

Designing a portable dialysis system - what is needed?

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Objectives

There is growing interest in developing portable systems for dialysis that rely on absorbents to remove toxins. Currently, most dialysis adequacy data focuses on urea clearance (KT/V) rather than total solute mass removed. Understanding the latter provides data that is more relevant for the design of such systems.

Methods

We reviewed data collected in the Peritoneal Dialysis Database for 439 people managed at a University Teaching Hospital from 30/04/1997 to 26/09/2019 as part of a quality improvement evaluation of regular clearance measurements. This includes 24 hour renal and peritoneal urea and creatinine removal, as well as ultrafiltration and urine volume. We then stratified the data according to demographics including age and sex.

Results

We had 1464 unique data sets. There was a median of 3 measurements per patient (range 1-25). 80th percentile peritoneal urea and creatinine removal among all patients was 166mmol and 4.89mmol respectively over 24 hours. This was higher in male (179mmol; 5.56mmol) compared to female (127mmol; 3.34mmol) patients. Urea and creatinine removal declined with age from 173mmol and 5.37mmol if aged less than 60 to 136mmol and 3.40mmol if aged more than 80 respectively. 80th percentile ultrafiltration was 798ml for all patients, 873ml for males, 700ml for females and it decreased from 812ml if aged less than 60 to 655ml if aged over 80. We did not have data on phosphate or sodium removal.

Conclusions

In order for novel technology to be of value to a standard peritoneal dialysis programme, we felt it would be necessary to cover at least 80% of a patient cohort. The data outlines solute and fluid mass removal values that are relevant when designing such portable systems for a typical UK peritoneal dialysis population. Noticeably, it would be easier to deliver a suitable system for women and older people.