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- PCOS: When Missed Periods and Infertility Are More Than A Gynecology Issue
- How To Minimize Diabetes-Related Kidney Damage
- The Facts About Sitting, Standing and Your Health

THE ARGUMENT FOR Plant-Based Diets
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Free educational resources featuring expert content curated by our own member endocrinologists to further patient understanding of endocrine-related health issues.
This Issue's Contributors

American Association of Clinical Endocrinologists and American College of Endocrinology Address Patient Access To Necessary and Appropriate Medical Care

Anatomy of a Continuous Glucose Monitoring Sensor

The Argument for Plant-Based Diets

The Facts About Sitting, Standing and Your Health

Recently Introduced Diabetes Medications Offer Additional Health Benefits

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How To Minimize Diabetes-Related Kidney Damage

Should Metformin Be Paired with a Vitamin B12 Prescription?

4 Steps to Manage Your Diabetes for Life

ENDO 101: Everything You (Should) Want To Know About Endocrinology

PCOS: When Missed Periods and Infertility Are More Than A Gynecology Issue

While it is the most common condition in females of reproductive age, PCOS is more than a gynecological disorder and can adversely affect a number of endocrine systems functions.

How To Minimize Diabetes-Related Kidney Damage

Many people know that kidney damage is among the most serious side effects of having diabetes. But there are very definite steps that you can take to prevent or slow the progress of kidney disease. Here are a few suggestions.

Should Metformin Be Paired with a Vitamin B12 Prescription?

Metformin is one of the oldest and most commonly prescribed sugar-lowering drugs for the treatment of diabetes mellitus, but caution should be exercised, as it can lead to a deficiency of vitamin B12 and a host of health issues.

4 Steps to Manage Your Diabetes for Life

The National Diabetes Education Program (NDEP) breaks down the practical — but crucial — steps you or a loved one with diabetes can take to deal with the chronic condition over the long haul.

ENDO 101: Everything You (Should) Want To Know About Endocrinology

If you’ve ever wondered what the function of the endocrine system is, here’s everything you could — and should — want to know about its vital functions, endocrine hormones’ crucial impact on your health and well being, and the role endocrinologists play in dealing with disorders.

Anatomy of a Continuous Glucose Monitoring Sensor

A relatively new tool in the diabetes care arsenal, continuous glucose monitors — commonly known as CGMs — are among the most welcome, providing advancements that dramatically improve the lives of people with diabetes.

The Argument for Plant-Based Diets

A number of people in the Western world are adopting a plant-based based on the potential health benefits. This article examines the science behind the promise and exactly what a plant-based diet entails.
EmPower®, published by the American College of Endocrinology (ACE), the educational and scientific arm of the American Association of Clinical Endocrinologists (AACE), is dedicated to promoting the art and science of clinical endocrinology for the improvement of patient care and public health. Designed as an aid to patients, EmPower® includes current information and opinions on subjects related to endocrine health. The information in this publication does not dictate an exclusive course of treatment or procedure to be followed and should not be construed as excluding other acceptable methods of practice. Variations taking into account the needs of the individual patient, resources, and limitations unique to the institution or type of practice may be appropriate.

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AACE is a professional medical organization with more than 7,000 members in the United States and more than 90 other countries. Founded in 1991, AACE is dedicated to the optimal care of patients with endocrine problems. AACE initiatives inform the public about endocrine disorders. AACE also conducts continuing education programs for clinical endocrinologists, physicians whose advanced, specialized training enables them to be experts in the care of endocrine diseases such as diabetes, thyroid disorders, growth hormone deficiency, osteoporosis, cholesterol disorders, hypertension and obesity.

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There’s no question that healthcare is weighing heavily on the minds of Americans. In fact, a poll conducted in January by the Monmouth University Polling Institute revealed that a preponderance of U.S. citizens overwhelmingly placed healthcare costs above national security as their top concern. A recent Gallup poll reinforced these findings: 55 percent of respondents indicated they personally were worried about the availability and affordability of healthcare.

Between rising healthcare insurance premiums, increases in deductibles and out-of-pocket expenses, escalating costs of prescription medications and uncertainty regarding reforms to the Affordable Care Act (commonly known as Obamacare), everyone from individual consumers to small business owners to advocacy groups to major medical organizations are expressing their concerns.

Amidst this backdrop, the American Association of Clinical Endocrinologists and its education/scientific/charitable arm, the American College of Endocrinology, have issued a position statement advocating for patient access to medical care. The position statement is printed below in its entirety.

This document represents the official position of the American Association of Clinical Endocrinologists and the American College of Endocrinology. Position statements are meant to provide guidance, but they are not to be considered prescriptive for any individual patient and cannot replace the judgment of a clinician.

The American Association of Clinical Endocrinologists (AACE) and the American College of Endocrinology (ACE) envision a society in which all people in need, regardless of their disability, age, race, religion, ethnicity, gender, sexual orientation, or ability to pay, should have access to consistent, affordable, timely, patient-centered, comprehensive medical care. AACE/ACE support healthcare initiatives and efforts to increase the access and affordability of health insurance for everyone. Additionally, AACE/ACE support the following positions regarding medical care:

- Individuals must be empowered to control and decide how their own healthcare dollars are spent;
- Individuals must have unencumbered access to specialty care;
- Healthcare coverage must be made more affordable;
- There must be improved value and increased quality in our healthcare system;
- Coverage and access should be extended to both the uninsured and under-insured;
- Health care should be provided in a comprehensive, culturally and linguistically appropriate manner;
- People of all ages and their families should have access to health care that responds to their needs over their lifetimes, and provides continuity of care that helps treat and prevent chronic conditions;
- All individuals and their families should receive comprehensive health, rehabilitation, habilitation, and long-term support services provided on the basis of individual need, preference, and choice;
AACE/ACE oppose any policies that restrict access to medically necessary care and/or medications. Such policies, which include preferred drug lists with prior authorization requirements, restrictive formularies, fail-first requirements, monthly prescription limits, and tiered co-payment structures, fail to achieve their intended purpose of reducing overall healthcare costs. Such policies also prolong human suffering, and reduce the potential for an individual with a medical condition to make a full recovery. Moreover, restrictive policies fail to acknowledge that practitioners and patients should make individualized treatment decisions, recognizing the unique and non-interchangeable nature of human beings and medical care/medications. Restrictive policies also fail to acknowledge that the lack of access to necessary and appropriate medical care and medications has both human and fiscal consequences.

AACE/ACE believe that decisions should always be clinically based and that best practice treatment planning will provide long-term cost containment. If implemented based upon the evidence, the practices and tools identified above can be useful for policy makers, practitioners, and patients to ensure appropriate access to medical care and medications leading to quality improvement and cost containment.

In this context, we wish to draw particular attention to insulin. Patients with type 1 diabetes need insulin for survival and frequently insulin is the only drug that can control the diabetes of patients with type 2 diabetes. In recent years, the cost of insulin has nearly tripled, which has placed tremendous hardship on many patients with diabetes, which may lead to poorly controlled diabetes when patients take less insulin than is prescribed, or even death in some cases.

Without adequate control of diabetes, people with diabetes have a higher risk of developing microvascular complications such as blindness, kidney disease and nerve damage, and macrovascular complications including heart attacks and strokes. Therefore, it is imperative that people who require insulin be able to obtain it at a cost that is affordable. AACE strongly encourages all parties involved in the production and distribution of insulin to make every effort to contain the cost of insulin.

Recognizing that many states have already implemented a preferred drug list, AACE/ACE support the exemption of all medications used to treat endocrine related conditions from prior authorization requirements. Such an exemption should address all classes of medications to treat endocrine diseases, and not include limits based on diagnosis. Moreover, states that have implemented preferred drug lists and other restrictive policies should ensure that the following consumer protection policies exist and are enforced:

1. No “fail-first” requirements;
2. Prescribers should have the option to designate “Dispense as Written” to prevent automatic switching at the pharmacy point-of-sale;
3. A “grandfathering” policy should exist to ensure that consumers who are successfully being treated on a non-preferred medication are not forced to switch;
4. Preferred drug lists should be developed and revised based on clinical evidence and scientific consensus taking into account efficacy, safety, and cost;
5. Utilization management strategies should be developed by a Pharmacy & Therapeutics Committee that includes practicing physicians in the field of mental health and substance abuse treatment;
6. The process for developing state utilization management strategies should include meaningful involvement from consumers and adequate opportunity for public input;
7. Prior authorization should be timely and efficient so as not to delay access to medication, nor to deter the prescriber from ordering medications that will have optimal benefits;
8. Appeals and grievance procedures must be clearly disseminated to beneficiaries (subject to restrictions) and must be both accessible and timely; and,
9. Third-party payers should be legally accountable for harm to patients resulting from negligent utilization management policies or patient treatment decisions through all available means, including proportionate or comparative liability, depending on state liability rules.

