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CORRESPONDENCE

We may return unduly long letters to the author for shortening so that we can offer readers as wide a selection as possible. We receive so many letters each week that we have to omit some of them. Letters must be signed personally by all their authors. We cannot acknowledge their receipt unless a stamped addressed envelope or an international reply coupon is enclosed.

Correspondents should present their references in the Vancouver style (see examples in these columns). In particular, the names and initials of all authors must be given unless there are more than six, when only the first three should be given, followed by et al; and the first and last page numbers of articles and chapters should be included. Titles of papers are not, however, included in the correspondence section.

Haemodynamic monitoring in the intensive care unit

SIR,—The challenge of haemodynamic monitoring in intensive therapy consists of supplementing clinical observations with the least demanding set of measurements which gives adequate information on circulatory function in any one kind of patient. Your leading article (12 April, p 1035) contains a valuable discussion of the physiology, but appears to give pride of place to the inferred measurement of left atrial pressure by pulmonary artery balloon catheter. Even in the relatively restricted field of coronary and postcardiotomy care on which it concentrates, a measure of cardiac output and its response to therapy is of primary importance. Thus mortality in coronary care is much more strongly associated with inadequate cardiac output (which passed clinically undetected in about 20% of postinfarct patients) than with excessive left atrial pressure.[1]

The majority of units, however, encompass a wider spectrum of disease; and it is our experience that haemodynamic monitoring is generally required for different reasons—in particular, optimisation of artificial ventilation in a patient haemodynamically compromised. Pulmonary capillary wedge pressure often ceases to reflect left atrial pressure at high levels of positive end-expiratory pressure,[2] but oxygen saturation in right heart blood samples should continue to indicate the adequacy of cardiac output.[3] Little mention either was made of sequential monitoring of right atrial pressure following a fluid challenge[4]; the clinical palpation of femoral artery pulse pressure and hourly urine output in association with this manoeuvre; and the fact that an isolated high reading of right atrial pressure may reflect increased intrathoracic pressure, poor pulmonary compliance, or increased pulmonary vascular resistance.

The insertion of a Swann Ganz catheter in desperately ill patients is not always easy, especially when the cardiac output is low; and it is essential that appropriate therapy is not omitted while catheter placement is awaited. We have found a recent development to be convenient and effective in the circulatory management of a substantial proportion of seriously ill patients. Transcutaneous aortovelography[5 6] is a non-invasive Doppler ultrasound technique which allows recordings to be taken of mainstream blood flow velocity in the aortic arch. Reproducible measurements (7% SD) proved obtainable by relatively inexperienced personnel from a transducer applied to the suprasternal notch. While these do not allow *absolute* cardiac output to be calculated, they satisfy the clinical requirements for which cardiac output measurements are usually indicated: firstly, they reflect serial percentage changes in cardiac output over a wide range with good accuracy (deviation from exact proportionality with reference techniques equalled 9-13% SD [7-9]); and, secondly, we have found them consistently to give a useful measure of the degree of depression or elevation of cardiac output.[6 10] In addition, the waveform of instantaneous aortic blood velocity gives valuable evidence of the condition and co-ordination of the left ventricular myocardium and its inotropic state.[6]

Measurements typically taking one minute can be made at the bedside by non-medical personnel, and may be repeated as often and for as long as required. Failure to obtain adequate signals by the normal non-invasive approach, which is visually evident from the real-time recordings, is limited to a small percentage of patients (largely those with lung hyperinflation). We have used the Transcutaneous Aortovelograph (Muirhead Medical Ltd, Beckenham, Kent) to optimise circulating blood volume, dosage of inotropic agents, positive end-expiratory pressure, pacemaker rate, and balloon pump settings, for evaluating the response to afterload reduction and as a rapid check on the presence and severity of some congenital and acquired cardiac defects.[6]

Several years' experience in centres specialising in intensive and coronary care, cardiology, anaesthetics, and clinical physiology suggest that transcutaneous aortovelography—often used in conjunction with other relatively undemanding measurements, such as that of central venous pressure—offers a convenient and reliable way of managing circulatory function. It is to be