

Mobile phone technology for the management of asthma

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Introduction: Adoption of e-health solutions on a large scale by people with chronic conditions requires technology that is easy to use, unobtrusive and adapted to their lifestyle. Using the latest generation of mobile phones linked to an electronic spirometer/peak flow meter, a new approach was developed for easy, accurate transfer of data (PEF – peak expiratory flow rate-, symptom scores and medication usage), followed by immediate feedback to the patient to assist in their self-management. In this paper, we report on its use in an observational study of mild-to-moderate asthmatics carried out in the Thames Valley from March to December 2003 in collaboration with mmO₂.

Methodology: Ninety-one patients with mild to moderate asthma were recruited from nine GP practices. They were each given an electronic peak flow meter, a GPRS mobile phone and a cable to link the two together. They were invited to record their peak flows using the electronic meter and simultaneously complete a patient diary on the phone twice a day. SMS reminders were generated automatically to support compliance. The peak flow and patient diary data were transmitted by the phone to the server as soon as they were generated. Software on the server analysed the incoming data in real time and immediately sent personalised feedback to the patient's phone. This consisted primarily of a display of the current peak flow value with respect to the patient's "asthma scale" and current trend which were graphically displayed in colour on the phone screen. The same screen also showed the weather forecast and air quality for the area.

Results: Of the 91 patients recruited into the study, 38 were minors and 53 were adults. Over the nine-month period, the 91 patients sent at least two readings per day for 55% of the time, and at least one reading per day for 68% of the time. Some patients experienced technical difficulties which had a significant impact on compliance. However, 61 patients provided at least two readings per day for 77% of the time and at least one reading per day for 91% of the time.

Analysis of recorded data has been used to identify patients whose asthma was well controlled. In minors, there was a progressive improvement in asthma control during the study: the mean Peak Expiratory Flow (PEF), calculated across all minors, improved by 18.34 L/min from month 1 to month 9 (from 330.1 L/min to 348.4 L/min), with a concomitant reduction in variance of 55.8 L²/min². Similarly, the average number of puffs of reliever inhaler per day, calculated across all minors, decreased by 1.03 over the same period (from 2.69 to 1.66 puffs per day).

Discussion: This technology is based around an every-day device, the mobile phone, which provides immediate feedback and is designed to be responsive to patient needs. It allows the patient to view their asthma control on a personalised colour scale and to

recognise when control is being lost. Within the context of a self-management plan, learning can be facilitated as to what actions need to be taken in order to optimise asthma control.

Conclusion: This study suggests that the technology may be valuable in the context of asthma self-management. Patients appeared satisfied with the mobile phone-based solution and found the experience helpful. The e-San solution has now been incorporated in a clinical trial in which biometric data (peak expiratory flows and forced expiratory volume) and symptom scores are being recorded.