine Residency program at the University of Oklahoma, Tulsa, where she was Chief Resident. She also earned her medical degree from, the University of Oklahoma, Tulsa.

Dr. Loveless completed graduate studies at Texas Tech University, and she earned her Bachelor of Arts degree at Davidson College in Davidson, North Carolina.

Board Certified in Internal Medicine and Sleep Medicine

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Dr. Good is an invasive/noninvasive cardiology specialist with expertise in adult echocardiography, nuclear cardiology, cardiac computed tomography, peripheral vascular ultrasound and MRI.

He completed his Cardiovascular Fellowship at the University of Kansas Medical Center in Kansas City, KS, where he also completed his Internal Medicine Internship and Residency.

Dr. Good received his medical degree from the Oklahoma State University Center for Health and Sciences in Tulsa and his Bachelor of Arts degree from the University of Colorado in Boulder.

Board certified in Internal Medicine and Cardiovascular Computed Tomography

Stanley K. Zimmerman, MD

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He completed his Interventional and Cardiovascular Fellowships at the University of Kansas Medical Center in Kansas City, KS, as well as his Internal Medicine Internship and Residency. In addition, Dr. Zimmerman received his medical degree from the University of Kansas Medical Center and his Bachelor of Arts degree from the University of Kansas in Lawrence.

Board certified in Internal Medicine and Cardiovascular Disease

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Dr. Dobratz specializes in diagnostic and interventional cardiology, including cardiac catheterization, peripheral angiography, pacemakers and defibrillators, cardioversion, cardiac nuclear studies, cardiac computed tomography, transesophageal echo and echocardiograms.

He completed his Fellowship in Cardiology at Allegheny General Hospital in Pittsburgh, Pennsylvania. Dr. Dobratz completed his Internal Medicine Internship and Residency at the University of Arizona in Tucson. He earned his medical degree at Eastern Virginia Medical School in Norfolk and his undergraduate degree at James Madison University in Harrisonburg, Virginia.

Board certified in Cardiovascular Disease

Transcatheter Aortic Valve Replacement (TAVR)

New Frontiers In Treating Aortic Stenosis

By Kamran I. Muhammad, MD, FACC, FSCAI

Transcatheter aortic valve replacement (TAVR) was recently approved as a life-saving therapy for patients with severe symptomatic aortic stenosis who are too high risk for traditional surgical aortic valve replacement. In this article, we will review the demographics, natural history, symptoms and recommended treatment for severe symptomatic aortic stenosis. Transcatheter aortic valve replacement will be highlighted as a treatment option for patients with severe symptomatic aortic stenosis who are not candidates for surgical aortic valve replacement.

Aortic stenosis refers to restricted opening of the main valve of the heart that separates the left ventricle from the aorta. The pathogenesis of this disorder is not fully understood and the most common cause of aortic stenosis in the United States is degenerative calcific disease of a normal trileaflet aortic valve (Figure 1).

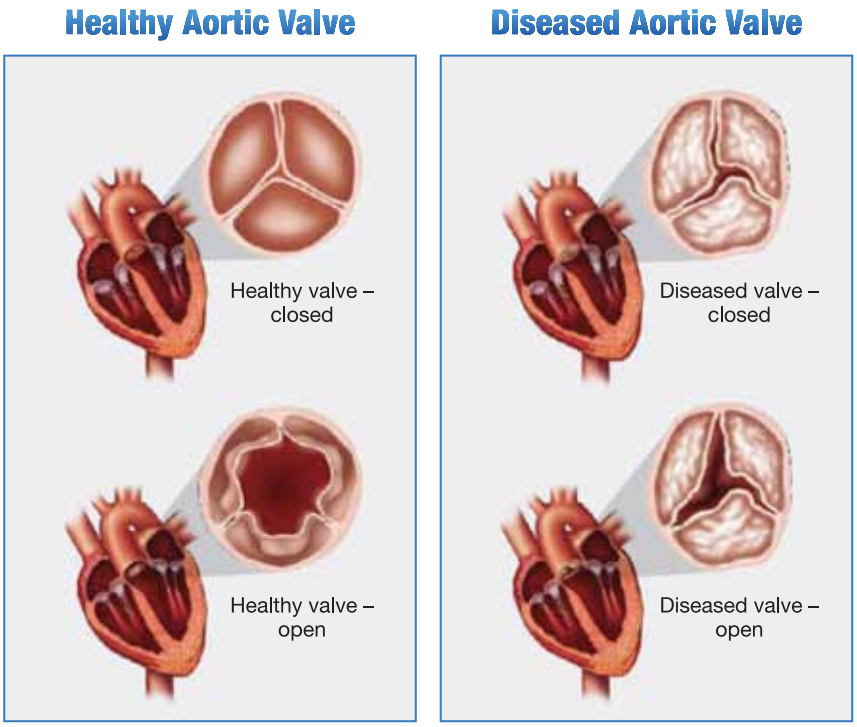
Aortic stenosis is the most common heart valve abnormality in the United States. It is estimated that aortic stenosis affects approximately 5 of every 10,000 adults. The prevalence of aortic stenosis increases with age: 2% of people over the age of 65, 3% of people over 75, and 4% of people of the age of 85 are estimated to have the disorder. The prevalence of aortic stenosis is known to be increasing with the increasing age of the U.S. population.

Aortic stenosis generally has a latent period during which time there is increasing calcification and restriction of the aortic valve leaflets. There is increasing obstruction to outflow of blood from the heart and myocardial overload. The patient remains asymptomatic during this latent period due to compensatory mechanisms. Eventually, however, the obstruction becomes severe such that compensatory mechanisms fail and symptoms develop. The diagnosis of severe aortic stenosis is made by transthoracic echocardiography, which is the gold standard test to diagnose this condition (Table 1).

