**10 Things to Know About Aging!**

Take-Home Notes

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General Overview:

Aging does not mean Frail! Just like playing soccer increases your risk of a leg injury, aging increases your risk of disease and frailty, but not everyone who is getting older is frail, and there are things you can do to decrease your risk of frailty!

Homeostenosis and Frailty:

Our bodies are always trying to maintain an inner balance, called “homeostasis,” that helps us “bounce back” after injuries or diseases. As we get older, our ability to maintain this balance decreases, and this is called “homeostenosis.” This means that the same injury that we easily recovered from when we were young will be much harder to recover from when older. This also means that it takes less of an “insult” to injure us or make us sick. For example: if you sprain your ankle at age 13, you’ll probably be better in a few weeks, but if you sprain your ankle when you’re 80, it may take a year for you to recover.

Frailty is when your ability to “bounce back” is so impaired that the least little thing will cause severe disability, and you go through life with low energy, poor appetite, weakness, unintended weight loss, and general physical debility. This increases your risk of hospitalization and death and is very concerning.

Musculoskeletal changes with age:

Muscle:

You lose muscle at the rate of about 1% per year over the age of 30. You have fewer mitochondria, which are the parts of the muscle cells that generate energy, and you have less ability to repair muscles. When you lose muscle, your body replaces it with fat. By exercising regularly, you can re-build some of this muscle and help prevent fat gain. You also want to make sure you get some protein with every meal in order to help build muscle.

Joints:

Believe it or not, arthritis is not normal aging! Normal aging joints have decreased padding between the bones, called cartilage, mostly because the cartilage gets dry and stiff. However, you generally have the same amount of rubbery fibers, called collagen, in the cartilage. Just like in the muscle, you have less ability to repair damaged cartilage. This is also true of the connections between bones, called ligaments, and the connections between muscle and bone, called tendons.

In arthritis, we actually see an increase in the size of cartilage in the joints, but it’s not good quality cartilage. Instead, it’s over-hydrated, very delicate, and easily irritated, with decreased collagen, so it’s weaker than normal cartilage. The cells that normally help repair cartilage turn destructive, and this causes inflammation which erodes into the underlying bone and leads to pain and deformity. We’re not really sure why some people get arthritis and others don’t. We also don’t know why some people have more pain from their arthritis and others don’t.

Bones:

Bones undergo a normal process of turnover all the time. You have two types of main bone repair cells, osteoclasts and osteoblasts. Your bones experience lots of small traumas every day as you go about your routines. Normally, osteoclasts find these little areas and drill them out, so that osteoblasts can come along and fill them in with new bone (much like a dentist drills out a cavity and fills it in with dental cement). As you get older, the osteoblasts start to slow down, but the osteoclasts keep going so you get more “drilling out” to “filling in.” If this process gets too far out of balance, you have dangerously porous bones, called “osteoporosis.” Osteoporosis increases your risk of falls and fractures. This is always concerning because over 33% of people over the age of 60 fall every year, and breaking a hip in a fall has a one-year death rate of 20% and a 50% risk of never returning to your normal state of health. This is why treating osteoporosis is so important! Daily exercise also stimulates your osteoblasts to work harder and repair your bones better, so this is also important.

As you get older, your body’s ability to make Vitamin D (which happens in the skin after sun exposure) decreases. Vitamin D helps you absorb calcium from your food, which you need for bone health, so getting enough Vitamin D and calcium in your diet is important. There are many differing opinions on how much Vitamin D and calcium to get, but the best evidence we have so far suggests that 1000 units (25 mcg) of Vitamin D is a safe and helpful daily supplement. You should get about 1,200 mg of calcium every day, but it’s best if you can get this from food. Most dairy products contain about 300 mg of calcium per serving. Other good calcium sources include dark green leafy vegetables (spinach, kale), salmon, canned fish, figs, walnuts, and black-eyed peas.

Vision:

As you get older, you lose muscle strength in your eye (just like everywhere else). We don’t usually think about the eye having muscle, but this is what controls the size of your pupil to let light into the eye. Pupils get smaller with age, and they have a harder time changing size. This means that most older people require more light to see well, and have a harder time changing focus from near objects to far away objects (and vice versa). Inside the eyeball is a fluid called “vitreous” which looks sort of like a raw egg white. As you get older, you get more bits of protein in this fluid, which can cause occasional “floaters” across your vision. However, if you get lots of floaters suddenly, you need to get your eyes checked. In the back of the eye is the retina, which is the part of the eye that actually “sees” the lines and colors of things you look at. Rods are the special cells that detect black & white vision and cones are the special cells that detect color vision. You lose some of these as you get older, so you cannot see as many variations of color, and have a harder time seeing the contrast between colors, or even shades of gray. Finally, as you age, you have more difficulty with depth perception and decreased peripheral vision. This is particularly important for driving. When older people are involved in car accidents, it is most likely to occur at an intersection when the person is making a left-hand turn, as that’s when all of your visual skills are needed to monitor for safety. Other dangerous situations include gray rainy days and twilight, as those are situations where there isn’t a lot of light or contrast. Very bright sunny days can also cause a lot of glare, so make sure to wear your sunglasses! I also recommend seeing an optometrist annually for a thorough eye exam. You usually don’t need an ophthalmologist unless something is wrong.

