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Age-stratified association between blood pressure and clinical outcomes in maintenance hemodialysis patients

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Objectives : Few studies have directly compared outcomes according to BP levels across different age groups in hemodialysis (HD) patients. This study aimed to identify the optimal pre-dialysis blood pressure (BP) range associated with key clinical outcomes across different age groups in a large cohort of patients undergoing HD.

Methods : We analyzed 42,258 maintenance HD patients, retrospectively linked to claims and mortality data. Pre-dialysis BP was categorized into six systolic and six diastolic ranges. Baseline demographics, comorbidities, laboratory markers, and medication use were extracted. Patients were followed until June 2024 for all-cause mortality, cardiovascular events, dementia, and fractures. Outcomes were assessed with Kaplan–Meier curves and Cox proportional hazards models, adjusting for demographic, clinical, and treatment variables.

Results : Baseline characteristics differed significantly across age groups (<65, 65–74, ≥75 years). Higher systolic and diastolic BP values were associated with increased risks of all-cause mortality and cardiovascular events in most groups. Mildly reduced BP levels were often protective, particularly against CVEs. In younger patients, elevated BP was linked to higher risks of dementia and fractures, while in older groups, associations were weaker or reversed. Overall, elevated BP conferred excess risk, whereas modestly lower BP tended to reduce adverse outcomes, highlighting age-specific variations in prognostic impact.

Conclusions : Our results suggest that intensive blood pressure control is necessary for favorable outcomes regardless of age, except in cases of severe hypotension in younger patients.