Oklahoma Heart Institute

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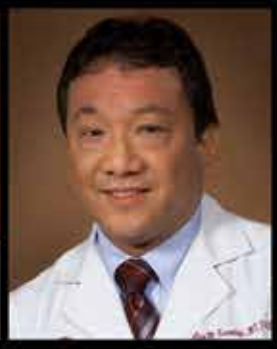

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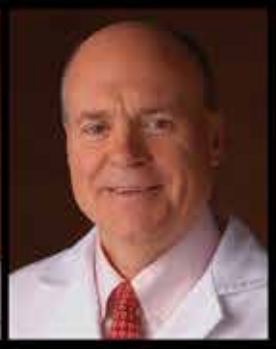

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The Oklahoma Heart Institute Magazine is mailed directly to referring physicians and other referring health care professionals in the Tulsa area and is also available in our patient waiting rooms.

features

to our readers

This issue of Oklahoma Heart Institute Magazine highlights the wide spectrum of issues that encompass the field of cardiology. The authors address topics ranging from prevention to advance treatments for heart failure and previously inoperable aortic valve disease.

Dr. Eric Auerbach, Director of the Lipid Clinic at Oklahoma Heart Institute, discusses the new guidelines for the management of hypercholesterolemia.

Dr. Kamran Muhammad, Director of the Valve and Structural Heart Division at Oklahoma Heart Institute, discusses the current use of Transcatheter Aortic Valve Replacement.

Dr. Sandra Rodriguez completed an advanced Heart Failure and Transplant Fellowship before coming to Oklahoma Heart Institute. She provides insight on destination LVAD therapy, a new hope for advanced heart failure patients.

Tips for Women to Prevent Heart Disease and Strokes are presented as information used in the prevention program.

I hope you find these articles informative and useful and strongly welcome any comments or suggestions.

Sincerely,

Wayne Leimbach

Wayne N. Leimbach, Jr., MD
Editor, Oklahoma Heart Institute magazine

ON THE COVER
Rolling on the River
Nothing says spring in Tulsa better than a picture-perfect day biking at RiverParks.
Photo by John Shoemaker

Treatment Options for Common Valvular Heart Diseases

By Kamran I. Muhammad, MD, FACC, FSCAI

Valvular heart disease refers to a disorder or disease process affecting any of the four valves of the heart: the aortic, mitral, tricuspid or pulmonary valves. The diseases of these may be congenital (present from birth) or acquired later in life. Valvular heart disease is very common and, in advanced stages, can cause significant symptoms, disability and premature death. In this article, we will focus on the most common types of acquired valvular heart disease affecting US adults — those affecting the aortic and mitral valves.

Aortic Valve Stenosis

Aortic stenosis is the most common cardiac valvular abnormality in the United States. This disorder results in restricted opening of the main valve of the heart that separates the left ventricle from the aorta (Figure 1). 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 over the age of 85 are estimated to have the disorder. The prevalence of aortic stenosis is increasing with the aging U.S. population. The cause of this disorder is not fully understood, and the most common cause of aortic stenosis in the United States is degenerative calcific disease of an anatomically normal valve.

Severe aortic stenosis eventually results in severe symptoms of congestive heart failure (shortness of breath, leg swelling, pulmonary edema), chest pain/angina or syncope (nearly passing out or passing out). Many patients, however, also present with non-specific symptoms, such as decreased exercise tolerance. Prompt recognition of the onset of symptoms due to severe aortic stenosis is essential as mortality dramatically increases after such symptoms develop. 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 evaluation for aortic valve replacement is recommended for patients with severe symptomatic aortic stenosis.

Surgical aortic valve replacement is a well-established and effective treatment for severe aortic stenosis, is generally associated with low operative mortality, and is considered the gold-standard therapy. Surgical replacement of the aortic valve results in improvement of symptoms and normalizes survival. However, given the highly invasive nature of open-heart surgery for surgical aortic valve replacement, coupled with the age group and associated comorbidities of patients with severe aortic stenosis, there remain a large number of patients with severe aortic stenosis that go untreated. 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.

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 high-risk for surgical aortic valve replacement. TAVR with the Edwards SAPIEN bovine balloon-expandable transcatheter aortic valve has been approved in the United

Figure 1

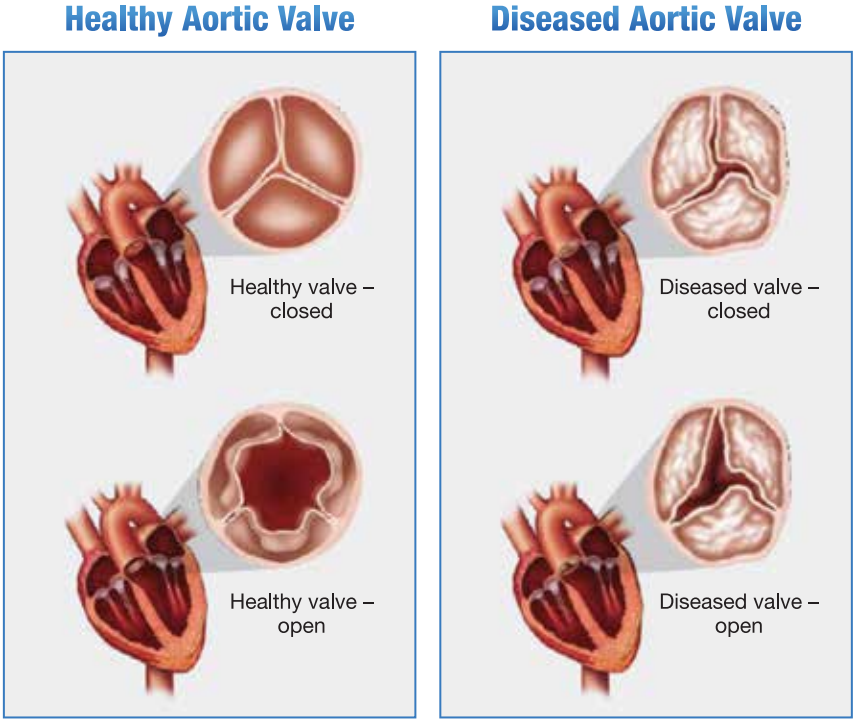
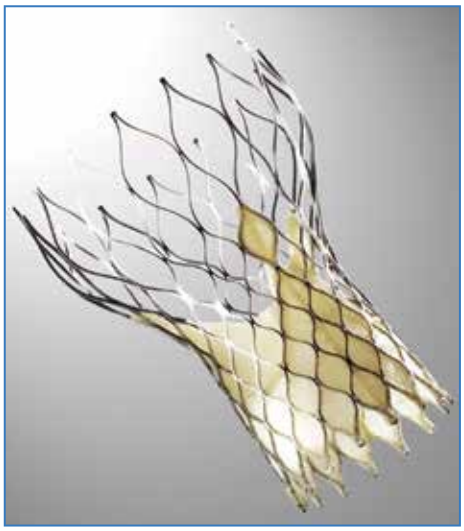


Figure 2

Figure 3

Medtronic CoreValve



States since November of 2011 (Figure 2). More recently, the Medtronic CoreValve porcine self-expanding transcatheter aortic valve also received FDA approval on January 17, 2014 (Figure 3). The majority of TAVR cases with these devices can be performed percutaneously (without surgery) through the femoral (groin) artery, similar in concept to a cardiac catheterization procedure. In cases where a femoral approach is not possible, alternative access routes are possible, including: transaortic (directly through the aorta), transapical (through the apex of the left ventricle) and left subclavian artery approach (through the artery under the left collarbone) (Figure 4). These approaches are more invasive in comparison to the femoral artery approach, but still remain significantly less invasive than open-heart surgery for surgical aortic valve replacement.

In particular, the heart does not need to be stopped for a TAVR procedure, and therefore cardiopulmonary bypass (the use of the heart-lung machine) is not required with TAVR as it is with surgical aortic valve replacement. TAVR procedures are performed in the hybrid cardiac catheterization laboratory, which combines the capabilities of a standard cardiac catheterization laboratory with a surgical operating room. TAVR is typically performed under general anesthesia. However, in patients who are very sick and are thus poor candidates for general anesthesia, TAVR can be performed with deep sedation without general anesthesia or intubation. The typical length of hospital stay after transfemoral TAVR is 3 days and 5-7 days after alternative-access TAVR.

Balloon aortic valvuloplasty (BAV) is also a minimally-invasive option to treat severe aortic stenosis in selected cases. This technique involves placing a balloon across the narrowed aortic valve and inflating it to improve the opening and function of the valve (Figure 5). This procedure is minimally-invasive and is performed through a percutaneous femoral artery approach in the cardiac catheterization laboratory with conscious sedation, similar to a heart catheterization procedure. Patients typically return home the day after the procedure. Because the narrowing of the aortic valve eventually returns several months after balloon aortic valvuloplasty, this procedure is not considered curative and definitive. Therefore, the use of BAV is limited to patients who are highly symptomatic but not felt to be candidates for TAVR or surgery, such that their symptoms can be improved and they can become stronger and potential future candidates for valve replacement. Additionally, BAV is also used as a diagnostic procedure to determine the contribution of aortic stenosis to a patient's symptoms when there may be other significant conditions contributing to symptoms as well (for example, severe aortic stenosis along with severe lung disease).

