

How mobiles and pharmacy are set to revolutionise chronic disease treatment

The mobile telephone is set to revolutionise pharmacists' involvement in managing chronic conditions like diabetes. **Stuart McWilliam** investigates

The mobile telephone has evolved from humble origins as the "must have" yuppie accessory of 15 years ago into an all-singing, all-dancing multimedia fashion item, and few would dispute that it is now an indispensable part of modern life. Now it looks set to revolutionise pharmacists' involvement in the management of chronic conditions like diabetes, asthma and hypertension.

The first generation of mobiles were more accurately described as "transportables". The size and weight of house bricks, they were just about capable of facilitating a two-way conversation in the places where (patchy) network coverage allowed. From these small acorns, mighty hand-held computers have grown. Today's mobile can take and send still photographs and video, download ringtones, browse the internet, send and store a mountain of text messages, and play MP3 music files. And you can still talk on it, too.

Field testing

Therefore, because of their ubiquity and data transfer capability, mobiles are starting to make their mark in medicine. Vodafone has been field-testing neurosurgical telemedicine applications using third generation (3G) technology in Germany.

Scientists in Denmark¹ have successfully used text messaging to collect diary data from asthma patients in a pilot study to determine whether increased remote support improves clinical outcomes. Previous studies using home PCs to send the same diary information proved disappointing, with users rejecting the application after a short while.

Researchers from the Norwegian Centre for Telemedicine in Tromsø² studied parent-child interaction using a mobile and wireless system for blood glucose monitoring, and concluded that, whether or not the health outcome is improved as a result, the peace of mind provided by such a system may make it a commercial proposition.

In Finland, Medixine has been promoting home care by integrating diagnostics and patient diaries before sending results via a PC based web-link to health professionals. The company is now offering the same functionality using hand-held mobile PCs.

Researchers in the UK have, however stolen a march. When scientists from Oxford University³ set out to determine whether a system based on automated transfer of data, real time analysis and immediate feedback to the patient could improve glycaemic control for young adults with type 1 diabetes, they adopted the mobile approach.

The substantive difference between their



Information can be sent direct to patients' mobile telephone handsets

work and others cited in the literature is that, with the help of funding from the charitable Vodafone Foundation, professors Andrew Neil and Lionel Tarassenko were able to conduct randomised clinical trials.

For the first time, the use of mobile telephone technology was proved to have a significantly beneficial effect and resulted in demonstrably improved clinical outcomes.

The system involved in the trials, which has subsequently been made commercially available under the "t+ diabetes" brand, uses a glucose meter linked by Bluetooth to a GPRS-enabled mobile telephone. (GPRS allows a handset to communicate with a remote server without the user having to dial in manually.)

After the patient has taken a reading in accordance with the advice he or she has been given by a GP or practice nurse, they spend around 10 seconds adding essential diary information about diet, exercise and general

health via the telephone's keypad. The system is intuitive and easy to use.

The information, together with the reading, is sent by the handset to a central computer which responds within seconds, providing patients with personalised feedback in easy-to-read graphical format delivered to their mobile's display.

The number crunching done by the remote computer uses sophisticated algorithms to help negate the effects of occasional rogue readings and deliver a consistently meaningful result to the patient's mobile.

At a glance

Using the system, patients can see at a glance how successful their glycaemic control has been since the previous reading, or over the past week, month or year. They can also see immediately the influence that specific lifestyle elements and events have had on their blood glucose levels as a result of the data they sent with the glucose reading in the patient diary. Patients who used their mobile to help control blood sugar levels during the nine-month randomised clinical trial reported significantly lower blood glucose levels than the control group:

- There was a reduction in HbA_{1c} in the intervention group after nine months from 9.2 per cent (SD=1.1) to 8.6 per cent (SD=1.4)
- The proportion of patients achieving an HbA_{1c} ≤8.0 per cent at nine months increased in the intervention group from 10.6 per cent to 46.8 per cent
- The authors concluded that real-time feedback using GPRS mobile telephone technology and targeted nurse support leads to sustained levels of monitoring, improvements in blood glucose levels and attainment of HbA_{1c} targets

Systems like t+ diabetes bring self-management within the reach of up to 90 per cent of the population because feedback is delivered direct to patients' mobiles, wherever they are when they take a reading. Patients are empowered to make the right decisions about the management of their diabetes because they are provided with the right information when they need it.

