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Physical Activity for Managing Cardiometabolic Risk
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Physical activity for managing cardiometabolic risk. I am Ralph LaForge of Duke University Medical Center, Endocrine Division. I also serve as a consultant to the IHS Diabetes Division in Albuquerque.

Today we will be talking about, in this podcast, the definition of cardiometabolic risk, mechanisms how exercise can enhance cardiometabolic risk reduction, the new guidelines on energy expenditure from exercise for weight management versus cardiometabolic risk reduction. We will talk a little bit about the modes of exercise for cardiometabolic risk reduction as well as some new guidelines on serial anthropometric assessment measures to gauge changes in total body adiposity between visits. We will close with exercise screening standards, in other words, when and when not to use graded exercise testing with ECG prior to embarking upon an exercise program. There are slides that describe most of what we talk about in this podcast on the DDTP website, under Training.

Now, we will be talking about physical activity first as fitness per se. Fitness is more of a qualitative value for the result of being fit or physical activity, namely aerobic capacity is one of the principal measures of fitness. We are not going to particularly talk about aerobic capacity or fitness per se, we are really just going to talk about generalized physical activities executed in the moderate intensity range, just about any physical activity; whether they impact fitness in a great way or not. We will be coming back to this point several times throughout this podcast.

So one of the central themes for this cardiometabolic risk reduction with physical activity is that total weekly energy expenditure from physical activity is really the focal point of reducing cardiometabolic risk, rather than specifically intensive exercise; just total, weekly choleric expenditure. Epidemiologic studies generally show that as long as physical activities have sufficient volume in terms of calories per week, there is really no great difference between the form of physical activity, the type of physical activity you do, and its impact on reducing cardiovascular disease, diabetes, or even all-cause mortality.

However, it is true that if you execute physical activity regimens at higher and higher intensities, sometimes there is a greater benefit, but it comes with a greater risk of injury. So for that reason we are going to pretty much stick with moderate level intensity exercise. We will be defining moderate a little bit later, but I will go ahead and tell you, we really are talking about those particular intensive activities that lie between 40 and 60% of effort max. That is 40-60% of aerobic capacity is the range of exercise intensity we generally are going to be speaking to in this podcast.

Now, it's important to understand that physical activity works via multiple biologic mechanisms, many of which are non-inextricably tied to weight loss. For instance, the activity itself can stimulate metabolic enzymes, very similar to how diabetes meds work. Some of the nuclear

receptors in muscle tissue and in liver tissue and adipose tissue are stimulated with exercise. There are certain lipoprotein particles that are influenced by exercise, acute physical activity programs that are not necessarily reflected on a standard lipid profile, and there are other mechanisms by which exercise can reduce cardiometabolic risk and we will be discussing some of those.

Let's take a brief look at elevated blood lipids, since they are one of the characteristics of high cardiometabolic risk. Exercise is not generally considered primary therapy for elevated blood lipids, especially in the current era of lipid-altering drug therapy. This is quite unfortunate, because physical activity of appropriate quality and quantity can clearly reduce cardiometabolic risk through non-lipid mechanisms. Exercise can also induce significant favorable changes in the lipid and lipoprotein profile, partly as a result of moderate reductions in adiposity, but more so for the physical activity's direct effect on the lipoproteins.

For instance, if a patient is only able to add nine or ten miles a week, that is one or two miles a day of walking to their weekly activity regimen, they have essentially expended the same weekly energy expenditures as those who completed the diabetes prevention program with impressive results. Dr. William Kraus of Duke University is part of the Duke Stride Study, was among the first to show in a well-controlled trial published in the *'New England Journal of Medicine'* a few years back, comparing various weekly exercise volumes and intensities on lipids and lipoproteins that regular exercise with minimal weight change has broad beneficial effects on the lipoprotein profile, even without changes in total cholesterol and Friedwald predicted LDL cholesterol.

Dr. Kraus demonstrated that at moderate volumes and intensities, for instance walking about 12 miles a week at 40-55% of aerobic capacity, can significantly reduce LDL particle number as measured by NMR, when total cholesterol and Friedwald predicted LDL cholesterol remained unchanged. Such patients on a return clinic visit would be considered unresponsive to exercise therapy when a conventional lipid profile was used to score the patient's progress.