Mitral Valve Regurgitation

Mitral regurgitation is another common valvular abnormality in adults in the United States, with severe mitral regurgitation affecting approximately 2% of the population. The mitral valve separates the left atrium from the left ventricle and helps control the flow of blood through these chambers as the heart pumps. In mitral regurgitation, the mitral valve does not close properly when the left ventricle contracts, and there is resultant leakage of blood back into the left atrium. When leakage is severe, this can result in significant symptoms of congestive heart failure (shortness of breath, leg swelling, decreased exercise tolerance and energy) and decompensation of cardiac function. There are a variety of causes of mitral regurgitation, and mitral regurgitation can be acute (sudden) or chronic (slowly progressive over many years).

Mitral valve surgery is recommended for patients with severe mitral regurgitation who have symptoms or evidence of deterioration of heart function. In addition, mitral valve surgery may be recommended for patients with severe mitral regurgitation who do not have symptoms, but have signs of volume overload on the heart due to the leaky valve. Patients without symptoms but with a high likelihood of having a successful repair of the valve with surgery are also recommended to have surgery. In general, surgical mitral valve repair is preferred over surgical mitral valve replacement when possible because of better long-term outcomes with repair. Similar to aortic valve surgery, mitral valve surgery is highly invasive, open-heart surgery and requires the heart to be stopped and the use of cardiopulmonary bypass (heart-lung machine).

Similar to aortic stenosis, there are a significant number of patients with severe and clinically significant mitral regurgitation who are poor candi-

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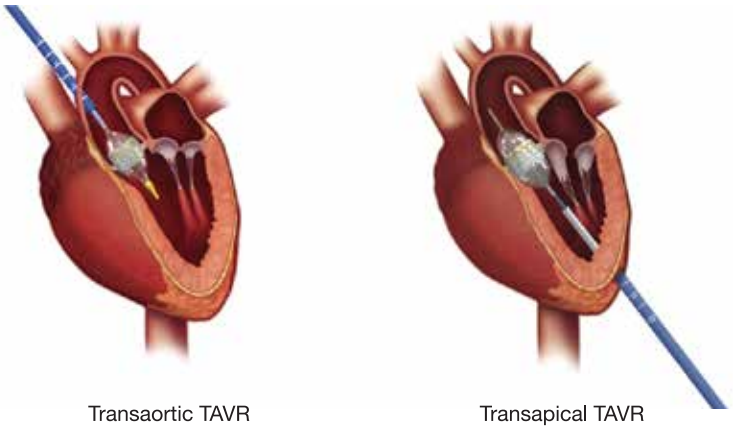
Figure 4

Alternative Access TAVR



Transaortic TAVR

Transapical TAVR

Figure 5

Balloon Aortic Valvuloplasty

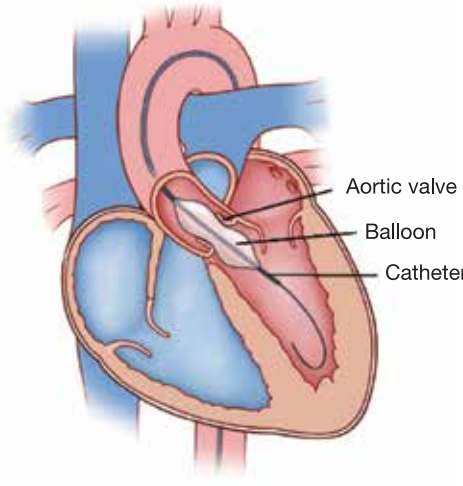


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Figure 6

MitraClip Device

Figure 7

Oklahoma Heart Institute Valve Team

dates for open-heart surgery for mitral valve repair or replacement. For such patients, there may be a new option for repair of their mitral valve without surgery, using the recently-approved MitraClip device (Figure 6). This device, which was approved by the United States FDA in October of 2013 for high-risk patients with severe degenerative mitral regurgitation, allows for percutaneous repair of the mitral valve through a femoral venous approach (through the main vein in the leg, without surgery). This very exciting technology allows patients with severe mitral regurgitation who are poor candidates for surgery to now be treated with a minimally-invasive, non-surgical procedure.

Mitral Valve Stenosis

Mitral stenosis is a disorder of the mitral valve characterized by narrowing of the opening of the mitral valve. There are a number of causes of this disorder, but the most common cause is due to rheumatic heart disease. Rheumatic heart disease refers to cardiac disease caused by inflammation due to previous non-cardiac infection with streptococcus bacteria (such as "strep throat"). The prevalence of rheumatic mitral stenosis has decreased significantly in the United States with appropriate treatment of streptococcus infections. However, when severe mitral stenosis is present, it can cause significant congestive heart failure symptoms. When the mitral valve anatomy is appropriate, severe symptomatic mitral stenosis can be effectively treated with percutaneous balloon valvotomy. This procedure involves placing a specially designed balloon across the mitral valve from percutaneous femoral venous access (the main vein in the leg) and inflating it to improve the opening of the valve. This procedure is minimally-invasive and non-surgical, and is performed in the cardiac catheterization laboratory with conscious sedation. Patients typically experience immediate relief of their symptoms and go home the next day.

Oklahoma Heart Institute's Approach to Valvular Heart Disease

Oklahoma Heart Institute has the most comprehensive valve disease program in the state. Our program is collaborative, multidisciplinary and patient-centered. The Valve Center at Oklahoma Heart Institute combines the expertise of physicians from non-invasive cardiology, cardiovascular imaging, interventional cardiology, cardiothoracic surgery and cardiac anesthesiology working together to ensure our patients with valve disease receive the most appropriate, comprehensive, evidence-based and cutting-edge care (Figure 7). All forms of valve disease repair and replacement are available at Oklahoma Heart Institute, including a comprehensive valve surgery program, minimally-invasive transcatheter aortic valve replacement (TAVR) and percutaneous balloon valvuloplasty/valvotomy for all valve disorders. In addition, Oklahoma Heart Institute offers a comprehensive Valve Clinic dedicated to the surveillance, monitoring and management of valvular heart disease.

We look forward to providing the highest quality and most advanced care to our patients. For more information about TAVR at OHI, including informational and patient videos, please visit: www.oklahomaheart.com/TAVR

Dr. Kamran I. Muhammad is a subspecialist in interventional cardiology at Oklahoma Heart Institute in Tulsa, OK with expertise in cardiac catheterization, coronary intervention (including angioplasty, stent placement, atherectomy, intravascular imaging), peripheral vascular intervention (including carotid intervention), as well as interventional therapies for structural heart disease, including PFO, ASD, and valvular disease. Dr. Muhammad serves as the Director of the Structural Heart Disease and TAVR programs at Oklahoma Heart Institute.

Oklahoma Heart Institute has always been at the forefront of innovation and advancement in the treatment of heart disease. This is especially true in the area of advanced valve disease therapy. Listed below are some firsts and highlights from our institution:

1. OHI performed the first transcatheter aortic valve replacement (TAVR) in Tulsa and Northeast Oklahoma on May 2, 2012 using the Edwards SAPIEN valve
2. OHI performed the first transapical and transaortic TAVR procedures in Tulsa and Northeast Oklahoma on November 13, 2012 and June 4, 2013, respectively
3. OHI performed the first valve-in-valve TAVR in Oklahoma on November 26, 2013. This procedure involved placement of an Edwards SAPIEN transcatheter valve inside a previously placed surgical aortic valve prosthesis that had degenerated and failed
4. OHI performed the first three commercial TAVR procedures in Oklahoma with the recently-approved Medtronic CoreValve on February 21, 2014
5. Oklahoma Heart Institute is the only program in Tulsa and Northeast Oklahoma which currently performs TAVR with both of the FDA-approved transcatheter valve systems: Edwards SAPIEN and Medtronic CoreValve
6. OHI performed the first TAVR procedure in Oklahoma without general anesthesia on February 21, 2014. This was performed with an excellent outcome in a patient who was felt to be too sick for general anesthesia
7. OHI is the most experienced center in this region for treating high-risk patients with valvular heart disease, through surgery, TAVR and valvuloplasty procedures