Hearing:

Believe it or not, your ears actually do get bigger with age (and grow more hair)! This makes getting ear wax out harder, which can cause itching and hearing problems. Inside the ear, you have a decrease in the supportive structure of the ear canal, so the canals get smaller, and the tube that drains the excess fluid from your ear to your nose, called the eustachian tube, collapses more easily, so you are more prone to having “plugged up ears” from allergies or a cold. There are two key structures in the ear involved in hearing: the tympanic membrane and the hair cells. The tympanic membrane is like the head of a drum – it lies across your ear canal and as sound enters, it vibrates. Those vibrations are conducted into the inner ear, where the hair cells respond by bending and causing an electrical signal to go to your brain. The pattern of vibration and bending determines what sort of electrical signal is sent, and tells your brain what you’re “hearing.” Hair cells are easily damaged by loud noises and poor blood flow, so often as we age, we lose many of them. Additionally, the tympanic membrane gets stiffer, and vibrates less. This causes something called “presbycusis,” or age-related hearing loss.

While we’re not exactly sure why, hearing loss leads to about 9% of dementia, and correcting hearing loss can decrease your risk! While they take some getting used to, hearing aids are the best way of improving hearing loss. They can be expensive, but fortunately will be over-the-counter soon. There are other devices, called “personal amplification devices” that can also help and usually cost much less.

Finally, the inner ear acts like a carpenter’s level and helps control balance. Just like in the eye, the fluid in the inner ear can get little protein crystals in it (called otoliths), that cause turbulence in the ear canal fluid. This is a main cause of “positional vertigo,” or the type of vertigo that happens when you sit up or stand up. Often the best treatment for this is to learn exercises (called Epley maneuvers) that will shake the crystals out of the fluid.

Side Effects:

One of the things many older people notice is that they are more prone to getting side effects from their medications. Also, something that I am always looking for is how an older person’s body handles medications, as if they are not handled quickly, they can build up and cause trouble.

There are two main processes involved in how your body deals with medications (or any substances, including supplements, alcohol, etc).

Pharmacokinetics is how your organs break down medications to get them out of your body. This is mainly done by the liver and the kidneys. You lose kidney cells with age, so by the time you’re in your 80s, you’ve lost 30-50% of your kidney cells. This means that your remaining kidney cells have to work harder to keep your kidney function normal. Many older people have “normal kidney labs” but because that represents the extra effort of your remaining kidney cells, it doesn’t take much to cause kidney injury – even mild dehydration can be a problem. The liver is pretty tough, but even this starts to slow down with aging, so it can take longer to break down medications. This means that the effects of some medications will last longer.

Pharmacodynamics is how a medication directly affects your body. This includes how soon it starts working, how much it does, and how long it lasts in the body. Much of this has to do with how much water and fat your body has in it. As we age, we lose muscle, and this is replaced with fat. That means there’s more space for medications that dissolve into fat easily to spread throughout the body. As most of the “active” role of medications happens when they are dissolved in blood, not fat, this means that it can take longer for a medication to take effect as you have to “fill up” the fat first before you have enough in the blood to work. This also means that medications take longer to leave the body, as they have to be pulled out of storage in the fat to be processed by the kidney and the liver. Some medications last three times longer in an older person than in a younger person. This is especially true of anything that affects the brain, such as sedatives, anesthesia, anti-depressants and anti-psychotics.

Your brain becomes more vulnerable to the effects of medications as you get older. We all have a lining around our brains called the “blood-brain barrier.” This keeps out infections, toxins, and many medications. As we get older, the blood-brain barrier gets leakier, which leads to increased risk of infection and toxins getting in, but also to medications getting in and causing side effects like confusion, sleepiness, balance problems, and even hallucinations. This is especially true of a class of medications called “anticholinergics,” which is a large group of medications and includes almost all of the medications for overactive bladder, many of the anti-histamines (especially diphenhydramine), and motion sickness medications.

It's always a good idea to review your medications with your health care provider and ask the following questions:

* Can my condition be treated effectively without pills (and if so am I willing and able to make the changes in my lifestyle necessary to do so)?
* Am I taking a medication for a medical condition/symptom or am I taking it to control the side effect from another pill?
* Is there a time when the pill can be stopped or the dose decreased?
* What systems can I use to keep my pills organized and efficient so that I don’t risk double-dosing or missing a dose?