Numerous studies also show improved arterial endothelial function with exercise training. Endothelial dysfunction contributes to the initiation and progression of atherosclerotic disease, and improved arterial function is thought to be one of the primary mechanisms responsible for reduced cardiovascular disease morbidity and mortality. Numerous trials have demonstrated improvements in arterial endothelial function with sufficient exercise training.

Dietary factors can also affect arterial function. When postprandial triglyceride lipoprotein particles are significantly elevated, especially after a fat-rich meal, arterial walls are exposed to a variety of atherogenic lipoproteins and there is a transient reduction in arterial endothelial function. Single exercise sessions, for example, a 45-minute moderate pace walk, can significantly reduce postprandial triglyceride levels and improve arterial function. These are just some of the exercise mechanisms that help reduce cardiometabolic risk.

Adequate volumes of moderate exercise utilize similar metabolic mechanisms as several diabetes drug classes; the biguanides and the glitazones, but without many of the side effects. For example, fluid retention of the glitazones, in other words, like pioglitazone and rosiglitazone.

The value of brief acute bouts of physical activity, for example, two to five minute intentional bouts of physical activity, at moderate intensities, activate AMP kinase, glucose transport mechanisms, and insulin signaling. Each intentional walking step is an AMP kinase activator,

which works very similarly to metformin and the PPAR-gamma-activating diabetes drugs like pioglitazone.

Both aerobic and resistance exercise training improve insulin sensitization and glucose transport mechanisms, which help to improve cardiometabolic health and are involved in deterring diabetes in pre-diabetic subjects. Perhaps the most promising of the metabolic mechanisms physical activity has to offer is its ability to up-regulate PPAR-delta receptors in skeletal muscle. PPAR-delta receptors are intimately involved in fatty acid transport, inflammation, and increased HDL cholesterol, essentially improving multiple aspects of the metabolic syndrome. Future development of the diabetes drugs will target PPAR-delta, essentially mimicking many of the benefits of exercise.

There's also emerging evidence that exercise training can reverse skeletal muscle mitochondrial abnormalities from lipid overload, that is lipid overload from diet especially, induced, again, by high-fat diets and inactivity. So anytime that there is sufficient volumes of weekly exercise and over the course of three or four months there is adequate exercise, you actually reduce the intramuscular stores of lipid, that is triglycerides, which affect mitochondrial abnormalities, and this is a very good thing in terms of reducing cardiometabolic risk.

Now, let's talk for a moment about what the new guidelines say about how much exercise per week, how much physical activity per week, is required for weight loss versus cardiometabolic risk reduction. The amount of exercise required for weight loss for most people is significantly more than it is to reduce diabetes and cardiometabolic risk. For example, the new 2009 guidelines for the amount of weekly physical activity to reduce body weight by the American College of Sports Medicine is 250-300 minutes per week, or about an hour a day, five or more days a week, to reduce body weight. This is tantamount to approximately 2,000-3,000 calories of physical activity per week, again, to lose significant body weight.

Let's contrast that briefly to the volume of weekly exercise to reduce overall cardiometabolic risk, and that would be about 150 minutes of exercise a week, or about a half-an-hour a day on most days of the week, or about 1,000-1,500 calories of exercise per week. So for weight loss, for most of us, 2,000-3,000 calories of exercise per week; for reducing cardiometabolic risk, almost half of that, 1,000-1,500 calories of exercise per week.

Of course we are not in any way saying that 1,500 calories of exercise a week is enough to lose weight. For most of us we probably over time need to increase energy expenditure up to at least 2,000 calories of exercise a week if we desire associated fat weight loss in addition to reducing cardiometabolic risk.

Now, for our patients that are significantly overweight; let's say they are well in excess of a BMI of 30, the exercise intensity, that means the speed or their heart rate or the resistive load they are exercising against, in obese patients should be more conservative. That is those patients that are significantly overweight need to actually operate at around 40-50% of effort max or 40-50% of aerobic capacity max, and in time they can ratchet that up to higher intensities of course. Again, this is particularly true for patients who are at BMIs in excess of 30, but especially BMIs that are in excess of 34 or 35. Eventually, obese patients may progress again to higher intensities, but only after having no abnormalities or no inadequate responses to lower intensity exercise.

Now, as a frame of reference, I have always used 1,000 calories of exercise a week as a starter program for most of our patients that have prediabetes, who are overweight, or who

have the metabolic syndrome, or in many respects, those patients with diabetes. What is a 1,000 calories of exercise a week? I am going to give you some examples, and this is based on 160 pound individual. Of course, many of our patients are heavier than 160 pounds, so you can surmise that it would be more than 1,000 calories of exercise per week, and I will explain this more in just a moment.

