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## Review

# Achievement of guideline targets for blood pressure, lipid, and glycaemic control in type 2 diabetes: A meta-analysis



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## ABSTRACT

We assessed global achievement of targets recommended by the American Diabetes Association (ADA), European Association for the Study of Diabetes (EASD), and National Institute of Health and Care Excellence (NICE) for type 2 diabetes.

We searched Medline, Embase, and The Cochrane Library for observational studies reporting target attainment (2006 to 2017 inclusive) for HbA1c, blood pressure, or lipids (low density lipoprotein cholesterol [LDL-C], high density lipoprotein cholesterol [HDL-C], or triglycerides). Rates were pooled using a random-effects meta-analysis. Study quality and risk of small study of bias was assessed.

From 2491 screened records, 24 studies were included reporting on 369,251 people from 20 countries. The pooled target achievement rates were; 42.8% (95% CI 38.1–47.5%) for glycaemic control, 29.0% (22.9–35.9%) for blood pressure, 49.2% (39.0–59.4%) for LDL-C, 58.2% (51.7–64.4%) for HDL-C, and 61.9% (55.2–68.2%) for triglyceride control. A higher proportion of people achieved HbA1c targets within Europe and North America than the rest of the world. A higher proportion of people achieved blood pressure targets in North America than Europe or the rest of the world. Meta regression showed no significant improvement in rates by year for any target.

The achievement of evidence-based targets is markedly suboptimal globally and not improving.

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## 1. Introduction

With the growing prevalence of type 2 diabetes (T2DM) worldwide there is an increasing burden of disease from complications, many of which are preventable [1,2]. Improvements in glycaemic control (HbA1c reduction) have been demonstrated to reduce both microvascular and macrovascular complications [3]. Blood pressure reduction in people with significant hypertension and diabetes reduces the risk of macrovascular disease when aiming for modest targets [4] although intensive blood pressure control (a target systolic blood pressure below 120 mmHg) has not been demonstrated to improve outcomes [5]. Similarly lipid control has also been demonstrated to reduce cardiovascular risk [6–8]. Many local, national, and international organisations have therefore developed guidelines which recommend evidence-based glycaemic, blood pressure, and lipid targets to improve outcomes in people with T2DM. Whilst there are a large number of guidelines available, previous analyses have demonstrated that they are broadly consistent [9,10].

The European Association for the Study of Diabetes (EASD) and American Diabetes Association (ADA) joint position statement, first produced in 2006, provides evidence-based recommendations for glycaemic control in T2DM [11]. This position statement was updated in 2012 [12], and again in 2015 [13]. The ADA also separately produces annual guidelines (Standards of Medical Care in Diabetes) which additionally provide blood pressure and lipid targets [14]. The EASD in conjunction with the European Society of Cardiology (ESC) also provides recommendations for blood pressure and lipid control [15]. In the UK, the National Institute of Health and Care Excellence (NICE) provides similar glycaemic control, blood pressure, and lipid recommendations [16]. A summary of glycaemic, blood pressure, and lipid targets from the most recent guidelines is provided in [Supplementary Table S1](#).

Previous studies have suggested that achievement of glycaemic, blood pressure, and lipid targets in diabetes is markedly suboptimal [17–19]. A systematic assessment of the current levels of achievement of major diabetes guideline targets is important to provide a global overview of care quality

in people with T2DM. We conducted a systematic review and meta-analysis to evaluate the achievement of targets set by the ADA, EASD and NICE guidelines for glycaemic, blood pressure, and lipid control in people with T2DM globally.

## 2. Methods

We performed a systematic review and meta-analysis to describe the proportion of people with T2DM achieving targets recommended by ADA, EASD, or NICE for glycaemic control, blood pressure, or lipid targets. Lipid targets comprised targets for low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C), or triglycerides. This systematic review and meta-analysis was performed and reported in accordance with the review protocol registered with PROSPERO (Registration Number CRD42015027865) and in accordance with the PRISMA and MOOSE guidelines [20,21].

### 2.1. Study selection

We identified observational studies that reported the proportion of people with T2DM achieving one or more of clinical targets of interest. As per our pre-specified inclusion criteria we included only those studies which provided a comparison against guidelines published by the ADA, EASD, or NICE in the last 10 years (2006 onwards). We excluded studies which provided a comparison against other guidelines, which assessed or involved an intervention, which included children, or which included people with other types (type 1 diabetes, gestational diabetes, monogenic diabetes, or secondary diabetes) where outcomes for those with T2DM were not reported separately.

We searched the Medline, Embase, and Cochrane Library electronic databases from 1st January 2006 to 22nd February 2017. The search strategy incorporated both Medical subject headings (MeSH) and keywords for T2DM, guidelines, and adherence ([Appendix 1](#)) and was adapted from recent published reviews [22–24]. All MeSH subheadings were included. No language restrictions were applied to optimise capture of guideline target achievement globally. Online translation

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