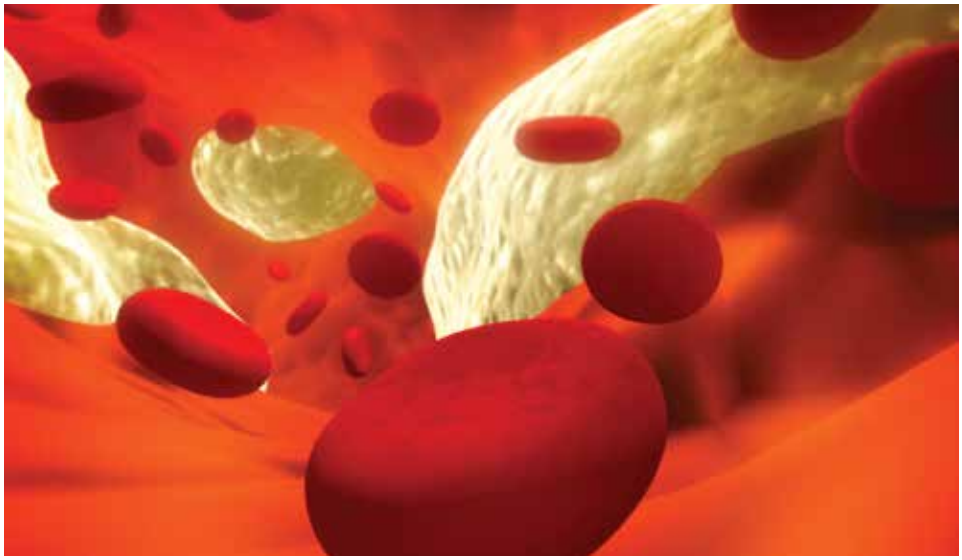
New Lipid Guidelines Met with Controversy

By Eric G. Auerbach, MD, FACC

New guidelines from the American Heart Association (AHA) and American College of Cardiology (ACC) for management of cholesterol were released on November 13, 2013. Less than one week later, the editorial board of *The New York Times* recommended ignoring this new advice issued by "the nation's two leading heart organizations." This sort of scathing criticism in the lay press reflects controversy and even antagonism from the medical community towards the new document, which was not endorsed by the National Lipid Association, and which departs in substantial ways from European and Canadian guidelines, as well as from earlier guidelines published in this country. Here, we will summarize the new recommendations, and then explore some of the ramifications and controversies that they have engendered.

Who Should Be Treated and How

The last major set of lipid guidelines, the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III), released in 2001 and updated in 2004, was a comprehensive treatise on management of lipid disorders. The full document, over 300 pages, discussed all lipid fractions, emerging risk factors, inflammatory markers, and treatment options. The new guidelines, however, take a different approach. For the 2013 guidelines, the authors sought to provide a "strong evidence-based foundation for the treatment of cholesterol." In order to do so, they limited themselves to a review of randomized controlled trials (RCTs) and meta-analyses of RCTs that utilized cardiovascular outcomes as endpoints. Observational studies and studies with less than twelve to eighteen months of follow-up were excluded from review. The authors do acknowledge "important contributions arising from decades of genetic and biochemical studies, observational epidemiological and ecological studies, and *in vitro* and animal experiments," but they argue that this sort of data simply "[provides] the rationale for RCTs" and so should not be considered in creating guidelines.



Based on this review of RCTs, the guidelines indicate that a benefit from statin (i.e., HMG-CoA reductase inhibitor) pharmacotherapy has been consistently demonstrated for four groups of patients:

1. Those who have clinical atherosclerotic cardiovascular disease (ASCVD).
2. Those with an LDL cholesterol of 190 mg/dL or greater.
3. Diabetics aged 40 to 75 with LDL cholesterol 70 mg/dL or greater.
4. Those without clinical ASCVD or diabetes, but a ten year ASCVD risk of at least 7.5%, and with LDL cholesterol 70 mg/dL or greater.

The new guidelines define these four groups as "Statin Benefit Groups." The guidelines do point out that all of the reviewed RCTs utilized statin therapy as an adjunct to lifestyle modification background therapy. Therefore, the guidelines state that "lifestyle modification (i.e., adhering to a heart healthy diet, regular exercise habits, avoidance of tobacco products, and maintenance of a healthy weight) remains a critical component of health promotion and ASCVD risk reduction, both prior to and in concert with the use of cholesterol-lowering drug therapy." The guidelines do not go into any specifics regarding appropriate diet or exercise, but rather refer the reader to separately published lifestyle management guidelines.

The first three statin-benefit groups in the list above include those with established ASCVD, those with diabetes (which is commonly considered an ASCVD risk equivalent), and those with markedly elevated LDL cholesterol, as is typically associated with a genetic abnormality. For the fourth category, primary prevention in the absence of diabetes or markedly elevated cho-

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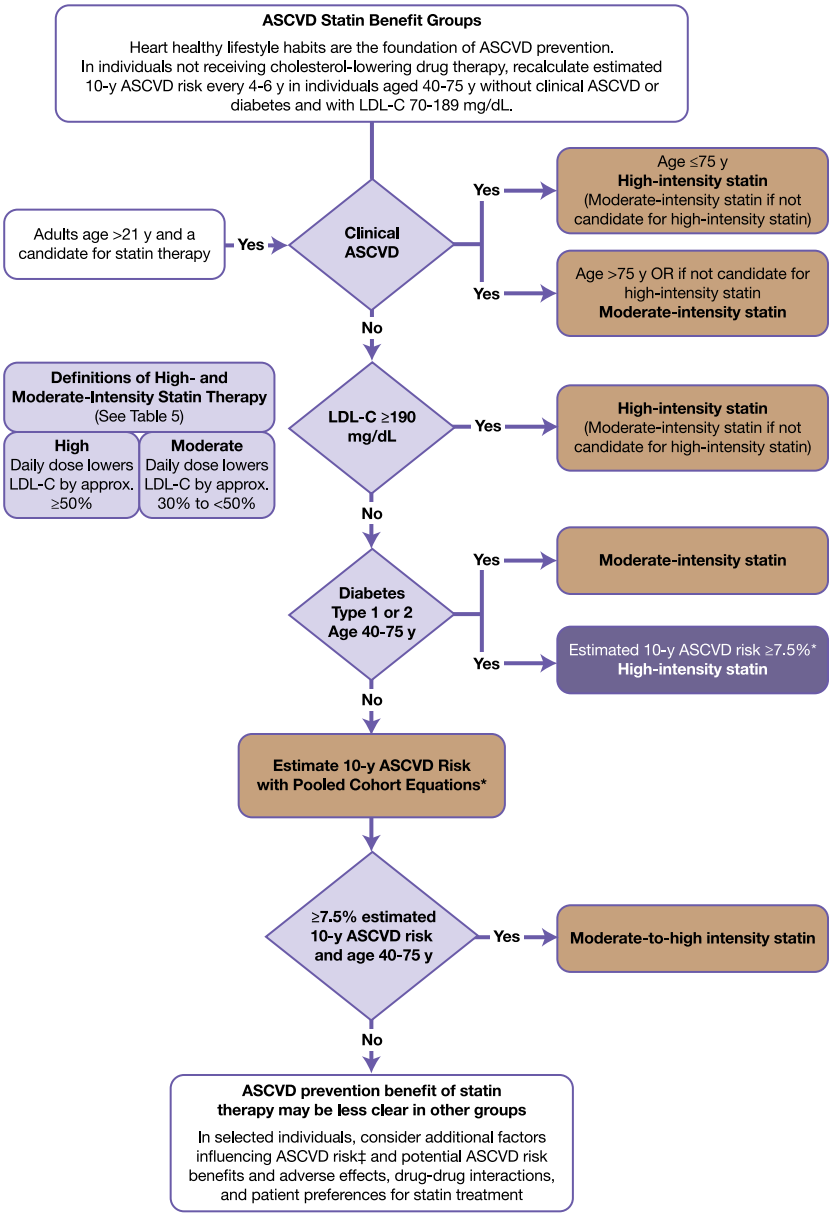
The guidelines state that "lifestyle modification (i.e., adhering to a heart healthy diet, regular exercise habits, avoidance of tobacco products, and maintenance of a healthy weight) remains a critical component of health promotion and ASCVD risk reduction, both prior to and in concert with the use of cholesterol-lowering drug therapy."

Figure 1

Algorithm for treatment from the new lipid guidelines.

From "2013 w/AHA Blood Cholesterol Guidelines" published in Circulation online November 12, 2013.



lesterol, the guidelines recommend that ten year cardiovascular event risk be estimated by using a risk calculator. Whereas NCEP ATPIII had recommended the Framingham risk calculator, the new guidelines recommend using a new "Pooled Cohort Risk Assessment" tool, which is available on the internet at http://clincalc.com/Cardiology/ASCVD/PooledCohort.aspx. This new calculator is preferred in the guidelines because it was developed using stroke, as well as myocardial infarction, as an ASCVD event, and because it was developed using data more racially inclusive than the Framingham cohort.

As summarized in Figure 1, the guidelines recommend "high intensity statin therapy" for patients with established ASCVD who are up to 75 years old, patients with an LDL cholesterol of 190 mg/dL or above, diabetics who have a ten year event risk of 7.5% or greater, or anyone else who has a ten year event risk of at least 7.5%.