But let's just give an idea about what is a 1,000 calories of exercise a week for about 150, 160 pound individual. It would be equivalent to a 10-mile walk at three miles an hour. Two-and-a-half to three hours of continuous exercise at 55-65% of maximum aerobic capacity. Three 50-minutes aerobics class sessions per week. A 3-hour hike over variable terrain, with a 10-pound backpack. Three hours of cycling at 10-12 miles an hour outdoors. Three sets of singles tennis. Three miles of freestyle swimming as a woman, or about two miles, two-and-a-half miles or so of freestyle swimming as a male; males work a little harder to stay buoyant, and therefore energy cost of swimming a given distance is a little bit more in men. Now, as I said, these examples were for 150, 160 pound individual. Our patients that are heavier than let's say 33, 34, 35 BMIs expend more calories for each activity. Perhaps these are 1,400-1,800 calorie workouts in someone who is significantly overweight from the examples I just gave.

So in many respects, the heavier you are, the more calories you expend for a given duration and intensity, and I guess that's an advantage for those people who are significantly overweight, that they don't have to do much of weight bearing type of exercise to expend a lot of calories and to actually inaugurate initial significant weight loss.

Now, what do we mean by moderate versus vigorous exercise? The official, legal, if you will, definition of moderate intensity exercise is exercise between 40-60% of VO2 max, aerobic capacity max, or as I always tend to relate it to, is effort max, physical effort max, 40-60% of effort max. Effort max, if you want to give a sliding scale of 0-10, 10 being all out or exhaustive exercise, 40-60% of that scale of 0-10 would be exercising between a 4 and a 6; whereas vigorous exercise would be anything in excess of 60% of aerobic capacity max or VO2 max or effort max.

So again, vigorous intensity, in excess of 60% of your aerobic capacity; moderate intensity exercise, 40-60% of your aerobic capacity; and low intensity exercise is anything below 40% of your effort max or aerobic capacity.

So just to be clear, prediabetic, those patients with the metabolic syndrome or who are obese and/or have diabetes, usually require moderate intensity activity, such as 40-60% of aerobic capacity, or even lower intensity activities.

If you are going to be recommending vigorous intensity activities, you may need a medical evaluation and/or stress electrocardiogram prior to engaging in vigorous activities. And we will describe the decision to have a medical evaluation and a graded exercise test with ECG in the very last segment of this podcast.

Now, as we said, 30 minutes a day of activity as one of the guidelines, should you do that 30 minutes all at once or can you break it up? The research is pretty clear; you can break it up. In other words, short bouts of exercise result in similar reduction in body fat and improvement in fitness as long bouts as long as they are both at the same total energy expenditure. So three 10-minute workouts of the same relative intensity is just as good as 30 minutes of sustained duration activity, and this is true not just for body weight reduction, but for all the other benefits, including blood pressure reduction, etcetera.

I think at this point we will like to carve out just some cautions for patients with type 2 diabetes, particularly those patients that have had type 2 diabetes more than five or as much or longer than ten years. Typically speaking, type 2 diabetic patients tend to have blunted heart rate responses; tend to have blunted blood pressure responses to a given level of exercise. They also have suppressed aerobic capacities. They don't quite measure up in terms of their peak power exercise outputs. They also have altered thermoregulatory responses. They are more subject to hyperthermia. They don't sense hyperthermias as well as apparently healthy individuals do. And of course type 2 diabetic patients, depending on how long they have had diabetes, can have peripheral neuropathies and weight-bearing exercise cautions are certainly appropriate there.

Now, let's talk a little bit about resistance exercise training or weight training. The addition of resistance exercise training to energy restriction or dietary restriction of calories certainly increases muscle mass, and we do know now that increases in muscle mass help improve insulin sensitization, and that's a good thing. Compared to resistance training alone, resistance training combined with aerobic exercise may increase the loss of body fat, but not necessarily body weight. Many people will gain a kilogram or two of body weight once they embark upon a six to eight week resistance training program. Resistance training also may enhance muscular strength and physical function in overweight and obese patients, and this is also a very important attribute of using resistance training versus just aerobic training. Finally, no evidence currently exist for resistance training being employed for the prevention of weight regain after weight loss, as was once thought.

