

COMPUTERIZED POLYSOMNOGRAPHY AT EPWORTH HOSPITAL

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The Sleep Disorders Unit at Epworth Hospital has been operating since September 1988 with a unique digital recording and analysis system using hardware and software especially developed by us in Melbourne.

The system is based on parallel, distributed processing with multiple interconnected processors and software written in C language. It provides full polysomnography for two patients now, but can be expanded to four or more. The structure is modular with modules providing (1) remote computer control of all preamplifiers and preconditioning functions for the inputs, (2) on-line displays of raw data on 20-inch very-high-resolution graphics workstations, each with two separate time-bases operating simultaneously, (3) storage of all raw data on hard disc for review next day or for archival storage on magnetic tape, (4) on-line, primary analysis of the data, updated on a separate screen every 20 seconds and printed in colour every 90 minutes during recording. Primary analysis of a whole night's polysomnography is available on 5 or 6 sheets of paper at the end of recording.

A special feature is the EEG analysis which, when combined with computer detection of eye movements, EMG amplitude and spindles detection, enables sleep stages to be distinguished, even for very disturbed sleep. The EEG analysis is based on period-amplitude analysis and combines displays of percent time for each 20 second epoch spent in the usual frequency bands, plus displays of percent time taken up by delta-waves of various amplitudes. The percent time of low-amplitude delta-waves is a new measurement which has proved very useful. A new method for detecting leg movements will be described elsewhere at this conference.

Further developments in software are going on so that the system can provide secondary analysis of the results automatically - e.g. the apnea index in REM vs NREM sleep and in various sleeping positions.

This complicated computer system is operated at night by a specially trained nurse who need not be computer literate. The running costs are considerably less than for the equivalent analogue polygraphs.