"Moderate intensity statin therapy" is recommended for secondary prevention of ASCVD in the elderly (above age 75), diabetics with ten year risk below 7.5%, or for primary prevention in individuals with a ten year risk in the range of 5% to 7.5%. A "high intensity" statin regimen is defined as one that lowers LDL cholesterol by 50% or more, such as atorvastatin at 40 to 80 mg, or rosuvastatin at 20 mg. "Moderate intensity" regimens lower LDL-cholesterol by 30% to 50%, and include atorvastatin or rosuvastatin at 10 mg daily, simvastatin 20 to 40 mg daily, 40 mg daily of pravastatin, lovastatin, or fluvastatin, or pitavastatin at 2 to 4 mg daily.

Oh Statin, My Statin

One area in which these new guidelines depart from prior versions is the major emphasis placed on statin therapy for the reduction of LDL-cholesterol, with the glaring omission from discussion both of non-statin pharmacological agents and of treatment of non-HDL cholesterol. The panel "could find no data supporting the routine use of nonstatin drugs combined with statin therapy to further reduce ASCVD events. In addition, identification of any RCT's that assessed ASCVD outcomes in statin-intolerant patients was

not found." The new guidelines make minimal to no recommendations regarding management of high triglycerides or low HDL-cholesterol, nor regarding use of medications other than statins. These are effectively "Statin Guidelines," since the authors found insufficient data from RCTs to address lipid topics more broadly.

Ten Year Risk

Another area of controversy is the new "Pooled Cohort" calculator. Using this risk assessment tool and a treatment threshold of 7.5% ten year risk, it is estimated that the new guidelines will result in a recommendation for statin therapy for one in every three American adults. Guideline authors speaking following publication of the document have countered that the lifetime risk of ASCVD in this country is about 40%, on which basis treating one-third of the population with an effective risk-reducing agent seems reasonable.

Use of the calculator, however, stands out as a departure in a set of guidelines that otherwise stringently limits itself to use of RCT data. There have not been any randomized trials of statin therapy that have used a global risk calculator as entry criteria. RCTs have established that statins provide effective primary prevention in the settings of elevated LDL-cholesterol (WOSCOPS, MEGA), low HDL-cholesterol (AFCAPS/TEXCAPS), diabetes (CARDS), hypertension (ASCOT-LLA), and elevated hs-CRP (JUPITER). However, rather than identifying populations of benefit based on these studies, the guidelines recommend an unproven calculator that does consider factors (such as smoking status) not specifically studied in these trials, and omits a factor (hs-CRP) for which there is RCT evidence.

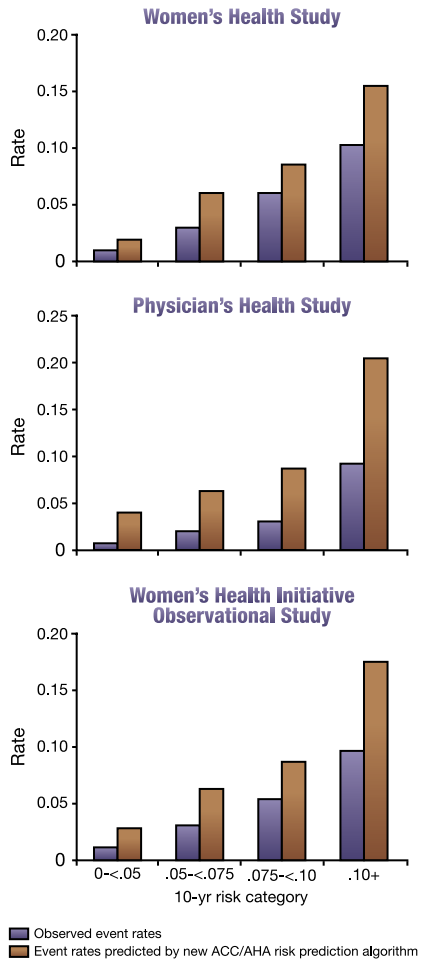
Additionally, the new calculator may systematically over-estimate risk. As demonstrated in Figure 2, the new calculator over-estimates ten year cardiovascular event risk by 75% to 150% when checked against data from the Women's Health Study, the Physician's Health Study, and the Women's Health Initiative Observational Study. While not shown in that graph, a similar and substantial over-estimate of risk was determined when the new calculator was applied to data from the Multi-Ethnic Study of Atherosclerosis (MESA) trial.

Treating to No Targets

Another major departure in the new guidelines is the absence of numerical targets of therapy. The professional community has been divided for some time regarding whether treatment should be to targets, or simply be aggressive, and, if treatment should be to a target, then what that target should be. There is only weak data supporting use of specific targets of therapy, and none from the major RCTs utilized by the authors of the new guidelines. RCTs have generally been structured as a comparison of "fixed doses of statins with placebo or untreated controls," or have compared high intensity to moderate intensity statin therapy. Thus, the authors note that they were "unable to find RCT evidence to support titrating cholesterol-lowering drug therapy to achieve target LDL-C or non-HDL-C levels, as recommended by ATP III."

The elimination of specific treatment targets, however, may place clinicians in positions in which the guidelines contradict clinical judgement. Patients who are, overall, at high ASCVD risk (on the basis, for example, of smoking and hypertension), but who have a low risk lipid panel, should be treated with high intensity statin therapy as per the guidelines. Conversely, patients with a very suboptimal lipid panel on high intensity therapy, who have substantial residual risk on that basis, would not be a candidate for further guideline-based lipid therapies.

Figure 2



Comparison of predicted event rates using the new risk calculator to observed event rates in three primary prevention cohorts. From Paul Ridker and Nancy Cook, "Statins: new American guidelines for prevention of cardiovascular disease," published in Lancet 2013; 382:1762-5.

Simplifying or Over-Simplifying

Overall, the new lipid guidelines do contribute positively to appropriate patient management in several respects. They emphasize prevention of stroke, as well as prevention of heart disease, as an appropriate goal of lipid therapy. They recognize that aggressive therapy is appropriate for most patients for whom pharmacotherapy is indicated. By eliminating treatment targets and focusing solely on major RCTs, they also simplify care for the general medical community.

Simplification, however, comes at a price. In the contemporary era, 70% of ASCVD is related to metabolic syndrome, a condition that, from a lipid standpoint, manifests as elevated triglycerides and low HDL-cholesterol. Based on the absence of RCT data, the guidelines are fairly silent on this major issue. Strongly consistent subgroup analysis from major RCTs, suggesting potent benefit from use of non-statin agents in the setting of elevated triglycerides and low HDL-cholesterol, is ignored. RCTs from the pre-statin era also seem to be outside the field of evidence reviewed. The new guidelines are also silent in regards to new and emerging risk factors. In most cases, this is because of lack of study in large RCTs. However, while there is major RCT support for aggressive therapy in the setting of elevated hs-CRP (based on the JUPITER trial), the new algorithm does not consider inflammatory markers.

Ultimately, evidence-based medicine is inherently limited, and particularly so when the evidence reviewed is limited to recently-published, large RCTs. Many important questions will never be answered in this fashion. The authors note that "[their] process did not provide for a comprehensive approach to the detection, evaluation, and treatment of lipid disorders." The new guidelines "focus … on those individuals most likely to benefit from evidence-based statin therapy to reduce ASCVD risk." Such an approach is a good starting point, and its implementation is likely to reduce the large burden of ASCVD in the United States. It cannot, however, be considered a comprehensive approach to lipid management, nor a substitute for the sound judgement of an educated physician.

Dr. Auerbach is the Director of Preventive Cardiology at Oklahoma Heart Institute.

A HEART-HEALTHY EATING PLAN

The Mediterranean Diet

By Nasrin Sinichi, Clinical Dietitian

The Mediterranean diet is a modern nutritional recommendation inspired by the traditional dietary patterns of Greece, Spain and Italy. The Mediterranean means "the sea between lands." The principal aspects of this diet include proportionally high consumption of olive oil, legumes, unrefined cereals, fruits, and vegetables, moderate to high consumption of fish, moderate consumption of dairy products (mostly as cheese and yogurt), moderate wine consumption, and low consumption of meat and meat products.

Benefits of the Mediterranean Diet

The Mediterranean diet has been researched for over 50 years, and its benefits continue to become apparent. The traditional Mediterranean diet reduces the risk of heart disease. In fact, an analysis of more than 1.5 million healthy adults demonstrated that following a Mediterranean diet was associated with a reduced risk of death from heart disease, stroke and cancer and diabetes, as well as a reduced incidence of Parkinson's and Alzheimer's diseases.

The Dietary Guidelines for Americans recommends the Mediterranean diet as an eating plan that can help promote health and prevent disease.

A recent randomized Spanish trial of diet patterns published in *The New England Journal of Medicine* in 2013 followed almost 7,500 individuals over 5 years and found that individuals on a Mediterranean diet had a 30 percent reduction in risk of having a major cardiovascular event and a 49 percent decrease in stroke risk.