References
AACE’s Position Statement on Patient Access to Necessary and Appropriate Medical Care are drawn from and reflect the significant background work of many organizations, particularly the American College of Physicians1, the American Academy of Dermatology Association2, Council of Medical Specialty Societies3 and, Mental Health America4.

If you don’t know what a CGM (continuous glucose monitor) is, you probably have heard someone mention this alphabet soup recently, perhaps at your doctor’s office or in the news. A CGM is a small, wearable device that monitors your blood sugar (glucose) levels by measuring the glucose level of the fluid in the tissue under the skin, which is called “interstitial fluid.” The CGM sensor measures the glucose levels frequently, with an average determination made every five minutes. It then transmits the information to a recording device that displays the blood glucose levels. The levels are shown as numbers and a graph. Conveniently, the system is wireless, and the sensor can be worn under clothing but has to be changed, depending on the brand, from every several days to every week or slightly less often. To be sure that the device is working as it should, it is recommended that a traditional finger stick for blood glucose levels using a traditional glucose meter be performed at least twice daily to calibrate the system.

What are the different types of sensors available?
Currently, there are two kinds of CGMs: one for diagnostic use and one for personal use. Your healthcare provider may suggest the use of a diagnostic CGM to look at patterns and trends in your daily blood glucose fluctuations that might not be clear from your self-monitoring or traditional finger stick blood glucose (SMBG) log.

Examples of fluctuations include frequent low blood glucoses (hypoglycemia) or difficult-to-explain changes in your blood glucoses. The diagnostic CGM, depending on the brand, is usually worn from three to 14 days. At the end of this period, the information collected from the CGM is processed through computer software and reviewed along with a diary of your meals, physical activity and insulin doses. While being collected, the glucose information is not visible to anyone...that is, it is “blinded,” so the data must be reviewed retrospectively. Therefore, it is very important that meal content and timing, as well as diabetes medication (usually insulin doses and timing), be correctly recorded in the daily diary that you will be asked to keep.

The personal CGM allows you, the wearer, to see your glucose changes. You insert the sensor yourself, a relatively easy task using a spring-loaded device specific to the sensor brand you are using. And you can even have the blood sugar information transmitted to your phone, which minimizes the number of care-related items you have to carry around. You can also share the information (or not) with family, spouses, or others, if you wish. Or if you have a history of having low blood sugars and not being aware that they are going low, it can certainly be comforting to know that your spouse or family member could be watching your blood sugars as you exercise.

High blood sugar or low blood sugar alert settings can be chosen, with an alarm that goes off when blood glucoses don’t fall within a pre-determined range. The live information showing blood glucose changes or trends which predict when you are...
about to go out of your personal blood sugar target range gives you an opportunity to take action, so seeing trends when eating different foods or food amounts, or exercising, allows you to better manage your diabetes.

The CGM device may be “stand-alone” or “linked” to an insulin pump system. For the linked CGMs, the information directly transmitted to your pump can help calculate doses for insulin boluses, a dose of insulin that is specifically taken at meal times to keep blood glucose levels under control following a meal.

In addition to high and low alerts, some pumps have a “low glucose suspend” function: there is an automatic suspension of insulin delivery if the glucose falls lower than a pre-set value, and the wearer of the pump/sensor is not aware that blood sugar has dropped so low.

**How accurate is the CGM?**

If your blood glucose is steady, glucose in the interstitial fluid is about the same as in your blood. But if your blood glucose is rapidly changing, there can be a lag in the change in the interstitial fluid glucose level up to 15 minutes behind the blood glucose level. The CGM is less accurate once glucose falls below 70mg/dL (milligrams per deciliter) or if the glucose level is changing rapidly. For this reason, finger stick glucose checks are recommended, although the technology in sensor chemistry has been improving. In fact, the Food and Drug Administration (FDA) just recently approved one sensor system as being accurate enough to use to make insulin dosing decisions without a corroborating finger stick value. Progress!

**Are there recent scientific studies about CGM use?**

Until recently, most scientific studies on CGM and diabetes mellitus were focused on patients that used insulin pumps. In January 2017, two studies put a spotlight on CGM use in persons not using insulin pumps, but using multiple injections of insulin. Both studies explored how CGM would impact blood glucose control compared to usual treatment.

In the DIAMOND trial at the Jaeb Center for Health Research in Tampa, Florida Roy Beck, MD, PhD, and his team conducted a 24-week trial that randomly assigned 158 study participants to either a CGM group or finger stick glucose group (but they were required to check blood sugar four times daily). All participants used multiple daily insulin injections, but were not using insulin pumps. Blood sugar control was significantly better in the group using CGM, both in terms of an average overall blood sugar level as well as fewer ups and downs, and less variation, in daily blood sugar levels.

In the GOLD trial, Marcus Lind, MD, PhD, of the Diabetes Outpatient Clinic at Uddevalla Hospital in Sweden, and his team conducted a study of 161 participants who were using multiple daily insulin injections. In this study, the participants switched between using a CGM and not using one. Again, blood sugars were significantly better with CGM, both in overall average, as well as less fluctuations in high to low sugars.

Together, these studies support that CGM can improve diabetes control when using multiple daily doses of insulin, not just when paired with an insulin pump.

**Would a CGM system be helpful for me?**

CGM is most beneficial if you are willing to:

- Wear the device daily
- Understand what the glucose trends suggest (your blood sugar is going up or down), and
- Understand how to treat your blood sugar changes (change meal time or content, change insulin doses, go for a walk or exercise)

In January 2017, the Centers for Medicare and Medicaid Services (CMS) announced that “therapeutic” CGM systems were newly classified as “durable medical equipment,” which is covered under Medicare Part B. This was a great victory for persons wanting to get the CGM systems covered under Medicare. But for now, the Dexcom G5 Mobile system is the only CGM system that falls within this classification.

There are CGM devices on the market that require minimal or no calibration, but are only available for personal use outside of the United States at this time. However, scientists are also working on an implantable device with long-term use capability. Stay tuned for developments, as this is the future!
Plant-based diets are a relatively new concept — or, rather, a return to dietary habits followed by our ancestors before weapons were invented for hunting animals. And as unconventional as it may seem, more and more people in the Western world are adopting a plant-based diet due to the many health benefits it promises.

Worldwide, an estimated 2 billion people live primarily on a meat-based diet, while an estimated 4 billion live primarily on a plant-based diet, often by necessity rather than specific choice, due to food availability. Here in the U.S., food production systems use about 50 percent of the total U.S. land area, approximately 80 percent of the fresh water, and 17 percent of the fossil energy. The heavy dependence on our natural resources suggests that our country's food system, whether meat-based or plant-based, is not sustainable. So why consider a plant-based diet for yourself at this time? Quite simply, for better health.

Adopting a plant-based diet is mostly based on the theory of promoting healthy gut microbiomes. Gut microbiomes refer to the type of bacteria and microbes we have in our GI (gastrointestinal) tract. By adopting a plant-based diet, a person can positively alter the gut microbiome by eating optimal foods, i.e., plants.

The typical American diet is high in carnitine, lecithin and other substances which promote bacteria that produce compounds that are atherogenic (promote artery clogging). Eating meat and other animal products also contributes to weight gain. And in addition to saturated fat, meat contains a high amount of food preservative sulfur dioxide, which can cause a number of adverse effects; arachidonic acid, which can generate inflammatory responses in the body; and heme iron, which can be harmful in large amounts. Meat, fish, dairy and eggs may also increase our exposure to dietary antibiotics; industrial toxins; mercury and other toxic heavy metals; advanced glycation end-products (AGEs), which can be a factor in aging and in the development or worsening of many degenerative diseases, such as diabetes, atherosclerosis, chronic kidney disease and Alzheimer's; cadmium, a toxic metal which can cause kidney problems and bone softening with long-term exposure; and xenoestrogens in fish and estrogenic meat carcinogens, which both can impact proper hormone balance.

So what specific benefits have actually been shown by making a dietary change? Let's take a look at vegetarian diets, which have been studied extensively.
Vegetarian Diets and Weight Loss

A 2006 review reported that a vegan or vegetarian diet can be very successful in achieving weight loss, accompanied by the additional benefit of lower rates of heart disease, high blood pressure and diabetes. This review presented evidence that weight loss in vegetarians was not dependent on exercise and suggested a diet-only weekly weight loss of approximately 1 pound. The study authors further noted that a vegan diet seemed to cause more calories to be burned after meals in contrast to non-vegetarian diets, where food was being stored as fat.

