Transcript for PROMINENCE – Exercise Prescription Lecture

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In this lecture, it will be explained how to prescribe exercise to adults with obesity.

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And we will first discuss - will any exercise do the job? Will generic physical activity advice be sufficiently effective to treat patients with obesity, followed by precision exercise prescription for the treatment of adults with obesity? The second part of the lecture will be a case study where we explain how this can be used in clinical practice, followed by the references used to back up the evidence for this lecture.

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So, let us start first with the first question. Will any exercise do the job? Is it sufficiently effective to provide a generic physical activity advice in the treatment of obesity in adults?

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It has been put to test whether a generic physical activity advice would be clinically effective in people suffering from cardiometabolic conditions. In this meta-analysis, randomised controlled trials were included, where people were exposed to usual care versus being provided a step counter with the advice to become physically more active, no matter what activity that would be. And it seems to be the case that if you provide physical activity trackers to people with cardiometabolic conditions, that that leads to an improvement of the physical activity on a daily basis, shown here in this daily step count. But then the question is whether this increase in daily step count is sufficiently effective to also improve the cardiovascular risk profile. And this does not seem to be the case, because there are no associations found between the physical activity tracker output and changes in blood pressure, lipid profile, body weight, or body mass index. And also, the glycaemic control was minorly affected by increasing the physical activity level. So, this meta-analysis reminds us that a generic physical activity advice may not be effective enough to improve

cardiovascular risk in people with cardiometabolic conditions, including diabetes and obesity to give a few examples.

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And what do the guidelines actually recommend in terms of physical activity? The WHO provides generic physical activity advice for the wide public. They recommend that you should expose yourself to a sufficient volume and intensity of endurance exercise, shown here on this slide, but also to resistance exercise at least twice per week. For obese individuals it's more or less the same. So, all scientific guidelines recommend that at least 150 minutes of moderate intensity aerobic exercise should be provided, combined with three weekly sessions of resistance exercise to increase muscle strength as well. So, they are actually quite comparable.

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But the question is, does it work? What happens actually if people with obesity expose themselves to exercise training on a regular basis for a sufficiently long duration like six months? And this meta-analysis provides us the effect sizes of different types of exercise on body compositional outcomes. And what they found was that if obese individuals expose themselves to six months of endurance training only, that leads to a body weight reduction of around two kilograms only. If obese individuals expose themselves to resistance training only for six months, that leads to a weight loss of around 500 grams only. And if they combine aerobic training with resistance training for six months, that leads to an average body weight loss of around 1.3 kilograms. In terms of change of fat mass, you see similar effect sizes. So, endurance training for six months in obese individuals leads to a fat mass loss of around 1.5 kilograms only. And if you combine endurance training with resistance training, that will lead to a fat mass loss of around 2 kilograms only after six months of exercise training. So, this meta-analysis shows us that on average the amount of body weight loss or fat mass loss as a result of excess training only is not that large. Actually, only small effect sizes have been noticed in many randomised control trials.

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So, that brings us to the second part of this lecture. How should exercise then be prescribed to adults with obesity? And what are the reasons for using exercise in the treatment of obesity?

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So, let us first start with fat mass. So, how to exercise to specifically reduce fat mass in people with obesity? And this meta-analysis shows us now that there is a dose-response relation between the volume of weekly exercise and the amount of visceral fat mass loss. And it was calculated from this meta-analysis that if you want to reach a clinically meaningful and detectable reduction in visceral fat mass, that patients with obesity should expend at least 2,000 kilocalories per week as a result of exercise training. So, this shows us that if you want to reduce your fat mass loss, you need a high volume of exercise training. And to many patients with obesity, and particularly in those who are physically inactive or suffer from exercise intolerance, this target is very often not achievable in the first few weeks of an exercise intervention. So, in those individuals, you need to gradually increase the dose of exercise to come to these thresholds.

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So, we have to learn now that reducing fat mass by exercise training only is really hard in patients with obesity. And then the question is, what is then the true value or role of exercise intervention in treatment of obesity? And it turns out to be the case that exercise training is not only used to reduce fat mass in people with obesity, exercise training is used to target every relevant health factor or health outcome, including body composition, cardiometabolic health, physical fitness, quality of life and eating behaviour. We not only use exercise to reduce fat mass or body weight, we actually use exercise training to target all these important outcomes.