The classic symptoms of severe aortic stenosis are those of heart failure (shortness of breath, dyspnea on exertion, orthopnea, paroxysmal nocturnal dyspnea, leg swelling), chest pain/angina and syncope. Many patients, however, present with non-specific symptoms such as de-

Continued on p. 18

Figure 1



Courtesy of Edwards Lifesciences

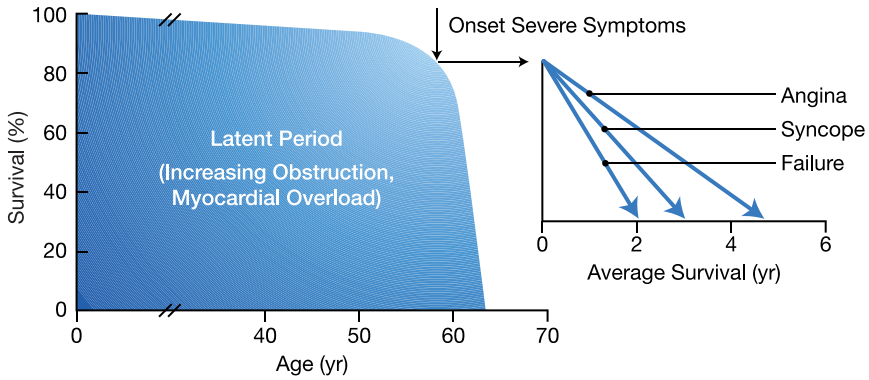
Table 1

Aortic Stenosis Echocardiography

	Aortic Jet Velocity m/s	Mean Gradient mmHg	Valve Area cm2
Normal	≤ 2.0	< 5	3.0 – 4.0
Mild	< 3.0	< 25	> 1.5
Moderate	3.0 – 4.0	25 – 40	1.0 – 1.5
Severe	**> 4.0**	**> 40**	**< 1.0**

Figure 2

Aortic Stenosis Is Life-Threatening and Progressing Rapidly



Ross and Braunwald, Circulation 1968

Figure 3

Aortic Stenosis Effect of Treatment

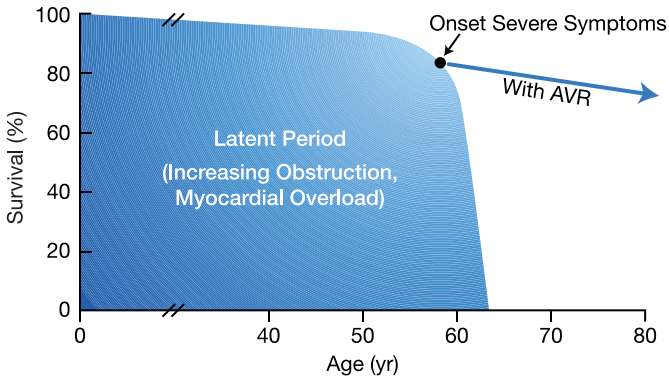


Figure 4

Edwards SAPIEN Valve

Table 2

Aortic Stenosis Surgical Treatment

ACC/AHA Class I Indications
• Symptomatic patients with severe AS
• Patients with severe AS undergoing CABG
• Patients with severe AS undergoing surgery on the aorta or other heart valves
• Patients with severe AS and LVEF < 50%

Continued from p. 17

creased exercise tolerance. Prompt recognition of the onset of symptoms in severe aortic stenosis is essential as mortality dramatically increases after such symptoms develop (Figure 2). Specifically, the 2-year mortality after the onset of symptoms in severe aortic stenosis is 50% and the 5-year mortality is 80%. As such, prompt referral for aortic valve replacement is recommended for patients with severe symptomatic aortic stenosis (Table 2).

Surgical aortic valve replacement is a well-established and effective treatment for severe aortic stenosis, is generally associated with low operative mortality, and should be offered to virtually all patients with severe symptomatic aortic stenosis. Surgical replacement of the stenotic aortic valve results in improvement of symptoms and normalizes the survival curve (Figure 3). However, despite the established efficacy of surgical aortic valve replacement, there remain a large number of patients that never receive this important therapy. Indeed, numerous studies over the past decade have shown that at least 40% of patients with severe aortic stenosis never undergo surgical aortic valve replacement. The factors behind this are complex and multifactorial. However the highly invasive nature of surgical aortic valve replacement, coupled with the age group and associated comorbidities of patients with severe aortic stenosis, likely explain much of the undertreatment seen in this population.

Transcatheter aortic valve replacement (TAVR) has been developed as a minimally-invasive approach to aortic valve replacement in patients with severe symptomatic aortic stenosis who are not candidates for traditional aortic valve replacement. TAVR was first performed in 2002 by a French cardiologist, Dr. Alain Cribier, and several subsequent observational studies suggested that it had clinical utility. The Placement of AoRTic TraNscathetER Valves (PARTNER) Trial was the first multicenter, randomized trial to evaluate TAVR using the Edwards Lifesciences SAPIEN valve in high-risk and inoperable patients with severe symptomatic aortic stenosis. This trial included two individually stratified and powered cohorts: Cohort A included high-risk patients with severe symptomatic

aortic stenosis in which TAVR was compared to surgical aortic valve replacement, and Cohort B included patients with severe symptomatic aortic stenosis who were deemed inoperable and randomized them to TAVR versus standard therapy. The Edwards SAPIEN transcatheter heart valve, a trileaflet bovine pericardial valve mounted on a balloon-expandable, stainless-steel support frame, recently received U.S. Food and Drug Administration (FDA) approval in November of 2011 based on the results of Cohort B of the PARTNER Trial (Figure 4). This device is currently the only FDA-approved transcatheter heart valve available in the United States.

