

Evolution in diabetes management

A vision of an artificial pancreas and the roles of pharmacists in delivery of diabetes services were topics covered in a session on the science and practice of diabetes care on 27 September. **Harriet Adcock** reports

When insulin injections came to the market they were hailed as a miracle, Moira Harrison, an insulin pump consultant and researcher at the University of Brighton, declared. "They gave patients an option besides death," she said.

However, insulin injections did not protect people from the complications of diabetes and could not be seen as a cure. "The main reason for this is that insulin injections are not responsive," she explained.

"Although we have tinkered with formulations, so we have long-acting and short-acting insulin analogues, trying to mimic the biphasic release of insulin is actually very difficult."

Dr Harrison added that the pain associated with insulin injections was a barrier to achieving glycaemic control. "The pain of injections is often underestimated and given the choice most people would prefer not to have to stick needles in themselves."

Dr Harrison went on to describe some alternatives to insulin injections, culminating in her vision of an artificial pancreas.

One way to deliver insulin was via a pump. This option was now gaining in popularity having fallen out of favour after the initial introduction of pumps in 1978. "Insulin pumps have come on in leaps and bounds," she said. Pumps had got smaller and smaller over the years and were now the size of a pager or mobile telephone.

The idea behind pump delivery was to mimic the delivery of insulin from the pancreas. "It allows the user to set different amounts of insulin release for each hour of the day." Users can set a basal insulin release rate to keep blood sugars normal when they are not eating. They can then decide on the amount of carbohydrate they are going to eat and calculate a bolus release to match. "With

most pumps you have an option to have all your insulin in one go, or to have a little bit up front and then the rest over a longer period. You can have temporary increases in basal rates, with different profiles depending on activity. This means there is a lot less variability with a pump than with multiple daily injections. It is a lot more like the physiological situation," Dr Harrison explained.

So what was wrong with pump therapy? "It is not a pancreas," Dr Harrison conceded. This meant glucose monitoring was still required, and that the brain was still needed for calculating basal rates and profiles. "There's no feedback, so if you have a hypoglycaemic attack the pump isn't going to tell you. You still have to react." And if something were to go wrong with the infusion set, so insulin was not delivered, users would quickly reach high blood glucose levels.

"Pumps require a great degree of dedication to get optimal care. But for a lot of people it's well worth it."

Dr Harrison reported that many people imagined that insulin pumps measured a person's blood glucose level and then automatically delivered the amount of insulin required. "It doesn't work like that. There is operator input," she said.

However, she added that there were experimental pumps being developed that involved an implantable glucose sensor connected to a computer control panel. "A complicated algorithm means that the pump user shouldn't need to interfere at all," she explained.

There were, however, some problems with these devices. Work was still being done to perfect the algorithms, they could be a source of infection and not everyone wanted an implanted device.

There were a number of requirements for Dr Harrison's vision of an artificial pancreas.



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Insulin pump: alternative to injections

As a minimum it would need a glucose monitor that could report whether blood glucose was normal, high or low and whether it was falling or rising. It would also need a programmer connected to a pump that would release the appropriate amount of insulin or glucose.

Dr Harrison reported that throughout the world there were over 12 different projects being conducted to combine an external pump with continuous glucose sensing.

There was also research being carried out to find a new sensor that would be biocompatible as well as long-lasting. Current implantable sensors lasted for around three days, making their use prohibitively expensive.

"It's my belief that insulin pumps will drive the most physiological insulin delivery. They will be the closest thing to an artificial pancreas in your pocket. Coupled with continuous glucose sensing this will be the best means of achieving not just tight glycaemic control but also quality of life," Dr Harrison concluded.

Services should be developed alongside those of other professions

Pharmacists' roles in the delivery of diabetes care is changing, Irene Gummerson, a community pharmacist in Wakefield, told conference participants. "There are increasing opportunities," she said.

However, she warned that pharmacy services had to meet the needs of local health communities. "We need to develop pharmacy diabetes services complementary to other professions. There are pockets of activity where there is strong nursing input. We can't upset that." Mrs Gummerson added that there was certainly a need for pharmacy input but that it was up to pharmacists to work out where that need existed.

Pharmacy-led diabetes services had been growing steadily since 1992, when Mrs Gummerson first became interested in diabetes care. At that time, pharmacists were not involved in diabetes care other than through their medicines supply function, she explained. So what had changed since then? "The Government wants to use pharmacists in a better way," she said. This was illustrated in national and local policy documents that used terms such as patient choice, access and responsiveness.

Mrs Gummerson said that other professionals had facilitated change and helped pharmacists in their expanding role. "But

they have also blocked it. Things are better than they were but there are still barriers." She added that pharmacists themselves had been drivers for change, through the new community pharmacy contracts, hospital pharmacists running diabetes clinics, primary care trust pharmacists getting involved with local diabetes committees and working on diabetes guidelines, and GP practice pharmacists conducting medicines use reviews.

Mrs Gummerson pointed out that the idea of pharmacists with a special interest had also been mooted and that pharmacists would be able to show, with accreditation, "that they have something extra to offer".