## The 30-year clinical outcome of type 1 diabetes

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It goes without saying that a diagnosis of type 1 diabetes is a life-changing event. Very soon after diagnosis the person is likely to start insulin therapy. They need to know about the practicalities of administering insulin, blood glucose testing, carbohydrate counting and a variety of other day-to-day issues.

Somewhere in this torrent of information the clinician will discuss the complications of diabetes. What can an individual with newly diagnosed type 1 diabetes expect to happen to them as a consequence of this disease? This is a crucial question that most people will want answered at an early stage. The problem we have is that our information is always out of date.

Progress in treatment and management of complications improves year on year. Consequently, any figure we give of the chances of developing, for example, retinopathy, is likely to be an overestimate. Having said that, these further data from the Diabetes Control and Complications Trial/Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC Research Group et al, 2009; summarised below) are very important. The original 10-year study compared a conventional treatment group with an average $HbA_{1c}$ level of 9.1% (76 mmol/mol) with an intensive treatment group with an average $HbA_{1c}$ levels of 7.1% (54 mmol/mol). By study end subjects were followed for a further 12 years with $HbA_{1c}$ levels ranging from 7.8% (62 mmol/mol) to 8.1% (65 mmol/mol) with no difference between groups (Nathan et al, 2005).

A key message from these new data is that the rate of complications is going down. The original study told us that intensive treatment reduced complications. This latest report tells us what an individual can expect over 30 years (presuming that they match the intensive treatment group). There is good news and bad news. Although the numbers are better, the facts are still frightening. About 1 in 5 people will develop proliferative retinopathy, with 1 in 10 developing nephropathy or cardiovascular disease. However, the chances of going blind, requiring kidney replacement or losing a limb are less than 1 in 100.

It is worth restating that this is a pessimistic view of the future. We can realistically hope to do better than this with current treatment and, of course, better still with future developments.

Nathan DM, Cleary PA, Backlund JY et al (2005) Intensive diabetes treatment and cardiovascular disease in patients with type 1 diabetes. *N Engl J Med* **353**: 2643–53

ARCHIVES OF INTERNAL MEDICINE

## The modern-day clinical course of type 1 diabetes

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| Readability | ✓✓✓ |
| Applicability to practice | ✓✓✓✓✓ |
| WOW! factor | ✓✓✓✓ |

1 This study aimed to describe the modern-day clinical course of type 1 diabetes in the age of intensive therapy.

2 The authors performed an analysis of the cumulative incidence of long-term complications observed in the intensively and conventionally treated groups from the Diabetes Control and Complications Trial (DCCT) and Epidemiology of Diabetes Interventions and Complications (EDIC) study of a diabetes duration of 30 years.

3 In the conventional treatment groups, cumulative incidences of proliferative retinopathy, nephropathy and cardiovascular disease after 30 years of diabetes were 50%, 25% and 14%, respectively (DCCT), and 47%, 17% and 14%, respectively (Epidemiology of Diabetes Complications study).

4 Cumulative incidences for the above complications in the DCCT intensively treated group were lower than in the conventional treatment groups: 21%, 9% and 9%, respectively.

5 The authors concluded that the frequency of complications in people with type 1 diabetes is lower than that reported historically, especially when treated intensively.

DCCT/EDIC Research Group et al (2009) Modern-day clinical course of type 1 diabetes mellitus after 30 years' duration: the diabetes control and complications trial/epidemiology of diabetes interventions and complications and Pittsburgh epidemiology of diabetes complications experience (1983-2005). *Arch Intern Med* **169**: 1307–16

DIABETIC MEDICINE

## Clinical and economic benefits of insulin lispro

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| Readability | ✓✓✓✓ |
| Applicability to practice | ✓✓✓✓ |
| WOW! factor | ✓✓ |

1 Evidence suggests that rapid or short-acting insulin analogues are associated with reduced postprandial hypoglycaemia and a reduced frequency of severe and nocturnal hypoglycaemia than regular human insulins (RHIs).

2 This literature review aimed to evaluate the long-term clinical and economic benefits associated with insulin lispro compared with RHI in people with type 1 diabetes in the UK, using the CORE Diabetes Model.

3 The estimated difference in $HbA_{1c}$ level between insulin lispro and RHI was –0.1% (–1.1 mmol/mol; 95% confidence interval –0.2 to 0.0%). Rates of severe hypoglycaemic events for insulin lispro compared with RHI were 21.8 and 46.1 events per 100 patient years, respectively.

4 Regarding quality-adjusted life expectancy (QALE), insulin lispro was associated with improvements of approximately 0.10 quality-adjusted life years (QALYs) compared with RHI (7.60 vs. 7.50, respectively).

5 Treatment with insulin lispro was associated with lower lifetime medical costs per patient than with RHI (£70 576 vs. £72 529, respectively).

6 Severe hypoglycaemia was a key factor in the differences in QALE and lifetime costs. Sensitivity analyses regarding clinical and economic benefit found insulin lispro to be dominant.

7 The authors concluded that insulin lispro is likely to improve QALE, reduce the incidence of complications and lifetime medical costs compared with RHI.

Pratoomsoot C, Smith HT, Kalsekar A et al (2009) An estimation of the long-term clinical and economic benefits of insulin lispro in Type 1 diabetes in the UK. *Diabet Med* **26**: 803–14

DIABETES CARE

## CGM beneficial in people with well controlled T1D

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| Readability | ✓✓ |
| Applicability to practice | ✓✓✓✓ |
| WOW! factor | ✓ |

1 This 26-week randomised trial was undertaken to evaluate the effect of continuous glucose monitoring (CGM) in adults and children with type 1 diabetes (T1D) with good glycaemic control ($HbA_{1c}$ <7% [53 mmol/mol]).