Aortic stenosis is the most common heart valve abnormality in the United States. It is estimated that aortic stenosis affects approximately 5 of every 10,000 adults.

Cohort B of the PARTNER Trial randomized patients with severe symptomatic aortic stenosis who were deemed inoperable for surgical aortic valve replacement by two cardiothoracic surgeons, to either transfemoral TAVR with the Edwards SAPIEN valve or standard therapy. As would be expected, patients enrolled in this trial were elderly and frail with multiple comorbidities (Figure 5a,b). Despite the advanced age and multiple comorbidities of the patients in this trial, there were remarkable improvements in all-cause mortality (25% absolute risk reduction, 44% vs. 68%), cardiovascular mortality (31% absolute risk reduction, 31% vs. 62%), and repeat hospitalization (38% absolute risk reduction, 35% vs. 73%) at 2 years associated with TAVR as compared with standard therapy (Figures 6-8, see p. 20-21). To put this fully into perspective, these data show that only 4 patients need to be treated with TAVR to save 1 life at 2 years (number needed to treat [NNT] = 4), a remarkable finding in this elderly and frail population. In addition, TAVR was associated with significant improvements in measures of quality of life, including New York Heart Association functional class, patient walk times and distances, as well as other objective quality of life scoring metrics. Importantly, TAVR was associated with increased rates of stroke and major vascular complications at 30 days, 1 and 2 years as compared with standard therapy. However, the beneficial effects of TAVR were noted to outweigh

Continued on p. 20

Figure 5A

An Elderly and Highly Symptomatic Population

Characteristic	Edwards SAPIEN THV n=179	Standard Therapy n = 179	p Value
Age (yr)	**83.1 ± 8.6**	**83.2 ± 8.3**	**.95**
Male sex (%)	45.8	46.9	.92
STS Score	**11.2 ± 5.8**	**11.9 ± 4.8**	**.21**
Logistic EuroSCORE	26.4 ± 17.2	30.4 ± 19.1	.04
NYHA			
I or II (%)	7.8	6.1	.68
III or IV (%)	**92.2**	**93.9**	**.68**
CAD (%)	67.6	74.3	.20
Prior MI (%)	18.6	26.4	.10
Prior CABG (%)	32.4	40.8	.12
Prior PCI (%)	26.3	21.8	.39
Prior BAV (%)	16.2	24.4	.09
CVD (%)	27.4	26.9	1.00

BAV: balloon aortic valvuloplasty; CABG: coronary artery bypass graft; CAD: coronary artery disease; CVD: cardiovascular disease; MI: myocardial infarction; NYHA: New York Heart Association; PCI: percutaneous coronary intervention; STS: Society of Thoracic Surgeons
N Engl J Med, 2012 May 3;366(18):1696-704

Figure 5B

Patient Has Multiple Severe Comorbidities

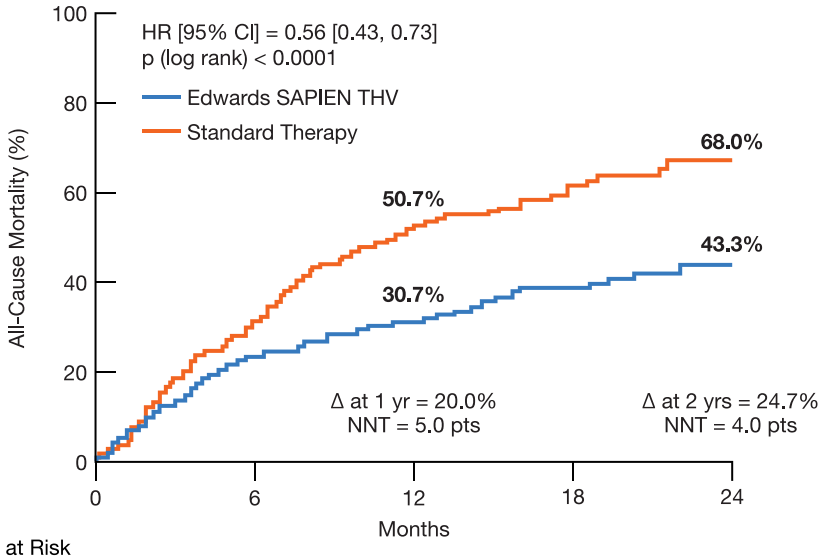
Characteristic	Edwards SAPIEN THV n=179	Standard Therapy n = 179	p Value
Peripheral valve disease (%)	**30.9**	**25.1**	**.24**
Chronic obstructive pulmonary disease			
Any (%)	41.3	52.5	.04
O2-dependent (%)	**21.2**	**25.7**	**.38**
Creatinine > 2 mg/dL (%)	4.5	9.0	.10
Atrial fibrillation (%)	32.9	48.8	.04
Permanent pacemaker (%)	19.6	17.3	.68
Pulmonary hypertension (%)	42.4	43.8	.90
Frailty (%)	**18.1**	**28.0**	**.09**
Porcelain aorta (%)	**19.0**	**11.2**	**.05**
Chest wall irradiation (%)	**8.9**	**8.4**	**1.00**
Chest wall deformity (%)	**8.4**	**5.0**	**.29**
Liver disease (%)	**3.4**	**3.4**	**1.00**