During the 1999 to 2004 time span, the National Health and Nutrition Examination Survey (NHANES) – a research program conducted by the National Center for Health Statistics (NCHS) to assess the health and nutritional status of adults and children in the United States and to track changes over time – reported that the more meat in a diet, the more likely the person was to be obese. Other studies have further supported this finding. The Oxford component of the European Prospective Investigation into Cancer and Nutrition found over a five-year period that mean annual weight gain was lowest among individuals who had changed to a diet containing fewer animal foods. And compared with non-vegetarians, vegetarian children are leaner, and their BMI (body mass index) difference becomes greater during adolescence, so a plant-based diet seems to be a sensible approach for the prevention of obesity in children as well.

Plant-based diets are low in energy density and high in complex carbohydrates, fiber and water, which may increase satiety (the feeling of being full) and resting energy expenditure, in turn preventing weight gain by fewer calories taken in overall and better “burning” of the calories actually eaten.

Plus, vegetarian diets offer the added bonus of being more nutritious than diets that include meat, typically containing more magnesium, potassium, iron, thiamin, riboflavin, folate and vitamins.

Diabetes and a Vegetarian Diet

Plant-based diets may prevent diabetes, and if it has already developed, help manage the condition.

Adventist Health Studies reports that vegetarians have approximately half the risk of developing diabetes as non-vegetarians. Another study in 2008 reported that non-vegetarians were 74 percent more likely to develop diabetes over a 17-year period than vegetarians. A low-fat, plant-based diet with no or little meat may help prevent and treat diabetes by allowing insulin to work better in the body.

And if you already have developed diabetes, changing to a low-fat vegan diet can reduce your HbA1C levels (a measure of average blood sugars over the previous three months) by 1.23 points, compared with 0.38 points for those on just a carbohydrate-restricted diet. In addition, 43 percent of people on the low-fat vegan diet were able to reduce their medication, compared with 26 percent of those on the carbohydrate-restricted diet.

Reducing Heart Disease

In the LIFESTYLE Heart Trial, the first randomized clinical trial to investigate whether ambulatory patients could be motivated to make and sustain comprehensive lifestyle changes and, if so, whether the progression of coronary atherosclerosis (hardening and narrowing of the arteries) could be stopped or reversed without using lipid-lowering drugs, lead researcher Dr. Dean Ornish reported that 82 percent of patients with diagnosed heart disease who followed his program had some level of regression of atherosclerosis. Although his program involved diet changes, it also focused on stress management and physical activity. His prescribed plant-based regimen allowed a very low 10 percent of calories from fat, but 15 to 20 percent from protein, and 70 to 75 percent from carbohydrates. Cholesterol was restricted.

Interestingly, 53 percent of the control group in the study had progression of atherosclerosis. After five years, this narrowing in the experimental group decreased from 37.8 percent to 34.7 percent (a 7.9 percent relative improvement).

(Continued on page 10)
Low-density lipoprotein (LDL cholesterol) decreased 40 percent at one year and was maintained at 20 percent less than baseline after five years. These reductions are similar to results with lipid-lowering medications. The control group experienced a progression of stenosis from 46.1 percent to 57.9 percent (a 27.7 percent relative worsening).

In those placed on a Mediterranean-style diet, which included more plant foods, vegetables, fruits and fish than meat, with butter and cream replaced by canola oil margarine (canola oil and olive oil were the only fats recommended), this diet group had a 73 percent decrease in coronary events at 27 months and a 70 percent decrease in all-cause mortality as compared to the group eating their usual diet.

Yet more data comparing heart disease-specific death rate ratios of vegetarians and non-vegetarians showed a 24 percent reduction in coronary heart disease death in vegetarians as compared with non-vegetarians. Some of this effect might be due to lower cholesterol blood levels, but vegetarian diets are also known to decrease blood pressure.

**The Plant-Based Diet: A Step Beyond Vegetarian Diets**

Although vegetarian diets are associated with lower risk of several chronic diseases, different types of vegetarians may not experience the same effects on health. The key is to focus on eating a healthy diet, not simply a vegan or vegetarian diet. Healthy eating may be best achieved with a plant-based diet, which is a dietary regimen that encourages whole, plant-based foods and discourages meats, dairy products and eggs, as well as all refined and processed foods. It encourages lots of vegetables (cooked or raw), fruits, beans, peas, lentils, soybeans, seeds and nuts (in smaller amounts) and is generally low in fat. And a true plant-based diet really takes the vegetarian diet a step forward. Unlike the vegan diet, processed foods, including oil, white flour, and refined sugars, are eliminated entirely.

The easiest way to remember the distinction between the vegan diet and a whole food, plant-based diet: people who are vegan can eat cookies and crackers, while people who consume whole food, plant-based diets choose not to eat those. And water replaces fruit juices and milk.

In short, a plant-based diet excludes processed foods and sweets, which makes it unique among other diets for better health.

Another plant-based diet option is to use olives and avocados for fat sources instead of processed oils like olive oil or canola oil and cheese. Again, beans and legumes can be chosen instead of veggie patties, which come under the category of processed foods.

For those who are worried about getting enough protein from a plant-based diet, about three to five servings of legumes, three to five servings of whole grains, and one to three servings of nuts will provide 20 to 25 grams of protein per day. Some essential nutrients that can be missing on plant-based diet are vitamin B12 and vitamin D. These deficiencies can be compensated by choosing products that are fortified and possibly taking vitamin B12 and vitamin D supplements.

Plant-based diets help with weight loss similar to other diets such as the Atkins diet and Paleo diet. In addition to helping treat obesity, plant-based diets have been show to help with reducing mortality, improving and preventing cardiovascular diseases, diabetes and high blood pressure. Fifty percent of all cancers are thought to be due to our diet, and a plant-based diet can reduce this risk.

Plant-based diets also lessen food cost by reducing the purchase of processed food and supports local farmers to grow fresh grains and produce. On a global level, plant-based diets also help lessen greenhouse gas emissions and have a much smaller impact on the environment.

There’s no doubt that reducing your intake of meat and embracing a plant-based diet is not only good for you, but the environment as well. So, whether you’re planning on making a dramatic change to enhance your well-being or prefer to ease into such a significant lifestyle change, there are plenty of resources available on the internet and in your local bookstore to help you embrace a new, healthier way of eating.
What do you call kids who don’t let type 1 diabetes stand between them and their dreams?

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To learn more about these scholarships, visit diabetescholars.org/Lilly. And take this page to discuss with your healthcare provider. For more information about all the helpful programs Lilly offers families with type 1 diabetes, visit lillydiabetes.com.
The Boston Globe recently referred to sitting as the modern poor health equivalent of smoking. And yes, we are spending much more time sitting these days. Sitting in front of office computers, sitting in front of TV screens, sitting while working, sitting while driving and sitting while eating. Sitting, sitting, sitting!

Standing, and especially standing work stations or desks, are being advertised as the solution to the escalating rates of diabetes, heart disease and obesity. But they can be expensive and outright uncomfortable. And how can you run a meeting behind a standing desk – should your meeting require everyone then stand? Are we in an era of “the sitting disease”? Just what are the facts, the data, that prove this is so important?

Analyses suggest that, on the average, each of us spends nine of our 14 waking hours in an office chair or on the couch, which is indeed a very substantial portion of each day!

Many studies reported over the past decade suggest that too much sitting leads to more disability as we age. It has been associated with a doubling of the risk of developing diabetes and heart disease, and it has been suggested that spending too much time sitting could even shorten your life. A Harvard study in 2014 involving more than 92,000 women reported that the more time study participants spent sitting at work, driving, or watching TV, the greater their risk of dying from heart disease, cancer, or strokes.

While standing in one place while you are working, rather than sitting at your desk, will help you lose pounds, improve your heart health and prevent other health concerns associated with too much sitting, some occupational health specialists worry that there could also be negative effects. They remind us of why chairs were developed for the work place, suggesting that chairs help decrease varicose veins, curvature of the spine and arthritis. While standing burns a few more calories as our hearts work harder to circulate blood upward, it also puts more strain on our veins, backs and joints, especially if you are overweight.

Also, researchers have not yet made clear whether the health benefits of reduced sitting time potentially come from just moving around more or from standing still – a bit

By Dace L. Trence, MD, FACE
difficult to determine as you can guess, as when we stand, we do not stand at attention, but continually move. We shift positions, shift weight bearing from one side to the other, move our arms more. And results of studies about whether exercise reduces the health risks of sitting are actually not all in agreement.

A study of nearly 17,000 Canadian adults found that those who reported the most time standing had a 33 percent lower risk of dying from any cause over 12 years compared to those who stood the least. But those who exercised at least two hours each week — even if they sat the rest of the time — had the same positive impact in benefit that extended their life as those who stood the most. This would suggest that if you sit a lot, but also exercised, the sitting would not matter as much.

But, in direct contrast, the Harvard researchers in the study mentioned earlier found that regular exercise did not decrease the increased death risk associated with prolonged sitting.

