Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis


CRD summary
This review concluded that many trials of quality improvement strategies in diabetes management showed improvements in diabetes care. The authors’ conclusion reflected the overall results. Difference between the strategies assessed, the poor quality of most trials, and the impact of baseline glycated haemoglobin control on intervention effect should be considered when interpreting the reliability and applicability of the conclusions.

Authors’ objectives
To assess the effectiveness of quality improvement strategies for diabetes care on glycated haemoglobin (HbA1c), vascular risk management, microvascular complication monitoring and smoking cessation in patients with diabetes. This is an update and expansion of a previous review (see Other Publications of Related Interest)

Searching
MEDLINE and Cochrane Effective Practice and Organisation of Care (EPOC) Group database were searched between July 2003 and July 2010. References from the original systematic review (see other publications of related interest) were also considered for inclusion. The search strategy was reported. References of included studies were also checked for additional studies. Only studies reported in English were included in the review.

Study selection
Randomised controlled trials (RCTs) that assessed 11 predefined quality improvement strategies or financial incentives (for health care professionals) for the management of adult out-patients with diabetes were included. Eligible strategies or incentives targeted health systems, health care professionals or patients. Full definitions of eligible strategies were reported in the paper. Trials of interventions aimed solely at patients were excluded. Trials were required to report at least one process of care measure (such as proportion of patients taking aspirin, statins or antihypertensive drugs, screening for retinopathy or foot abnormalities, monitoring of renal function), or intermediate outcomes (glycated haemoglobin or low-density lipoprotein cholesterol concentrations, blood pressure, controlled hypertension rates and smoking quit rates).

Included trials assessed a range of quality improvement strategies such as: audit and feedback; case management; team changes; electronic patient registry; clinician or patient education or reminders; facilitated relay; promotion of self-management; continuous quality improvement; and financial incentives. Almost half the trials were conducted in the USA, fewer than 10% in the UK, and a large number of developed and emerging health care systems were represented. A wide-range of health care professionals were represented in the delivery of interventions. Approximately half the enrolled patients were male and mean ages ranged from 19.5 to 76 years.

Two reviewers independently assessed the studies for inclusion in the review; disagreements were resolved by discussion or consultation with a third reviewer.

Assessment of study quality
Risk of bias in the included studies was assessed using the Cochrane EPOC method by two independent reviewers; disagreements were resolved through discussion or consultation with a third reviewer.

Data extraction
Data on outcome measures at both baseline and post-intervention were extracted. For cluster randomised trials with patient-level analysis, inter-cluster correlation coefficients were used to calculate effective sample sizes for each outcome; these were imputed from other included trials where necessary. Relative risks (RR) and mean differences were calculated. Two independent reviewers extracted the data using a prespecified form for both new studies and those
Methods of synthesis
Random-effects meta-analyses were used to calculate pooled relative risks (RRs) with 95% confidence intervals (CI) for dichotomous outcomes or weighted mean differences for continuous outcomes. Where trials with multiple arms were concerned, data from only two arms were used in the analysis. Heterogeneity between studies was assessed using I². A post-hoc analysis was used to explore the impact on treatment effect of enrolling patients with poor values on quality indicators. A prespecified meta-regression with a linear fixed-effect model was used to assess the impact of baseline glycated haemoglobin and median effective sample size on treatment effect; full details of the analysis were reported in the paper.

Results of the review
Forty-eight cluster-randomised trials (2,538 clusters, 84,865 patients) and 94 patient-randomised trials (38,664 patients) were included in the review. The risk of bias was high or unclear in most trials on all criteria.

Quality improvement strategies resulted in statistically significant improvements in a number of measures compared to usual care. These included glycated haemoglobin (mean difference 0.37%, 95% CI 0.28 to 0.45; 120 trials); low-density lipoprotein cholesterol (0.10mmol/L, 95% CI 0.05 to 0.14; 47 trials); systolic blood pressure (3.13mmHg, 95% CI 2.19 to 4.06, 65 trials) and diastolic blood pressure (1.5mmHg, 95% CI 0.95 to 2.15; 61 trials). The likelihood of patients receiving aspirin and anti-hypertensive drugs was also statistically significantly higher in intervention arms compared to usual care, as was the rate of screening for retinopathy, renal function and foot abnormalities. There were no statistically significant differences in statin use, hypertension control or smoking cessation. Although effect estimates varied across the different strategies assessed, all showed benefits on glycated haemoglobin except for clinician education. Statistical heterogeneity was moderate or high for most analyses. In a sensitivity analysis, removing the results of trials of each strategy in turn did not significantly alter the results of the glycated haemoglobin analysis.

Baseline glycated haemoglobin mediated the impact of the intervention on glycated haemoglobin levels, and diastolic and systolic blood pressure; larger effects were seen when baseline control was poor.

Authors' conclusions
Many trials of quality improvement strategies showed improvements in diabetes care; a larger effect was found when baseline control was poor.

CRD commentary
The review question and inclusion criteria were clear. Two relevant databases were searched but the restriction of the review to studies reported in English may have led to the omission of relevant studies and the introduction of selection bias. The authors reported using methods designed to reduce reviewer bias and error at all stages of the review process. Quality assessment used appropriate criteria for assessing risk of bias. The methods used to synthesise the studies appeared reasonable.

The authors' conclusions reflected the results of the synthesis. Heterogeneity between the strategies assessed and the health care settings in which they were assessed, the poor quality of most trials, and the impact of baseline glycated haemoglobin control on intervention effect should be considered when interpreting the reliability and generalisability of the conclusions.

Implications of the review for practice and research
Practice: The authors stated that interventions that targeted the system of chronic disease management, with patient-mediated quality improvement strategies should form an important part of interventions to improve diabetes management. Interventions that were targeted only at health care professionals appeared beneficial only if baseline glycated haemoglobin control was poor. The authors further stated that careful selection of patients who would receive most benefit from quality improvement strategies should be considered by decision makers.

Research: The authors stated that future assessments should target a broad range of diabetes process and outcome measures and carefully assess the role of context. The quality improvement strategy should be carefully tailored and
interventions fully described. They further stated that further exploration of the relative cost-effectiveness of different quality improvement strategies for diabetes management was warranted, with an assessment of the value associated with the expected benefits from such strategies.

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