N Engl J Med, 2012 May 3;366(18):1696-704

Figure 6

All-Cause Mortality

All-Cause Mortality at 1 Year and 2 Years



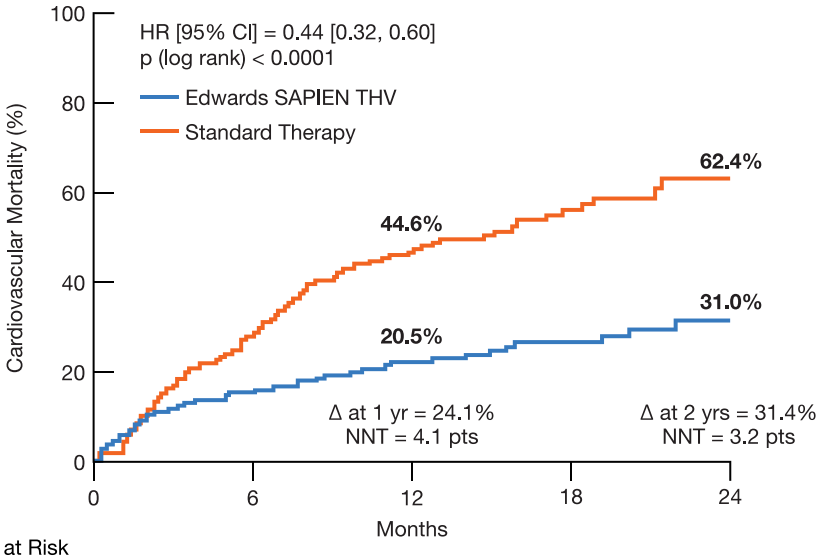
No. at Risk					
Edwards SAPIEN THV	179	138	124	110	83
Standard Therapy	179	121	85	62	42

N Engl J Med, 2012 May 3;366(18):1696-704

Figure 7

Cardiovascular Mortality

Cardiovascular Mortality at 1 Year and 2 Years



No. at Risk					
Edwards SAPIEN THV	179	138	124	110	83
Standard Therapy	179	121	85	62	42

N Engl J Med, 2012 May 3;366(18):1696-704

Transcatheter aortic valve replacement (TAVR) has been developed as a minimally-invasive approach to aortic valve replacement in patients with severe symptomatic aortic stenosis who are not candidates for traditional aortic valve replacement.

Continued from p. 19

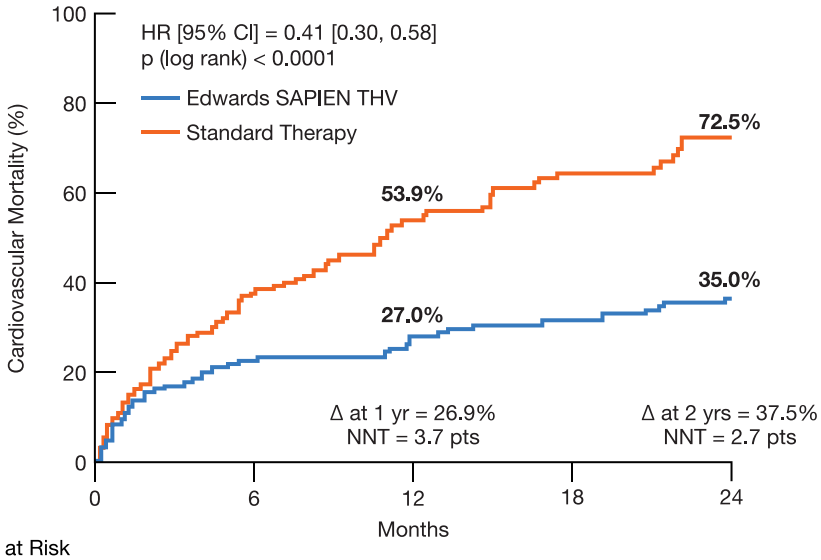
the complications, resulting in net positive outcomes for patients treated with this therapy. The Edwards SAPIEN aortic valve prosthesis was also noted to be durable and effective as assessed by echocardiography throughout the length of follow-up of the study. Based on these results of the PARTNER Trial, Cohort B, transfemoral TAVR with the Edwards SAPIEN valve was approved by the U.S. FDA in November 2011, and is currently available for commercial use in patients with severe symptomatic aortic stenosis who are inoperable for surgical aortic valve replacement.

Transfemoral transcatheter aortic valve replacement is minimally-invasive and, in most cases, can be performed in a completely percutaneous fashion (without any surgery) from femoral artery access. General endotracheal anesthesia is utilized and the procedure is performed in a hybrid cardiac catheterization laboratory — a special environment that combines the capabilities of both a cardiac catheterization laboratory and operating room. The Edwards SAPIEN transcatheter heart valve is advanced into position across the diseased native aortic valve using a special delivery catheter from femoral artery access. Optimal positioning of the valve is confirmed using fluoroscopy and transesophageal echocardiography. The valve is then carefully deployed and assessed immediately after deployment by transesophageal echocardiography. Please visit www.oklahomaheart.com/tavr to access additional information on the TAVR procedure, including animations of the procedure and valve deployment. Patients are generally extubated in the cardiac catheterization laboratory and ambulate on post-procedure day #1. Most patients are discharged home on post-procedure day #2 or #3 depending on their clinical course. Lifelong aspirin therapy and 3-6 months of clopidogrel (Plavix) therapy is recommended following TAVR.