In terms of calorie burn and physical exertion, standing in one place is the same as 1.3 MET (a measure of the energy cost of physical activities) compared to 1 MET for sitting. Compare this to walking at a 3-mile-per-hour pace, which is a 3.3 MET activity, and jogging as a 7 MET, translating to a 7 times energy-burning activity than the energy burned when than your body is at rest. So, if you are looking at the hard number of calories burned sitting versus standing, there’s not much of a difference. But this could be a bit misleading, in that standing at a workstation encourages us all to move around more and so indirectly burns significantly more calories. And calorie burn might not be the only benefit to better health.

In another 2014 study, 28 office workers who were given a sit/stand desk for a month reduced their time spent in a sedentary position by 38 minutes a day compared to when they used a traditional desk. Very importantly, these workers also reported a boost in their mood, increased energy and reduced fatigue. Benefits have also been reported from more engagement with others in the office: you are more likely to speak with others, touch bases, just interact. And we are just becoming aware of the health benefits of socialization, which addresses another modern-day health concern, “social isolation disease.” It is now recognized how critical social contact can be, particularly as we age.

And there is also a chemical basis to support that sitting is not healthy. A fat-burning enzyme called lipoprotein lipase increases when muscles get activated by moving around. Animal studies support the premise that keeping an organism in a fat-burning metabolic state helps improve cholesterol, blood sugar, and high blood pressure.

As to aging, just recently a study suggested that sitting shortened a cell component called telomeres, especially for women. And shortened telomeres are associated with faster aging. In this study of nurses’ health, women who did not get in a daily half-hour of exercise and those who spent more time sedentary (about 10 hours or more) had shorter telomeres than those who spent less time sitting every day. The effect of shortening this cell component was believed to be the equivalent of about eight years of aging! So, inactive women who spent more time sitting were about eight years older, on average, than those who were inactive but spent less time sedentary.

People who stand live longer and have longer telomeres, an indicator of good health and longevity. But many workers may find it too difficult to use their computers or even read while standing, even more so if their standing workstation is linked to a treadmill or a constantly moving conveyor belt. It can also be difficult to speak on the phone or respond to co-workers or colleagues while you’re walking on a treadmill. But treadmills can be stopped, and many people find that breaking up their work time between standing and sitting works better for their work flow than just standing alone.

Analyses suggest that, on the average, each of us spends nine of our 14 waking hours in an office chair or on the couch.

Sit/stand desks that can be easily adjusted, or using a standing desk with a high-rise chair, can provide comfort and prevent back and joint problems. But you can also place your desk on supports to raise it, or place a small table on the desk to raise the work or computer level; both could be easily removed periodically. And stools can be an easy solution for alternating between sitting and standing.

So, what is best for your muscle and joints and your mind’s productivity?

Experts recommend that you sit for no more than 20 minutes at a time and stand still in one position for no more than 8 minutes. You should also take a two-minute moving break at least twice an hour to stretch or walk around. After all, if you don’t stand up for your health, who will?!
The last decade has been very exciting in the world of diabetes care. As the result of much effort, time and money dedicated to research, many new diabetes medications have made it out to market. The medications can be grouped into two major new categories that have rather exotic chemical names: glucagon-like-peptide-1 (GLP-1) receptor agonists and sodium-glucose co-transporter 2 (SGLT2) inhibitors.

The GLPs include exenatide (Byetta® and Bydureon®), albiglutide (Tanzeum®), dulaglutide (Trulicity®), and liraglutide (Victoza®), while the SGLT-2s include canagliflozin (Invokana®), dapagliflozin (Farxiga®) and empagliflozin (Jardiance®).

So why is there so much excitement surrounding the introduction of these drugs?

The GLP-1s lower blood sugar (and, delightedly, often also weight) through a few different mechanisms. GLP-1 is a hormone normally produced in the gut when we eat. The medication class mimics the work of the gut hormone, although in a more long-lasting way. The medication decreases calorie intake by making you feel full faster by slowing how fast your stomach empties and through effects that we do not fully understand on the satiety (fullness) center of the brain.

The medication class also helps the pancreas produce more insulin (a hormone that lowers blood sugar) but decreases glucagon, another hormone made in the pancreas. Less glucagon is important as glucagon can act against insulin. So, the less glucagon, the better the insulin action.

GLP-1 medication requires injection (with a pre-filled pen and a very small and short needle). There is ongoing research into making a pill form, but currently only the injectable versions are available. GLP-1s can cause some abdominal fullness, abdominal discomfort, or nausea when initially started and when the dose is increased from the baseline dosage, but these side effects, if present, usually decrease after a few days and can even go away completely.
More serious concerns are that GLP-1s can also increase the risk of pancreatitis, an inflammation of the pancreas which usually causes severe abdominal pain with nausea. Individuals with type 2 diabetes (the diabetes in which the insulin does not work as well as it should, plus less insulin being produced over time) are at higher risk of pancreatitis than individuals who do not have diabetes, even if they are not taking the GLP-1s, so it has been confusing to researchers as to whether it is the diabetes or the drug group that is at fault.

In rats and mice (but not monkeys or humans), there are receptors (areas of attachment) on thyroid cells for the GLP-1s. So, in rats and mice, GLP-1s have been shown to increase the risk of a rare type of thyroid cancer called medullary thyroid cancer. The GLP-1s have not been shown to cause this cancer in humans, but to be cautious, if there is any history in the family or personal history of having medullary thyroid cancer, it is recommended this drug class not be used.

SGLT2 inhibitors work through effects on the kidneys. SGLT2s removes sugar from the body via urine. This results in less sugar in your blood and body. Often there is also a bit of weight loss from the loss of the sugar calories in the urine, but there is also a water loss with the elimination of sugar through the kidney, so the medication also has an effect on lowering blood pressure.

Potential side effects most commonly come from the increased sugar in the urine, specifically creating a more hospitable environment for bacteria and yeast infections of the urinary tract and genital areas. If you have any symptoms such as pain or burning sensation at the time of urination or in the genital area, or feel like you have to urinate more frequently than usual or cannot hold your urine, it is recommended you contact your healthcare team.

Another potential side effect of SGLT-2s that has come to attention over the past few years is ketoacidosis. Ketoacidosis is a very serious complication of diabetes typically seen in patients with very high blood sugars. With the SGLT-2s, the diagnosis can be confused by blood sugar levels that are not high. Ketoacidosis symptoms usually include nausea and vomiting, so it is recommended that if you are taking an SGLT-2 and feel sick or nauseated, or become in any way dehydrated, check for ketones in your urine. And if they are present when you test for the ketones, call your healthcare team immediately!

A major question about all these medications is whether they offer other benefits beyond controlling blood sugar, such as positively affecting the heart or kidneys? For example, could they decrease the risk of heart attack or kidney damage in ways that might not be directly connected to blood sugar control? Some recent and very exciting studies suggest this is the case.

An FDA-mandated cardiovascular safety study called LEADER (Liraglutide Effect and Action in Diabetes: Evaluation of Cardiovascular Outcome Results—A Long-Term Evaluation) compared the use of liraglutide (Victoza) versus no liraglutide in participants with diabetes, evaluating the drug’s ability to lower death from heart and other blood vessel disease causes. Over 9,000 individuals with diabetes and documented heart disease or at high risk for heart disease were involved with the study and were followed by researchers for about four years. Results showed that those taking liraglutide had less overall death from cardiovascular causes and fewer non-fatal heart attacks, non-fatal strokes, coronary surgery and hospitalizations for unstable angina (a type of chest pain caused by reduced blood flow to the heart) or heart failure. Also, less kidney disease progression was seen in those taking liraglutide. Participants taking liraglutide did report more nausea and abdominal symptoms, but interestingly also had a lower incidence of pancreatitis.

In a similar study using semaglutide (another GLP-1 awaiting FDA approval at this time), benefits again were seen. This study showed less death from all causes, as well as fewer hospitalizations for unstable angina or heart failure in those participants using the drug. Additional benefit was seen in less diabetes-related eye damage and less kidney disease.

Data also have been collected on the SGLT-2s. From a study of over 7,000 participants with type 2 diabetes who were at high risk of developing cardiovascular diseases, and who were given either empagliflozin or a placebo, empagliflozin was associated with lower death due to cardiovascular causes, non-fatal heart attacks and non-fatal strokes. Participants who took the empagliflozin were also less likely to be hospitalized for heart failure. And kidney function, followed over the course of three-and-a-half years, was better in those receiving empagliflozin. However, and not surprisingly, genital infections were more common in those taking empagliflozin.

In summary, two relatively new groups of diabetes medications, GLP-1s and SGLT-2 s, have now been shown to have beneficial health effects beyond controlling blood glucose. They can help weight control, blood pressure, can positively impact the development of heart and blood vessel disease and, depending on the specific agent, can even lead to fewer eye and kidney diabetes-associated complications!
What does it mean to be transgender? It’s a question that many people are asking since the increase in visibility of those who consider themselves transgender or gender non-conforming.

