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Impact of Aging on the Natural Decline of Kidney Function in a Healthy Population

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Aging is a fundamental biological process that exerts a profound influence on renal structure and function, even in the absence of overt kidney disease. In otherwise healthy individuals, the glomerular filtration rate (GFR) begins to decline as early as the third or fourth decade of life and continues progressively over time. Longitudinal cohort studies estimate that the average annual decline in estimated GFR (eGFR) ranges from 0.4 to 1.0 mL/min/1.73 m², with an accelerated decline observed after the age of 60. This physiologic reduction is driven by cumulative nephron loss, global glomerulosclerosis, mesangial expansion, interstitial fibrosis, and cortical atrophy—while single nephron GFR tends to be relatively preserved until advanced age. However, the application of a fixed eGFR threshold (<60 mL/min/1.73 m²) for chronic kidney disease (CKD) diagnosis does not account for age-related physiological decline and may lead to overdiagnosis in older adults. Studies show that more than half of individuals aged 70 or older fall below this threshold despite lacking albuminuria or any clinical evidence of kidney dysfunction. Such findings raise important questions about the appropriateness of age-independent diagnostic criteria. Recent initiatives to develop age-specific reference values—seen in German, Japanese, and Chinese populations—support a more nuanced diagnostic framework that can distinguish between healthy aging and true pathological decline. In addition, modifiable risk factors such as hypertension, diabetes, smoking, obesity, and albuminuria can accelerate kidney function loss, compounding the effects of natural aging. Conversely, lifestyle interventions—such as blood pressure management, dietary modification, and regular physical activity—have demonstrated potential to slow the progression of renal decline in older adults. Renal aging is not solely a structural process; it carries tangible clinical consequences. Even modest reductions in eGFR are associated with shorter healthy life expectancy, increased healthcare utilization, and greater risk of complications, including anemia and cardiovascular disease. In conclusion, recognizing the natural

trajectory of kidney aging—and differentiating it from early CKD—is critical for accurate risk assessment, prevention of overdiagnosis, and delivery of individualized care. Incorporating age-adjusted diagnostic thresholds and monitoring eGFR trends over time will be key to optimizing kidney health in an aging global population.

Keywords: Renal aging, Natural decline, Healthy population, eGFR threshold , Natural trajectory