Exercise adequacy in dialysis

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Dialysis adequacy

Since the early 1980s, dialysis adequacy has been predominantly associated with small solute clearance of urea, most often urea reduction ratios (URRs) or Kt/V, where K=clearance, t=time and V=volume. In parts of the world the reliance on a minimum value of Kt/V had the unfortunate effect of decreasing dialysis treatment times and consequently increasing dialysis patient mortality (Lowrie, Zhu, & Lew, 1998). Although many clinicians reject urea clearance as the gold standard, it ubiquitously pervades nephrology clinical care.

Other approaches have been proposed as better measures of adequacy than those addressing urea. Australian guidelines propose that adequate dialysis includes blood pressure control, fluid management, ideal dry weight, salt intake and review of the ultrafiltration rate limits (Kerr, Perkovic, Petrie, Agar, & Disney, 2005). Scribner and Oreopoulos (2002) proposed the highly palatable Haemodialysis Product (HDP=hrs/dialysis session) x (session/wk)2) concept citing its simplicity and capacity to incorporate ideal weight and blood pressure as advantages over traditional urea-based measures. Although the HDP has not been embraced per se, embedded principles, including longer and more frequent dialysis sessions, have enjoyed greater attention of late.

The whole notion that we simply provide adequate and not optimal dialysis quality in our consumer satisfaction driven Western dialysis programs has been a source of frustration for some (Butman & Nissenson, 2005; Twardowski, 2003). Optimal dialysis would include many parameters addressed by clinicians such as nutrition, albuminaemia, mineral metabolism, inflammatory markers, volume control, blood pressure, maintenance of residual renal function, and haemodynamic stability (Basile, 2011). Unfortunately, a complex mathematical formula, resulting in a single number to define whether our dialysis treatment is adequate or optimal has been too seductive for many clinicians and administrators (Bennett & Neill, 2008).

Dialysis and exercise

Recent renewed interest in activity and exercise as an important component of dialysis treatment is encouraging. The most recent review demonstrates the positive impact of dialysis exercise programmes on people's physical function (Smart & Steele, 2011). Unfortunately the increased rhetoric has not resulted in an increase in sustained exercise programmes for people on dialysis. Commonly reported barriers to the sustainability of programmes include time, physical limitations and motivation (Delgado & Johansen, 2011; Goodman & Ballou, 2004). Not so well defined are the health service delivery barriers such as human (exercise professionals) and material resources, compensation mechanisms and individual exercise prescription requirements (Bennett *et al.*, 2010). What strategies may work to enhance the uptake of exercise in our dialysis units?

Dialysis exercise adequacy DEA=FTA/100

A formula to measure the dialysis exercise adequacy (DEA) is proposed that takes into account the frequency (F) and duration (T) of the exercise in hours and the age (A) of the person in years; thus DEA=FTA/100. If John, a 70-year-old male on dialysis, exercised three times per week on dialysis for 30 minutes (0.5 hour) per exercise episode, his DEA would be 1.05:

3 x 0.5 x 70/100 = 1.05

If John was 50 years old, his DEA would be:

3 x 0.5 x 50/100 = 0.75

A minimum DEA "target" could be established (for example, 1.0) that considers the amount and frequency of exercise relative to the age of the person. Thus the older a person on dialysis the less they are expected to exercise, not dissimilar to the non-dialysis community. Longer, more frequent exercise will increase a person's DEA. Clinicians may even consider a maximum DEA for people on dialysis, particularly those with comorbid conditions.

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Although the DEA appears a very simplistic method of measuring exercise, and requires much more development and validation, it may provide a starting point for exercise physiologists, nephrologists and nephrology nurses to subjectively measure dialysis exercise programmes. The DEA provides a formula not dissimilar to Kt/V, with an aim to focus more on exercise and activity. In addition to future clinical and research applications, the DEA could also assist each person receiving dialysis to monitor their exercise adequacy.

This paper has introduced the concept of DEA in order to challenge our urea adequacy focus to include more patient-centred, quality of life measures such as physical exercise. Increasing the exercise and activity in the dialysis population can decrease mortality, improve quality of life, improve physical function and decrease depression. Urea removal is important but may not be the most important measure of haemodialysis treatment quality.

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