Now, in general, how should we counsel patients to go about doing resistance training? As a general principle, two to three times per week is adequate. Two to three times a week of two to three sets of each of 10-12 repetitions of exercise is adequate. Again, two to three times per week, two to three sets, and each set of exercises that you do, you want to perform 10-12 exercise repetitions. How much should the load be on each particular resistive device, free weights or machine weights? 60-80% of your maximum load. If you could do 100 pounds just one time, 60-80 pounds would be just about an ideal for improving strength, and that's how much you should add to the load on the bar or the machine.

How many exercises should you do? Research supports eight to ten multi-joint exercises, distributed within the upper extremities as well as the lower extremities. Again, all major muscle groups should be involved in the same session. Again, we are just talking two to three times per week of engagement in resistance training is plenty adequate to improve cardiometabolic risk and functional fitness.

Just one word of caution though for very high-risk patients or patients that already have diabetes or cardiovascular disease, when doing resistance exercise, if the patient cannot lift the load or contract the muscle at least ten times, they probably have too much weight on the bar or on the machine lever. So you want to have them set the resistive load such that they can do at least ten, if not a few more, repetitions. That ensures that they are not putting too much back pressure on the heart and in the arterial system, and they can have at least ten repetitions or more, would be a good safe minimum.

One of the questions that's frequently asked by many people is, why do exercise and exercise programs tend to generate less than expected weight loss? There are several reasons behind this and they are all fairly complicated. One is that the impact that a given workout has on the total daily energy expenditure over the course of 24 hours period, that is, for many of us we will

conserve more energy over the course of a day when we do too much exercise. That is, we don't do as much activity around the yard or the house or at work because we are tired from an early morning workout. Another particular factor is energy compensation. Many of us actually, perhaps by example would maybe work out for a 300-calorie treadmill workout, and then we follow that by eating maybe 100-200 more calories in the given day, because we feel we deserve more calories, we want that cookie, or we just have stimulated our appetite. So that workout instead of being in effect a 300 calorie workout from an energy balance perspective is really only 100-150 calorie workout, depending on if you ate more that day.

So energy conservation, that is, not doing as much around the yard or the house or your work environment because you have worked out earlier that day and you are a little bit tired, you are going to sit or relax or rest more than you would have otherwise had you not worked out is a factor. And then energy compensation, that is, how much more you eat in response to a given workout over the course of a day is another factor that can certainly contaminate your ability to predict how much weight you will lose in response to an exercise program.

Of course you also have to consider muscle weight gain, especially from resistance training or just about any -- even aerobic training program for someone who has not done anything in years, even six to eight weeks of aerobic training might add a kilogram or two of lean muscle weight, displacing anything you would have seen on the scale as weight loss. So when you read the scale before and after 6-12 weeks of exercise training and you don't see much of a change there, it doesn't necessarily mean they have not lost fat weight; they could very well have. And that's one reason we are certainly enthusiastic about providers using skinfold assessment strategies to see changes and actually total body adiposity that are not inextricably linked to weight loss on the scale and we will explain that more in just a few moments in this podcast. Finally, there are a number of genetic factors that controls one's individual to lose weight or not in response to exercise programs. It's not a huge factor, but it does play some role.

And I should not forget to mention there is some gender specificity; that it has been known for many years in research that women tend to lose a little bit less fat weight, or at least body weight that is, in response to a given exercise program compared to men, not much less. But overall it's a little harder for women at just about any age, but especially ages over 18 years of age to lose weight in response to a given exercise program. And partly the reason there is, because women as a rule tend to compensate more with added calories in response to exercise, but also women tend to preserve certain fat stores more for necessary endocrine purposes. And it does not mean in any way that women do not respond in terms of reducing cardiometabolic risk in response to exercise training; they do that at least as well as men do, it's just not as much through weight loss as you might see with men.

Now, when using physical activity for the express purpose of losing body weight, we certainly can use BMI, waist circumference, scale weight to help gauge their progress. But I would submit there is a more definitive way to show changes in body adiposity, and that is the utilization of select skinfold assessment is a reliable means of assessing serial changes in total body adiposity in response to physical activity programs. That is, skinfold thickness in select sites is a better gauge of changes now in total body adiposity than just using BMI or even scale weight for reasons that I have mentioned earlier.

The most reliable skinfold site for reflecting changes in total body adiposity, including abdominal visceral adiposity, is the subscapular site, with the tricep skinfold site as a secondary measure. And of course this is only with the use of well-engineered clinical calipers.