Figure 8

Repeat Hospitalization

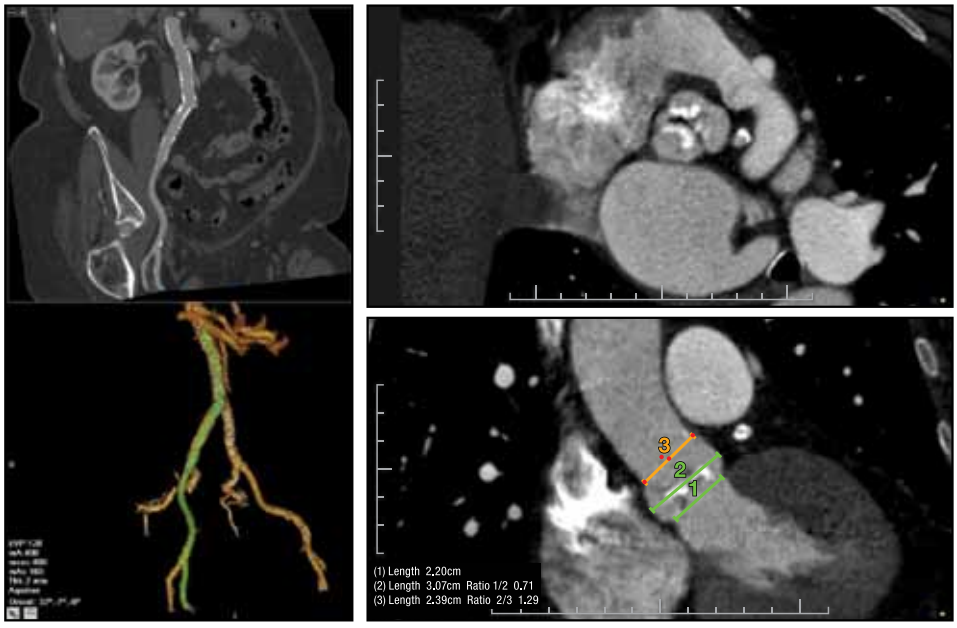
Repeat Hospitalization at 1 Year and 2 Years



No. at Risk					
Edwards SAPIEN THV	179	115	100	89	64
Standard Therapy	179	86	49	30	17

N Engl J Med, 2012 May 3;366(18):1696-704

Figure 9



Oklahoma Heart Institute (OHI) was the first program in Tulsa and region to offer transcatheter aortic valve replacement, and we remain the most experienced and busiest program in the region with excellent clinical outcomes. Oklahoma Heart Institute Hospital is home to the only custom-designed and purpose-built, dedicated, hybrid cardiac catheterization laboratory which opened in April of 2012, and is used to perform all of our TAVR procedures. Patients that are referred for TAVR at Oklahoma Heart Institute can expect to be evaluated by experts with specialized training in this field and will receive a comprehensive multidisciplinary evaluation to determine their candidacy for the procedure. This will include consultations with cardiology and cardiothoracic surgery as well as pre-procedural imaging evaluation (computed tomography and echocardiography) to evaluate for appropriate valve sizing and adequacy of femoral access (Figure 9). Patients and their families will also have access to a full-time TAVR coordinator, who will serve as an important resource to answer questions and provide support throughout the TAVR screening, evaluation and procedural process. Following the procedure, patients will continue to receive follow-up care through the TAVR clinic with comprehensive care and monitoring.

Additional new and exciting indications and technologies are on the horizon related to transcatheter aortic valve replacement. It is expected that the U.S. FDA will expand the indications for TAVR to high-risk patients with severe symptomatic aortic stenosis based on the results of Cohort A of the PARTNER Trail. Additional next-generation transcatheter valve technologies are currently in clinical trials and are expected to allow for more patients to be successfully treated with this technology with improved clinical outcomes.

Dr. Kamran Muhammad is a subspecialist in interventional cardiology with the Oklahoma Heart Institute in Tulsa, OK with expertise in cardiac catheterization, coronary intervention (including angioplasty, stent placement, atherectomy, intravascular ultrasound), peripheral vascular intervention (including carotid intervention) as well as interventional therapies for structural heart disease, including PFO, ASD and valvular disease. With advanced training in structural heart disease intervention from the world-renowned Cleveland Clinic, Dr. Muhammad serves as the Director of the Structural Heart Disease and Transcatheter Aortic Valve Replacement Programs at Oklahoma Heart Institute. Dr. Muhammad led a team of OHI physicians in performing the first transcatheter aortic valve replacements (TAVR) in Tulsa and the region.

In addition to his clinical experience, Dr. Muhammad has authored many peer-reviewed articles and textbook chapters on important cardiology topics. He also serves as Clinical Associate Professor of Medicine at the University of Oklahoma College of Medicine - Tulsa.

Dr. Muhammad completed his Clinical Cardiology and Interventional Cardiology Fellowships at the Cleveland Clinic, which included additional dedicated training in peripheral vascular and structural cardiac intervention. Dr. Muhammad completed his Internal Medicine Internship and Residency at Yale University where he was selected and served as Chief Resident. He earned his medical degree from the University of Massachusetts Medical School. Dr. Muhammad earned his Bachelor of Science degree in computer science from the University of Massachusetts.

To learn more about TAVR and the OHI TAVR program, please visit www.oklahomaheart.com/tavr.

Obstructive Sleep Apnea and Type 2 Diabetes Mellitus

By Kevin L. Lewis, MD

In recent years, the relationship between obstructive sleep apnea (OSA) and type 2 diabetes mellitus (T2DM) has been increasingly studied, leading to a better understanding of the pathophysiology of both conditions. The characteristics of this relationship will be reviewed here.

OSA occurs when repetitive airway closures, often with associated hypoxemia or arousal occur during sleep at least five times per hour. T2DM results in elevated blood glucose levels as a result of altered glucose metabolism and increased resistance to the effects of insulin. Glucose levels greater than 125 mg/dl in the fasting state or greater than 200 mg/dl in a 2 hour glucose tolerance test establish the diagnosis. Obesity, particularly centripetal obesity, as well as advancing age, are risk factors for the development of either condition. In addition, both T2DM and OSA are independent risk factors for cardiovascular disease and stroke.