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So, to affect all these health outcomes, you need targeted exercise intervention or prescription towards adults with obesity. But how does that work? Well, first of all, when you're going to expose obese individuals to exercise training, you need a good pre-participation screening. And in that screening, you should assess the entire cardiovascular risk profile and also the physical fitness. And based on these outcomes, then you can start to adjust the exercise prescription to target every health outcome that seems to be insufficient or below the norm value. For example, to target exercise intolerance, you can use high-intensity interval training in the first three weeks or months of your exercise intervention. In adults with obesity, it has been shown that high-intensity interval training is more effective to improve the VO_{2max} when compared to isocaloric endurance training of a moderate intensity. So, that can be done in the first weeks or

months of an exercise intervention. However, if you're going to expose an obese individual to a long-term exercise intervention that exceeds six months, that's the volume of endurance training that seems to matter the most. So, that's where you can use higher volumes of endurance training to improve VO_{2max} to a greater extent. If you encounter a patient with dyslipidaemia, it is endurance exercise training that is very, very effective. are there, the volume seems to matter a lot. And you have to exceed a weekly expenditure of around 1,200 kilocalories per week to observe significant improvements in the lipid profile. If you encounter a patient with hypertension, endurance exercise is the most effective type of exercise training to reduce blood pressure. And there is the intensity that matters a lot and the session duration. So, you have to adjust the intensity and the session duration to also target hypertension. If you encounter an obese individual with type 2 diabetes, then you need to try to reach a sufficient volume of endurance exercise, at least 250 minutes per week. So, you try to spread that dose over the entire week by increasing the exercise frequency, but also the volume of resistance exercises seems to matter a lot. So, you need a high volume of resistance exercise in every session, at least 21 sets per session should be executed. That basically means you should expose at least seven large muscle groups to three sets of repetitions. If you encounter a patient with evidence for muscle wasting or muscle weakness, that's where you need resistance exercise of a higher intensity, because higher intensity resistance exercise training generally leads to greater improvements in muscle strength and mass.

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And then the second step is to further tailor your exercise prescription based on the patient needs, considerations of safety precautions, including the level of supervision. And this is where we use the Edmonton Obesity Staging System to see in what stage the patient actually is. And based on the stage where the patient actually is, that is where we adjust the level of supervision of the exercise training and also, we take into account the safety precautions.

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So, we have shown that we have to shift away from the focus on fat mass reduction by exercise training only. We should try to broaden the goals of exercise intervention in the treatment of obesity that compromises many different health outcomes. And we have shown what to do in case of

different positive cardiovascular risk factors. Now we show you how this can be done in clinical practice by the use of a case study.

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So, here's a patient case example, with recordings of the cardiovascular risk factor assessments and physical fitness assessments. So, have a very close look at all these different data and think about what should be the intensity, type, and volume of exercise that we should use for this individual to improve the entire cardiovascular risk profile, physical fitness, as well as body composition. And what you can learn from this case example is that this is a female with a normal endurance exercise capacity, but she suffers from obesity based on the height and weight. She also suffers from dyslipidaemia based from the total cholesterol assessment. She also suffers from hypertension and type 2 diabetes. And now the question is, how should we prescribe exercise to this individual?

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So, we can always start with the one-size-fits-all approach, which is the generic physical activity advice shown here in this box. And then the question is, how to adjust this generic physical activity advice toward a tailored prescription to target every health outcome that seems to deviate from the norm. So, obviously this patient suffers from obesity and in obesity we know that you need a high volume of endurance exercise on a weekly basis to come to a significant and clinically relevant fat mass reduction. So, you have to think carefully about the intensity of exercise and the duration of exercise to come to this number of energy expenditure. The patient also suffers from dyslipidaemia and to target dyslipidaemia also the volume of endurance exercise seems to matter, again. And here you need to reach a weekly energy expenditure of around 1200 kilocalories per week. The patient also suffers from dysglycaemia due to type 2 diabetes. And we know that in case of type 2 diabetes, you need a higher volume of endurance exercise, but also a high volume of resistance exercise. So those are the adjustments that you make there to target the HbA1c or glycaemic control as well. And finally, the patient also suffers from hypertension. And for hypertension, we know that endurance training is the most effective type of training to improve blood pressure control regulation. And the exercise training of the type of endurance should be sufficiently long and intense to induce those beneficial impacts. And for safety precautions, we take into account the patient takes sulfonylurea, which can lead to hypoglycaemia during exercise training. That is why you should execute glycaemia on a regular basis during your

exercise training sessions, in particular during the first few weeks of the exercise intervention and/or consider the intake of carbohydrate intake during exercise training to avoid hypoglycaemia occurring. So, this is an example on how you can shift from a one-size-fits-all approach towards a more tailored exercise prescription to target every risk factor that seems to deviate from the norm. So, what you can see here is that the one-size-fits-all generic physical activity advice is very different from tailored prescription that would be clinically much more effective to improve every health outcome in this individual.

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And then finally, these were references that were used in the preparation of this lecture. I have to mention that all the exercise advice that was provided in this lecture are all based on meta-analyses. Thank you very much.