Management of type 1 diabetes

Diabetes and death in Africa

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There are many things that we need to explain to a young person newly diagnosed with type 1 diabetes. There is the initial explanation of what the diagnosis means, an introduction to insulin self-administration and how to live with diabetes. There will usually be discussion about the long-term nature of the condition and the risk of, and risk modifiers for, the associated complications. Rarely will the risk of death be mentioned to a young person newly diagnosed with diabetes. This is because in the UK, and other developed countries, the immediate risk of death is very small (Podar et al, 2000; Feltbower et al, 2008).

The article by Muyer and colleagues (2010; summarised alongside) is striking because it is so far from our own clinical experience. In the Democratic Republic of Congo (DRC) one in six people will die within 5 years of a diagnosis of diabetes – and the authors admit that this is likely to be an underestimation.

The DRC is a country that sits at the very centre of Africa. It is the third largest country in Africa and, with a population of 61 million, the fourth most populous. It has the potential to be a rich country – with diamond, tin and cobalt reserves – but the inherent corruption and almost continuous civil war have left the economy in drastic decline. The average health-spend per person per year is $US18. The major killers are, of course, infectious diseases. Diarrhoeal diseases, AIDS, measles and tuberculosis feature high on the country's mortality list, with war being the fifth most common cause of death (World Health Organization, 2008).

The problems that lead to high rates of these diseases are the same as those that lead to death from diabetes. The health infrastructure of the country has been destroyed. From the diabetes perspective, this means that regular supplies of insulin cannot be guaranteed. There is now the additional challenge of trying to halt the rise in type 2 diabetes as a result of urbanisation and dietary change. It is the role of the DRC government to ensure supplies of insulin, but it must also be the responsibility of developed economies to support our African neighbours.

> ***"The health infrastructure [in the Democratic Republic of Congo] ... has been destroyed. From the diabetes perspective, this means that regular supplies of insulin cannot be guaranteed."***

Feltbower RG, Bodansky HJ, Patterson CC et al (2008) Acute complications and drug misuse are important causes of death for children and young adults with type 1 diabetes: results from the Yorkshire Register of diabetes in children and young adults. *Diabetes Care* **31**: 922–6

Podar T, Solntsev A, Reunanen A et al (2000) Mortality in patients with childhood-onset type 1 diabetes in Finland, Estonia, and Lithuania: follow-up of nationwide cohorts. *Diabetes Care* **23**: 290–4

World Health Organization (2008) *WHO Statistical Information System: Democratic Republic of the Congo.* WHO, Geneva. Available at: www.who.int/countries/cod/en/ (accessed 05.07.10)

DIABETES CARE

CGM reduces hypos in the critically ill

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

1 People (n=124) on mechanical ventilation were randomly assigned to real-time continuous glucose monitoring (CGM; glucose values given every 5 minutes) or control (selective arterial glucose measurements according to an algorithm) for 72 hours.

2 The primary endpoint was percentage of time with a blood glucoes <110 mg/dL (<6.1 mmol/L).

3 The rate of severe hypoglycemia was lower in the CGM group (P=0.031), but CGM failed to improve overall glycemic control.

Holzinger U, Warszawska J, Kitzberger R et al (2010) Real-time continuous glucose monitoring in critically ill patients: a prospective randomized trial. *Diabetes Care* **33**: 467–72

DIABETIC MEDICINE

One in six people with diabetes in Kinshasa die before age 20

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

1 The authors undertook a retrospective review of medical records in Kinshasa, Democratic Republic of Congo, to determine the rate of mortality among young people with diabetes. This was the first study of its kind in this population.

2 Standardised medical records from an integrated healthcare network between 1994 and 2004 were assessed for people who were ≤30 years old at the time of clinical diagnosis of diabetes (mixed cohort, no facility for classification according to diabetes type).

3 Mortality in the cohort was established by review of the medical records and by community interview, up until 2007.

4 Approximately 17.4% (159/915) of the cohort died during follow-up, the majority during the first 5 years following diagnosis. Mean annual mortality was 3.62/100 patient-years.

5 Male sex (hazard ratio [HR], 0.66; 95% confidence interval [CI], 0.5–0.9) and age at diagnosis (HR, 0.97 per 1 year increase; 95% CI, 0.94–0.99) were independent predictors of mortality.

6 The most common causes of death were diabetic ketoacidosis (38%) and infection (12%). However, in close to one-third of cases (31%) the cause of death was not known.

7 One in six young people with diabetes die within 5 years of diabetes diagnosis, with those who are ≤20 years of age or male being the most affected groups.