OSA in patients with T2DM

In the general adult population, the prevalence of OSA is 20% using minimum polysomnographic criteria and drops to about 9% using definitions that require associated symptoms.[1] However, the prevalence of OSA in patients with an established diagnosis of T2DM is much higher, ranging from 54% to 94% in the medical literature.[2] Despite the high prevalence of OSA in T2DM, the evaluation and treatment of OSA in patients with T2DM is unacceptably low at around 18%.[2] Therefore, a higher index of suspicion for OSA and more intensive screening is required for patients with T2DM. The complex reasons why OSA is more common in, or may even be induced by, T2DM are still poorly understood and do not simply represent the shared features of obesity and age. One hypothesis is that a relative neuropathy in T2DM may cause changes in responsiveness in the upper airway.[3]

T2DM in patients with OSA

Even after adjusting for age, race, baseline fasting blood glucose, and body mass index (BMI), untreated OSA increases the relative risk for incident T2DM by 43% compared to patients without OSA.[4] The presence of untreated OSA impairs glucose metabolism and worsens insulin resistance proportional to the severity of the OSA.[5,6] Ultimately, this leads to the potential development of T2DM or poorer glucose control and haemoglobin A1c (HbA1c) levels in established diabetics[7] (Figure 1). In addition to OSA severity, the minimum SpO_2 during sleep also has an impact on insulin resistance and glucose control.[8,9]

OSA treatment and T2DM

The gold standard treatment for OSA is nasal continuous positive airway pressure (CPAP) therapy used nightly during sleep. The weight of the evidence indicates that CPAP treatment of OSA improves diabetes control. Yet, it is important to note that not every study or review has found improved diabetes control from CPAP, owing to methodologic differences and challenges in controlling for variations in diabetic care.

As expected, CPAP therapy improves glycemic control during sleep, possibly relating reduced catecholamine response to OSA and improved nocturnal insulin sensitivity.[10] In addition, post-prandial glucose levels in the daytime are improved significantly by consistent CPAP use overnight with more robust improvements seen when CPAP is used more than 4 hours per night[11] (Figure 2). Further, there is an improvement in HbA1c with consistent CPAP use that also depends on the duration of CPAP use each night.[12] In addition, there appear to be beneficial effects on total cholesterol, low-density lipoprotein levels and leptin resistance in diabetic sleep apneics treated with CPAP.[13] Thus, patients with T2DM and OSA should be treated with nasal CPAP and encouraged to optimize compliance with therapy.

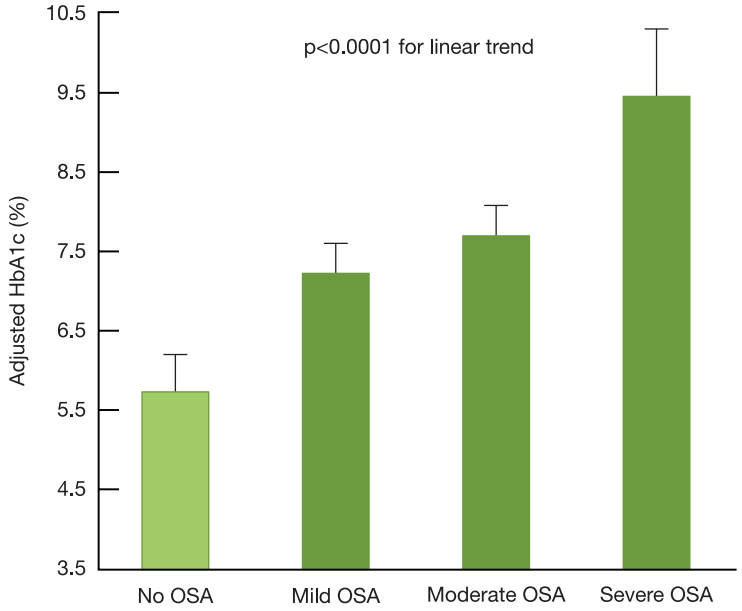
As with any emerging field of study, larger well-controlled studies are needed to further assess the impact of CPAP on glucose control and the optimal nightly CPAP use durations to maximize improved outcomes.

Sleep Deprivation and T2DM

In addition to OSA, increased attention has been paid recently to the role of reduced sleep duration as a cause or contributor to obesity, cardiovascular disease, hormonal abnormalities and glucose metabolism. Currently, average nightly sleep duration in the general population is inadequate, effectively leading to a sleep deprived society. This appears to be impacting general health in a significant way even in the absence of another diagnosable sleep disorder such as OSA. Specifically, sleep deprivation leads to an increase in the development of impaired fasting glucose and an increase in HbA1c independent of BMI, smoking, or work shift.[14,15]

Further studies evaluating the impact of sleep extension on glucose control and the incidence of T2DM will be welcome. In the meantime, all

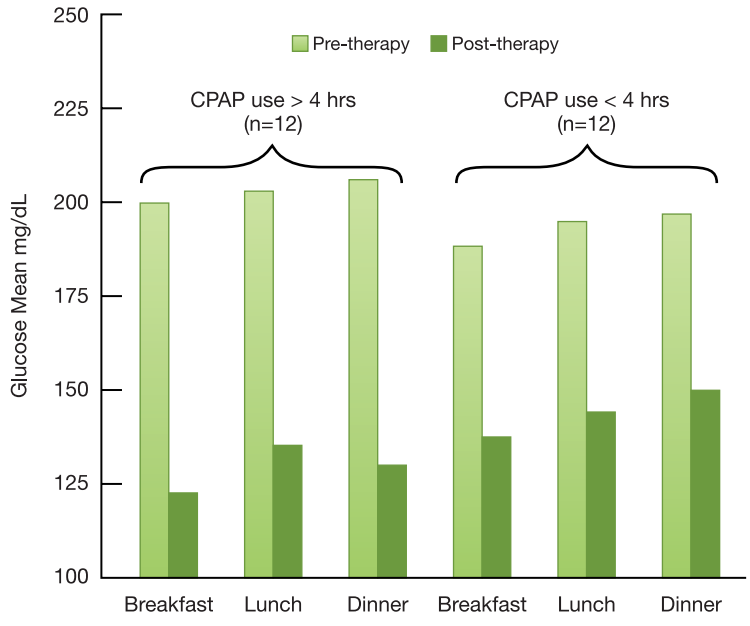
Figure 1
Sleep Apnea Associated with Poorer Glucose Control in Patients with Type 2 Diabetes



Adjusted mean values of HbA1c in each OSA category compared to patients without OSA

Aronsohn et al, Am J Respir Crit Care Med 2009

Figure 2
Postprandial Glucose Values Significantly Reduced with CPAP Treatment



Postprandial CGMS data obtained for all patients and patients with high and low CPAP compliance.
The data represents mean glucose values obtained by the CGMS for 1 hour after each meal before and after CPAP treatment.

