



Diabetes in Teens: What's New?

Some teens may be newly diagnosed with diabetes. Others may be moving on to a new set of doctors and nurses after having been looked after by a paediatric endocrine team. Many might be asking themselves what it means to have diabetes, especially since many educational materials seem directed not at them, but at older individuals with diabetes.

So, is it better to be a teen with Type 1 diabetes (T1DM), or Type 2 diabetes (T2DM)?

An Australian study of 354 individuals with T2DM and age of onset between 15 and 30 years from 1986 to June 2011 were compared with 470 patients with T1DM with a similar age of onset. The study showed that over the 20 years or more of follow-ups, there were more cardiovascular deaths, higher prevalence of albuminuria, higher chance of nerve damage and macrovascular complications in those with young onset T2DM versus those with T1DM.

It appears that young-onset T2DM is the more lethal phenotype of diabetes and is associated with a greater mortality,

more diabetes complications, and unfavourable cardiovascular disease risk factors when compared with T1DM, in a study from Australia, published in *Diabetes Care* 36:3863–3869, 2013. A study from Finland about people with early onset T1DM showed that their survival has improved over time, compared to those with late onset T1DM, *BMJ* 2011.

As a specialist in the field of paediatric diabetes for the last 25 years since the early nineties, I have seen many changes in how we treat diabetes, what medicines we use and how we monitor progress and glucose control.

For example, the new rapid acting analogues are better able to control

glucose spikes so that ice cream and cakes which were once out of the question for children with diabetes, can now be special treats when taken in moderation and, preferably, after a meal so that glucose spikes are moderated and lots of insulin is active.

Also, we are now able to encourage teens to go all out and excel in sports, because if the doctor and patient work together to tweak doses, sporting excellence and good diabetes control can go together, and extreme sports such as endurance bike rides, marathon runs and even scuba diving are real possibilities in the well controlled, knowledgeable person with diabetes.



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The advent of newer continuous glucose monitoring systems has changed how we monitor glucose readings. What about new technologies?

Well, just as widespread blood glucose monitoring was a game changer about 20 years ago, widespread use of continuous glucose monitoring equipment will be a game changer in the coming years, because products like the DEXCOM CGM, the Abbott Freestyle Libre and the new Guardian Sensor 3 CGMS systems promise to make it easier, more affordable and more patient-centric.

The key issue is that these new CGMS devices are now good enough that you might give a dose of additional insulin based on the data provided and that you can start taking over control of your diabetes rather than having to see a doctor for every insulin change.

The first, the Medtronic Guardian and Enlite 2 systems allowed patients and their doctors to see for the first time how many undetected lows they might be having, eg in the afternoon, during sport or at night during the course of a week. This made it much easier for patients and doctors to adjust their basal insulin or insulin pump basal settings.

Newer systems do even more—the Freestyle Libre (Abbott) which is available only overseas is able to let patients wear

a CGMS sensor on their arms for 14 days and either get on the spot readings by passing the reader over the sensor or download serial data to build up a continuous picture of their readings.

Dexcom (also not available in Singapore) is a conventional CGMS system but is not tied to a pump manufacturer and has an easy smart phone type interface young users find intuitive. Even conventional blood glucose meters have become better and some can measure blood ketones, an important capability which can keep T1DM patients out of hospital for diabetic ketoacidosis (DKA), while others come with an built-in algorithm which can help guide correction doses and meal doses for insulin.

The Medtronic 670G and Guardian Sensor 3 Continuous glucose monitoring system was just given FDA approval in September 2016. The 670G is considered a “hybrid closed loop” system because it is not fully automated—it still requires manual food and correction insulin boluses, as it only automates basal insulin. At least four other companies are poised to launch similar systems in the coming months and trials already are in place for a fully automated system which is able to take care of even meal boluses on their own.

It is, however, sobering to note that because of cost and because not everyone can tolerate the placement of CGMS



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What I see most, besides the technology, is the locus of control, which has passed from doctor and closer towards the patient.

When I first started in the field of paediatric diabetes, the top three problems were :

1 Lack of good rapid acting and reliable, predictable long acting insulins and lack of oral drugs that could help control blood sugar levels. Few patients were on basal bolus, most were on twice a day mixed insulins and some were on fixed ratio mixed insulins (eg Mixtard 70/30). The rapid acting insulin analogues would only come in the late nineties beginning with Humalog, then Novorapid and then Apidra, and the long acting analogues Lantus and Detemir were to appear around 2003 onward.

2 Lack of knowledge on the part of patients and doctors, so that people with diabetes were not getting access to the best management strategies that would have helped them to both get good quality of life and also minimise their long term complications rates.

3 Limitations in technology: blood glucose machines were less portable and were relatively beyond the reach of many people. Most people were using urine glucose testing to guide their insulin regimes. Continuous glucose monitoring and insulin pumps were not yet available, and the concept of the artificial pancreas was just a dream.

In the mid nineties, the DCCT or Diabetes Care and Complications Trial in the USA showed conclusively that intensified care (basal bolus injections and insulin pumps) compared to standard care (twice a day insulin) led to tighter control, better HbA1c and lower diabetes long term complications rates, while the EDICT trial that followed showed that even 10 years after going back to standard care, those in the intensively treated group had better survival and lower complication rates more than those who received standard care. Sadly, this knowledge has not always translated into action.

While all the current insulin analogues rapid and long acting are coming to the end of their exclusive patented period, I find that many young people are still on twice a day mixed insulin regimes instead of using basal bolus (three to five times per day) using analogue insulins to achieve better and smoother control.

Cost has been often cited as a factor but, in reality, the additional cost of better insulin per day translates into two cups of coffee or two soft drinks at coffee shop prices per day, or, at the most, a latte a day if you a big-sized person. Perhaps mindset change and more patient and healthcare provider education is needed here.

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