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Children with type 1 diabetes: where are we at?

Improving glycaemic control in children and adolescents presents unique problems

TYPE 1 DIABETES affects one in 500 children and adolescents, and vascular complications remain a major cause of mortality and morbidity in adult life. Blood glucose targets have fallen since confirmation of the unequivocal relationship between glycaemic control and microvascular complications.^{1,2} In this issue of the Journal (*page 235*), Craig et al present a population-based, cross-sectional study of 1190 children and adolescents with type 1 diabetes in New South Wales and the Australian Capital Territory.³ Their median HbA_{1c} level of 8.2% probably reflects some selection bias, because 571 (33%) of the population did not participate. However, this level of glycaemic control still represents a considerable improvement over the past 10 years⁴ and is comparable to levels found in international studies of children with type 1 diabetes.⁵ This trend accompanies the increasing use of intensive management in children and adolescents, but also the worrying rise in the incidence of severe hypoglycaemia.

There are compelling reasons to recommend intensive therapy in adolescents with type 1 diabetes — either multiple daily injections or continuous subcutaneous insulin infusion. The effectiveness of intensive therapy in improving and maintaining good glycaemic control is well established in adolescents under research trial conditions.⁶ More recent data also indicate that the benefits of intensive therapy and improved glycaemic control persist even when HbA_{1c} levels later rise.⁷ After completion of the Diabetes Control and Complications Trial (DCCT), adolescents from the former intensive therapy and conventional therapy groups returned to routine care and were advised to use intensive therapy. Despite no difference in their glycaemic control for four years after the end of the DCCT, the benefits of previous better control in the intensive therapy group persisted. Their prevalence of progression to proliferative or severe non-proliferative retinopathy was reduced by 78% during the four years. Suboptimal control during adolescence appears to have a lasting harmful effect, even when better glycaemic control is achieved later.

Those caring for children and adolescents with type 1 diabetes may worry about the demands on the family and child of achieving good glycaemic control with intensive therapy. However, good glycaemic control is associated with better quality-of-life scores (QOL) in adolescents and less perceived burden by their parents.⁸ The intensity of the insulin regimen does not adversely affect QOL. Clearly, the demands of achieving good control are less than the consequences of poor control.⁸

The limiting factor of achieving ideal glycaemic control remains hypoglycaemia, excluding other problems of adherence or family functioning. Adolescents in the DCCT had higher rates of hypoglycaemia than their adult

counterparts, despite having higher HbA_{1c} levels.⁶ Glucagon secretion, which stimulates hepatic glycogenolysis, is blunted early in the course of type 1 diabetes, increasing the patient's vulnerability to hypoglycaemia. Further, the blood glucose threshold level for catecholamine release in response to hypoglycaemia is lowered in patients with better glycaemic control and this counter-regulatory response is most blunted during sleep.⁹ Recently available continuous blood glucose monitoring devices have shown that nocturnal hypoglycaemia is frequent in children. However, both new insulin analogues and continuous subcutaneous insulin therapy hold promise of improving control without the attendant increased risk of hypoglycaemia. In Western Australia, children with type 1 diabetes had more

hypoglycaemia in association with falling HbA_{1c} levels until 1995;⁴ since then their control has improved further, but without increased hypoglycaemia.

Can the DCCT recommendations that adolescents receive intensive therapy be reproduced in routine care? The Hvidore Study Group has followed more than 2500 children and adolescents over three years in Europe, Canada and Japan.⁵ Despite more use of intensive therapy, glycaemic control did not necessarily improve with wide differences between paediatric centres. Intensive therapy demands intensive follow-up, education and support, as well as resources that many Australian paediatric diabetes units do not have if most patients are to be supported in this way. Most success in implementing the DCCT recommendations is reported from well-resourced units using diabetes clinical nurse consultants.

While it is recommended that adolescents with type 1 diabetes receive intensive therapy, schedules need to be individualised. For example, some schoolchildren need insulin at afternoon tea, most adolescents need longer-acting insulin before bed for night control, and many preschoolers are managed on intermediate-acting insulin in the morning with small doses of insulin analogues to cover hyperglycaemia later in the day. Insulin pumps may provide the best solution for some patients, especially those with frequent hypoglycaemia or hypoglycaemic unawareness, but without government subsidy they are not affordable for most families. None of these options are easy for children and their families and, for some, intensive therapy is not possible. Insulin omission and chronic poor glycaemic control remain problems in adolescence and require ongoing intervention.¹⁰

The NSW and ACT study has demonstrated a relatively fast decline in HbA_{1c} levels³ since the DCCT findings. However, glycaemic control (and risk of long term vascular complications) is unlikely to improve further in population

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studies unless multidisciplinary resources increase. It is especially relevant for more educators to be trained in the unique problems of improving control in this age group, and for their expertise to be available to all children.

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