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## Current Therapeutic Guidelines of Lipid Management in CKD Population

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Given the increased risk of cardiovascular disease (CVD) in patients with chronic kidney disease (CKD), lipid assessment and treatment is an important part of care in these patients. In line with drastic paradigm change by the American College of Cardiology/American Heart Association (ACC/AHA) guidelines, which lipid treatment is based on atherosclerotic cardiovascular disease (ASCVD) risk rather than specific lipid levels, the Kidney Disease: Improving Global Outcomes (KDIGO) organization developed clinical practice guidelines on lipid management in CKD patients. In the KDIGO guidelines, statin or statin/ezetimibe was recommended for adults  $\geq 50$  years with estimated glomerular filtration rate (eGFR)  $< 60$  ml/min/1.73 m<sup>2</sup> but not treated with chronic dialysis or kidney transplantation. Statin alone was suggested, if CKD adults  $\geq 50$  years with eGFR  $> 60$  ml/min/1.73 m<sup>2</sup>. In adults aged 18-49 years with CKD but not treated with chronic dialysis, the KDIGO suggested statin, if patients have one of the following: 1) known coronary disease (myocardial infarction or coronary revascularization), 2) diabetes mellitus, 3) prior ischemic stroke, or 4) estimated 10-year incidence of coronary death or nonfatal myocardial infarction of  $\geq 10\%$  based on the Framingham risk score. In dialysis patients, statin or statin/ezetimibe combinations should not be initiated, but it can be continued, if patients are receiving treatment at the time of dialysis initiation. Even though nephrology communities agreed with most recommendations of the KDIGO guidelines, risk assessment score was criticized. Because age is the strongest predictor of CVD in any equation of the Framingham risk score models, treatment decision is driven in large part by age. Moreover, the Framingham risk score could overestimate or underestimate risk in populations other than the United States (US) population, and within the US populations other than European Americans and African Americans,

e.g. Hispanic Americans or Native Americans. However, apart from limitation of the Framingham risk score, other national and international guidelines or expert recommendations of lipid treatment have consistently regarded CKD patients as high risk group of ASCVD. In the US National Lipid Association (NLA) recommendations, patients with CKD stage 3B (eGFR 30-44 ml/min/1.73 m<sup>2</sup>) or stage 4 (eGFR 15-29 ml/min/1.73 m<sup>2</sup>) are categorized into high risk group of ASCVD. Moreover, the NLA recommended that ASCVD risk calculators should not be used in these patients, because they may underestimate risk. The European Society of Cardiology (ESC)/European Atherosclerosis Society (ESA) guidelines also indicated that CKD patients are automatically at very high or high total CV risk and no risk estimation models are needed for them. From these current guidelines, there is no longer any question about high risk of CVD in CKD patients, leading to careful attention on dyslipidemia management in these patients. However, unfortunately, there is a lack of recommendation for stage 5 (or on chronic dialysis) patients in current guidelines. The KDIGO recommended avoiding initiation of statins or statin/ezetimibe combinations in dialysis patients. But there is no recommendation to stop statins or statin/ezetimibe in dialysis patients who are already receiving therapy. The US NLA did not recommend a treatment goal in dialysis patients due to insufficient evidence. Because CKD stage 5 (or on chronic dialysis) patients have a very high risk of ASCVD, further research and guidelines for these population are essential. In addition, emerging data on recent therapeutic drugs, including proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitor, MTP inhibitor, or antisense apolipoprotein B oligonucleotide, should be addressed in future treatment guidelines in patients with CKD.