Lifestyle intervention during dialysis

Associate Professor Kenneth Wilund discusses how he became interested in working with patients undergoing haemodialysis therapy who are affected by chronic kidney failure, and what healthcare practitioners should be turning their focus to in terms of treatment.

Can you offer a brief synopsis of how your research has progressed within nutrition and exercise science?

I started conducting research in haemodialysis (HD) patients primarily because I realised there were significant shortcomings in the literature regarding the effects and potential benefits of exercise training in this population. As most previous studies had used intradialytic (during dialysis) cycling as the exercise of choice for HD patients, I started with that as well. However, my research showed that cycling is unlikely to address the health needs of these patients as a major comorbidity in HD patients is muscle wasting, and the subsequent loss of strength and physical function. Cycling alone is likely to have modest impacts on muscle mass in particular; so other forms of exercise such as resistance/strength training are also important. Additionally, there are some very complex nutritional concerns that must be addressed if any exercise prescription is going to be successful. For example, many HD patients eat an excessive amount of fast and/or processed foods. This would be bad for any patient population, but is even worse for HD patients based on their need to limit sodium and phosphorus. I am not certain that the benefits of exercise can overcome these poor dietary habits as it may be able to do in healthier populations. These issues mean that my research has evolved to try to develop more comprehensive exercise and nutritional interventions that in combination have a much better chance of addressing these complex problems.

Why has chronic kidney disease (CKD) become the central focus of your research?

CKD patients have among the highest rates of cardiovascular disease (CVD) mortality of any population. Additionally, the pathophysiology of CVD in CKD patients is rather unique. Whereas CVD is traditionally associated with abnormalities in lipid metabolism, CVD in CKD patients is often more closely related to abnormalities in mineral metabolism. They tend to have very high rates of vascular calcification, which causes the arteries to stiffen and contributes to high blood pressure, heart failure, and the excessively high CVD mortality rates in this population. Moreover, they suffer from other comorbidities such as muscle wasting and bone disorders. Due to these multiple comorbid conditions, CKD has been described as a premature model of ageing. As such, it is a very interesting patient population to study.

Can you provide an overview of current pharmacological therapies for CKD?

There are several types of drug that can be used to manage the disease, including drugs that attempt to correct abnormal mineral metabolism, calcimimetics, phosphate binders, blood pressure lowering medications, drugs to prevent anaemia, as well as statins. However, despite all of these advancements mortality rates have changed very little for dialysis patients in the past several decades. Indeed, the efficacy of many of these drugs has not been demonstrated, regardless of many clinical trials attempting to do so.

Have you encountered any problems during the clinical trials associated with your research?

In brief, many! The biggest problem that we struggle with is patient compliance with both their dialysis treatment as well as their exercise and nutrition interventions. Because all of our interventions to date have focused on the intradialytic period, if patients don’t show up for treatment we cannot give them their nutritional supplements, or exercise them. Some patients feel better on dialysis days, others on non-dialysis days, therefore the more options we can provide, the more likely patients will be to comply with some component of our lifestyle interventions.

How do you hope to build on the successes of your research in the future? What are the major issues you intend to address?

My primary focus moving forward will be to develop a more comprehensive and sustainable lifestyle intervention programme that has a real chance to significantly improve patient quality of life, and reduce hospitalisations and mortality rates. A major key to this approach will be to get the HD clinics to contribute to our efforts in a much more significant manner than they are currently doing. We are developing protocols for engaging the clinics’ nephrologists, nurses, dietitians, social workers, and technicians to help support our work and to provide a more consistent message to the patients. Without this support, our research efforts will not translate into sustained patient behaviour change.
Finding the right balance

A team at the University of Illinois is investigating the use of exercise and nutrition to increase the quantity and quality of life in patients with kidney failure undergoing chronic dialysis treatment.

The kidneys play a critical role in maintaining the health of the human body – primarily through filtering out waste products from the blood and excreting them into the urine. They also help to control blood pressure and the correct levels of chemicals in the body, produce vitamin D to keep bones healthy and generate a substance that aids the production of red blood cells. When the kidneys fail, dialysis is a potentially life-saving treatment, with approximately 400,000 patients in the US currently on chronic dialysis therapy. There are two types of dialysis – haemodialysis (HD) and peritoneal dialysis – which are used to filter out the harmful waste, extra salt and water from the blood. HD is the most common form and involves transferring blood from the body to a dialysis machine.

In the advanced stages of chronic kidney disease (CKD), renal failure, the kidneys have little or no function and patients are either treated with dialysis or undergo a kidney transplant. CKD is on the rise in the US and affects around one in five men and one in four women between the ages of 65 and 74. For those with CKD, their kidneys are often under too much strain to filter the blood properly.

This often occurs due to the stress placed on the kidneys by other conditions such as diabetes, high blood pressure and obesity.

