

## Association of postural balance and falls in adult patients receiving haemodialysis: a prospective cohort study.

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**Introduction:** People receiving haemodialysis (HD) for the treatment of stage-5 chronic kidney disease (CKD-5) are at high risk of falls (1.18–1.6 falls/person-year) and fall-related injuries. Chronic kidney disease (CKD) can negatively impact on the sensory information processing (i.e. visual, proprioceptive and vestibular) required for the fine tuning of postural balance control. Previous research has shown that people receiving HD have a poorer postural balance compared to non-uraemic, age-matched individuals, as evidenced by the higher sway of centre of pressure (CoP) measures (range: +22% to +139%) assessed during static posturography. However, the question as to whether a higher postural sway is associated with adverse clinical outcomes such as falls in people receiving HD has not been addressed yet. Therefore, we aimed to explore the association between static posturography-based measures of postural balance and risk of falling.

**Methods:** Seventy-five prevalent CKD-5 patients on HD were recruited from three Renal Units for this prospective cohort study, which was conducted between October 2015 and August 2018. Static postural balance was assessed with a Bertec force platform in eyes open (EO) and eyes closed (EC) conditions. The following centre of pressure (CoP) measures were taken for the analysis: CoP range in the mediolateral (Range-ML) and anterior-posterior (Range-AP) axis, root mean square range in the mediolateral (RMS-ML) and anterior-posterior (RMS-AP) axis, CoP velocity along the mediolateral (CoPv-ML) and anterior-posterior (CoPv-AP) axis, and the 95% confidence ellipse area (Area95). The number of falls experienced during a 12-month follow-up were recorded by a researcher on a monthly basis. The association between all postural balance variables and falls (yes or no) was analysed using logistic regression modelling. ROC curve analyses were also performed to explore the differences in prognostic accuracy among postural balance measures. **Results:** Sixty-eight participants completed the 12-month follow-up and were therefore included in the final analysis. Twenty-five participants (36.8%) experienced at least one fall during the study period. In univariable logistic regression analysis, higher sway of CoPv-AP in EO (OR: 1.11, 95%CI: 1.01-1.23, p= 0.036), Range-ML in EC (OR: 1.04, 95%CI: 1.01-1.07, p= 0.02) and RMS-ML in EC (OR: 1.21, 95%CI: 1.02-1.45, p= 0.034) were associated with increased odds of falling. After adjustment for sex, Charlson comorbidity index (age factored in) and number of prescribed medications, only Range-ML in EC (OR: 1.04, 95%CI: 1.00-1.07, p= 0.036) was associated with increased odds of falling. CoPv-AP in EO exhibited the greatest prognostic accuracy (AUC: 0.69, 95%CI: 0.55-0.82, p= 0.01), however this was not statistically different (p-values ≤ 0.631) from CoP measures of area (AUC: 0.65, 95%CI: 0.51-0.80) and range (AUC: 0.65, 95%CI: 0.51-0.79). **Conclusions:** This prospective cohort study showed that higher postural sway (i.e. lower postural balance) was associated with increased odds of experiencing a fall during 12 months of follow-up. CoP measures of range, velocity and area displayed similar prognostic value in discriminating fallers from non-fallers. The clinical utility of static posturography for the prediction of future fall-risk in people receiving HD warrants further investigation in larger observational studies.