Interventions with adherence-promoting components in pediatric type 1 diabetes: meta-analysis of their impact on glycemic control

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CRD summary
The authors concluded that adherence-promoting interventions that focused on direct behavioural processes and neglected emotional, social and family processes were unlikely to improve diabetes management in children. The evidence showed very low effect sizes for both direct and combined interventions that together with potential for bias in the review mean the authors’ conclusions should be interpreted with substantial caution.

Authors’ objectives
To assess the effects of interventions with adherence-promoting components on glycaemic control in children and adolescents with type 1 diabetes.

Searching
PubMed and SCOPUS were searched between 1994 and April 2009 for relevant articles; search terms were reported. Recent reviews and meta-analyses were reviewed.

Study selection
Randomised controlled trials (RCTs) that assessed the effects of interventions with adherence or self-management promoting components in children and adolescents (less than 19 years) with type 1 diabetes were eligible for inclusion if they reported results on adherence and glycaemic control (levels of glycated haemoglobin A1C).

Most of the included studies were conducted in USA; one was conducted in UK and one in India. Studies were conducted between 1994 and 2007. Patient age ranged from three to 22 years. There was considerable variability in the race/ethnicity of patients. Mean duration of type 1 diabetes ranged from 2.7 to 8.7 years. The interventions were categorised as direct behavioural (such as diabetes video games, individual or family instruction and individual play at home to increase blood glucose monitoring frequency) or combined behavioural (delivered to individuals, their families or in groups and targeting emotional, social or family processes to facilitate diabetes management). Most studies delivered the intervention for one hour for between four and 15 sessions. Most controls received standard care in the diabetes clinic.

The authors did not state how many reviewers screened the studies for inclusion.

Assessment of study quality
The authors did not state that they assessed study quality.

Data extraction
Two reviewers extracted data on adherence and glycaemic control at post-treatment and up to six months follow-up. Effect sizes and 95% confidence intervals (CIs) for change in glycaemic control from pre- to post-treatment were calculated, weighted by the inverse of the variance, for the intervention versus control groups.

Methods of synthesis
Mean effect sizes and 95% CIs were pooled across studies using a previously described approach (Lipsey and Wilson 2001) and weighted by the inverse of the variance. Statistical heterogeneity was assessed using the Q statistic.

Associations between the mean effect size and time to follow-up or whether the intervention targeted direct behavioural interventions or combined behavioural interventions were assessed using Spearman’s rho.

Results of the review
Fifteen studies (n=997 participants, range 22 to 127) were included in the review. Follow-up ranged from 12 to 52 weeks. Attrition rates reported in nine studies ranged between 3.4% and 13.3%.

The mean effect size for pre- to post-treatment change for the intervention versus control group was 0.11 (95% CI -0.01 to 0.23; 15 studies), which indicated a very modest improvement in glycaemic control. There was no evidence of statistical heterogeneity.

The association between the mean effect size and time to follow-up was not significant, but the association between mean effect size and type of intervention indicated that combined interventions were associated with larger effects on glycaemic control (p<0.03).

**Authors' conclusions**
Adherence-promoting interventions that focused on direct behavioural processes for type 1 diabetes management in children and neglected emotional, social and family processes were unlikely to improve glycaemic control; multicomponent interventions showed more robust effects on A1C. Further clinical research was needed to assess interventions that involved these components and their effects on paediatric health outcomes.

**CRD commentary**
The review question and supporting inclusion criteria were clearly stated. The literature search was adequate, but did not appear to search for unpublished data and it was unclear whether there were any language restrictions. As such, potentially relevant data may have been missed. Study quality was not assessed formally so the quality of the included studies was unknown. Data extraction was undertaken in duplicate; it was unclear whether this was the same for study selection. It was unclear whether a random-effects or fixed-effect model was used to pool the studies. There was no evidence of statistical heterogeneity. Some studies appeared to include participants over the age of 19. The dose of intervention varied between studies and generally involved a small number of short sessions. Sample sizes were generally small. It should be noted that only four studies assessed direct behavioural interventions and only a small number of studies reported adherence levels. The authors highlighted potential for selection bias as all studies recruited patients from a larger paediatric diabetes clinical population and acknowledged the methodological heterogeneity among studies.

Given the uncertainties in the review and very low effect sizes for both direct and combined interventions, the authors’ conclusions should be interpreted with caution.

**Implications of the review for practice and research**

**Practice**: The authors did not state any implications for practice.

**Research**: The authors stated that trials should be replicated and deployed in clinics to further demonstrate the effectiveness of these types of intervention in improving glycaemic control and identify the most effective interventions. Future research should examine the effect of variables (such as socioeconomic status and family structure) on glycaemic outcomes. Research into costs of these interventions was needed.

**Funding**
No direct funding was reported.

**Bibliographic details**
Hood KK, Rohan JM, Peterson CM, Drotar D. Interventions with adherence-promoting components in pediatric type 1 diabetes: meta-analysis of their impact on glycemic control. Diabetes Care 2010; 33(7): 1658-1664

**PubMedID**
20587726

**DOI**
10.2337/dc09-2268

Original Paper URL
http://care.diabetesjournals.org/content/33/7/1658.abstract

Indexing Status
Subject indexing assigned by NLM

MeSH
Child; Diabetes Mellitus, Type 1 /drug therapy /psychology; Humans; Hyperglycemia /drug therapy /psychology; Hypoglycemic Agents /therapeutic use; Insulin /therapeutic use; Medication Adherence; Self Care; Social Support

Accession Number
12010007652

Date bibliographic record published
08/06/2011

Date abstract record published
26/10/2011

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.