

original  
papers

RICHARD HUW DAVIES AND ROWAN WILSON

## Audit of an electroconvulsive therapy clinic's missed-fit rate

### AIMS AND METHOD

To audit the missed-fit rate of a consultant-led electroconvulsive therapy (ECT) clinic adhering to a stimulus dosing policy. After an initial first audit a standard for the missed-fit rate was set at  $\leq 5\%$ . A second and third audit examined whether the standard was met and then maintained over time.

### RESULTS

The audit standard of maintaining a missed-fit rate  $\leq 5\%$  was achieved in the second audit and maintained in the third audit. The missed-fit rate dropped from 5% in the first audit, to 2% in the second audit and to 1.8% in the third audit.

### CLINICAL IMPLICATIONS

A missed-fit rate of  $\leq 5\%$  was achieved and maintained over a 6-year period with rigorous adherence to a stimulus dosing policy in a consultant-led ECT clinic. This compares favourably with missed-fit rates of 25% found in national audits of ECT. A missed-fit rate of  $\leq 5\%$  might provide one possible standard for the efficiency of ECT clinics nationally.

Electroconvulsive therapy (ECT) is one of the most effective psychiatric treatments currently available (Lock, 1994). Seizure adequacy is important to achieve a therapeutic response, but the minimum requirements of a 'therapeutic seizure' have not yet been defined (Royal College of Psychiatrists, 1995). An 'adequate seizure' is currently defined as "a generalised (bilateral) tonic/clonic seizure lasting 15 seconds or more peripherally, and/or 25 seconds or more on an electroencephalogram (EEG) recording" (Royal College of Psychiatrists, 1995). Although it is recognised that the length of a seizure is not reliably related to therapeutic efficacy, the complete absence of a convulsion – a 'missed-fit' or 'failed seizure' – is generally accepted as never being therapeutic (Royal College of Psychiatrists, 1995). Measuring the number of missed-fits may therefore provide one way of assessing an ECT clinic's efficiency.

The ECT clinic in Bridgend has been actively consultant-led (R.H.D.) since 1993 and used a Thymatron DGx ECT machine in conjunction with a stimulus dosing policy since 1994. The latter is based on one described in *The ECT Handbook* (Royal College of Psychiatrists, 1995). Its early implementation used a version recommended at a Royal College of Psychiatrists 'ECT training day'. 'Stimulus dosing' refers to the technique of adjusting the electrical stimulus to the requirements of individual patients at different points in the course of ECT (Scott, 1994) – a practice that maximises the chances of a therapeutic response while minimising the incidence of adverse side-effects.

Seizure monitoring in the Bridgend ECT clinic involves both the timing of peripheral clonic muscular activity and the measuring of EEG seizure activity. The Bridgend stimulus dosing policy incorporates a written restimulation protocol detailing how to proceed if a treatment stimulus fails to elicit an 'adequate seizure'. The restimulation protocol (a) specifies a maximum of three stimulations per ECT session; (b) requires that the correct application of electrodes, adequate contact and correct

position be checked; (c) specifies an appropriate re-stimulation treatment dose in accordance with the stimulus dosing policy; and (d) advises on other relevant details, for example the minimum time between successive stimulations.

The trainees performing ECT in the Bridgend clinic have all been first given theoretical training in ECT technique and stimulus dosing. They then observe ECT at the clinic and are individually supervised by R.H.D. until it is clear they have a correct technique and sound understanding of the process. No locums or doctors who have not received this local training are allowed to perform ECT.

### The study

Measurement of the missed-fit rate was chosen as a way of assessing the Bridgend ECT clinic's efficiency. Three audits of missed-fit rate were carried out over a 6-year period from April 1994 to January 2000. The time periods audited increased in length in successive audits to compensate for a reduction in patient numbers receiving ECT.

By 'fit' we mean an observed bilateral tonic-clonic muscular convulsion and/or evidence of cerebral seizure activity recorded by EEG. By 'missed-fit' we mean an ECT session (comprising up to three individual stimulations of the patient in accordance with a written restimulation protocol) that (a) fails to elicit an observed bilateral tonic-clonic muscular convulsion of any duration and (b) fails to yield any evidence at all of cerebral seizure activity via EEG measurements.

An initial audit (Audit 1) was carried out over a 12-month period from 1 April 1994 to 31 March 1995. Of the 46 patients who had ECT in this period, case notes were obtained for 44. Audit showed that 19 out of 364 (5%) ECT sessions had resulted in a missed-fit. A standard was then set of trying to maintain the missed-fit rate at  $\leq 5\%$ . A second audit (Audit 2) of the missed-fit rate



original papers

over a 16-month period from 1 April 1995 to 31 July 1996 was carried out to determine whether the standard was being achieved. Of the 33 patients who had ECT in this period, case notes were obtained for 31. Audit showed that four out of 191 (2%) ECT sessions resulted in a missed-fit. A third cycle of audit (Audit 3) of the missed-fit rate was carried out for the 42-month period from 1 August 1996 to 31 January 2000. Of the 63 patients who had ECT in this period, case notes were obtained for 55. Audit showed that nine out of 508 (1.8%) ECT sessions had resulted in a missed-fit.

