thesia with halothane. In each of eight dogs, doses of 15 μCi of ^{131}I-hippuran were injected during the control period under chloralose anaesthesia, during the administration of halothane and after the recovery from halothane.

Following each injection of the isotope, the clearance curves are observed by means of an external scintillation counter placed over the heart and also by the taking of simultaneous serial arterial blood samples. Each clearance curve, lasting 30 to 40 min, is then analysed on the basis of a single or double exponential function. The effective renal plasma flow (ERPF) is calculated on the basis of the activity of the injected dose (*Io*), the extrapolated activities at zero time (*Ao, Bo, Co*) and the slope of these lines (γA, γB, γC) according to a single compartment analysis (Ram, Evans & Chisholm, 1967). For the blood samples, ERPF$_B$=$Io\gamma B/Bo$ and ERPF$_C$=$Io\gamma C/Co$ for the external counting. A double compartment analysis (Sapirstein, Vidt, Mandel & Hanusck, 1955) is also performed with the external count values, that is $\mathrm{ERPF}_{a+c} = \frac{Io\ \gamma A\ \gamma C}{Ao\ \gamma C + Co\ \gamma A}$. The ERPF is converted into total renal plasma flow (TRPF) by taking the extraction ratio (E) of hippuran into account, i.e. TRPF=ERPF/E. (E was found by us to be 75% in previous experiments.) Total renal blood flow (TRBF) is calculated from TRPF and the haematocrit (hcrt), that is TRBF=TRPF/(1-hcrt).

A good correlation (0·983) was found between both methods of analysing the curves. Blood halothane concentrations of 6–8 mg/100 ml (0·5% v/v) did not alter the mean renal blood flow, but at 10–14 mg/100 ml (1% v/v) the TRBF was reduced to an average of 64% of the control value.

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A three-channel telephone data link for the transmission of physiological variables

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Telephone data links can be used to send physiological signals in analogue form to a computer for digitizing and processing if the distances are too great to employ direct wire connections. A three-channel frequency modulation link has been established between the operating room at St. Peter's Hospital, Covent Garden, and an Elliott 903 on-line computer system in the Royal College of Surgeons. The three carrier frequencies lie in the band 1,000 to 2,000 Hz and are generated by voltage controlled multivibrators; the bandwidth available for each channel is zero to approximately 100 Hz. The modulators are fed with signals from the outputs of a multichannel ink-jet recording system. The input to each channel is provided with gain and d.c. level setting controls, and the signal applied to each modulator is monitored on a large screen oscilloscope. An overload warning circuit indicates when an excessively large input signal is sweeping the carrier out of band. At the receiver, narrow band passive filters select the individual carriers, which are then demodulated, and a digital frequency meter monitors the centre frequencies of the carriers. After

demodulation, the signals are displayed on a large screen oscilloscope and recorded on analogue magnetic tape for subsequent reference. The signals are selected in an appropriate sequence under software control and digitized at a suitable rate, for example 300 times/s for an e.c.g. waveform. The analogue data transmission can be switched out and normal telephone conversation substituted to help to identify sequences of recorded signals. The processed data are printed out in the operating room area on a teleprinter, shortly to be replaced by an alpha-numeric visual display unit. When the duration and amplitude of the transmitted and received signals are compared they invariably agree to within 5% and usually to within 2%. For example, when a series of fifteen cardiac outputs from three patients were analysed a mean difference of −0·38% (range +3·4 to −4·1) was obtained between the original dye curve values and those derived from the computer.

The link, which has been used regularly for 9 months, is reliable and no external electrical interference has been encountered. It has been used for the transmission of e.c.g., e.e.g. and respiratory patterns, arterial and right atrial pressure waveforms and dye dilution curves in the study of drug actions during anaesthesia in man. In this connection suitable on-line programs have been developed. Although this project has been confined to a short distance in central London, other studies carried out with a single channel link from Lincoln to London (Colbeck, Hill, Mable & Payne, 1968) and a two-channel link from Nijmegen, Holland, to London (Hill, Payne & Crul, 1970) have shown the suitability of the system for long-distance transmission.

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An improved method of measuring drug-induced peripheral vascular responses in conscious man

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The application of venous occlusion plethysmography has been extended by the development of on-line digital computing methods (Hope, Carter, Horny & Wilcock, 1970). Individual blood flow results are now made available immediately but there is still difficulty in assessing the adequacy of control period measurements and the degree of recovery from a response to a pharmacological or physiological stimulus. This difficulty arises from the several spontaneous and cyclic fluctuations in tissue volume which occur in normal resting man (Burch, Cohn & Neumann, 1942; Burch, 1954) and which obscure the mean trend if regular sampling is employed with a pre-set inter-batch interval (Hope, Carter, Horny & Wilcock, 1970).

The five main physiological volume fluctuations as identified by Burch are those due to pulse and respiration and alpha (α), beta (β) and gamma (γ) volume fluctuations. The last three have naturally occurring frequencies of 8/min, 1–2/min and 1–8/h respectively.

The intermittent nature of venous occlusion plethysmograph acquisition makes it impractical to synchronize venous occlusion with any fluctuations faster than the