



The Role of Technology in Improving Medication Prescription Adherence

Long term conditions such as hypertension, diabetes and arthritis affect more than half of the adult population of developed countries including the UK. Many are known as Lifestyle Diseases because they are related to diet, level of physical activity and the use of recreational drugs (including smoking). They cannot be cured, but can be managed sometimes for many years throughout a combination of medication and other therapies. Older people may suffer from two or more of these diseases, so it is hardly surprising that many have to take a cocktail of different medications several times a day. See Figure 1 for an idea of how the number of prescriptions increases with age – so there are lots of opportunities for error.

Numerous studies have shown that many people fail to take all their medication at the right time as prescribed by their doctors. While some take more than they are supposed to, risking serious complications, the majority fail to take some or all their drugs, and the situation deteriorates over time (known as poor persistence). This leads to poorer outcomes, but can also cause a sudden decline in well-being and a possibility that a doctor will stop prescribing a particular drug because it appears not to be working when, in fact, it simply isn't being taken.

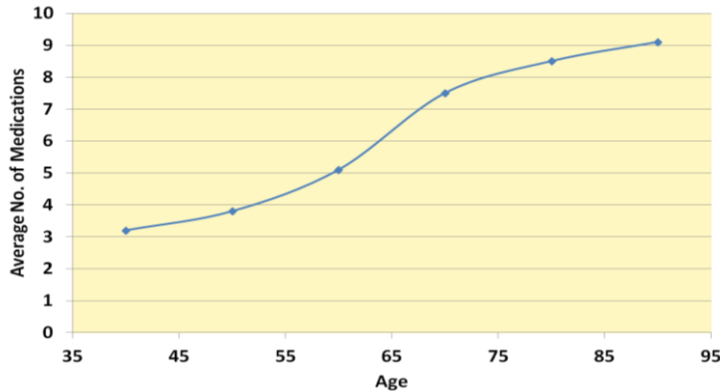


Figure 1: The Average Number of Medications Prescribed to People in England by Age



Figure 2: Dose-alert Low-Cost Electronic Medication Reminder

These problems are not confined to the UK but occur almost at the same level in countries such as the USA where medication costs are often borne by the user and in Holland where prescriptions are universally free of charge. This suggests that the cost of medication is not the main factor for poor prescription adherence. So why do people behave irrationally in refusing to follow their doctor's instructions, and what can be done to improve the situation?

Most people would suggest that the main reason for not adhering to their prescription is that they simply forget. There are many simple reminders available (including the one from the USA shown in Figure 2) that are so low-cost - £2 to £3 each in bulk - that they could be used by anyone and everyone. There are text messaging systems and other lower-tech options. But people don't want to use them (at least not for long) which implies that they want to be

able to forget sometimes because this could be an easy option to explain why they haven't been taking their medications properly. There are some deeper reasons:

- Taking lots of tablets makes them feel old
- Taking medication reminds people that they're ill and unable to do some things
- They may be feeling better so they don't need medication any more
- They don't have faith in their doctor's diagnosis or prescription, and
- They don't want to take a particular medication because it will react with something that they intend to eat or drink, or will prevent them from doing something that they really want to do.



Figure 3: The Dispense-A-Pill Device



Figure 4: The Medido Pill Pouch Dispenser

Several trials have shown that automatic medication dispensers such as the Pivotell can improve adherence significantly, making calls by formal carers almost redundant, and saving considerable sums for social services and the NHS. They not only provide reminders – they also help to dispense the tablets and provide a remote alarm if they haven't been removed within the required time window. They can't, of course, confirm that the medication has actually been taken, so the measured improvements in adherence will always be optimistic. They also require a pharmacist to take responsibility for filling and delivering the medication cassette every week – a service which isn't available to everyone. Could a bigger and more sophisticated device such as the Dispense A Pill (shown in Figure 3) make matters easier? This enables family members to prepare the medication by simply filling the containers with each medication in turn. The device issues the correct number of each tablet at the right time, and also provides reminders about oral medications, eye-drops and injections. We are currently showing the Dispense-A-Pill to interested parties; feedback has been positive (except for the price!)

Finally, blister packs are being employed increasingly in the UK and Europe to ensure that all medications are available to be taken together at the right time. They allow adherence to be measured but do allow overdosing and for doses to be forgotten. A combination of blister packs and electronic reminders and monitoring systems may be the way forward, and there are currently two different approaches being taken. One is called EMMA – Electronic Medication Management Assistant – and is becoming popular in the USA. It is currently being researched by Aberdeen University. It stores up to 10 blister packs and dispenses tablets automatically when appropriate. The other is the Medido unit shown in Figure 4. It uses individually prepared pouches which are issued by the machine when appropriate. The pouches are prepared by robotic machines at central facilities such as those in Runcorn and in Durham. It will be interesting to see if the new approaches are popular with both professional staff and with end users and their families. The first Telecare EPG Group Comparison Report for 2012 will focus on electronic medication aids and will be available free of charge to licence holders.