## Findings

Over a 6-year period successive audit cycles demonstrated an ECT clinic can consistently achieve a missed-fit rate of  $\leq 5\%$ . The decline in missed-fit rate from 5% to 1.8% suggests standards of ECT can actually improve, not just be maintained, over time.

## Comment

Two national audits of ECT found worryingly high missed-fit rates of 50% in 1981 (Pippard & Ellam, 1981) and 25% in 1992 (Pippard, 1992). The most recent national audit of ECT did not provide information on missed-fit frequency (Duffett & Lelliott, 1998). Missed-fits can occur during a course of ECT for a variety of reasons (Royal College of Psychiatrists, 1995). Because stimulus dosing requires initial estimation of a patient's seizure threshold using potentially sub-threshold doses, a missed-fit in the early treatment sessions, although uncommon, is a recognised outcome. Poor ECT technique – for example, incorrect application of electrodes – could result in inadequate stimulation and a missed-fit. Anticonvulsant drugs like carbamazepine or benzodiazepines can form part of a patient's medication regime and result in missed-fits. The seizure threshold can rise during an ECT course, causing missed-fits towards the middle or end of the course. There is an unresolved debate about whether some modern ECT machines are underpowered (Galloway *et al*, 1998), or whether excessive doses of anaesthetic induction agents are responsible for missed-fits in a few rare cases (Scott & Duncan, 1999).

The missed-fit rate of  $\leq 5\%$  achieved and sustained in the Bridgend ECT clinic over a 6-year period compares very favourably with the national audits and may be because of a combination of three factors: (a) use of an adequately powered ECT machine; (b) sustained input to the clinic by a single senior psychiatrist, in particular with regard to supervision of trainees; and (c) strict adherence

to a stimulus dosing policy that incorporated a restimulation protocol. All three factors reflect recommendations by the Royal College of Psychiatrists on how to improve standards of ECT (Royal College of Psychiatrists, 1989, 1995). The decline over time in the missed-fit rate may reflect increasing familiarity with a stimulus dosing policy as applied to a particular ECT machine, supervised by a single senior psychiatrist. No changes in the stimulus dosing policy or re-stimulation protocol were made during the 6-year audit period. Reports from other ECT clinics about attempts to improve efficiency have stressed the importance of regular supervision by senior psychiatrists (Trezise & Conlon, 1997), particularly when a stimulus dosing policy is introduced (Shaikh *et al*, 1999).

It appears that a consultant-led ECT clinic rigorously adhering to a stimulus dosing policy allows standards to be not just maintained, but actually improved over time. This is despite changes in personnel (trainee turnover) and even changes in ECT practice – for example, the anaesthetic agents used (Freeman, 1999). A missed-fit rate of  $\leq 5\%$  might represent a standard that could be adopted nationally as one measure of an ECT clinic's efficiency.

## References

- DUFFETT, R. & LELLIOTT, P. (1998) Auditing electroconvulsive therapy. The third cycle. *British Journal of Psychiatry*, **172**, 401–405.
- FREEMAN, C. (1999) Anaesthesia for electroconvulsive therapy. Statement from the Royal College of Psychiatrists Special Committee for electroconvulsive therapy. *Psychiatric Bulletin*, **23**, 740–741.
- GALLOWAY, J., BLAKEY, A. & BENBOW, S. (1998) Maximum output of ECT machines. *Psychiatric Bulletin*, **22**, 713–714.
- LOCK, T. (1994) Advances in the practice of electroconvulsive therapy. *Advances in Psychiatric Treatment*, **1**, 47–56.
- PIPPARD, J. (1992) Audit of electroconvulsive treatment in two National Health Service regions. *British Journal of Psychiatry*, **160**, 621–637.
- & ELLAM, L. (1981) Electroconvulsive treatment in Great Britain. *British Journal of Psychiatry*, **139**, 563–568.
- ROYAL COLLEGE OF PSYCHIATRISTS (1989) *The Practical Administration of Electroconvulsive Therapy*. London: Royal College of Psychiatrists.
- (1995) *ECT Handbook: The 2nd Report of the Royal College of Psychiatrists Special Committee on ECT*. CR39. London: Royal College of Psychiatrists.
- SCOTT, A. I. F. (1994) Contemporary practice of electroconvulsive therapy. *British Journal of Hospital Medicine*, **51**, 334–338.
- & DUNCAN, A. (1999) Maximum output of ECT machines. *Psychiatric Bulletin*, **23**, 116.
- SHAIKH, G., IRELAND, R. McBRENN, M., *et al* (1999) Audit of a recently introduced stimulus dosing policy in an electroconvulsive therapy clinic. *Psychiatric Bulletin*, **23**, 541–543.
- TREZISE, K. & CONLON, B. (1997) Effects of changes in practice of electroconvulsive therapy over a 2 year period. *Psychiatric Bulletin*, **21**, 10–12.

\*Richard Huw Davies Consultant Psychiatrist Rowan Wilson Specialist Registrar in Old Age Psychiatry, Glanrhyd Hospital, Tondu Road, Bridgend, Mid-Glamorgan CF31 4LN