Far from perfect

At present, there is no cure for CKD and treatment can only slow the progression of the disease. People affected by CKD are at an increased risk of suffering strokes or heart attacks, as well as kidney failure which can lead to them undergoing HD for the rest of their lives. Furthermore, current pharmacological therapies have not yielded significant improvements in mortality rates for dialysis patients, therefore new approaches to advanced CKD treatment are needed.

Safety of exercise

Dr Kenneth Wilund, Associate Professor in the Department of Kinesiology and Community Health at the University of Illinois at Urbana-Champaign, is providing novel insights into the benefits of exercise and nutrition for patients on dialysis, whose symptoms and comorbidities add an additional layer of complexity. “Focused efforts to improve a patient’s nutritional intake and their physical activity levels could yield significant improvements in their quantity and quality of life, at a fraction of the cost of treating patients primarily through pharmacological therapies,” Wilund states.

Exercise is rarely prescribed for dialysis patients, due in part to concerns over safety, especially in patients with different characteristics – for example those who have high weight gain (interdialytic weight gain), or those whose blood pressure either increases (intradialytic hypertension), or decreases significantly (intradialytic hypotension) during dialysis. One focus of the team’s research is to demonstrate that exercise during dialysis is safe in virtually all groups of patients, regardless of these different characteristics.

The group already has anecdotal evidence that by providing patients with a small amount of protein and having them exercise by cycling for 30-45 minutes a day, patients had increased mobility and could also do more work around the house. Another unforeseen benefit was the reduction in depression among those who often found dialysis treatment monotonous. Wilund is pleased with the results that the study is already demonstrating: “A few of our obese and overweight patients have been inspired by the
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The Renal and Cardiovascular Disease Research Laboratory team.

exercise at the clinic to do more at home and this has led to them losing enough weight to be eligible for a kidney transplant. They are now off dialysis – “there can be no greater improvement in a patient’s quality of life than that”.

IHOPE
The IntraHemodialytic Oral Protein and Exercise (IHOPE) study is Wilund’s largest research project which is examining whether oral protein supplementation with and without exercise can improve physical function, cardiovascular disease (CVD) risk and bone health in haemodialysis patients. In this 12 month intervention – the longest and largest randomised controlled clinical trial examining the effects of exercise and protein supplementation to date – the group will examine the potential mechanisms for these effects and determine whether improvements in these factors also lead to enhancements in patient quality of life.

The study will be the most comprehensive analysis of the effects of protein supplementation and exercise training on body composition and cardiovascular structure and function, which are related to mortality from CVD. Additionally, there is little information about the effects of protein supplementation on bone health, which the IHOPE project is seeking to address.

FOOD FOR THOUGHT
However, despite good anecdotal evidence, the successes have not been consistent. As a result, the group is now working towards a more comprehensive lifestyle intervention strategy that includes increasing physical activity levels outside of the clinic, especially focusing on improving muscle strength, balance, and reducing fall risk, as well as promoting better nutrition overall, such as eating less processed foods and having more consistent meals throughout the day.

A major concern for Wilund and his team is that many clinics in the US do not allow patients to eat during treatment. This is primarily due to concerns that it may cause patients to choke or vomit, or result in unsafe drops in blood pressure that could lead to cramping and other adverse events. However, there is little evidence in the scientific literature that any of this occurs, therefore the researchers are aiming to demonstrate that these concerns are not valid. The group is planning to more closely examine the effects of eating during dialysis and will investigate the influences of different types of test meals ingested at the start of dialysis on both dialysis efficiency and blood pressure, measuring this over the course of the dialysis session.

Wilund also proposes that allowing patients to eat during dialysis could increase the effectiveness of their exercise. A patient’s metabolic rate increases during dialysis, so if patients do exercise during dialysis, this uses more energy and potentially contributes to further muscle loss, especially if they are in a fasted state. Allowing patients to eat would not only improve their nutritional status, but would also help the exercise to promote increases in muscle strength and growth.

A MORE COMPREHENSIVE PLAN
If, as Wilund intends, the results of this work demonstrate that the primary concerns with eating during dialysis are not substantiated, he believes that providing food for patients throughout dialysis in the future will provide a unique opportunity to counsel patients about their nutritional knowledge and concerns.

He suggests a more comprehensive plan is needed that allows patients to be able to choose for themselves which aspects of their health they would like to focus on. “Telling dialysis patients that there is a bunch of food that they cannot eat is not an appropriate nutritional strategy. Instead, they need more consistent advice on how to shop for healthier foods and planning tips for avoiding unhealthy meals away from home. Likewise, sticking a bike in front of a patient is not a suitable exercise or physical activity prescription,” concludes Wilund. “Patients also need a plan for exercising outside the clinic that includes activities to improve strength and balance to prevent falls. Nutritional intake continues to be poor, and physical activity levels are still excessively low, so we need comprehensive changes in our approach to these problems.”