Blood Pressure Control and Cardiovascular/Renal Outcomes

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KEYWORDS

• Diabetes • Hypertension • Cardiovascular outcomes • Diabetic kidney disease
• Blood pressure goals

KEY POINTS

- Type 2 diabetes mellitus is associated with an increased risk of hypertension, kidney disease, and cardiovascular disease.
- Strong evidence from clinical trials and meta-analyses supports targeting blood pressure reduction to at least less than 140/90 mm Hg in all adults with diabetes.
- Lower blood pressure targets that are less than 130/80 mm Hg are beneficial for selected patients with high cardiovascular disease risk if they can be achieved without undue burden.
- Treatment is based on a foundation of lifestyle modifications, especially a reduce sodium diet (<2300 mg/d) and at least 6 hours of uninterrupted sleep nightly, along with medications including renin angiotensin system (RAS) inhibitors, calcium antagonists, and thiazide-like diuretics.
- For patients with albuminuria greater than 300 mg/d, a renin angiotensin system inhibitor must be part of the antihypertensive regimen.

INTRODUCTION

Diabetes mellitus (DM) is a growing epidemic. By 2030, it is projected that there will be at least 400 million individuals with type 2 DM worldwide, with many of those affected being relatively young and living in low- or middle-income countries.[1] Type 2 DM is associated with an increased risk of hypertension. At the age of 45, around 40% of patients with type 2 diabetes are hypertensive, and the proportion increases to 60% by the age of 75.[2] There is also an increased risk of renal disease and a 2-– to 4-fold

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increased risk for cardiovascular disease (CVD) compared with the general population.[2–4]

CVD is the most common cause of death and disability in patients with type 2 DM.[5,6] Hypertension is an important and modifiable risk factor for CVD associated with DM, and the results of studies suggest that 35% to 75% of the cardiovascular risk in patients with DM can be attributed to the presence of hypertension.[6–8] Hence, management of hypertension contributes significantly to the reduction of burden of CVD in diabetes.[9]

TARGET BLOOD PRESSURE IN PATIENTS WITH DIABETES

The bulk of outcome data about blood pressure (BP) levels in diabetes is based on trials in patients with high cardiovascular risk (generally >7–10 years). Only 2 prospective trials were powered to address the question of BP level and effect on cardiovascular outcome in diabetes, the United Kingdom Prospective Diabetes Study (UKPDS)[9] and the Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial.[10]

In 1998, much enthusiasm was increased by the publication of the post hoc analysis of the Hypertension Optimal Treatment (HOT) trial,[11] and, shortly thereafter, of the UKPDS,[9] both showing that intense BP-lowering treatment significantly reduces cardiovascular morbidity and mortality in hypertensive patients with type 2 DM. These trials are discussed in detail later.

Thereafter, most diabetes and hypertension guidelines published in the first decade of the current century recommended that antihypertensive treatment be initiated at a lower systolic BP (SBP) threshold (130 mm Hg) in individuals with diabetes. They also recommended lower SBP targets (SBP <130 mm Hg in diabetes vs SBP <140 mm Hg in non–diabetic individuals).[12,13] Hence, earlier data from 2000 to 2012 from American Diabetes Association (ADA), Canadian Hypertension Society, Joint National Committee 7 (JNC 7), and Kidney Disease Outcomes Quality Initiative (KDOQI) (National Kindey Foundation [NKF]) all supported a BP goal of less than 130/80 mm Hg in patients with diabetes to reduce cardiovascular risk. After attention was called on the lack of trial evidence for these recommendations,[14] most of the recent guidelines reconsidered their conclusions and now usually recommend that initiation and target of treatment should be similar regardless of diabetes status.[15–19]

The ADA report in 2016, Kidney Disease: Improving Global Outcomes (KDIGO)/KDOQI (NKF) 2013 and the 2014 Expert Panel Report support a BP goal of less than 140/90 mm Hg for those with diabetes to reduce cardiovascular risk.[18,20,21] The most recent ADA 2017 BP Consensus Report, however, states that although all patients with diabetes must have a BP less than 140/90 mm Hg, a lower BP, that is, less than 130/80 mm Hg, should be achieved for those with high CVD risk. This lower goal should be achieved without undue treatment tolerability issues.[22]

RANDOMIZED CLINICAL TRIALS OF INTENSIVE BLOOD PRESSURE CONTROL

In type 2 diabetes, the UKPDS showed that targeting BP less than 150/85 mm Hg versus less than 180/105 mm Hg reduced composite microvascular and macrovascular diabetes complications by 24%.[9] Events included reduction in deaths related to diabetes, stroke, and heart failure, and in microvascular end points predominantly owing to a reduced risk of retinal photocoagulation. There was a nonsignificant reduction in all-cause mortality. Hence, the SBP goal less than 150 mm Hg improved cardiovascular and cerebrovascular outcomes.

The ACCORD blood pressure (ACCORD BP) trial examined the effects of intensive BP control (goal SBP <120 mm Hg) versus standard BP control (target SBP <140 mm Hg) among people with type 2 diabetes. Although it failed to demonstrate any