vented. There was some support for this in an analysis of 53 patients who died in Cardiff hospitals over 10 years. It was estimated that 28 of these might have had a better chance of survival if they had been admitted early in the attack to a specialised respiratory unit.

It is much more difficult to estimate the number of deaths from asthma outside hospital that were prevented by the emergency asthma admission service. Three patients died at home from asthma out of 360 for whom admission was requested, representing a death rate of 0.83%, in a group of patients known to have a severe form of the disease. This is virtually the same as that recorded for all emergency admissions to the three Edinburgh hospitals (0.9%), and we cannot believe that the number of deaths occurring at home would not have been larger among patients on our emergency list if they had been subject to the delays inherent in conventional admission procedures. It was certainly the impression of the medical team who treated them that but for the scheme several would not have reached hospital alive and more would have needed tracheal intubation and mechanical ventilation.

In another Cardiff survey it was reported that in about one-third of 80 deaths occurring outside hospital the fatal exacerbation of asthma lasted less than two hours, and in about one-fifth less than 30 minutes. Hence it was estimated that over 10 years at least 33 deaths could have been prevented had the patients been able to admit themselves directly to hospital.

Without a controlled trial, which most doctors would regard as unethical, it is impossible to obtain incontrovertible proof that an emergency asthma admission service saves lives, but we believe that there is now a strong prima facie case to support that contention. The type of service operating in Edinburgh, and now also in Melbourne, Australia, could be made available in most cities and large towns, provided that all hospitals with facilities for respiratory intensive care were prepared to cooperate with the emergency admission services, the ambulance service, and local general practitioners in its organisation.

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References

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ABC of Blood Pressure Measurement

Reconciling the controversies: a comment on “the literature”

Eoin T O’Brien, Kevin O’Malley

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In the 80 years since the sphygmomanometer was first introduced a large body of reports has developed around the subject. We comment here on some of the papers most relevant to our discussion on blood pressure measurement.

Aspects of measuring blood pressure

Observer error and the importance of training—The three major causes of observer error are: poor technique, observer bias, and terminal digit preference. Proper training would probably do much to eliminate the errors arising from technique and bias, but unfortunately the training techniques available are not widely known, and there is no standard programme for training and assessing competence.

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smaller than this is used the centre of the bladder must be placed over the brachial artery.

Factors affecting the patient—Environmental factors and the patient's general physiological state are major influences on blood pressure measurement.13 Perhaps less well known is the relevance of obesity, arrhythmias,3 the arm chosen,3 the level of the arm, isometric exercise in the unsupported arm,17 and venous congestion of the limb due to repeated measurements.

The diastolic dilemma—The choice of Korotkoff phase 4 (muffling of sounds) or phase 5 (disappearance of sounds) as the true diastolic pressure has been a major controversy and there is some evidence that the cardiovascular complications of hypertension are more closely related to mean pressure over 24 hours than to casual readings.9 Unfortunately, techniques for continuous blood pressure measurement are invasive, and although they provide much-needed information on blood pressure behaviour they are not applicable in routine practice.

Direct intra-arterial measurement is, of course, very valuable in patients with obesity or in those in whom the blood pressure is difficult to measure with a conventional sphygmomanometer. Non-invasive techniques for recording ambulatory blood pressure depend on cuff occlusion and therefore record intermittent rather than continuous pressure.14 Clinical experience with the few devices available is limited, mainly because they are very expensive, but development of a cheap and accurate means of ambulatory recording would have a considerable impact on the diagnosis of borderline hypertension and the assessment of the efficacy of treatment.

Home recording—We have found home recording of blood pressure by the patient, a relative, or a friend to be practicable and a useful guide to management, and see the technique serving as a compromise between casual and continuous recording. Home recording has never been popular, probably because guidelines for training subjects have not been stated adequately, but several workers have found the practice valuable.19

Conclusion

In this series we have examined the many sources of error in blood pressure measurement and suggested ways of improving technique. In particular, we have emphasised the importance of training, eliminating observer bias, using a bladder of adequate size, maintaining equipment, and accepting 5th-phase diastolic pressure. The mercury sphygmomanometer is the most accurate device for indirect measurement of blood pressure, and newer, more expensive, and often less accurate pieces of equipment should be viewed critically unless they have been independently assessed by a reputable laboratory. Ambulatory recording is important but the lack of cheap non-invasive techniques makes home-recording the most satisfactory means of obtaining a profile of blood pressure response to daily activities.

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References

5. King, G., and Orma, B., Cardiovascular Medicine, 1965, 36, 980.
7. Fishtr, H. W., Cardiovascular Medicine, 1969, 3, 769.