Skin:

As we age, the collagen and fat layer that support the skin decrease, which causes looser, wrinklier skin. In parts of the body where people have gotten a lot of sun exposure, this happens more. The small blood vessels in the skin, called capillaries, get stiffer, and since the supporting fat and collagen are gone, they are more prone to injury. Even the gentlest tap can cause bruising. The pigment cells of the skin, called melanocytes, start to decrease, and the remaining cells tend to get bigger. This can lead to small “blobs” of darker color, or “blobs” where there is no color, both called “age spots.” Additionally, sweat and oil glands decrease in number, so the skin gets drier and itchier. Like other places in the body, the repair system slows down and stops repairing some things, so you get more skin tags, little spots, and other small bumps. However, you can still help your skin stay healthy at any age by staying well-hydrated, wearing sunscreen, using lotion, and stopping smoking (which causes additional thinning of the skin and increased brittleness of blood vessels).

Intestines:

You have two main sections to your intestines: the small intestine and the large intestine (or colon). The small intestine is responsible for absorbing nutrients from the food you eat. While it has some decreased absorption ability with age, it generally does okay, though sometimes struggles with dairy products. The large intestine is in charge of both expelling all your digested food waste (aka stool) and absorbing the water you’ve used to digest your food back into the body and prevent dehydration. As you get older, you lose muscle and nerve cells in the colon, but the absorptive surface, called mucosa, stays the same. The nerves on your colon control how much stool it takes to make you feel like you need to have a bowel movement, so when there’s less of them, you have to have more stool in your colon to have the urge to defecate. As you lose muscle to the colon, it takes more straining to have a bowel movement. Finally, as the mucosa is working just fine but the stool is moving more slowly, your stool becomes drier and harder. The colon also has sensors for opiate medications, and these increase with age, which causes the gut to slow down even more. These changes are why most older people are constipated. If you have diarrhea as an older person, you should seek medical attention, as this is quite unusual.

To prevent constipation, it’s important to get plenty of water, but also eat foods or take supplements that will soften and bulk up your stool so it’s easier for your body to know when it’s time to have a bowel movement and get everything out without straining. Soluble fiber is the type of fiber that turns into a gel when water is added, and is found in foods like oatmeal, barley, apples, pears, prunes, and stone fruits. Insoluble fiber is fibrous and bulks up your stool, and is found in foods like bran, leafy or stringy vegetables, and beans. You need both types, and many people have to supplement with things like psyllium, methylcellulose, polycarbophil, or polyethylene glycol. Regular exercise can also help your guts move, so a daily walk can help you have a good daily bowel movement.

Bladder and Urinary Tract:

Like other muscles in the body, the bladder gets weaker and stiffer with age. This includes the bladder itself, which holds and pushes out the urine, and also the little valves that keep urine from leaking out all of the time. Additionally, the bladder gets a little smaller with age, and has an increased tendency to have spasms, which cause urine to push against the weaker valves and sometimes leak out.

Men have an organ called the prostate, which is generally in charge of producing the fluid in which sperm are carried out of the body. However, with age, the prostate starts to enlarge (though it doesn’t make more fluid, in fact, it often makes less) and this causes compression on the urethra, which the tube that empties the bladder. This pressure causes difficulty getting the urine stream started, slower urine stream, and incomplete emptying of the bladder.

If you think you’re urinating more at night with age, you’re right! Your brain produces hormones for all sorts of things, and one of them is called “ADH” or anti-diuretic hormone. This hormone tells your body not to make urine, to help you hold onto water when you need it. Like many hormones produced by the brain, it’s produced more at certain times of the day than others. These brain “clocks” tend to get a little off-course with aging. In the case of ADH, when you’re young, you make most of it at night, so that you make less urine while you’re sleeping. As you age, your brain puts out less ADH at night, so you make the same or even more urine while you’re sleeping as you do during the day. If you combine this with the smaller weaker bladder, this can mean a lot of trips to the bathroom at night! Finally, your brain has an area called the “micturition center,” which controls how much urgency you feel. This also tends to get a bit off with age, so you have less warning that you need to urinate than you do when you’re young.

To help your aging bladder, you can exercise the bladder muscles just like you would your other muscles! These exercises are called “Kegel exercises,” and involve flexing you urinary muscles just like you’re trying to stop in the middle of urinating, except you do them when you’re not using the bathroom. They work for both women and men, and in many cases are as effective as any of our medications (medications for prostate problems are different and Kegels cannot replace them). To perform them, you want to flex these urinary muscles, hold for a count of ten, then release, and the goal is to do 30-40 of them a day, though you don’t have to do them all at once.