Systems such as t+ diabetes will, in time, mean that GPs, practice nurses and specialist diabetes nurses are able to keep track of their patients' progress without having to see them in surgery time. Alerts can be generated if blood glucose levels fall outside defined parameters while 24-hour supervision is possi-

ble by accessing a secure website. At the same time, t+ diabetes offers new opportunities for the pharmacist.

The version of t+ diabetes involved in the trial included medicines management software which alerted the patient when prescription items were running low. The commercially released product has taken this functionality and added to it. Patients are now able to order repeat prescriptions remotely from within the t+ diabetes application. This means that pharmacists are alerted to any issues surrounding potential medicines misuse which can be addressed when the prescription is filled.

Self-management

This led e-San Ltd, the company responsible for the development of t+ diabetes, to consider how pharmacists could become more involved in patients' self-management of chronic disease using systems like t+ diabetes.

The company, which is in the process of developing remote self-management systems for hypertension and asthma, realised that the mobile approach offers pharmacists an opportunity to make a greater impact as part of the extended health care team.

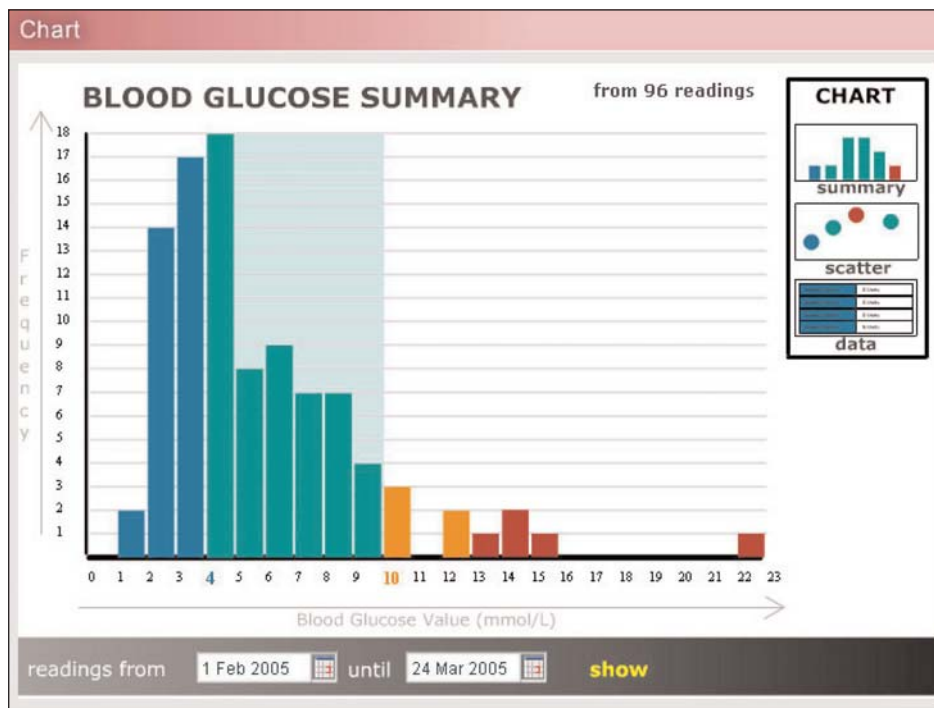
Pharmacy services seem poised to make an increasingly significant contribution to the community health care of people with diabetes and providing services to this group of patients is likely to become an important source of revenue.

