Commentary

Computerised Pill Counting – how will technology support research into medication adherence?

Jamie J. Coleman MBChB, MRCP(UK)

Honorary Lecturer in Clinical Pharmacology, Division of Medical Sciences, University of Birmingham, Birmingham, United Kingdom, B15 2TH

Assessing adherence in individuals may be as simple as asking patients 'How often do you take your medicines correctly?' Health planners and policy makers are more concerned with the extent to which medications are taken in the whole population and what impact this has on the health of that population. Pharmacoepidemiologists attempt to measure the drug use in populations, but assessing the medication adherence of a population often requires different techniques than just asking simple questions.

In this issue of BJCP Wei *et al.* have analysed a record-linkage database to measure aspirin and statin use in order to assess the effect of adherence on cardiovascular outcomes and death [1]. They provide an important message in that better outcomes seem to be driven by adherence to the medicines rather than healthy behaviour per se. Long term adherence to cardiovascular medicines in this and other studies is still suboptimal with the resulting impact on cardiovascular outcomes. One of the great strengths of this type of pharmacoepidemiological research is the ability to examine 'real world' data on patients, in contrast to the 'sterile' world of clinical trials.

Technological approaches to measuring direct adherence have been around for over 20 years in the form of 'electronic pill counters' – microprocessor-based devices embedded in the medicine bottle cap which log when the bottle is opened [2]. However, the use of such devices is financially and practically impossible for monitoring the medication habits of hundreds or thousands of patients in order to assess the effects on chronic disease morbidity and mortality. This and other indirect methods such as the verbal reports of patients, questionnaires, or pill counts are the most common approaches taken in clinical trials.

Computerised records, for example those used by the Medicines Monitoring Unit (MEMO) in Dundee, have opened up the possibility of assessing adherence on a much larger scale. These administrative databases are used ostensibly for research into the use of medicines, but are

essentially a by-product of the data's primary administrative purposes. Although such electronic dispensing records cannot reveal individual dosing errors, they allow one to make inferences about non-adherence from the timing of refills.

Electronic health records and electronic prescribing are increasingly being used in different countries and health-care systems around the world. These have the potential to provide a more extensive repository of information for research than record linkage of administrative databases. There are relative strengths and weaknesses of both types of database in relation to pharmacoepidemiological research [3]. Medical records databases contain information that is recorded as part of the process of clinical care, but medication information is usually restricted to prescriptions issued rather than drugs dispensed.

Systematically bringing together computerised records of individuals in a large population is the basis of record linkage techniques [4]. In England, the National Health Service, through Connecting for Health (NHS CfH), has a vision for the creation of electronic medical records that are shared between primary and secondary care through a Summary Care Record. This record will be created initially from information such as current medications, adverse drug reactions, and allergies from general practitioner records. Primary care prescribing in England is already mostly done electronically, and in some cases prescriptions can be sent directly to community pharmacies in the Electronic Prescription Service. The use of electronic prescribing in secondary care in the UK is only in its infancy, with systems being fully active only in a few hospitals countrywide. The more widespread use of electronic prescribing should facilitate prescribing and administrative tasks, including reductions in paperwork, improved audit trails for medication and enhanced communication between healthcare providers. The research potential of the whole programme is being developed and supervised by the Research Capability Programme with the primary

aim of gathering data to support ground-breaking work on population health and the effectiveness of healthcare interventions. There is no doubt that prescription and dispensing record linkage will be a linchpin in substantial parts of this programme. There is an opportunity for clinical pharmacologists to influence the evolution of electronic prescribing and to engage with the Research Capability Programme (for more information see www.connectingforhealth.nhs.uk/systemsandservices/research).

Finally what is the future potential for patients to interact with technological changes in medicines management? In England the NHS, again through CfH, have launched HealthSpace – an online health record that allows users to record selected data through the internet and share this with their healthcare providers [5]. Patients can input, view and print their current or historic medication details, but as yet there is no space for inputting information about doses actually taken. There is great potential in emerging health informatics systems. There is even the prospect that mobile technology will allow remote submission of data to electronic records allowing new possibilities for monitoring adherence, electronic drug reminders and real time clinical decision support.

Health surveillance of populations will increase as patients start to interact with new health informatics systems and documentation of medicines usage is linked between healthcare databases. Until there are more widespread systems in place where record linkage can provide high quality data on the use of medicines, doctors will still have to rely on asking their patients whether they take their medicines and reminding them why they should. After all as Wei *et al.* have shown, 'Drugs do work in patients who do take them'.

Conflict of interest: JC is an honorary consultant in clinical pharmacology at University Hospital Birmingham NHS Foundation Trust with clinical and research interests in the Trust's established electronic prescribing programme.

Financial support: none

REFERENCES

- 1 Wei L, Fahey T, MacDonald T. Adherence to statin or aspirin or both in patients with established cardiovascular disease: exploring healthy behaviour versus drug effects. *Br J Clin Pharmacol* 2008; 66:110–6.
- 2 Cramer JA, Mattson RH, Prevey ML, Scheyer RD, Ouellette VL. How often is medication taken as prescribed? A novel assessment technique. *JAMA* 1989; 261:3273–7.
- 3 Hennessy S. Use of health care databases in pharmacoepidemiology. *Basic Clin. Pharmacol. Toxicol.* 2006; 98:311–313.
- 4 Libby G, MacDonald TM, Evans JM. Record-linkage methodology for prescribing research. *J Clin.Pharm.Ther.* 2001; 26:241–6.
- 5 Pagliari C, Detmer D, Singleton P. Potential of electronic personal health records. *BMJ* 2007; 335:330–3.

RECEIVED

19 May 2008

ACCEPTED

28 May 2008

CORRESPONDENCE

Dr Jamie Coleman, Department of Clinical Pharmacology, University of Birmingham, Birmingham B15 2TH, United Kingdom.

Tel: 44-121-4146874

Fax: 44-121-4141355

E-mail: j.j.coleman@bham.ac.uk