More than one million Americans identify as transgender, but what this classification actually means can often be confusing. When a person identifies with a gender other than their biological sex at birth, a condition called “gender dysphoria,” in which a person experiences discomfort or distress because there’s a mismatch between their biological sex and gender identity, they are transgender. Establishing this identity is the first step on the gender transition journey, which can begin at any age. But this journey can often be physically, mentally and emotionally taxing, requiring that stable support systems be in place before the journey can begin.

Transgender healthcare: where to begin?
The roots of transgender healthcare began in the early 1900s when German physician Magnus Hirschfeld, often considered the most important early pioneer of studies of sexuality, established the Institute for Sexual Science in Berlin. Several decades later, endocrinologist Harry Benjamin laid the foundation for modern American transgender healthcare by writing the first textbook on the subject in 1966, “The Transsexual Phenomenon.” With these two pioneers having laid the groundwork for transgender health care, physicians today are better equipped with the therapies needed to help patients begin their gender transition through either medical therapies, surgical changes, or both.

Once a person decides to begin their transition from their biological gender to the gender they truly identify with, establishing a relationship with a physician is key. Typically, medical endocrinologists specialize in transgender health care and can help initiate the needed medical therapies after the patient-doctor relationship has been established.

Generally speaking, those who are male by sex at birth have more testosterone than those who are female by sex at birth. Similarly, those who are female by sex at birth have more estrogen than those who are male by sex at birth. These hormone level differences help shape many of the physical, mental and emotional characteristics that we usually associate as the differences between men and women.

Thus, to help a patient who was born male by sex but identifies as female, we start estrogen therapy along with medications...
that can reduce their natural testosterone levels. Conversely, to help a patient who was born female by sex but identifies as male, we begin testosterone therapy. After these therapies are started, doctors monitor hormone levels and the clinical effects of the medications. Based on the changing hormone levels and on the patient’s experience, these medications can be increased or decreased in dosage as needed.

What to expect with hormone therapy

For female-to-male transgender persons:
Testosterone therapy is commonly administered via either skin patches, topical gels, or through intramuscular injections. After starting testosterone therapy, patients can expect to see the beginnings of masculinizing physical changes within three months. These changes include the end of menstrual periods, increased muscle mass, fat redistribution, increased oiliness of skin, and increased facial and body hair. Within 12 months of testosterone treatment, further physical changes that some patients may see include increased strength, clitoral enlargement, voice changes and male-pattern hair loss.

For male-to-female transgender persons:
Most commonly, estrogen therapy can be found in pill form, skin patches, or topical gels, creams, or sprays, while testosterone-lowering medications are almost always administered as pills. After starting estrogen therapy and testosterone-lowering medications, patients may see physical feminizing changes in the first few months that include decreased facial and body hair, decreased oiliness of skin, breast growth, and fat redistribution. Maximal breast development can be expected after two years of hormone therapy, and with even more time, the prostate and testicles will become smaller in size. There are no voice changes noted with estrogen and anti-androgen therapies.

Potential complications of hormone therapy

As with any medications, there are risks and benefits associated with hormone therapy for transgender patients. In addition to improvement in symptoms of gender dysphoria, the benefits include the changes noted above, while the risks include the medication side effects along with the potential to make pre-existing medical conditions worse.

For transgender females on medical therapy, estrogen therapy is associated with an increased risk of blood clots (ranging from deep vein thromboses in the lower extremities to blood clots in the lungs that can be medical emergencies). Additionally, estrogen therapy can cause serious adverse effects in patients with liver disease, breast cancer, heart disease, migraine headaches and those with a history of stroke. Testosterone therapy for transgender males carries the potential to worsen liver dysfunction and a condition known as erythrocytosis, whereby the red cells in the blood begin to significantly outnumber the other blood cells. Additionally, testosterone therapy can worsen symptoms of congestive heart failure and sleep apnea.

The role of surgery for transgender patients

While the hormonal therapies mentioned above will have a modest effect on the internal and external sex organs that patients are born with, they will not be able to alter these organs completely. This is why some transgender patients consider undergoing gender confirmation surgeries. For many transgender patients, surgery is often considered the final step in their journey to live fully and completely as the gender they most identify with.

Gender confirmation surgeries typically involve both the removal of internal sex organs and cosmetic surgery to change the external appearance of the genitalia. These surgeries can often lead to improvement in the mental health of transgender patients, but these are highly specialized surgeries that are only performed at a few select centers in America.

Where can you learn more?

If you still have questions about what it means to be transgender or if you want to learn more about transgender health care, the following websites are very useful resources:

3. The International Foundation for Gender Education: http://www.ifge.org/
4. World Professional Association for Transgender Health (WPATH): http://www.wpath.org/
5. Renaissance Education Association: http://www.ren.org/
Chances are that if you’re reading this article, you’re in a medical office reception area or a doctor’s exam room. And odds are better than even that you are there to be seen by an endocrinologist, a physician who specializes in the diagnosis and treatment of a wide range conditions affecting the endocrine system including diabetes, thyroid disorders, growth hormone deficiency, infertility, cholesterol problems, hypertension, obesity and more.

Even for some under the care of an endocrinologist, the medical specialty can be something of a mystery. So, here’s a primer to help promote understanding of this vital area of clinical practice.

The word endocrinology is from the Greek words endon, meaning "within" and krīnō, meaning "to separate" and is a branch of medicine that deals with the endocrine system’s glands, the actions of their hormones and the metabolic consequences. The endocrine system’s glands and organs secrete hormones that regulate a number of vital functions of our body. Although every organ system in the body secretes and responds to hormones, endocrinology focuses primarily on the endocrine glands whose primary function is hormone secretion. These include the hypothalamus, pineal, pituitary, thyroid, parathyroid, adrenals, pancreas, testes and ovaries.

Hormones have many different functions and modes of action and often affect different parts of the body in different ways. For example, the male sex hormone testosterone is responsible for sex drive, but also impacts muscle size and encourages the growth of pubic, facial or body hair. There are up to 40 different hormones circulating in your blood at any time. Once released into the bloodstream, a hormone circulates throughout the body until it reaches its specific target -- or targets -- to perform its function. These targets can be either other endocrine glands or other organs and tissues in the body.

While all these glands normally coordinate with each other exceptionally well in order to regulate various metabolic processes, hormonal function is a balancing act of sorts. Too much or too little of one hormone can have an impact on the release of other hormones. If this hormonal imbalance occurs, some of your body’s systems do not work properly. In order to bring the hormones back to their normal levels, your body has built-in mechanisms to keep track of and respond to any changes by means of a complex, but highly efficient, feedback system that links some endocrine glands with others. A hormonal imbalance typically is corrected by the body by "feeding" some of its hormones (and sometimes other hormones) from the target back to the original endocrine gland.

ENDO 101: Everything You (Should) Want to Know About Endocrinology

By Mary Green
This “tells” the endocrine gland to release more or less of the hormone, and the balance is restored.

When this system goes awry and there appears to be a problem, a patient is usually referred by his/her primary care physician to an endocrinologist, who is an expert in treating frequently complex (and often chronic) conditions which can involve several different systems within the body.

Endocrinologists perform diagnostic tests to evaluate the problem, determine a course of treatment and counsel patients on lifestyle changes that can improve the medical condition(s). This type of specialist needs extensive knowledge of clinical chemistry and biochemistry to understand the physiology and chemical processes underlying endocrine disorders. Many endocrinologists also are involved in clinical research to gain a better understanding of endocrine disease and to assist in the development of better treatment options. Some endocrinologists treat a range of endocrine disorders, while others choose to specialize in a single category such as diabetes, infertility or pediatrics.

While certain disorders are clearly within the domain of endocrinologists, others can involve the endocrinology system even though they don't originate there. In these cases, the endocrinologist may work with an internist, primary care physician or a specialist in another discipline to coordinate the patient’s follow-up care.

In order to become an endocrinologist, one must first complete medical school, advanced training during three to four years of a residency program, and a minimum of two years', but often three years', further sub-specialization in a fellowship before seeking required certification from the American Board of Internal Medicine.

Because endocrinology encompasses so many conditions and diseases, there is great demand from patients for information. For that reason, the American Association of Clinical Endocrinologists (www.aace.com) and its educational, scientific and charitable arm, the American College of Endocrinology (ACE), have created an in-depth patient information website which features educational materials covering a broad range of endocrine conditions; a “Find an Endocrinologist” feature where the public can locate endocrinologists by geographic region and/or specialty; valuable tips on how to charge of your health; and online issues of this magazine. Visit www.empoweryourhealth.org to learn more about endocrine conditions or www.aace.com to learn more about endocrinologists and AACE, the world’s largest association of clinical endocrinologists, with over 7,000 members in the U.S. and abroad.
Anatomy of the Endocrine System
(Continued from page 7)

adrenals and reproductive glands). It also produces hormones that stimulate the growth of bones and tissues, affect sexual development, encourage reabsorption of water by the kidneys and even trigger uterine contractions during and after labor.