There are only two sets of manufactured clinical calipers that really should be used in the clinical setting and those are the Lange or the Harpenden Calipers. Now, on the DDTP website, under Tools, and if you go to Quick Guide Cards, there's a whole list of new Quick Guide Cards under the DDTP website. And under the Quick Guide Card link you will see Anthropometric Measures, and there's explicit instructions and Quick Guide Card instructions, including a video and how to skillfully measure skinfold thicknesses.

Now, we are not using skinfold thickness measurement to screen people or to tell them what percent body fat they are at all, we are just using it as a gauge to show changes in skinfold thicknesses, on a given site or two between return visits to the provider. So we are not using it to screen people into weight control programs, we use BMI and body weight and weight circumference for that, but the skinfold thickness measurement is really used as a gauge to show change in adiposity between clinic visits.

Now, you might also be interested to know that on this Quick Guide Card Anthropometric website on skinfold thicknesses and adiposity measures are newly published reference curves for triceps and subscapular skinfold thicknesses in U.S. children and adolescents by percentile for children and adolescents between the ages of one-and-a-half years of age all the way up to 20 years of age, and I call your attention to those documents on the Quick Guide Card Anthropometric website.

Now, somewhat more controversial is the question, is it the weight loss or the physical activity itself that reduces the risk of diabetes for instance?
In one of the most elegant clinical Exercise Science Reviews recently published, Richard Telford, in 2007, who is a Physiologist at the University of Melbourne, revealed that the scientific literature indicates consistent findings of strong associations of physical activity with mortality and morbidity associated with type 2 diabetes after controlling for obesity and other potentially confounding factors. Collectively, these findings indicate that low physical activity is not just a predictor, but a direct cause of metabolic dysfunction and morbidity and mortality associated with diabetes. Considering the many cellular mechanisms that can explain this phenomenon, this finding is not difficult to justify. By contrast, Telford argues, there is little evidence that overfatness and obesity, adjusting for any effect of reduced physical activity actually cause type 2 diabetes. Numerous other investigators share the same belief.

Dr. Lopez Soriano and research colleagues in Spain and France, who have focused their whole life's professional work on exercise metabolism studies, cogently argue that physical activity is afforded very little attention in recent studies and reviews evaluating the link between insulin resistance, inflammation, and obesity. They insist that physical activity is a potentially confounding factor, which has been overlooked by many attempting to understand the role of obesity.

Now, what are some more practical physical activity intervention strategies, and I would like to describe two of these strategies. Both of these strategies are in very good detail as a Quick Guide Card under the Tools section of the DDTP website, again, under Quick Guide Cards, and under Physical Activity.

These two practical physical activity strategies are systematic clinical pedometry, the use of pedometers in a systematic way, and household circuit activity.

Let's start with a very briefly systematic pedometry utilization in those patients that are high cardiometabolic risk. The systematic use of well-engineered pedometers as objective of

cardiometabolic risk reduction outcome measures is on the increase, throughout metabolic syndrome clinics, diabetes prevention programs, and of course even in wellness programs. Well-engineered step filtered pedometers measure foot strikes or steps of course, but these are tantamount to measuring muscle contractions. And it is the muscle contraction that is the insulin sensitizing outcome, not the distance someone walks, not necessarily the projected or estimated caloric expenditure that's sometimes registered on a pedometer, but it's the actual foot strikes that is the insulin sensitization mechanism, if you will, the metformin mechanism. So the outcomes measure using a pedometer is actually the steps or the foot strikes or the step count itself to record in the chart.

Recent data published from recent Strong Heart Study data from American Indians have shown quite clearly that their average man and woman just barely meet the minimum activity standards for adults, and that is around 5,000-5,200 steps per day, which is just minimal compared to where they should be. As you may know by now, the 5,000 steps per day or less over the course of an entire day is the new sedentary lifestyle index. Ideally, most of us would be getting 10,000 or more steps per day, but that needs to be gauged and that needs to be individualized based on the baseline that the patient has to begin with. If a patient comes to you and they wear a pedometer for a few days or a week and they average only 2,500-3,500 steps per day, to double that over a period of a month or six weeks is excellent, going from 2,500 or 3,500 steps per day to 7,000 or 8,000 steps per day is a tremendous accomplishment and certainly has a cardiometabolic risk reduction equivalent. Even though many of our patients will never get to the 10,000 mark, that won't be absolutely necessary, with exception of those patients where you are striving to reduce body weight significantly, in which case most recent clinical trials show that 11,000-12,000 steps per day is on average necessary to lose significant body weight.