A meta-analysis published in the *American Journal of Clinical Nutrition* in 2013 compared Mediterranean, vegan, vegetarian, low-glycemic index, low-carbohydrate, high-fiber, and high-protein diets with control diets. The research concluded that Mediterranean, low-carbohydrate, low-glycemic index, and high-protein diets are effective in improving markers of risk for cardiovascular disease and diabetes.

Key components of the Mediterranean diet

The Mediterranean diet emphasizes:

- Eating primarily plant-based foods, such as fruits and vegetables, whole grains, legumes and nuts
- Replacing butter with healthy fats, such as olive oil
- Using herbs and spices instead of salt to flavor foods
- Limiting red meat to no more than a few times a month
- Eating fish and poultry at least twice a week
- Drinking red wine in moderation (optional)

The diet also recognizes the importance of being physically active. People who follow the average Mediterranean diet eat less saturated fat than those who eat the average American diet**.** More than half the fat calories in a Mediterranean diet come from monounsaturated fats (mainly from olive oil), which doesn't raise blood cholesterol levels the way saturated fat does.

Focus on fruits, vegetables, nuts and grains

The Mediterranean diet traditionally includes fruits, vegetables and grains. For example, residents of Greece average six or more servings a day of antioxidant-rich fruits and vegetables.

Grains in the Mediterranean region are typically whole grain and usually contain very few unhealthy trans fats. Bread is an important part of the diet. However, throughout the Mediterranean region, bread is eaten plain or dipped in olive oil, not with butter or margarine, which contains saturated or trans fats.

Nuts are another part of a healthy Mediterranean diet. Nuts are high in fat, but most of the fat is healthy. Because nuts are high in calories, they should not be eaten in large amounts, generally no more than a handful a day. For the best nutrition, avoid candied or honey-roasted and heavily salted nuts.

Olive oil contains a very high level of monounsaturated fats, most notably oleic acid, which epidemiological studies suggest may be linked to a reduction in coronary heart disease risk. There is also evidence that the antioxidants in olive oil improve cholesterol regulation and LDL cholesterol reduction, and that it has other anti-inflammatory and anti-hypertensive effects.

The inclusion of red wine is considered a factor contributing to health as it contains flavonoids with powerful antioxidant properties.

Nasrin Sinichi is a clinical dietitian at Hillcrest Hospital South.

Superfast Mediterranean Pizza Recipe

Yield: 4 servings (serving size: 2 wedges)

With artichokes, arugula, pesto, prosciutto, and Parmesan, this pizza has intense, addictive flavor. Splurge and try it with homemade pesto.

From Morocco, to Italy, to Greece, to Turkey, to the Middle East, these recipes are tasty and none take more than 20 minutes to make.

INGREDIENTS:

Cooking spray

1 tablespoon cornmeal

1 (13.8-ounce) can refrigerated pizza crust dough

2 tablespoons commercial pesto

1/2 cup (2 ounces) shredded part-skim mozzarella cheese

1 (9-ounce) package frozen artichoke hearts, thawed and drained

1 ounce thinly sliced prosciutto

2 tablespoons shredded Parmesan cheese

1 1/2 cups arugula leaves

1 1/2 tablespoons fresh lemon juice

PREPARATION:

1. Position oven rack to lowest setting. Preheat oven to 500°.
2. Coat a baking sheet with cooking spray; sprinkle with cornmeal. Unroll dough onto prepared baking sheet, and pat into a 14 x 10-inch rectangle. Spread the pesto evenly over dough, leaving a 1/2-inch border. Sprinkle mozzarella cheese over pesto. Place baking sheet on the bottom oven rack; bake at 500° for 5 minutes. Remove pizza from oven.
3. Coarsely chop artichokes. Arrange artichokes on pizza; top with sliced prosciutto. Sprinkle with Parmesan. Return pizza to the bottom oven rack; bake an additional 6 minutes or until crust is browned.
4. Place arugula in a bowl. Drizzle juice over arugula; toss gently. Top the pizza with arugula mixture. Cut the pizza into 4 (7 x 5-inch) rectangles; cut each rectangle diagonally into 2 wedges.

Note: *This updated version of Artichoke and Arugula Pizza with Prosciutto is based on a recipe that originally ran in Cooking Light, January 2007. The recipe was retested and updated for Cooking Light Crave!, Oxmoor House, 2013.*

Nutritional Information: *Amount per serving: Calories: 260, Fat: 7.9g, Saturated fat: 2.4g, Monounsaturated fat: 3.8g, Polyunsaturated fat:0.4g, Protein: 11.3g, Carbohydrate: 37.5g, Fiber: 3.8g, Cholesterol: 12mg, Iron: 2mg, Sodium: 762mg, Calcium: 131mg*

Oklahoma Heart Institute

SERVICES

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
- Resistant 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
- Center for Peripheral Arterial Disease
- The Valve Clinic

Cardiovascular Surgery

CARDIAC SURGERY

- Coronary Artery Bypass
- Surgical Aortic Valve Replacement
- Transcatheter Aortic Valve Replacement with TAVR Team
- Mitral and Tricuspid Valve Repair and Replacement
- Surgical Treatment of Atrial Fibrillation: “Mini-Maze”, Full Maze, Left Atrial Appendage Ligation
- Cardiac Tumor Resection

THORACIC NON-CARDIAC SURGERY

- VATS (Video Assisted Thoracoscopy Surgery) for Biopsy and Treatment
- Minimally Invasive and Open Techniques for Diagnosis and Staging of Lung and Nonpulmonary Cancer in the Chest
- Minimally Invasive and Open Techniques for Therapeutic Lung Cancer Resection
- Surgical Treatment of Esophageal Cancer and Benign Esophageal Conditions

VASCULAR SURGERY

- Endovascular and Open Treatment of Aortic Aneurysms: Abdominal and Thoracic Diagnosis, Surgical, Interventional and Medical Management of Peripheral Arterial Disease (PAD)
- Surgical Treatment of Carotid Occlusive Disease

MEDIASTINAL SURGERY

- Evaluation and Treatment of Mediastinal Masses

THYROID/ENDOCRINE SURGERY

- Full Spectrum of Thyroid Surgery (Total versus Near Total Thyroidectomy)
- Parathyroid Surgery with Intraoperative PTH monitoring
- Recurrent Nerve Monitoring

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THE DOCTORS OF OKLAHOMA HEART INSTITUTE

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

Dr. Leimbach is a specialist in interventional cardiology with expertise in cardiac catheterization, coronary intervention (including angioplasty, stent placement, atherectomy, intravascular ultrasound), peripheral vascular interventions, such as carotid stenting, as well as interventional therapies for structural heart disease, such as percutaneous closure of PFOs, ASDs and PDAs, and percutaneous placement of stent valves (TAVR). He is Director of the Cardiac and Interventional Laboratories at Oklahoma Heart Institute Hospital and also is 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 Processor 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 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 noninvasive 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 preventive 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 echocardiography, transesophageal echocardiography, 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 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

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.

Dr. Lim completed his Internal Medicine Internship and Residency at Loma Linda University in Loma Linda, CA. He earned his medical degree from the Stony Brook School of Medicine in Stony Brook, NY. Dr. Lim received his Bachelor of Science degree in physics at New York University in New York, NY.

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

Arash Karnama, DO, FACC

Dr. Karnama is a specialist in interventional cardiology, including cardiac catheterization, coronary intervention, nuclear cardiology, echocardiography (TEE/TTE), cardioversion, peripheral angiography, peripheral intervention, carotid angiography, intravascular ultrasound, atherectomy, and PTCA/stenting for acute myocardial infarction.

Dr. Karnama completed his Interventional and Clinical Cardiology Fellowships at Oklahoma State University Medical Center and his Internal Medicine Internship and Residency at the Penn State Milton S. Hershey Medical Center in Hershey, PA. Dr. Karnama received his medical degree from Des Moines University in Des Moines, IA and his Bachelor of Arts degree from the University of Iowa in Iowa City.

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

Victor Y. Cheng, MD, FACC, FSCCT

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.

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

Jana R. Loveless, MD

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

Mathew B. Good, DO

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, FACC, FSCAI

Dr. Zimmerman is a specialist in interventional cardiology, including cardiac catheterization, coronary angioplasty, and related interventional procedures such as coronary stents, atherectomy, vascular ultrasound and peripheral vascular interventional procedures.

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, Cardiovascular Disease and Interventional Cardiology

Stephen C. Dobratz, MD, FACC

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

Paul Kempe, MD

Dr. Kempe is a Cardiovascular Thoracic Surgeon at Oklahoma Heart Institute. He completed his Residency in Cadiothoracic Surgey at Boston University Medical Center in Boston, MA.