Muyer MT, Buntinx F, Mapatano MA et al (2010) Mortality of young patients with diabetes in Kinshasa, DR Congo. *Diabet Med* **27**: 405–11

DIABETES CARE

Severe hypos most frequent during first half of pregnancy in women with T1D

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

1 Using data from a trial comparing T1D pregnancy outcomes in women randomised to receive prandial insulin aspart (IAsp) or human insulin, the authors sought to assess the incidence, and compare the frequency, of severe hypoglycaemia during pregnancy.

2 IAsp was compared with human insulin in 99 women randomly assigned pre-conception, and in 223 women randomly assigned in early pregnancy (<10 weeks gestation).

3 One or more severe hypoglycaemic events (i.e. requiring third-party assistance) were experienced by 23% (73/322) of the cohort during the study period, with six women experiencing ≥10 events.

4 The relative risk (RR) of severe hypoglycaemia in the first half of pregnancy (RR, 1.70; 95% confidence interval [CI], 0.91–3.18) was greater than during the second half of pregnancy (RR, 1.35; 95% CI, 0.38–4.77).

5 Estimated risk of severe hypoglycemia was lower in women randomised to receive IAsp than human insulin (RR, 0.37; 95% CI, 0.10–1.32; *P*=NS), but higher among women who switched regimens in early pregnancy compared with those whose regimens did not change (IAsp, 3.0 events/patient-year vs 2.1; human insulin, 4.5 vs 3.3).

6 The authors concluded that severe hypoglycaemia is more frequent in early pregnancy, and that fewer severe hypoglycaemic events were experienced by women switched to IAsp in the pre-conception period.

Heller S, Damm P, Mersebach H et al (2010) Hypoglycemia in type 1 diabetic pregnancy: role of preconception insulin aspart treatment in a randomized study. *Diabetes Care* **33**: 473–7

DIABETES CARE

Fuzzy logic theory applied to insulin pump technology

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

1 Insulin pump technology relies on linear mathematical models of glucose–insulin dynamics that are unlike the complex biological system.

2 The authors used the principles of fuzzy logic – a form of multivalued logic that deals with reasoning that is approximate rather than precise – to programme a fully closed-loop system (the MD-Logic Artificial Pancreas System) that imitates the traditional insulin administration decisions.

3 A pilot was conducted in seven adults with T1D who underwent 14 closed-loop control sessions of 8- and 24-hours' duration.

4 During 24-hour closed-loop control, 73% of blood glucose values were between 70 and 180 mg/dL (4 and 10 mmol/L) and no symptomatic hypoglycaemic episodes occurred.

5 Larger population studies of the system are planned.

Atlas E, Nimri R, Miller S (2010) MD-Logic artificial pancreas system. *Diabetes Care* **33**: 1072–6

DIABETIC MEDICINE

Overnight CSII interruption to avoid hypos did not cause hyperglycaemia

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

1 The investigators interrupted the continuous subcutaneous insulin infusion (CSII) of seven children (14.2±2.1 years) with T1D for a minimum of 90 minutes when they approached hypoglycaemia overnight.

2 Criteria for insulin interruption were (i) predicted hypoglycaemia, (ii) low prevailing glucose levels or (iii) too-steep declines in plasma glucose.

3 Plasma glucose was a mean of 6.2±3.2 mmol/L at the time of interruption, 6.4±2.2 mmol/L when insulin delivery was restarted and peaked 60 minutes later after CSII recommencement at a mean of 7.9±2.1 mmol/L (*P*=0.01).

4 The authors did not find hyperglycaemia to be associated with a prolonged CSII interruption to prevent overnight hypoglycaemia.

Elleri D, Allen JM, Nodale M et al (2010) Suspended insulin infusion during overnight closed-loop glucose control in children and adolescents with type 1 diabetes. *Diabet Med* **27**: 480–4

DIABETIC MEDICINE

Mycophenolate mofetil fails to preserve beta-cells in new-onset T1D

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

1 Mycophenolate mofetil (MM; alone or in combination with daclizumab [DB]) was assessed for its potential to arrest beta-cell loss in new-onset T1D.

2 People with sufficient C-peptide within 3 months of T1D diagnosis were randomised to either MM, MM plus DB, or placebo. Primary outcome was mean area under the curve of C-peptide from the 2-hour mixed meal tolerance test at 2 years' follow-up.

3 Mean C-peptide area under the curve was unaffected by MM alone or MM plus DB versus placebo.

4 Adverse events were higher in the active treatment arms than in the placebo group (*P*=NS).

5 Higher MM doses, or more targeted immunotherapies, may be areas for future study.

Gottlieb PA, Quinlan S, Krause-Steinrauf H et al (2010) Failure to preserve beta-cell function with mycophenolate mofetil and daclizumab combined therapy in patients with new- onset type 1 diabetes. *Diabetes Care* **33**: 826–32

"One or more severe hypoglycaemic events were experienced by 23% of the cohort [pregnant women with T1D] during the study period, with six women experiencing ≥10 events."