2 A total of 129 adults and children with T1D (age range 8–69 years) were randomised to either CGM ($n$=67) or standard glucose monitoring ($n$=62). Study outcomes were time with glucose ≤70 mg/dL (≤3.9 mmol/L), $HbA_{1c}$ level and severe hypoglycaemic events.

3 At 26 weeks, median time with glucose levels ≤70 mg/dL (≤3.9 mmol/L) had decreased from 91 minutes at baseline to 54 minutes in the CGM group ($P$=0.002), and from 96 to 91 minutes in the control group ($P$=0.43); between group difference was not significant ($P$=0.16).

4 Time spent "out of range" (≤70 or >180 mg/dL [≤3.9 or 10 mmol/L) was lower in the CGM group compared with the control group (377 vs. 491 minutes per day; $P$=0.003).

5 A significant between group difference was observed in $HbA_{1c}$ level that favoured CGM at 26 weeks adjusted for baseline ($P$<0.001).

6 Seven subjects (10%) in the CGM group and seven (11%) in the control group experienced at least one severe hypoglycaemic event.

7 In terms of $HbA_{1c}$ and hypoglycaemic outcomes, CGM was favoured over standard monitoring. The authors concluded that CGM appears to be beneficial in individuals with already well controlled T1D.

Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group (2009) The effect of continuous glucose monitoring in well-controlled type 1 diabetes. *Diabetes Care* **32**: 1378–83

DIABETES CARE

## CSII no better than basal once-daily glargine plus lispro

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| Readability | ✓✓✓ |
| Applicability to practice | ✓✓✓✓ |
| WOW! factor | ✓✓✓ |

1 This prospective randomised study investigated whether multiple daily injections (MDIs) of basal insulin glargine plus prandial insulin lispro could achieve equivalent glycaemic control to CSII in people with type 1 diabetes (T1D).

2 Fifty people on NPH insulin therapy were randomised to either CSII ($n$=24) or MDI ($n$=26) for 24 weeks.

3 By study end, total insulin requirements (mean+SD) for CSII and MDI were 36.2±11.5 and 42.6±15.5 units/day, respectively. $HbA_{1c}$ levels dropped in both groups (CSII −0.7±0.7% [−7.7±7.7 mmol/mol]; MDI −0.6±0.8% [−6.6±8.7 mmol/mol].

4 Hypoglycaemic events were observed in 82% of the CSII group and 93% of the MDI group. Costs for CSII were approximately 3.9 times higher.

5 Glycaemic control was concluded to be no better with CSII therapy than MDI glargine-based therapy in people with T1D previously naïve to both.

Bolli GB, Kerr D, Thomas R et al (2009) Comparison of a multiple daily insulin injection regimen (basal once-daily glargine plus mealtime lispro) and continuous subcutaneous insulin infusion (lispro) in type 1 diabetes: a randomized open parallel multicenter study. *Diabetes Care* **32**: 1170–6

DIABETIC MEDICINE

## Hypoglycaemic risk not reduced by pregnancy planning

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| Readability | ✓✓✓✓ |
| Applicability to practice | ✓✓✓✓ |
| WOW! factor | ✓✓✓ |

1 This study aimed to identify risk factors for severe hypoglycaemia (SH) in pregnancy in type 1 diabetes, including changes in glycaemic control and the effect of pregnancy planning.

2 As part of a 12-month national Scottish audit, data were collected prospectively from 160 women regarding their pregnancy care.

3 SH was experienced by 29.4% of women, with the percentage decreasing through trimesters 1–3.

4 Longer diabetes duration was associated with increased risk of SH pregnancy ($P$=0.012). Glycaemic improvements at the start of pregnancy was not associated with increased risk.

5 The authors concluded that SH during pregnancy in type 1 diabetes is common and that pregnancy planning did not decrease the risk.

Robertson H, Pearson DW, Gold AE (2009) Severe hypoglycaemia during pregnancy in women with Type 1 diabetes is common and planning pregnancy does not decrease the risk. *Diabet Med* **26**: 824–6

DIABETES TECHNOLOGY & THERAPEUTICS

## CGMS accurate and reliable during diving

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| Readability | ✓✓✓✓ |
| Applicability to practice | ✓ |
| WOW! factor | ✓✓ |

1 This study evaluated the accuracy and reliability of the CGMS® (Medtronic, US) during recreational diving in people with type 1 diabetes.

2 Over five dives spanning 3 days, plasma glucose was studied in 12 people with type 1 diabetes and 12 healthy controls. Mean sensor survival time was >48 hours, and 85% of sensors lasted the entire trial duration.

3 Overall mean absolute difference in the type 1 group was 14.4±6%.

4 Hypoglycaemia (≤70 mg/dL) pre- and post-dive was detected with a positive predictive value of 0.39, a negative predictive value of 0.98, sensitivity 0.64 and specificity 0.94.

5 CGMS was concluded to be accurate and reliable in extreme conditions such as scuba diving.

Adolfsson P, Ornhagen H, Jendle J (2009) Accuracy and reliability of continuous glucose monitoring in individuals with type 1 diabetes during recreational diving. *Diabetes Technol Ther* **11**: 493–7

> *"Continuous glucose monitoring appears to be beneficial in individuals with already well controlled type 1 diabetes."*