**Pineal body (pineal gland)**
Located deep in the center of the brain, the pineal gland is involved in several body functions, including secretion of the hormone melatonin, which helps maintain a person’s wake/sleep cycles and regulate reproductive hormones and the conversion of nervous system signals to endocrine signals.

**Pancreas**
Located in the abdomen, the pancreas is both a digestive organ and an endocrine gland. The “islets of Langerhans” are the regions of the pancreas that contain its hormone-producing cells. The two primary endocrine functions of these cells are to keep the body supplied with fuel for energy by maintaining a steady level of the glucose (sugar) in the bloodstream with the hormones insulin and glucagon and to help in food digestion by secreting digestive enzymes.

**Parathyroid glands**
Each the size of a grain of rice, the body’s four parathyroid glands have a very rich blood supply, which comes in handy since they monitor the calcium level in the blood. Calcium is the element that allows the normal conduction of electrical currents along nerves—it’s how our nervous system works, how one nerve ‘talks’ to the next, and is the primary element which causes muscles to contract. As blood filters through the parathyroids, they detect the amount of calcium and make more parathyroid hormone (PTH) when calcium levels are too low. Once the PTH is released, it circulates to the cells of the bones and causes them to release calcium into the bloodstream. When calcium levels are too high, the parathyroids make less PTH or cease producing it until normal levels are restored. The parathyroids also help the lining of the intestines become more efficient at absorbing calcium in the diet.

**Thyroid gland**
The butterfly-shaped thyroid takes iodine and converts it into two hormones (T3 and T4), which are transported throughout the body and enter cells to regulate blood pressure, body temperature, heart rate, metabolism and how the body reacts to other hormones. The thyroid gland also produces calcitonin, which stimulates bone cells to add calcium to bone, as well as regulating calcium metabolism.

**Ovaries**
The ovaries, the female gonads, have two main reproductive functions in the body: they produce oocytes (eggs) for fertilization and the reproductive hormones estrogen and progesterone. Estrogen is involved in the development of female sexual features such as breast growth, the accumulation of body fat around the hips and thighs, and the growth spurt that occurs during puberty. Both estrogen and progesterone are also involved in the regulation of the menstrual cycle and prepare the lining of the uterus for pregnancy in the event of the released egg being fertilized.

**Testes**
The testes, also known as testicles or male gonads, have two functions: to produce sperm and to produce hormones, particularly testosterone, which regulate body changes associated with sexual development, including enlargement of the penis, the growth spurt that occurs during puberty, and the appearance of other male secondary sex characteristics such as deepening of the voice, growth of facial and pubic hair, and the increase in muscle growth and strength.

*Editor’s Note: This article was originally published in the Summer 2013 issue of EmPower Magazine. Due to popular demand, we are reprinting it here in its entirety. If you’re interested in receiving a poster version of this article, please email: mgreen@aaec.com.*
Polycystic (pah-lee-SIS-tik) ovary syndrome, commonly known as PCOS, is the most common endocrine condition in females of reproductive age, affecting as many as one out of 10 in the U.S.

Commonly known as PCOS, the syndrome was first discovered in 1935 by American gynecologists Dr. Irving Stein and Dr. Michael Leventhal, from whom its original clinical name of Stein-Leventhal syndrome was taken. But despite its prevalence, there is still a significant amount of misunderstanding and confusion surrounding PCOS.

Even though the name suggests that the ovaries are central to pathology of the disease, cysts are not a cause of PCOS, but rather a symptom. And it is not simply a gynecological disorder impacting a woman’s reproductive system. It can also affect hormones, sugar metabolism, lipids (blood fats) and blood vessels.

For some women, PCOS symptoms emerge shortly after they begin menstruating. Others may not show signs of the disorder until later in life, or after substantial weight gain. And many are unaware they have PCOS and don’t receive a diagnosis until they are struggling to get pregnant. In fact, PCOS is the most common cause of infertility in women of child-bearing age.

Although PCOS is believed to be genetic, the exact genes and patterns of inheritance are not clear.

There is currently no single, simple test for diagnosing PCOS. Physicians look for a variety of symptoms, some of which are manifested in appearance. Among the physical clues that PCOS may be present are excessive facial and/or body hair, a condition known as hirsutism; acne; patches of thick, darkened skin on the neck, groin, underarms, or skin folds (a condition called acanthosis nigrican); loss of scalp hair; skin tags, which are small, soft flaps of skin that resemble tiny, extended fingers; and weight gain, particularly around the middle section of the body.

Additional symptoms include irregular or absent menstrual periods, elevated cholesterol, high blood sugar and recurring pregnancy loss.

If you are suspected of having PCOS, your physician may use a diagnostic tool such as an ultrasound to determine if your ovaries are enlarged and contain numerous small cysts (polystic) located along the outer edge of each ovary that often resemble a string of pearls. However, this test is not absolutely necessary, as the ovaries may not look abnormal, and having ovarian cysts does not mean that you have PCOS.

Hormone testing may also be used to determine if you have elevated levels of the male hormone testosterone; elevated luteinizing hormone, which stimulates ovulation and is involved in the production of estrogen; normal-to-low follicle-stimulation hormone (FSH) levels; and an elevated level of prolactin, which can interfere with ovulation and decrease fertility. Testing cholesterol, triglycerides and blood sugar is also part of a thorough evaluation.

Not all women with PCOS have all of the medical problems associated with the syndrome. Each person may have a different combination of symptoms. In addition, other conditions may cause some of these health issues, which is why PCOS can sometimes be difficult to diagnose. Your doctor also will try rule out other possible causes for your symptoms.

PCOS cannot be cured, but it can be treated. Treatment depends on the patient’s age and the severity of symptoms. For teenagers concerned with the acne and facial hair that can accompany PCOS, medications such as birth control pills can decrease production of androgen hormones (which stimulate or control the development and maintenance of male characteristics), while others can reduce their impact. Women with irregular periods will be prescribed medication to help regulate their periods and help shedding of the uterus lining to prevent build up, which decreases the risk of uterine cancer. For women trying to conceive, medications to help ovulation will usually be needed, but not always. Women who are menopausal should discuss with their physician the benefits and risks of hormone replace treatment to treat the PCOS.

The condition can lead to an increased risk of some serious long-term health issues such as diabetes and cardiovascular disease, so it’s important to get the right diagnosis and treatment. Diabetes is four times more likely to develop in a PCOS patient, especially is there is a family history of diabetes. Also, the risk of developing high blood pressure and certain lipid abnormalities—which increase the likelihood of a heart attack or stroke—require that blood pressure and cholesterol be routinely monitored.

A good first step after diagnosis is to lose weight, which can help restore hormone balance. With proper lifestyle changes and treatment, you can help improve most of your symptoms and reduce the chance of developing health issues related to PCOS.

For additional information on PCOS, as well as other endocrine system disorders, visit www.empoweryourhealth.org.
How To Minimize Diabetes-Related Kidney Damage

By Maamoun Salam, MD

If you have diabetes, you have no doubt been told that diabetes can damage your kidneys and may even cause kidney failure. Exactly how does higher-than-normal blood sugar cause kidney damage? Does this happen to everyone or just some people? Are you at risk? What are the effects? These are some of the many questions that may come to mind AFTER you leave the doctor’s office. We’ll try to address your concerns in this article.

First and foremost, let’s define what the kidneys do. Kidneys are the master regulators of fluid volume in the body, excreting more or less urine as needed to keep the rest of the body hydrated with fluid, but not overloaded. Kidneys also regulate all of the different salts in the body, excreting or holding onto sodium, potassium, chloride and others to keep the blood levels in a very narrow range. Kidneys excrete many byproducts of the body’s metabolism, and filter out toxins as needed. In addition, kidneys help to regulate blood pressure and produce a hormone called erythropoietin that signals the bone marrow to make red blood cells. In addition, kidneys also regulate calcium, phosphorus and vitamin D, which are essential for bone integrity.

When kidneys fail, all of these functions are affected, and individuals can become very ill and even die if proper steps are not taken. Dialysis corrects some of the problems, such as fluid and salt regulation, and also eliminates toxins. However, erythropoietin is still lacking and may need to be taken separately as a medicine to treat low red blood cell counts seen in kidney failure. Blood pressure needs to be controlled, and additional measures may be needed to ensure bone health. Kidney transplantation corrects these additional problems, but requires medications to prevent rejection. Clearly, kidney failure is a devastating event in a person’s life.