Babu et al, Arch Intern Med 2005

persons should be advised of the benefits of an optimal sleep schedule and duration with the same fervor with which attention is paid to diet, exercise, and preventive health services. In particular, patients with OSA need to optimize sleep duration on top of complying with CPAP therapy, lest they run the risk of a "double whammy" effect on T2DM.

Conclusion

OSA and T2DM are essentially interacting epidemics with associated public health concerns due to the associated increased morbidity, mortality and health-care costs. Based on the current evidence, clinicians need to address the risk of OSA in patients with T2DM and, conversely, evaluate the presence of T2DM in patients with OSA. Intensive treatment of both conditions simultaneously is required in patients with both diagnoses.

Kevin L. Lewis, MD is a sleep specialist and a leading researcher and expert on the diagnosis and treatment of sleep disorders. He is Director of Sleep Care Services for Oklahoma Heart Institute, as well as Medical Director of Oklahoma Heart Institute Sleep Care of Hillcrest Medical Center.

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Advanced Medical Treatment of Stable Angina

By Anthony Haney, MD, FACC

Angina is the term physicians use to describe symptoms that are caused by impaired blood flow to the heart. Most commonly these symptoms are described as chest tightness or pressure during exertion but may also include shortness of breath, sweating, fatigue or other symptoms that limit one's ability to do activity.

Angina occurs when the heart's need for oxygen exceeds the amount available, known as a **demand-supply mismatch**. Many factors determine the workload of the heart and its oxygen requirement (**demand**) including heart rate, systolic blood pressure, the amount of stress on the walls of the heart and how hard the heart is contracting. Oxygen supply is affected by red blood cell counts, the size or tone of the heart arteries, collateral blood supply and the perfusion pressure (similar to the water pressure from your faucet). The most common disease that limits blood supply to the heart and causes angina is atherosclerosis (blockages in the arteries – see Figure 1).

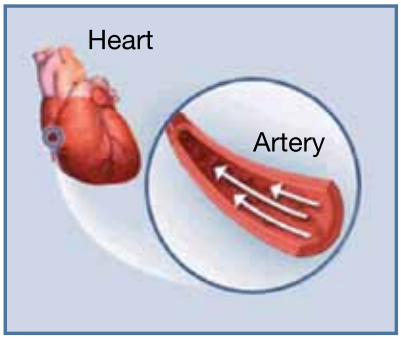
Angina can either be classified as stable or unstable. Unstable angina (USA) has no predictable pattern, occurs at rest, and frequently causes damage to the heart muscle if not quickly treated. USA is caused by a plaque in one of the arteries that has ruptured and a blood clot has formed. Unstable angina is almost always best treated by an invasive procedure where a balloon (angioplasty) and commonly a stent (metal coil that keeps the artery open) are used. Stable angina is a more predictable pattern of symptoms that occur with physical exertion or emotional stress that typically resolves after several minutes.

The type of plaque that causes stable angina is completely different from the type that causes unstable angina. It is typically calcified and has a lot of fibrosis or scar tissue. Because of its structure, it is unlikely to rupture and cause unstable angina or a heart attack and therefore may be treated differently.

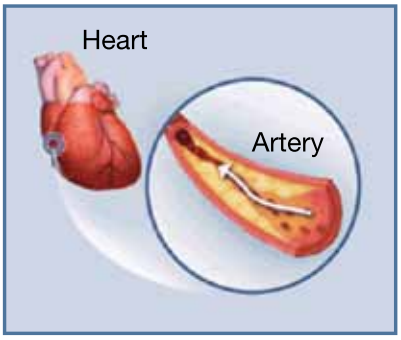
The goal of treating stable angina is to prevent/minimize symptoms and allow for normal activ-

Continued on p. 26

Figure 1



Healthy Artery Carrying Oxygen-Rich Blood to the Heart



Narrow Artery Carrying Less Oxygen-Rich Blood to the Heart, Causing Angina

Continued from p. 25

ity. Typically, a lot of different treatments are combined to achieve this goal. These include lifestyle measures, medications for angina, treatment of associated risk factors (such as diabetes, high blood pressure and high cholesterol) and revascularization (restoring normal blood flow to the arteries by stent or surgery).

Revascularization by stents or bypass surgery is a common and effective treatment for stable angina. However, not all patients are candidates for these and not all blockages can be treated due to small vessel size or very diffusely diseased arteries. Many patients will still need medication to prevent angina even after a stent or bypass surgery.

Typical medical therapies include long-acting nitroglycerin (e.g. imdur, isosorbide), beta-blockers (e.g. metoprolol, atenolol) or calcium channel blockers (e.g. amlodipine). In general, these treatments work by decreasing the demand of the heart muscle by decreasing the heart rate and blood pressure. They are effective in many patients and many of them are available in generic formulation and, therefore, very affordable. Side effects most commonly include dizziness (with positional changes), headache, fatigue, constipation and, in men, may cause erectile dysfunction.

