The TRxCare™ adherence support system: a pilot study of its acceptability to patients on virologically successful HAART

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Objective

This was a pilot study of a medication adherence support programme which monitors adherence in 'real time', provides patients with feedback regarding their adherence and sends a reminder to a mobile phone text service in the event of a late dose of HAART. The principal objectives of the pilot were:
To assess the acceptability of the programme to patients
To ensure that the programme is safe (that is, it does not hinder adherence and hence result in an increase rate of treatment failure)

Background

Morbidity and mortality associated with HIV infection can be dramatically reduced by highly active antiretroviral therapy HAART [1] but the success of this treatment is dependent on patients maintaining high levels of adherence over the long-term [2]. Studies with marginalised populations have reported around 70% of prescribed doses taken [3-8]. This level of adherence is not sufficient to reduce or maintain viral load at an undetectable level [2], compromising the efficacy of this treatment. Although several studies have attempted to enhance treatment adherence in HIV, the interventions have achieved limited success [9]. As this is a problem common to all chronic diseases, the National Institute for Health and Clinical Excellence (NICE) has recommended that research be conducted to identify the most clinically effective and cost-effective methods for addressing the practical barriers that limit an individual's ability to implement intentions to adhere to medicines [10].

Non-adherence to medication may be intentional or unintentional [11]. Intentional non-adherence is likely to be due to patients' beliefs about their treatment (e.g. fear of side effects) while unintentional non-adherence may be due to capacity or resource limitations (e.g. forgetting). The most common reason patients give for missing doses of HAART is forgetting [12]. However to date, interventions that remind patients when doses are due (such as a small portable alarm) have had little success and they may be associated with a higher risk of virological failure [13]. This may be because these have involved an alarm sounding every time a dose was due, even when the dose had been taken, which patients may have found irritating or unhelpful.

Electronic monitoring of adherence (where patients are typically given their drugs in a bottle with an electronically monitored cap that records the time each time the bottle has been opened) has been described as the 'Gold Standard' of adherence measures [14]. This method of measuring adherence is more objective than self-report questionnaires, which are believed to overestimate adherence [7]. Preliminary studies have suggested providing patients with feedback from electronic monitoring of adherence may be a useful intervention for increasing adherence [15], by alerting patients to their own patterns of non-adherence. However, the utility of using these devices in clinical practice may be hindered by the fact that existing monitors are perceived to be a burden on patients for several reasons: Patients are not permitted to decant their medicines into daily pill organisers (e.g. a dosette box), since doing so would jeopardise the accuracy of the monitor. Consequently, the patient is required to take the bulky pill bottles with them when they are away from home, which many find inconvenient. Furthermore the data from these devices usually needs to be downloaded from the monitor to a computer typically after a period of weeks, which means that the patient is unable to obtain feedback regarding any missed doses of HAART until long after the event.

Intervention

This study aimed to describe the utility of an innovative adherence intervention combining an innovative electronic monitor (the SMART dispenser) and an intelligent reminder system provided by TRXCare Ltd.:

The SMART dispenser
The SMART dispenser is a slim-line medication organiser, which is used to monitor medication taking. It contains an electronic monitor which records each time the device is opened (the medication event) and sends a message to a server using the GSM mobile telephone network. At the beginning of each week, patients receive a text message reminding him or her to refill the SMART dispenser.

Feedback service

Patients receive a text message once a week, giving feedback on their medication taking over the previous week. At each follow-up appointment the patient is shown graphs illustrating their patterns of medication taking. Individualised recommendations can be made on the basis of these adherence outputs.

Medication reminder service
This technology allows reminders to be sent out ONLY when a dose is late. In the event of a late dose, up to three reminders are sent to the patient's mobile phone. The definitions of a late dose will be set in collaboration with the patient.

Primary Outcome Measures

Acceptability measured by questionnaire
Proportion of patients with 2 consecutive plasma HIV viral loads >400 copies/ml at end of study

Inclusion and exclusion criteria
The principal inclusion criteria for this study were:
1. HIV positive patients age 16 or above
2. Patients who were taking HAART
3. Plasma HIV viral load <50 copies/ml at last measurement
4. Consenting to participate
5. Had a mobile phone and were able to receive text messages.

Exclusion criteria were as follows:
1. Patients taking more than 4 other tablets per day (as these will not fit in the dispenser)
2. Patients unable to understand the information sheet and questionnaires in English

Study design

This was a single arm cross over study.

Study procedure

The study was approved by Brent Research Ethics Committee. Informed consent was secured to participate. A sample was taken for measurement of plasma HIV viral load. The use of the SMART dispenser was demonstrated and a dispenser was given to take home. Patients completed the following study visits:

Week	0	12	24
Adherence measured by SMART box			
Weekly reminders to fill SMART box			
Dosing reminders			
Beliefs about Medicines Questionnaire	✓		
MASRI Adherence questionnaire	✓	✓	✓
Acceptability Questionnaire		✓	✓
HIV viral load (as part of routine clinical care)	✓	✓	✓
Adherence feedback using SMART data		✓	✓

Results

Fourteen patients participated in the pilot; all were male with a median age of 43 years (IQR 37-46). Eleven were on once daily medication, 3 twice daily.

At baseline reported adherence over the previous month was high at 99.5% and remained at 98% at week 24.

The median number of reminders sent out per patient was 14 (range 1-43). Dose times were later after reminders were switched on (p=0.017), but overall the number of doses missed was low (4.8% wk 0-12; 6.3% wk 13-24) and did not change over time. On days when a dose was taken, 81% of doses were taken within 1 hour of the correct time in both phases. At week 24, 64% were satisfied with the system but 36% were neither satisfied nor dissatisfied. 50% found the text reminders & overall system useful & 67% found the verbal feedback useful. However 54% found the pill -box inconvenient or that it made more difficult to take HAART regularly; 55% found reminders irritating.

Conclusion:

This pilot found remarkably high, consistent adherence in patients on stable HAART. While open to possible bias towards those willing to be monitored, this suggest that future UK studies of adherence interventions may need to select patients at risk of low adherence e.g. based on virological failure. However given that even in this highly adherent group, TRxCare™ presented some barriers to adherence further study is required before it can be generally recommended. Adherence interventions should address individual needs.

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