Diabetes is a major risk factor for kidney disease, and the leading cause of new cases of kidney failure. Kidney failure from diabetes takes years to develop, and kidney problems can be identified far in advance in most cases. Thus, there are many steps that can be taken to keep you and your kidneys healthy. Here are some suggestions:

Get the SCREENING TESTS.

Kidney damage from diabetes is identified by one of two types of tests:

- Albumin in your urine. This is also known as microalbuminuria or proteinuria. The test is done on a urine sample. It is important that you are not sick when your urine is tested, that you do not have a urinary tract infection and, for women, that you are not menstruating. All of these can falsely elevate the test result. You should have this test done every year and more often if there has been a significant change in either the prior test or your health. Albumin in the urine is a
very early indicator of kidney damage and appears years before any of the kidney functions are affected. It serves as a warning sign that there could be problems in the future.

- Creatinine is tested in blood samples and is commonly done as part of chemistry blood panels. Kidneys clear creatinine from blood and excrete it into the urine. Depending on your age, a plasma or serum creatinine of 0.7 – 1 milligrams per deciliter (mg/dL) would indicate normal kidney function, while a creatinine of >1.5 mg/dL clearly signals reduced kidney function. Your creatinine level, along with your age, sex and race can be entered into a formula to obtain an estimated glomerular filtration rate, or eGFR. That number tells your physician how well your kidneys are performing the filtering function. A normal eGFR is >90 ml/min/1.73m2, a slightly reduced eGFR is 60 – 90 ml/min/1.73m2, and definite kidney dysfunction is noted at an eGFR of <60 ml/min/1.73m2.

Chronic kidney disease, or CKD, is the term applied to persistent kidney problems, which is what we see in diabetes. CKD is divided into stages, which are listed in the table to the right. As kidney function declines, you may move from stage 1 or 2 to stage 3 or 4. You should be referred to a kidney specialist, a nephrologist, before you reach stage 4. CKD can progress into end-stage renal disease (ESRD) that requires dialysis.

What can be done to prevent kidney disease in diabetes? There are very definite steps that you can take to prevent or slow the progress of kidney disease. Here are a few suggestions:

- Keep your HbA1c (a measure of your average level of blood sugars in your body over the past three months) less than seven percent. Since high glucose – blood sugar – is the main driver for eye and kidney complications from diabetes, maintaining good-to-excellent control of your diabetes is the single best long-term strategy. If your HbA1c is as high as nine percent, your risk of kidney complications doubles compared to an HbA1c of seven percent.

- Keep your blood pressure less than 140/98. Some guidelines suggest an even better number to shoot for is <130/80mmHg. High blood pressure is a secondary driver of kidney disease, and very high blood pressure can cause kidney damage even without diabetes. Blood pressure readings fluctuate, which causes a lot of confusion, however it is the blood pressure taken during your medical appointment that matters when it comes to the risk of kidney disease. If you have high blood pressure, you may want to check it at home between doctor visits or at the drug store if an automated cuff is available.

- Take a blood pressure medication that is either an ACE inhibitor, which is a pharmaceutical drug used primarily for the treatment of hypertension and congestive heart failure, or ARB, a medication that dilates the blood vessels, thereby reducing blood pressure. Your doctor will typically prescribe one of these drugs if your blood pressure is even a bit high or if you show signs of albumin in your urine. Long-term use of an ACE inhibitor or ARB reduces your risk of developing albumin in your urine and slows progression of loss of kidney function.

- Stop smoking! If you smoke, please make efforts to stop. We don’t completely understand how smoking affects your kidneys, but smokers are at much higher risk of kidney complications than non-smokers.

- Diet is important. Lose weight if you are carrying extra pounds. This reduces the burden on your kidneys and may prolong their life and your life if you have diabetes. Increase the amount of vegetables that you eat, and keep portions of proteins, especially red meats, and carbohydrates to a somewhat lower than usual level. Also, work hard to lower your salt intake.

Staying healthy with diabetes is a big job. It takes a lot of work and requires that daily attention be paid to many details, such as taking medications and eating the right foods. There are many, many things that can trip you up....time pressures, financial pressures and social pressures. Doctors, nurses and educators know this, so don’t feel guilty. Just make an incremental effort to manage your health and fit diabetes into your life in such a way that you can keep up with all of the demands over the long term. We’re honored to be a part of your life and health.
Metformin is one of the oldest and most commonly prescribed blood sugar-lowering drugs used in the treatment of diabetes mellitus. Approximately 120 million diabetes patients worldwide are treated with this drug. The active ingredient in metformin (a derivative of a substance called guanidine), extracted from the French lilac plant (Galega officinalis), had been used for centuries by European medical practitioners to treat diabetes along with multiple other conditions such as plague, worms, bites, chorea, or urinary infections.

Metformin is usually the first medication started (along with lifestyle interventions) after a diagnosis of type 2 diabetes, the diabetes that occurs when insulin does not work as well as it should, and includes a progressive loss of insulin production and release from the pancreas over time. Most patients tolerate metformin well, with the most common side effects relating to the gastrointestinal system (bloating, nausea and diarrhea). These possible side-effects are usually mild and often resolve with time or a simple dose adjustment.

Metformin also is known to reduce possible cardiovascular complications of diabetes such as heart attacks or strokes, the number-one killer of patients with type 2 diabetes.

Long-term use of metformin can, however, lead to vitamin B12 (cobalamin) deficiency. Vitamin B12 plays a vital role in several chemical reactions inside the human body that are critical for DNA synthesis and amino (part of protein) and fatty acid (part of cholesterol) metabolism. A study from France reported that in about one in 20 cases of vitamin B12 deficiency, metformin is the main cause. Up to one-third of patients treated with metformin can experience decreased vitamin B12 absorption from the gut, which, with time, can result in lowering of the blood level of this vitamin. This problem is more likely with prolonged use of metformin, higher doses taken and in older individuals.

A small, but detectable, decrease in the blood level of vitamin B12 happens early during treatment with metformin (three to four months after initiation), but it usually takes much longer (5 to 10 years) for the level to drop below the normal value and result
in symptoms. This is because our bodies store a large amount of vitamin B12 in the liver (around 2,500 micrograms), while we only use 1 to 2 micrograms per day. The main natural source of vitamin B12 is from what we eat, mainly animal products such as meat, fish, eggs, and dairy (vitamin B12-fortified foods include cereals, yeasts, or tofu), and most people eating a general diet get enough of vitamin B12 in their food to meet the recommended daily adult allowance of 2.4 – 2.8 micrograms in their food.

Calcium supplementation seems to reduce this effect of metformin – in some patients, it may prevent the problem from getting worse, but it will not restore the level of vitamin B12 to normal.

Vitamin B12 deficiency can lead to many hematological (blood) and neurological problems. It could also result in bowel irregularities, weaken the immune system, and lower bone mineral density (osteoporosis). Often, only one symptom may be present. The classic blood finding is a condition called megaloblastic anemia (with a complete blood count – CBC – showing a low hemoglobin, the protein in red blood cells that carries oxygen throughout the body, and a large red cell size). Sometimes, patients will have other blood abnormalities such as abnormal white blood cell appearance (described as hypersegmented neutrophils), or pancytopenia (a combination of low hemoglobin, low white blood cells and low platelets). The neurological symptoms include mild numbness and tingling in the feet (peripheral neuropathy), muscle weakness, decreased vision, balance problems, loss of bowel or urine-holding control, chronic fatigue, psychiatric symptoms (depression, psychosis), or memory problems. The symptoms of peripheral neuropathy due to vitamin B12 deficiency can mimic those of diabetes-associated nerve damage.

Checking for vitamin B12 deficiency starts with a simple blood test. Deficiency is unlikely when the level is above 300 picograms per liter (pg/mL). In some laboratories, this will be equivalent to above 221 picomoles per liter (pmol/L), but is possible when the level is borderline, between 200 and 300 pg/mL (148 – 221 pmol/L), and is confirmed when the level is below 200 pg/mL (below 148 pmol/L). Additional blood tests can be done for those with borderline results and those with neurological symptoms that are difficult to explain, as these individuals may be experiencing vitamin B12 deficiency on the cellular level and will benefit from treatment, but their blood vitamin B12 remains relatively “normal.” These additional tests include homocysteine and methylmalonic acid. Both values will be elevated in vitamin B12 deficiency.

This evaluation should be accompanied by a review of medical conditions, medications and personal habits in order to exclude other causes for these elevated values. Patients taking metformin who test positive for vitamin B12 deficiency also need to be evaluated for other common causes of low vitamin B12: pernicious anemia, food-cobalamin malabsorption syndrome (the most common cause), very strict vegetable-based diets, stomach/small bowel/pancreatic abnormalities, certain medications (some antibiotics, acid reducers, colchicine) and parasites.

