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LETTER TO THE EDITOR

Disulfiram and the Zenalyser®: Teaching an Old Dog New Tricks

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Disulfiram is recommended by the National Institute for Health and Care Excellence as a cost effective drug for the treatment of alcohol dependence (NICE, 2011). Nevertheless, there continues to be suspicion regarding the usefulness of this medication, predominantly arising from the perception that compliance is poor. Several attempts to improve compliance have been made, the most notable of those being supervised consumption (e.g. Wright and Moore, 1990; Chick *et al.*, 1992). Supervision is, however, not without its limitations—relationships break down, individuals are mobile, supervisors weary of their task.

The German Out-patient Long term Intensive Therapy for Alcoholics (OLITA) programme demonstrated that disulfiram can be extremely effective in maintaining abstinence from alcohol (Krampe *et al.*, 2007). Over 50% of the 180 patients studied remained abstinent from alcohol for 9 years with high frequency support and long-term treatment. However, it is difficult to see how these key ingredients can be incorporated into services that are over-worked, under-resourced, and in locations distant from their patients.

In 2006 the author of this letter, together with colleagues, published the results of a study which demonstrated that the metabolic products of disulfiram can be identified on a sample of breath (Fletcher *et al.*, 2006). The specificity and sensitivity of the technique are 100% if the patient is prescribed 200 mg disulfiram daily. Over subsequent years continuing work has brought this finding to the point of clinical application. By combining disulfiram and breath alcohol measurements in a small hand-held breathalyser and adding appropriate software, a device has now been manufactured that allows individuals prescribed disulfiram to be remotely supported and monitored on a daily basis from any geographical location with internet access.

In brief, this device, a Zenalyser®, works in the following way: a patient blows into the instrument, connects it to a computer and the result is exported to the treating team—a process that takes <45 s from start to finish. The treating team read the result and email the patient back, which takes no more than a couple of minutes depending on the content of the email. Alternatively, the Zenalyser can be kept at the treating base, and patients can attend at frequent intervals to provide breath samples.

Clinical observations (unpublished data) on ten severely alcohol-dependent patients followed up after in-patient detoxification for up to 3 years (mean = 11.3 months), have revealed very high disulfiram compliance rates, which is the main purpose of the technique. Nine out of 10 patients remained totally abstinent from alcohol. One cirrhotic female patient had two brief relapses of 1 week each during an 8-month period of daily support with the Zenalyser—this exceeded, by some considerable margin, her responses to treatment in the previous 30 years, despite three periods of residential rehabilitation.

There have been, however, a number of other benefits observed that were not anticipated and which go beyond improving disulfiram compliance rates. These are as follows:

- Relapse can be anticipated before it occurs, being inferred from rapidly falling disulfiram metabolite levels, the appearance of alcohol on the breath, or because the patient stops sending data
- Out-patient follow-up no longer needs to be routine, but can be reserved for times of high risk thus reducing out-patient activity and other factors, e.g. travel time, carbon footprint
- Daily support and monitoring can be provided together with encouragement, feedback, warnings, etc.—all of the components of good motivational enhancement—very rapidly, cheaply and with minimal staffing requirements
- Patients can be supported and monitored on a daily basis even when they travel to foreign countries
- Patients have been able to use Zenalyser data in legal situations, e.g. alcohol-dependent mothers involved in child protection cases; and doctors under medical supervision from their governing body

Feedback from families and patients shows that they appreciate this technique, being reassured that when a patient leaves the safety of a detoxification or rehabilitation unit the clinical team continue with daily contact. Family members too, with permission, can read the emails from the treating team and be reassured that disulfiram has been taken and that the levels are in the therapeutic range.

There are limitations to the use of the instrument and to the conclusions that can be drawn at this stage. Home-based treatment with the Zenalyser currently requires patients to have daily access to a computer and the Internet. The technology needs to be developed to make use of smart phone communication. This would significantly widen accessibility to remote support and monitoring. Furthermore, the data upon which our observations have been based are restricted to a small group of severely dependent patients detoxified on our in-patient unit. No formal controlled trial has yet been undertaken but will be necessary to fully evaluate the potential of this novel technology.

Despite these limitations the clinical observations so far suggest that the Zenalyser has promise. It is now possible to provide high frequency support and long-term treatment (with minimal staffing requirements and at low cost). If these advantages of the OLITA programme can translate into over-worked

and under-resourced clinical services, the Zenalyser will indeed have something to offer the busy clinician.

Conflict of interest statement. K.F. is Medical Director to ZenaMed Ltd, the company that invented and distributes the Zenalyser (www.zenamed.co.uk).

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