Now, keep in mind, as I said earlier, that the step count itself is the AMP kinase activator. It represents a muscle contraction, very similar to the way TZDs work, the way a metformin works, and if that is the recorded number that you should put in the chart, both at baseline, without starting, without having starting an exercise program, and then throughout the progression of the walking program you have your patients embark upon.

New evidence also has shown that on average those individuals that are between about 5'6" and 6'2", when they are using a pedometer, a 3 mile an hour walk or faster is ideal for improving insulin sensitization, especially in using a pedometer. In other words, 3,000 steps in 30 minutes, at that rate, that's about 3 miles an hour or a mile-and-a-half in 30 minutes is exactly what they should actually aim for in terms of the speed at which they walk. Now, if they are walking over hilly terrain, of course that will slow down, that's fine, because the hills themselves will add enough stimulus to improve insulin sensitization, but on the flat terrain, flat ground, 3 miles an hour for most of us will be our goal.

Now, that should be corrected for height. Someone who is maybe 5'3", 5'4", relatively short, that speed probably only needs to be between 2.5 and 2.8 miles per hour, versus someone who might be 6'4", 6'5", perhaps 3.3-3.5 miles an hour is an adequate stimulus for insulin sensitization when walking.

When picking a pedometer, selection of appropriate pedometers should be made based on how well they are engineered. Essentially, there are three, if not more, but there are three primary manufacturers of the better engineered pedometers: Accusplit Corporation, NEWLIFESTYLES, that's all one-word, NEWLIFESTYLES, or Walk4Life, all three of these manufacturers actually make very well manufactured pedometers. They are very well-

constructed. They tend to be moisture resistant, have large displays, but above all, they tend to have step filters. Step filters are engineering devices that are programmed into the electronics that filter out spontaneous superfluous movements, such as, if you just cross your legs or move around in the chair, the pedometer won't count that. The pedometer and a step filter pedometer would be more apt to count actual foot strikes and then filter out all other spontaneous movements. So when you get your final recording on the pedometer at the end of the day, you can rest assured that 95% of all the step counts are actual step counts and not superfluous activity.

You may have seen at numerous IHS workshops, if I have been presenting, that I have recommended the Accusplit Eagle 2720, but there are many other models that would suffice. I am just used to that particular one, we have used that in numerous clinical trials, it's very inexpensive, but it's not to say it's the only pedometer model that you can use.

Now, this brings me to a new novel strategy of how to use the pedometers perhaps more creatively, and it's called pedometer trekking. Again, this has its own Quick Guide Card on the DDTP website. Pedometer trekking is where the provider over a course of time would actually measure out 3-10 customized paths or trails, in the Pueblo, the tribe or the community, of varying length and terrain; starting with the very short trail, maybe a half-a-mile to a mile, maybe an intermediate trek that might go a mile-and-a-half to two miles, maybe a upper intermediate trek that would go maybe three to four miles, and maybe a longer trek that would go maybe four to five miles longer.

So in this case what the provider would do is be prescribed the trek itself rather than just a step count, and the trek would start with maybe minimum terrain and then over time the patient could progress to longer treks, perhaps up to, like I say, four to five miles per trek, and adding more hilly terrain. This would certainly add interest, get the patient outside, when weather permits, and of course much better exposure to Vitamin D, sunlight, Vitamin D, and of course fresh air. It's a great way to individualize particular pedometer programs and get the patient -- remove the patient from indoor activity or just household labor.

Another new creative way to get patients active is to systematically have the patient do household or community chores. So these domestic chores would be 5, 6, 7, 8 minute chores, spaced by maybe 30 seconds of rest in between each chore, and you might have six or eight chores, such that if you do all six or eight chores, the entire duration of the session or circuit would be an hour, perhaps up to two hours, and you get the added benefit of getting something accomplished.

Again, this is an explicitly detailed Quick Guide Card on the DDTP website, under Tools, under Quick Guide Cards, and look for Household Circuit Activity. And again, the circuit domestic activity include yard work, gardening, housework, painting, cleaning, shoveling, scrubbing, washing, repair work, activities of daily living, etcetera, anything goes. So that way a patient wouldn't necessarily have to buy a membership to a gym, but they could stay close to home and still burn sufficient calories to help reduce cardiometabolic risk.