Ranolazine (trade name **Ranexa**) is a relatively new treatment for angina that was approved in 2006. It works by preventing too much calcium from staying inside the heart muscle. The movement of calcium in and out of the heart muscle is what allows it to contract. If too much calcium stays inside the muscle then it no longer works, which decreases the oxygen supply and, at the same time, increases demand. By delaying the time when demand outweighs supply, a patient is able to do more activity before getting angina. There are several factors that may make ranolazine an attractive option to treat angina.

- Ranolazine does not affect the heart rate or blood pressure. Many patients already have relatively low blood pressure, which prevents other anti-anginals from being started or the dosages increased. The traditional medications all cause or worsen the lightheadedness associated with changing positions, which is particularly problematic in the elderly. In very active patients, limiting heart rate response to exercise will cause premature fatigue and exercise intolerance.
- Because ranolazine works by a unique mechanism, it is very effective when added to the traditional anti-anginals and can allow for lower dosages of those medications with fewer side effects. In the CARISA trial, patients who were already taking a calcium channel or beta blocker were able to walk a significantly longer distance on a treadmill after they started taking ranolazine. In the ERICA trial, patients who were taking a calcium channel blocker used significantly less sublingual nitroglycerin on a weekly basis if they also took ranolazine (Figure 2).
- There may be additional beneficial effects of ranolazine other then reducing angina. In the MERLIN-TIMI 36 trial ranolazine reduced the frequency of abnormal heart rhythms (arrhythmias) and decreased the blood sugar in diabetics and reduced the onset of diabetes in non-diabetics.
- Erectile dysfunction (ED) is common in patients with atherosclerosis. Long-acting nitrates are not safe to use with the most common treatments of ED but ranolazine may be safely used with them.
- Patients have a varied response to medications. Although some will not respond to ranolazine, others will have a dramatic improvement or complete relief of symptoms.

The most common side effects of ranolazine include dizziness (not associated with position changes) or nausea and is generally very well tolerated. About one out of twenty patients will experience a side effect. It is typically started at 500mg twice a day and frequently increased to 1000mg twice a day in patients who have only some improvement in their angina. Ranolazine cannot be used in patients with liver cirrhosis or those taking one of the medications listed in Figure 3.

- If you take verapamil or diltiazem or drink a lot of grapefruit juice, the maximum dose is 500mg twice a day.

If you have angina symptoms that are not well controlled or limit your ability to do the activities you need or want to do, then you should review what options are best for you. A cardiologist is the ideal person to review your unique clinical situation and make the optimal recommendations.

Anthony Haney, MD is a noninvasive cardiologist with expertise in nuclear cardiology, echocardiography, peripheral vascular imaging and MRI. He also performs diagnostic cardiac catheterization.

Figure 2

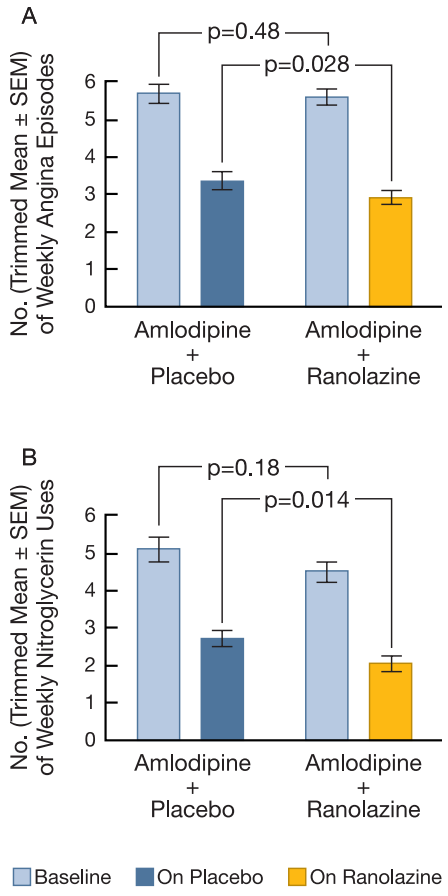


Figure 3

Do not take Ranexa if you are taking certain medications including:

- Nizoral® (ketoconazole)
- Sporanox® (itraconazole)
- Biaxin® (clarithromycin)
- Serzone® (nefazodone)
- Viracept® (nelfinavir)
- Norvir® (ritonavir)
- Crixivan® (indinavir)
- Fortovase® (saquinavir)
- Rifadin® (rifampin)
- Mycobutin® (rifabutin)
- Priftin® (rifapentin)
- Phenobarbital
- Tegretol® (carbamazepine)
- Phenytek® (phenytoin)
- St. John's Wort (herbal supplement)

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Carotid Artery Evaluation

1 Strokes rank 3rd among all causes of death behind diseases of the heart and cancer. To assess your risk for stroke, an ultrasound probe is placed on your neck to screen for blockages in your carotid arteries which supply blood to the brain. This is also a marker of heart attack risk. **15 minutes, $40**

Cardiac Function Evaluation

2 To analyze cardiac function and calculate your Ejection Fraction (the amount of blood your heart is able to pump), an ultrasound probe will be positioned at various locations on your chest. **15 minutes, $40**

Abdominal Aorta Evaluation

3 Most abdominal aneurysms are asymptomatic. They're the 10th leading cause of death in males over 55. To screen for aneurysm, an ultrasound probe is used to analyze your abdominal aorta. **15 minutes, $40**

Ankle/Brachial Index

4 Blood pressures are obtained from your legs and arms to screen for peripheral artery disease. It not only assesses circulation to the legs, but also is a marker of heart attack risk. **15 minutes, $40**

Cardiac Calcium Score

5 Coronary plaque can build up silently for years, and if untreated can cause blockages and heart attacks. This test measures the calcified plaque in the coronaries and is an indirect measure of the total amount of plaque in the coronaries. A multi-slice CT scanner takes a series of pictures of your heart in just a few seconds. **15 minutes, $99**

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