While discontinuing metformin may be advised in severe cases of metformin-induced vitamin B12 deficiency, metformin can be continued in most patients who are receiving adequate vitamin B12 replacement. Typically, vitamin B12 replacement is given in the form of an injection (either intramuscular or deep subcutaneous, i.e., under the skin) of 1,000 micrograms of cyanocobalamin (a form of vitamin B12) initially daily for a week, followed by weekly for a month, and sometimes continued monthly for life. There are many protocols available, and some clinics may use different doses and schedules.

In mild cases of vitamin B12 deficiency, or in patients who cannot tolerate shots, oral vitamin B12 replacement (with cyanocobalamin) can be used. Very high doses are usually given, typically 1,000 to 2,000 micrograms a day. Many patients will start with the injectable form, and, after their vitamin B12 level is back to normal, will convert to the oral form. A nasal spray and sublingual (under the tongue) tablets of cyanocobalamin are also available and approved for treatment. Other formulations containing different forms of vitamin B12 (methylcobalamin, hydroxocobalamin, adenosylcobalamin) are not officially approved for treatment of vitamin B12 deficiency.

Vitamin B12 replacement will reverse hematological abnormalities within days to weeks, will stop – but not completely reverse – further progression of nerve damage, and improve neurological and psychiatric symptoms within several months. Vitamin B12, homocysteine, methylmalonic acid and hematological studies (CBC) should be monitored during and after treatment.

Many experts recommend evaluating patients for vitamin B12 deficiency at the time metformin is begun, followed by every one to 2 years while on metformin therapy. Others even suggest a once-yearly injection of 1,000 micrograms of vitamin B12 as an alternative to testing. All patients should also be screened for distal neuropathy beginning at the time of diagnosis of type 2 diabetes, followed by at least yearly re-evaluation – this can not only diagnose diabetic neuropathy, but will identify other polyneuropathies, including that of metformin-induced vitamin B12 deficiency.
What is diabetes?

There are three main types of diabetes:

- **Type 1 diabetes** – Your body does not make insulin. This is a problem because you need insulin to take the sugar (glucose) from the foods you eat and turn it into energy for your body. You need to take insulin every day to live.

- **Type 2 diabetes** – Your body does not make or use insulin well. You may need to take pills or insulin to help control your diabetes. Type 2 is the most common type of diabetes.

- **Gestational (jest-TAY-shun-al) diabetes** – Some women get this kind of diabetes when they are pregnant. Most of the time, it goes away after the baby is born. But even if it goes away, these women and their children have a greater chance of getting diabetes later in life.

You are the most important member of your health care team.

You are the one who manages your diabetes day by day. Talk to your doctor about how you can best care for your diabetes to stay healthy. Others who can help are:

- dentist
- diabetes doctor
- diabetes educator
- dietitian
- eye doctor
- foot doctor
- friends and family
- mental health counselor
- nurse
- nurse practitioner
- pharmacist
- social worker

How to learn more about diabetes.

- Take classes to learn more about living with diabetes. To find a class, check with your health care team, hospital, or area health clinic. You can also search online.

- Join a support group — in-person or online — to get peer support with managing your diabetes.

Take diabetes seriously.

You may have heard people say they have “a touch of diabetes” or that their “sugar is a little high.” These words suggest that diabetes is not a serious disease. That is not correct. Diabetes is **serious**, but you can learn to manage it.

People with diabetes need to make healthy food choices, stay at a healthy weight, move more every day, and take their medicine even when they feel good. It’s a lot to do. **It’s not easy, but it’s worth it!**

Why take care of your diabetes?

Taking care of yourself and your diabetes can help you feel good today and in the future. When your blood sugar (glucose) is close to normal, you are likely to:

- have more energy
- be less tired and thirsty
- need to pass urine less often
- heal better
- have fewer skin or bladder infections

You will also have less chance of having health problems caused by diabetes such as:

- heart attack or stroke
- eye problems that can lead to trouble seeing or going blind
- pain, tingling, or numbness in your hands and feet, also called nerve damage
- kidney problems that can cause your kidneys to stop working
- teeth and gum problems
What can you do to help prevent type 2 diabetes?

If you're at risk for type 2 diabetes, you can take steps to help prevent or delay the disease by

• losing weight if you’re overweight
• eating fewer calories and focusing on healthy foods such as whole grains, lean meats, and fruits and vegetables
• getting active if you’re inactive, or increasing the amount of physical activity you do
• talking with your doctor about any of the health problems listed above that may need treatment to manage them
• asking your doctor about any medicines you take that might increase your risk, such as steroids

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) at the National Institutes of Health has information about diabetes and related health conditions at www.niddk.nih.gov. You also can follow the NIDDK on Facebook at Facebook.com/NIDDKgov and on Twitter at twitter.com/NIDDKgov.


Talk to your health care team about how to manage your A1C, Blood pressure, and Cholesterol. This can help lower your chances of having a heart attack, stroke, or other diabetes problems.

A for the A1C test (A-one-C).

What is it?
The A1C is a blood test that measures your average blood sugar level over the past three months. It is different from the blood sugar checks you do each day.

Why is it important?
You need to know your blood sugar levels over time. You don’t want those numbers to get too high. High levels of blood sugar can harm your heart, blood vessels, kidneys, feet, and eyes.

What is the A1C goal?
The A1C goal for many people with diabetes is below 7. It may be different for you. Ask what your goal should be.

B for Blood pressure.

What is it?
Blood pressure is the force of your blood against the wall of your blood vessels.

Why is it important?
If your blood pressure gets too high, it makes your heart work too hard. It can cause a heart attack, stroke, and damage your kidneys and eyes.

What is the blood pressure goal?
The blood pressure goal for most people with diabetes is below 140/90. It may be different for you. Ask what your goal should be.

C for Cholesterol (ko-LESS-tuh-ruhl).

What is it?
There are two kinds of cholesterol in your blood: LDL and HDL. LDL or “bad” cholesterol can build up and clog your blood vessels. It can cause a heart attack or stroke. HDL or “good” cholesterol helps remove the “bad” cholesterol from your blood vessels.

What are the LDL and HDL goals?
Ask what your cholesterol numbers should be. Your goals may be different from other people. If you are over 40 years of age, you may need to take a statin drug for heart health.

Step 2: Know your diabetes ABCs.

Why is it important?
If your blood pressure gets too high, it makes your heart work too hard. It can cause a heart attack, stroke, and damage your kidneys and eyes.

Step 3: Learn how to live with diabetes.

Eat well.

• Make a diabetes meal plan with help from your health care team.
• Choose foods that are lower in calories, saturated fat, trans fat, sugar, and salt.

Be active.

• Set a goal to be more active most days of the week. Start slow by taking 10 minute walks, 3 times a day.

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· Twice a week, work to increase your muscle strength. Use stretch bands, do yoga, heavy gardening (digging and planting with tools), or try push-ups.
· Stay at or get to a healthy weight by using your meal plan and moving more.

**Know what to do every day.**
· Take your medicines for diabetes and any other health problems even when you feel good. Ask your doctor if you need aspirin to prevent a heart attack or stroke. Tell your doctor if you cannot afford your medicines or if you have any side effects.
· Check your feet every day for cuts, blisters, red spots, and swelling. Call your health care team right away about any sores that do not go away.
· Brush your teeth and floss every day to keep your mouth, teeth, and gums healthy.
· Stop smoking. Ask for help to quit. Call 1-800-QUITNOW (1-800-784-8669).
· Keep track of your blood sugar. You may want to check it one or more times a day. Use the card at the back of this booklet to keep a record of your blood sugar numbers. Be sure to talk about it with your health care team.
· Check your blood pressure if your doctor advises and keep a record of it.

**Talk to your health care team.**
· Ask your doctor if you have any questions about your diabetes.
· Report any changes in your health.

**Step 4: Get routine care to stay healthy.**

See your health care team **at least twice a year** to find and treat any problems early.

**At each visit, be sure you have a:**
· blood pressure check
· foot check
· weight check
· review of your self-care plan

**Two times each year, have an:**
· A1C test. It may be checked more often if it is over 7.

**Once each year, be sure you have a:**
· cholesterol test
· complete foot exam
· dental exam to check teeth and gums
· dilated eye exam to check for eye problems
· flu shot
· urine and a blood test to check for kidney problems

**At least once in your lifetime, get a:**
· pneumonia (nu-mo-nya) shot
· hepatitis B (HEP-uh-TY-tiss) shot

This content is provided as a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), part of the National Institutes of Health. The NIDDK translates and disseminates research findings through its clearinghouses and education programs to increase knowledge and understanding about health and disease among patients, health professionals, and the public. Content produced by the NIDDK is carefully reviewed by NIDDK scientists and other experts.
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