The last topic I would like to discuss before I summarize what we have talked about in this podcast is the new recommendations on when to use a medical exam and a Stress EKG prior to advising exercise, in patients with prediabetes, obesity, or diabetes. The American College of Sports Medicine now has an algorithm, a decision tree, if you will, that basically says, depending on the level of risk, the number of risk factors a patient has, and the level of

exercise you intend for them to engage in, those two factors would dictate if they need a medical exam and a graded exercise test with ECG beforehand.

Again, this is another Quick Guide Card explicitly detailed on the Quick Guide Card section of the DDTP website, under Exercise Screening and Exercise ECG Stress Testing, you will see it there. But just to give you an example, for instance, if a person was moderate risk, they had two risk factors for coronary disease or diabetes but they did not yet have diabetes or cardiovascular disease, and that were just going to engage in moderate exercise, and we have already defined moderate exercise, then a medical exam and an exercise ECG is not recommended. However, if these people in moderate risk are going to be on a regular basis engaging in vigorous exercise, the medical exam and graded exercise test with ECG would be recommended.

Whereas, high-risk patients, those patients that already have known cardiovascular disease, pulmonary disease, or diabetes, whether they are doing moderate exercise or vigorous exercise, it is highly recommended that they have a medical exam followed by a graded exercise test with ECG prior to engaging in vigorous exercise. And again, this is to rule out any silent EKG problems, arrhythmias, blood pressure problems, etcetera, that the patient would not know they had. And again, even having a positive Stress EKG test would be even greater need for them to exercise, but perhaps with some supervision. Again, I call your attention to the Exercise ECG Quick Guide Card on the DDTP website.

So in summary, for those of us providers who have lost our enthusiasm for physical activity as a serious therapeutic modality, if we ask ourselves, what incremental physical activity changes could we value for ourselves and our patients? What pragmatic forms of physical activity can reduce cardiometabolic risk with or without dramatic changes in cholesterol or reduced body weight?

I will summarize by giving you three examples. First, give your patients credit for each and every step they take as recorded with well-engineered, reliable pedometers, irrespective of laboratory measures of body weight changes, etcetera. Prescribe walking programs through the systematic use of pedometers as feedback tools. Have patients record weekly step count. Some pedometer models, by the way, have seven day, six-month memories, and even longer-term memories than that, which permit the patient to accumulate steps over a much longer period of time without inadvertently resetting. At the patient's return visit chart -- at their first return visit, chart and give credit for each and every recordable walking step, much as you would for charting their glucophage or statin. There is good reason to believe that each of these intentional walking steps or muscle contractions is an AMP kinase or a PPAR-gamma activator working very similar to some of the anti-diabetic drugs.

For example, add at least a 1,000 calories of exercise a week to existing weekly activity patterns. This would be the equivalent of adding approximately 10 miles of walking per week or 20,000 pedometer step counts on a reliable pedometer. Ideally, graduating to at least 1,500 calories of exercise per week over time would be near optimal; that would be about 15 miles per week of walking or about 30,000 step counts per week.

Number two, right exercise prescriptions as combination therapy. Clinicians need to quantify and prescribe physical activity in terms of calories per day or week or step counts per week as prescribed combination therapy with drug therapy when applicable. For example, 1,500 calories a week of exercise or 30,000 step counts a week of pedometer walking, when added to Omega-3 fatty acid therapy, would further reduce triglycerides and triglyceride-rich

lipoproteins, understanding of course that 1,500 calories of energy expenditure at moderate intensities will oxidize intramuscular and adipose tissue stores of triglycerides well in excess of the Omega-3 fatty acids. So both in combinations would give consistently more triglyceride reduction than one or the other by itself.

And thirdly, systemize household domestic chores into a circuit of short utilitarian activities such that the patient expends anywhere from 200-350 calories during one household chore circuit session. And again, these chores can be done in the community, in the yard, they don't have to be confined to the house. This would provide a sense of accomplishing both household and yard task, community task, as well as generating increased daily energy expenditure and thus reducing cardiometabolic risk.

This concludes the session on Physical Activity and Cardiometabolic Risk Reduction. I would like to invite you to ask questions, and you can contact me by email. My email address is rlaforge@nc.rr.com, again, rlaforge@nc.rr.com. Thank you.

Total Duration: 48 Minutes.