He completed his General Surgery Internship and Residency at Richland Memorial Hospital in Columbia, South Carolina. Dr. Kempe earned his medical degree at the University of Texas Southwestern Medical School in Dallas. He received his undergraduate degree in Chemistry at Abilene Christian University.

Board certified in Thoracic Surgery

Michael Phillips, MD, FACC, FACS

Dr. Phillips is a Cardiovascular Thoracic Surgeon at Oklahoma Heart Institute. He completed his fellowship at Mid America Heart Institute in Kansas City, MO and his general surgery residency at the Mayo Graduate School of Medicine. He earned his medical degree from the University of Missouri. Dr. Phillips received his undergraduate degrees in Biology and Chemistry at William Jewell College in Liberty, MO.

Board certified by in Thoracic and General Surgery

James B. Chapman, MD, FACC, FSCAI

Dr. Chapman is a specialist in interventional cardiology, including cardiac catheterization, coronary angioplasty and related interventional procedures such as stents, atherectomy, laser, intravascular ultrasound imaging and direct PTCA for acute myocardial infarction.

He completed a Clinical Cardiology Fellowship St. Vincent Hospital and Health Care Center in Indianapolis, IN. He also completed his Internal Medicine Internship and Residency programs at St. Vincent.

Dr. Chapman received his medical degree from Indiana University School of Medicine in Indianapolis and his Bachelor of Science degree from Indiana University in Bloomington, IN.

Board certified in Internal Medicine, Cardiovascular Disease and Interventional Cardiology

Farhan J. Khawaja, MD

Dr. Khawaja is an interventional cardiologist who specializes in peripheral vascular disease, as well as coronary interventional disease. He completed an Interventional Cardiology Fellowship and then an Endovascular Medicine Fellowship at New York Presbyterian Hospital/Columbia University Medical Center in New York, NY. and his Cardiovascular Diseases Fellowship at Mayo Clinic in Rochester, MB.

Dr. Khawaja also performed his Internal Medicine Residency at Mayo Clinic. He earned his medical degree from Albany Medical College in Albany, NY.

Dr. Khawaja received his Bachelor of Science degree from Union College/Albany Medical College Accelerated Medical Program in Schenectady, NY.

Board Certified in Internal Medicine, Cardiovascular Disease, Nuclear Cardiology, Interventional Cardiology, American Board of Vascular Medicine in both Vascular Medicine & Endovascular Medicine

Sandra E. Rodriguez, MD

Sandra Rodriguez is a noninvasive cardiology specialist with expertise in congestive heart failure and transplants. She completed an Advanced Heart Failure and Transplant Fellowship at the University of Colorado Hospital in Aurora, Colorado and her Cardiology Diseases Fellowship at Texas Tech University Health Sciences Center in Lubbock Texas.

Dr. Rodriguez completed her Internal Medicine Residencies at Texas Tech and the Universidad El Bosque in Bogota, Colombia. She earned her medical degree from Medicine School, Escuela de Medicina "Juan N. Corpas," in Bogota.

Board certified in Internal Medicine, Cardiovascular Disease and Advanced Heart Failure/Transplant Cardiology

Joseph J. Gard, MD, FACC, FHRS

Dr. Gard is a cardiologist who specializes in electrophysiology, complex ablation and atrial fibrillation management. He completed his Cardiac Electrophysiology Fellowship and his Cardiology Fellowship at the Mayo School of Graduate Medical Education in Rochester, Minnesota.

Dr. Gard also performed his Internal Medicine Residency at Mayo. He earned his medical degree from the University of Nebraska in Omaha, Nebraska. Dr. Gard received his Bachelor of Science degree from Boston College in Chestnut Hill, Massachusetts.

Board Certified in Internal Medicine, Cardiovascular Disease and Electrophysiology

Edward J. Coleman, MD, FACC, FAHA, FACS, FCCP

Dr. Coleman is a cardiovascular surgeon who specializes in cardiac, thoracic and vascular surgery. He completed his residency in cardiothoracic surgery at State University of New York at Buffalo in Buffalo, New York. He was Senior & Chief Resident at Mary Imogene Bassett Hospital/Columbia University College of Physicians & Surgeons in Cooperstown, New York

Dr. Coleman performed his Internship and Residency in general surgery at the University of Rochester School of Medicine & Dentistry in Rochester, NY. He earned his medical degree from State University of New York at Buffalo School of Medicine, Buffalo, New York. Dr. Coleman received his Bachelor of Arts degree from Norwich University in Northfield, Vermont.

Board Certified in General Surgery and Thoracic Surgery

Michael B. Newnam, MD

Dr. Newnam is a Board Certified specialist in the diagnosis and treatment of sleep disorders. He completed his Family Practice Internship & Residency programs at the Womack Army Medical Center in Ft. Bragg, NC.

Dr. Newnam earned his medical degree from the University of Oklahoma and his Bachelor of Science degree from Oral Roberts University in Tulsa, OK.

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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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Top 10 Tips to Help Women Prevent Heart Disease and Stroke

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

MANY WOMEN are not aware that heart disease is the most common cause of death among women in the United States, and stroke is the third most common cause of death. In addition, heart disease and stroke are major causes of long-term disability.

The good news is that the #1 and #3 causes of death for women are preventable for most. There are 10 key heart prevention steps you can take to avoid heart problems and stroke in the future.

1 Do not smoke or use tobacco. Smoking is one of the major risk factors for the development of heart disease and stroke. The chemicals in tobacco can damage the blood vessels, leading to narrowing of the arteries called atherosclerosis. The more you smoke the greater the risk. Even so-called "social smoking" is dangerous and increases the risk of heart disease. Women who smoke and take birth control pills are at particularly high risk for heart attack and stroke because both smoking and taking birth control pills increase the risk of blood clots.

2 Assess your risk of having heart attack or stroke. A significant component of your risk for heart attacks and strokes is related to your genetic background. If you have multiple family members who have had heart attacks and strokes in their 40s or 50s, you may be more susceptible to the other risk factors. By knowing this, you may wish to become even more aggressive in treating your other risk factors.

3 Maintain a healthy weight. Being overweight can lead to conditions that increase your chance of heart disease such as high blood pressure, high cholesterol, and diabetes. One way to see if your weight is healthy is to calculate your body mass index (BMI). This considers your height and your weight in determining whether you are significantly overweight. A BMI of 25 and higher is associated with greater risk of heart disease and stroke.

You should know the BMI is a good, but not perfect guide. Muscle weighs more than fat and a very muscular person who is physically fit could have a high BMI without having excess risk. Another way to measure whether your weight is healthy is to measure your waist circumference. It is known that abdominal fat places people at greater risk of heart disease than fat stored elsewhere in the body. Women are considered overweight if their waist measurement is greater than 35 inches (88.9 cm).

What women should remember is that even a small weight loss can be beneficial. Reducing the weight by just 5-10% can help decrease blood pressure, lower blood cholesterol and reduce the risk of diabetes.

4 Get more exercise. Getting regular daily exercise can significantly reduce your risk of heart disease. Physical activity has benefits in addition to helping a woman control her weight. The traditional guidelines state that a woman should get at least 30-60 minutes of moderately intense physical activities most days of the week; however, even shorter amounts of exercise offer heart benefits. Dr. Timothy Church from Louisiana State University (LSU) evaluated a question many people wanted to know. What is

the least amount of exercise that one can do and gain benefit? He found that a simple 10-minute walk 7 days a week produced measurable benefit within 6 months. Continued walking 10 minutes 7 days a week produced long-term benefit. The more a person exercises the greater the benefit, but even a 10-minute walk a day was helpful.

5 Avoid foods with cholesterol, saturated fats, and salt. Eating cholesterol can significantly increase one's cholesterol level in the blood. Unlike blood sugars and triglycerides which go up and down within hours of eating, cholesterol can last for days within the blood. Therefore, high cholesterol foods are particularly hazardous. High cholesterol foods include egg yolks and foods made with egg yolks and liver. Eating foods high in saturated fats also significantly raises cholesterol levels. Saturated fats stimulate the liver to make cholesterol. Eating 3-1/2 ounces of cheddar cheese (high saturated fat food) significantly increases a person's cholesterol levels. Finally, salt intake is a major factor determining whether a person develops high blood pressure. Eating less salt and using spices such as lemon, lime, and herbs can significantly decrease one's risk of developing high blood pressure.

6 Eat more heart healthy foods. Focusing on eating fruits, vegetables, whole grains, fat free or low-fat dairy products, fish, beans, peas, nuts, and lean meats can significantly help reduce the risk of heart disease and stroke. In addition, these types of foods tend to be less calorie-dense and help with weight loss.

7 If you drink alcohol, do not have more than 1 drink each day. Too much alcohol raises blood pressure and can raise the risk of stroke and other illnesses. One drink a day or less actually has been shown to have a mild protective effect on the development of heart disease and stroke.

A recent national study conducted by the American Heart Association showed that fewer than 50% of American women know that heart disease is their leading killer. Even fewer recognized that heart disease and stroke are preventable in the majority of people.