Mood:

It sometimes feels like aging causes everyone to feel sad and depressed and this is just what you should expect. Fortunately, this is not true! There are some normal mood changes with age. It’s important and appropriate to allow yourself to grieve when needed during aging. It’s also common to have a harder time with change and transition, and to have uncertainty around your role, especially after retirement or once your kids are grown. I like to call this “existential malaise,” and it can take some time to develop new activities that provide you with a sense of purpose.

However, depression is not part of normal aging. Often, an older person who has depression doesn’t feel “sad” or tearful. Instead, they might feel more anxious or irritable (or grouchy), lose interest in activities, lose interest in eating, not be able to sleep, not be able to concentrate, be too exhausted to move, or develop strange pains that move around and have no clear cause or treatment. They may start neglecting themselves or losing weight. It can look a lot like dementia, as a person who can’t concentrate will appear to be forgetful. Other medical conditions can look like depression, such as sleep apnea, thyroid disease, and others, so it’s important to get a good medical evaluation if you notice changes in yourself or someone you care about. People who live in a facility, are in the hospital, have significant medical conditions, who have had a stroke or heart attack, or who are isolated are all at increased risk of depression.

Fortunately, treatment works! Like in a person of any age, mood medications work about half of the time. Therapy also works, and in combination with medication, works about 85% of the time. Yet again, exercise is also incredibly helpful, and multiple studies show that daily exercise works as well as medication and therapy for some people, though it takes longer to have an effect.

Memory:

There are some normal changes to the brain with aging. You should expect occasional and temporary lapses in memory. For example, it’s completely normal to walk into a room and forget why you went there. It’s also completely normal to take a long time to remember a word or someone’s name, something we call “tip of the tongue” phenomenon. You should expect a slower processing speed – it should take longer to learn a new skill or work your way through a problem. Multi-tasking, which is really just flipping between multiple tasks really quickly, also decreases significantly with aging. However, the knowledge you have and your vocabulary should stay stable or increase with time. Thus, while it may take you longer to remember a fact, the fact should still be in your brain.

When we talk about the brain changes of dementia, we often think of memory, but that’s only a small part of the brain function we call “cognition” (which is only part of what the brain does). Cognition has many parts, but the ones we tend to focus on are immediate memory (within seconds), delayed memory (minutes or longer), visuospatial skills (identifying and copying pictures and objects), language, attention/concentration, orientation (time, date, location), and executive function (navigation, judgment, reasoning). Any impairment in two of these areas that impacts your day-to-day function is called Major Neurocognitive Disorder, or dementia.

The most common form of dementia is Alzheimer’s disease, but there are many other forms, including vascular, Lewy Body, fronto-temporal, alcohol-related, and many more. Each has their own pattern of cognitive impairment and other effects, such as changes in balance, movement, or behavior.

Dementia is a really important condition to be aware of, as it is the 6th leading cause of death in the United States. Over 30% of people will develop dementia in their lifetime, and it causes significant suffering for both the person with dementia and everyone who cares about them.

There are lots of things you can do to reduce your risk of dementia. While you can’t make you’re risk zero, you can reduce your risk by up to 50%.

Controlling your medical conditions that cause damage to the blood vessels of the brain, like high blood pressure, heart disease, sleep apnea, and diabetes, is one big way to decrease your risk. Stopping smoking and only having one alcoholic drink a day are also good ways to lower your risk.

Additionally, yet again exercise is good for you. Regular aerobic exercise can cut your risk of Alzheimer’s by over 30%! The best exercise is the one that you can do consistently for 20-30 minutes most days of the week. Ideally, you want to be just short of breath enough that you can talk, but not sing. A recent study suggested that the ideal pace for walking is about 110-120 steps per minute, or just under 2 steps per second. You don’t have to do it all at once! Several small episodes of exercise throughout the day can add up to your 20-30 minutes and may even be better for you than one exercise episode (if you do nothing else all day). Sticking to a Mediterranean diet and keeping your brain active and social are also ways you can lower your risk of developing dementia. While there are many brain supplements on the market and many studies show they work well in mice, there are no supplements that have been shown to lower your risk of dementia.

Wisdom:

While there are many things that seem to be harder with aging, many studies show that older really can be wiser for many people. The aging brain is less prone to over-reacting and has an easier time putting events into context and determining what really matters. Additionally, older people tend to be more compassionate and understanding and have a better ability to deal with uncertainty than younger people. This can be developed and enhanced through regularly trying to imagine someone else’s viewpoint, meditating, and perhaps most importantly, talking to other people and asking them about their experiences and viewpoints (to get rid of something called the “egocentric bias”). Finally, older people are one of the key supports to our society and give more to charity and volunteer more than any other age group. Strong grandparent-grandchild relationships have been shown to decrease childhood mortality, improve grades, and decrease depression rates in both age groups. Therefore, while many things are harder with age, being older is important to everyone.

If you do nothing else, **START EXERCISING!!!!**