

Section III: Cardiovascular Disease

Introduction

The incidence of CVD is high after kidney transplantation (429–434). The annual rate of fatal or nonfatal CVD events is 3.5–5.0% in KTRs, 50-fold higher than in the general population (435). By 36 months after transplantation, nearly 40% of patients have experienced a CVD event (436). Although acute myocardial infarction is common after transplantation, especially in elderly patients and those with diabetes (437) congestive heart failure (CHF) is also a common CVD complication (436). Most of the

‘traditional risk factors’ in the general population, including cigarette smoking, diabetes, hypertension and dyslipidemias, are also risk factors for CVD in KTRs (Table 18). In addition, many KTRs have had CKD for an extended period of time prior to transplantation, and have thereby acquired additional CVD risk by the time they undergo transplantation. For all of these reasons, KTRs should be considered to be at the highest risk for CVD and managed accordingly.

Table 18: Independent predictors of CVD in KTRs

Predictor	Number of studies (number of analyses)	Total number of subjects (range)	Outcomes	Number statistically significant (p < 0.05)
Tobacco use (438–443)	6 (10)	57 027 (427–27 011)	All CVD	1/1
			CAD	1/2
			CeVD	1/2
			PVD	0/2
			CHF	1/1
			All-cause mortality	2/2
Diabetes (430,442,444–453)	12 (17)	115 510 (158–76 481)	All CVD	1/1
			CAD	3/3
			CeVD	2/2
			PVD	2/2
			CV mortality	3/3
			All-cause mortality	6/6
Obese/elevated BMI (14,443,454–456)	5 (6)	103 295 (2067–51 927)	CHF	1/1
			CV mortality	1/1
			All-cause mortality	2/4
Hypertension ^a (439–441,443,450)	5 (5)	29 259 (403–27 011)	All CVD	1/1
			CeVD	1/1
			CHF	2/2
			All-cause mortality	1/1
Dyslipidemia ^b (457–465)	9 (9)	3657 (21–1124)	All CVD (combined in systematic review)	5/9 1/4 2/7 2/7

BMI, body mass index; CAD, coronary artery disease; CeVD, cerebrovascular disease; CHF, congestive heart failure; CVD, cardiovascular disease; PVD, peripheral vascular disease.

^aBased on studies that met criteria for systematic reviews of tobacco use, diabetes and obesity.

^bBased on a systematic review performed for the KDOQI Dyslipidemia guidelines (466). This includes smaller studies than would have been included in a *de novo* systematic review. In addition, not all associations are independent in multivariable analysis.

Rating Guideline Recommendations

Within each recommendation, the strength of recommendation is indicated as **Level 1**, **Level 2**, or **Not Graded**, and the quality of the supporting evidence is shown as **A**, **B**, **C**, or **D**.

Grade*	Wording	Grade for quality of evidence	Quality of evidence
Level 1	'We recommend'	A	High
		B	Moderate
Level 2	'We suggest'	C	Low
		D	Very low

*The additional category 'Not Graded' was used, typically, to provide guidance based on common sense or where the topic does not allow adequate application of evidence. The most common examples include recommendations regarding monitoring intervals, counseling, and referral to other clinical specialists. The ungraded recommendations are generally written as simple declarative statements, but are not meant to be interpreted as being stronger recommendations than Level 1 or 2 recommendations.