8 Get enough quality sleep: Sleep deprivation can actually harm your health. People who do not get enough sleep have a higher risk of obesity, high blood pressure, diabetes, depression, and risk of heart attack. If you wake up with your alarm clock and you feel refreshed, you probably are getting enough sleep; however, if you are waking up still quite fatigued and you are getting less than 7 hours of sleep, you may need to change your sleep habits. If you feel like you are sleeping more than 8 hours a day, but still feel very tired throughout the day, you may wish to ask your doctor to evaluate you for sleep apnea. Signs and symptoms of sleep apnea include snoring loudly, waking up several times during the night, and waking up with headache, sore throat, and dry mouth.

9 Get regular health screenings to measure blood pressure, cholesterol, blood sugar (test for diabetes), and measure your high sensitivity CRP, a marker of vascular inflammation.

Adult women should have their blood pressure checked at least every 2 years and more frequently if they start to show evidence of elevated blood pressures. Optimal blood pressure is less than 120/80 mmHg. High blood pressure (hypertension) occurs when the blood pressure is greater than 140/90. High blood pressure is a major risk factor for not only heart disease, but for stroke.

Adults should have their cholesterol levels checked at least once every 5 years and after age 45, more frequently. Elevated cholesterol levels are a major risk factor for heart disease. Women should know not only their total cholesterol levels, but also their bad cholesterol level (LDL cholesterol) and their good cholesterol level (HDL cholesterol), as well as their triglyceride levels. It is optimal for women to have their bad cholesterol, less than 130 and if they have evidence of diabetes or heart disease, their target for LDL cholesterol should be definitely less than 100 and, if possible, less than 70.

Diabetes screening is essential. Diabetes is one of the major risk factors for both heart disease and stroke, as well as for peripheral arterial disease. Diabetes screening should start at age 45 for women and retested every 3 years. If the blood sugars are found to be borderline elevated, then more frequent testing should be done.

A high sensitivity CRP (hs-CRP) is a blood test that measures vascular inflammation. Elevated CRP levels greater than 2 are associated with increased risk of heart attack and stroke. This inflammation can be addressed by a physician.

These major risk factors for heart attack and stroke: high blood pressure (hypertension), high cholesterol levels, high blood sugars (diabetes) and high hs-CRP are all treatable, and that is why it is important to check them.

10 Take your medicines routinely. If you are found to have high blood pressure, high cholesterol, or high blood sugars, these are treatable problems. Lifestyle modification has been shown to be very beneficial in reducing blood pressure, cholesterol levels, and blood sugars. However, if lifestyle modification is not effective for a woman, then medications can be prescribed. The medications are very effective and can reduce the risk of heart attack and stroke by some estimates up to 80%.

A recent national study conducted by the American Heart Association showed that fewer than 50% of American women know that heart disease is their leading killer. Even fewer recognized that heart disease and stroke are preventable in the majority of people. Being aware of personal risk can substantially change one's destiny. Eating healthy, staying active, being smoke-free, and getting regular checkups are simple ways to lower a woman's risk of heart disease and stroke.

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

LEFT VENTRICUAR ASSIST DEVICE

The Most Practical Therapy for Advanced Heart Failure

By Sandra E. Rodriguez, MD

Heart failure is a condition that affects about 6 million Americans. It is a disease where the heart cannot provide adequate output to meet the body's needs, thereby causing symptoms of congestion and poor perfusion to organs. There are 670,000 new cases of heart failure diagnosed every year. Heart failure is the #1 reason for hospitalization in people over 65 years old. It is associated with a high mortality of 50% within 5 years of diagnosis and 34% at 1 year after a single hospitalization for heart failure. The risk of developing heart failure increases with age. By 80 years old, 1 in 5 persons will have this disease (Figure 1).

Progress in decreasing the rate of readmissions, improving quality of life, and decreasing mortality rates has been achieved by optimizing medical therapy with beta-blockers, angiotensin enzyme converting inhibitors, angiotensin receptor blockers, aldosterone antagonist, diuretics and by implanting devices with the capability of resynchronizing the heartbeat and shocking the heart if a fatal arrhythmia were to occur.

In spite of optimal medical therapy and good patient compliance with low salt diet and fluid intake restrictions, about 25% of this population will progress to what is called advanced heart failure. Patients with advanced disease will present with persistent symptoms and clinical signs of fluid retention and poor tissue perfusion. They will show echocardiographic findings indicative of progression of the disease, and will have more frequent recurrent hospitalizations for heart failure.

It is estimated that one fifth of the patients with the diagnosis of heart failure every year will decline in spite of therapies and will enter an advanced stage. For this group of patients, treatment options are limited to heart transplantation, palliative care, hospice and left ventricle assist device (LVAD) implantation.

Heart transplantation is a surgical procedure established for decades. It is effective in returning patients to a satisfactory quality of life and

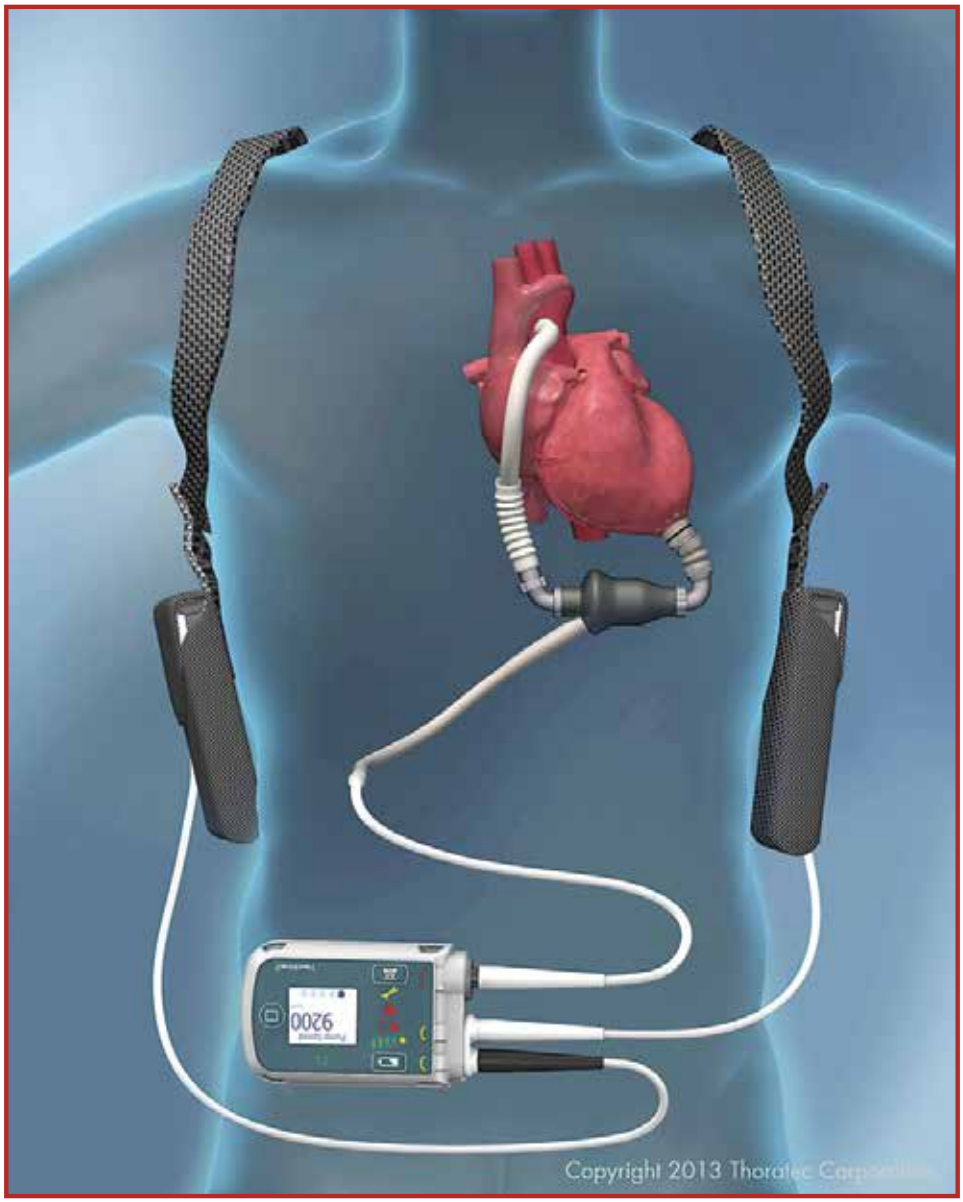
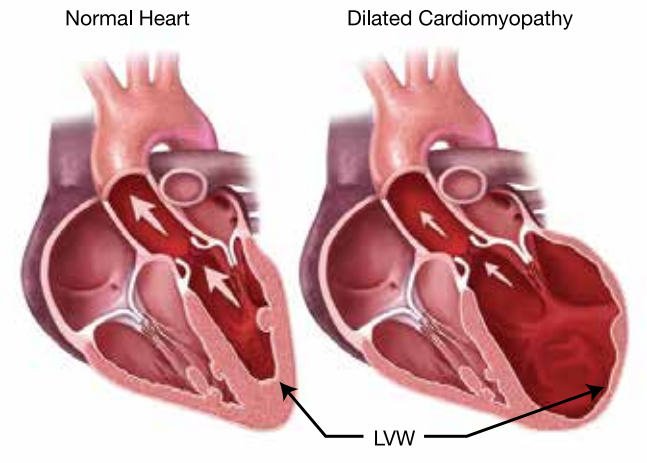