Article supplied by Kevin Doughty. More information on Telecare EPG can be found here: <http://www.telecare-epg.co.uk/> Full CUHTec members qualify for a 20% discount.

Accessible Digital Banking

The Needs of Eighty and Ninety Year Olds

Modern digital banking systems simply do not meet the needs and desires of many of our oldest citizens. Researchers at the Universities of York, Newcastle and Northumbria have been working with eighty and ninety year olds to understand exactly what these needs are. They have designed, with members of this age group, a number of illustrative new services and technologies that show how the payment systems and services provided by UK banks could be made much more inclusive.

The need for cheque-like payments

The eighty and ninety year olds who worked with the researchers to develop these provocative ideas saw great value in cheques for certain kinds of payment. Many of them were meticulous record keepers and valued the paper record provided by the cheque book stub. They also valued the flexibility of being able to simply write the name of the payee on the cheque rather than getting a bank account. Most of all they valued the experience of writing a cheque, particularly for gifts and donations.

Despite these obvious advantages, payment by cheques is one of the services the banks wish to withdraw. The cheque clearance system is costly to the banks and these costs are not currently reflected in bank charges. The pictures below are of devices developed with the eighty and ninety year olds to maintain the properties of cheques that they valued. A familiar paper cheque is used to initiate a purely electronic transaction. There is no reason why this transaction needs to be the responsibility of a bank and the eighty and ninety year olds suggested local organisations who might take this on. The researchers have gone on to make a working automated system capable of transferring money in to a Paypal account using Amazon Mechanical Turk.



**Cheque scanner and cheque book. Payer writes a cheque.
This is scanned by the payer or the payee to initiate an electronic transaction.**



Electronic pen and cheque book. Here the Anoto^R pen senses what you write and transmits the information to the payment system.

The need for other people to make financial transactions for you

For some of the eighty and ninety years olds who spoke to the researchers mobility problems and a lack of experience with modern bank accounts meant they received help from others in making financial transactions. Some would ask trusted third-parties such as family members or caregivers to withdraw money on their behalf. Others would ask people to pay their bills on their behalf. These people still desired to keep control of their own finances—they just required some support in order not to be disconnected from their own money. Current banking services and policies explicitly forbid much of this behaviour. What is required is some mechanism for delegating small well defined financial tasks to another individual in a way that limits the risk of abuse of the necessary relationship of trust by either party.

In response to these issues, the researchers have explored how a 'Guardian Angel' service provided by a bank could achieve this. This service would provide an account holder with an extra card that can be temporarily shared with others. In our simulation, a touch screen device is used to illustrate how the Guardian Angel card could be authorised for use by a helper, for example, to withdraw a specific amount of cash from a given ATM within a specified time limit. Alternatively, the account holder can preset what shops the card can be used in and for how many transactions.

A formal analysis of the "workarounds" used by housebound people to get cash and shopping was used to develop the Guardian Angel service. This model is intended as a tool that could be used by any organisation wishing to support delegated payments.

The problem of PINs and passwords

One of the reasons why cash and cheques are preferred by many of the eighty and ninety years olds was that these systems did not require the use of PINs or passwords to access funds. Many of the people who worked with the researchers felt the need to write down the numbers the banks provided them with, hiding them in diaries and address books. Others struggled so much with these security systems that they need friends and carers to help them remember and enter the codes. PINs and passwords are a not ideal for many people but the oldest members of our population they are clearly very problematic.

Biometrics, such as fingerprints and iris patterns, provide an alternative to PINs and many of the eighty and ninety years old co-designers were very open to using them. The very large number of PIN-based services currently in use in the banking and retail-service sector would make a move to replace them with biometric authentication systems very difficult. A secure PIN reminder, however, could be used with any of these services. The secure PIN reminder below uses three personal identifiers (fingerprint, hand gestures and body sway).

The secure PIN reminder is intended as a provocation to the banking industry. It highlights the lengths to which people have to go to use an unusable system. Banking policy and the technologies implemented in payment systems have a long way to go before than can be judged as accessible to the full population of people that need to use them.



A secure PIN reminder.

Article supplied by Andrew Monk. For more information on the "New approaches to banking for the older old" research project visit: <http://www.cuhtec.org.uk/banking.php>

CUHTec Regional Telecare Forums

North East England/Scotland Gateshead, Wednesday 8th February 2012 (Times TBA)

Midlands Glenfield, Leicestershire, Wednesday 14th March 2012, 10.30 am to 3.30 pm

CUHTec regional telecare forums are aimed at service providers at all levels. They provide an opportunity for CUHTec members (full and associate) to get together to exchange ideas and experiences with fellow professionals in the region with the emphasis on sharing best practice in telecare. Each forum targets specific subjects for discussion based on recent feedback from members in the area and is facilitated by Kevin Doughty. Please contact Jenny Parry at cuhtec@psych.york.ac.uk if you wish to attend. Attendance is free for full members and £50 per person for associate members.

Change to CUHTec Office Hours

CUHTec will be closed for Christmas from Monday 19th December until Wednesday 11th January. From 11th January, 2012 our office will be open on Wednesdays only, from 9.30am to 2.30pm.