Phil Jones, e-San's commercial director, says: "Why should the pharmacist only be involved in screening and medicines use reviews? Products like t+ diabetes will encourage the greater involvement of pharmacists in the management of chronic illness. By the pharmacist keeping a close eye on the way prescription medicines are used, misuse levels and wastage should go down, while greater compliance means medical outcomes will improve. At the same time, the patient will be relieved to know that someone is keeping a regular check on their progress."

With chronic diseases like asthma, diabetes, hypertension and coronary heart disease affecting up to one in five of the population, Mr Jones predicts huge opportunities for the community pharmacist.

"We realised that mobile telephone technology is commonplace and now found across the age range — t+ diabetes was successfully tested in a group that included 80-year-olds. If a system is easy to use, and combines the disease self-management element with the convenience of reminders and the automatic ordering of repeat medicines at the touch of a button, it will become very popular," says Mr Jones.

He adds that t+ diabetes not only gives customers more reasons to remain loyal to the pharmacist who initially supplied the self-management system, boosting revenue from repeat prescriptions, but it saves a significant amount of time; savings of up to two hours per week per pharmacy have been reported.



With a patient's consent, pharmacists can keep an eye on blood glucose readings by logging on to a secure web site

e-San is working with a major chain on a nationwide roll out, but t+ diabetes is already available via a network of independent pharmacies. Mahesh Amin, of Calder Pharmacy in Notting Hill, London, is one of the first to stock t+ diabetes.

"It's a product that's come around at just the right time for us," says Mr Amin. "We were already planning to do more by way of medicines use review, but t+ diabetes is going to enable us to get even more involved in patient treatment. We are ideally placed to analyse medicines use and counsel the patient about any issues we spot. If we can develop a closer relationship with the patient, we'll be better placed to draw any problems to the attention of their GP."

Greater involvement

"We're looking forward to the greater involvement in patient management as well as the increased patient loyalty that we think will follow. We have a good relationship with our local GPs. We're already talking to them about supplementary prescribing and the new contract. They are very much in favour of their community pharmacist having greater involvement in the treatment of patients with chronic conditions," adds Mr Amin.

"In general, GPs' attitudes have changed. Whereas they used to be set against pharmacists becoming more involved in patient care, for the most part they now welcome it. They trust us to pick up their mistakes. Why not trust us to keep a closer eye on the well being of their patients with chronic conditions," Mr Amin asks.

Mr Amin says he sells a fair number of blood glucose meters. He acknowledges that t+ diabetes and other mobile telephone based

self-management systems are not going to be suitable for all patients, but that they will be useful to many. He says it is common for people to come back after a few days of readings and ask, "what now, what do we do with this data?". He believes t+ diabetes will help them make sense of their blood glucose readings and see the impact that changes in their diet and exercise regimen have — and that should make a real difference.

As well as facilitating a closer involvement in patient treatment, t+ diabetes will promote greater patient loyalty. "I can see this kind of technology being applied to other disease management regimens, including heart disease and asthma," says Mr Amin. "In years to come, supervising this kind of mobile telephone-based self-management will be an accepted part of what we as pharmacists do."

STATEMENT Stuart McWilliam's primary occupation is that of a freelance journalist specialising in mobile telephones. He has worked with e-San on the design and implementation of t+ diabetes and other mobile telephone based-systems for chronic disease management.

References

1. Anhoj J, Moldrup C. Feasibility of collecting diary data from asthma patients through mobile phones and SMS (short message service): response rate analysis and focus group evaluation from a pilot study. *Journal of Medical Internet Research* 2004;6:e42.
2. Gammon D. Parent-child interaction using a mobile and wireless system for blood glucose monitoring. *Journal of Medical Internet Research* 2005;7:e57.
3. Farmer AJ, Tarassenko L, Neil A. A randomised controlled trial of the effect of real-time telemedicine support on glycaemic control in young adults with type 1 diabetes. *Diabetes Care* 2005;28:2697-702.