Figure 1

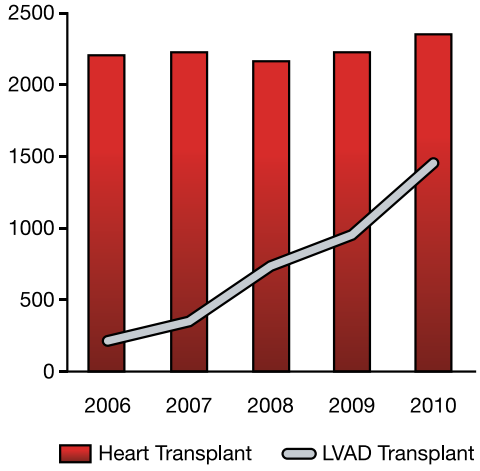
Advanced heart failure consists of end stage morphologic changes in the heart resulting in persistent symptoms and signs. Recurrent hospital admissions are a strong mortality predictor.



Note the thin left ventricular wall (LVW), dilated LV chamber, and depiction of decreased forward blood flow with DCM.

Figure 2

The number of LVADS implanted is increasing year after year, and is expected to match the number of heart transplants by 2015.



increasing survival to about 50% at 10 years. Unfortunately only about 2,300 heart transplants are performed in the United States every year. The waiting factor is the number of hearts available and the geographic allocation of them.

There is no expectation for donor numbers to increase. The number of patients with heart failure is increasing, and thus the demand for heart transplants is exceeding the supply.

There is a large number of patients in need of a heart transplant. Most die while waiting on the transplant list or are never listed due to contraindications. Therefore, LVADs have become the best therapy for a larger number of patients, and at lesser cost for all. After decades of research and technological improvements, there is a mechanical pump available that can assist the failing heart, and improve survival and quality of life for patients with heart failure while waiting for transplant or be used as a permanent therapy, known as destination therapy (DT)[1].

The LVAD HeartMate II from Thoratec consists of an inflow cannula in the apex of the heart that delivers blood from the heart to the motor that pumps blood to an outflow cannula that connects to the ascending aorta. The motor is connected by a line to a controller powered by two batteries. Early devices were designed to sit out of the patient's chest, were very large, and required the patient to remain in the hospital. Current devices are smaller and made to fit inside the chest.

In the future, pumps will become even smaller, will not require external connections due to wireless communications, and batteries will be lighter and longer lasting.

Patients with heart failure who experience persistent symptoms of congestion, such as shortness of breath with mild activity, persistent lower extremity swelling, abdominal distention, waking up from sleep with breathless sensation or symptoms of low cardiac output, such as chronic fatigue and decreased appetite, should ask their physicians to be referred to centers where evaluation for LVADs is performed and where LVADs are being implanted (Figure 2).

Medicare accepted criteria for Destination Therapy LVAD (DT LVAD)[2] includes patients not candidates for heart transplant, with severe symptoms of heart failure, despite optimal medical and device therapy for 45 of the last 60 days, left ventricle ejection fraction less than 25%, and oxygen consumption less than 14 ml/kg/m2 or continuous infusion of inotrope and/or temporary mechanical circulatory support for longer than 2 weeks.

Hospitals are embracing this technology all around the world. Initially, LVADs were only implanted in larger centers in large cities. However, as knowledge about their care and good outcomes has spread, LVADs are being implanted in a greater number of hospitals, making the therapy more available to a broader population throughout the United States and the world. Since LVAD approval, more than 15,000 patients worldwide have now been implanted.

By December 2012, there were 118 DT certified implanting centers in the United States[3]. The number of LVADs implanted is expected to surpass the number of heart transplants done each year by 2015.

Advanced heart failure programs are growing all around the country and are formed by cardiovascular surgeons trained on the LVAD implantation and initial postoperative management, cardiologists that evaluate candidacy for LVAD therapy and follow the patients thereafter, LVAD coordinators, specially trained nurses, social workers, emergency responders and a number of other multidisciplinary personnel combined to provide support before, during the implantation, and for the patient's lifetime thereafter.

Dr. Rodriguez is a noninvasive cardiology specialist with expertise in congestive heart failure and transplants.

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Kale with Honeyed Macadamia Nuts *Serves 6*

Subtly sweet, toasted macadamia nuts take kale to new culinary heights in this easy side.

2 tablespoons honey, divided
1/2 cup roasted and salted macadamia nuts
2 bunches kale, thick stems removed, leaves thinly sliced
2 tablespoons white wine vinegar
1 1/2 tablespoon creamy almond butter

Preheat the oven to 350°F. In a medium bowl, toss 1 tablespoon honey and nuts with 1 teaspoon water. Bake on a parchment-paper-lined baking sheet, tossing two or three times, until golden brown, 10 to 12 minutes. Cool and roughly chop.

Arrange kale in a large, deep skillet. In a medium bowl, whisk together vinegar, almond butter, remaining honey and 2 tablespoons water. Drizzle over kale, cover and cook over medium heat, tossing occasionally, until wilted and just tender, about 5 minutes. Scatter nuts over the top and serve.

Nutritional Info: *220 calories (110 from fat), 12 g total fat, 1.5 g saturated fat, 0 mg cholesterol, 80 mg sodium, 26 g carbohydrate (5 g dietary fiber, 6 g sugar), 8 g protein*

Grilled Salmon with Basil Lemon Butter *Serves 2*

Copper River salmon runs for only a short time in the spring, and is highly prized by chefs around the world. A delicious recipe! Use leftover compound butter tossed in pasta, spread on freshly baked biscuits or melted into a fresh vegetable sauté.

Basil Lemon Butter

8 ounces unsalted European-style butter, softened
8 leaves fresh basil
1 lemon, Juice and zest of
Sea salt and freshly cracked black pepper, to taste

Salmon

2 (6 to 8 ounce) Copper River salmon fillets
Vegetable oil for cooking

To make the compound butter, place butter in a mixing bowl. Layer basil leaves on top of one another and roll tightly, like a cigar. Thinly slice, creating slivers of basil. Place basil in the bowl. Add lemon zest and lemon juice and incorporate all ingredients using a potato masher, pastry blender or a spatula. Add salt to taste. Place butter on one end of a 10-inch square piece of parchment paper. Roll butter in the paper, creating a cylinder, about 5 inches long. Twist the ends and freeze for about an hour before using.

For the salmon, heat a grill or grill pan over medium high heat. Brush salmon on both sides with oil. Sear skin side down 3 to 4 minutes. Flip and cook 3 to 4 minutes longer. The general rule for coking fish fillets is 10 minutes per inch of fish, but in the case of wild salmon you definitely do not want to overcook the fish and medium to medium rare is preferred by most wild salmon connoisseurs.

Remove salmon from grill and take butter out of the freezer. Thinly slice one or two medallions of compound butter right though the parchment paper. Peel away the parchment paper and top salmon with the butter. Garnish with basil or lemon wedges to the plate, if desired.

Nutritional Info: *350 calories (190 from fat), 21 g total fat, 4.5 g saturated fat, 120 mg cholesterol, 110 mg sodium, 0 g carbohydrate (0 g dietary fiber, 0 g sugar), 39 g protein*

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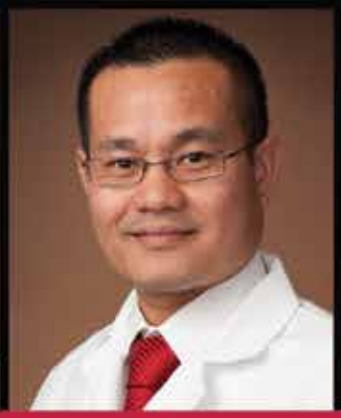
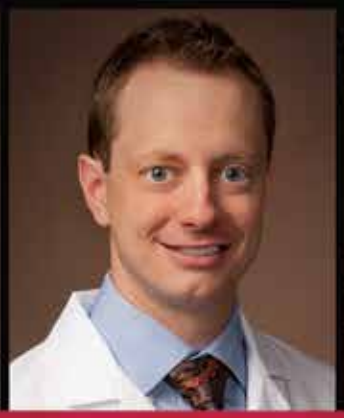


Morakod Lim, MD

Arash Karnama, MD, FACC



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