New concepts in the care of hypertensive patients

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Hypertension is a serious risk for cardiovascular disease, especially for stroke and to a lesser extent, heart attack. It is now well established that the cardiovascular complications of hypertension can be virtually abolished if elevated blood pressure is reduced and maintained within normal limits. The last decade has provided new technology permitting some rethinking of approaches to the diagnosis and management of hypertension. These will be the subject of this review.

High blood pressure is but one risk factor for cardiovascular disease and current thinking is moving towards a broader view of the patient as being exposed to a number of risks, none of which should be taken in isolation. The concept of calculating a risk factor profile or score for individual patients, therefore, has certain attractions.

Hypertension is generally an asymptomatic condition which can only be diagnosed by measuring blood pressure. However, it has been apparent for many years that conventional blood pressure measurement is an inaccurate technique which can lead to patients with hypertension being misdiagnosed as normotensive and, perhaps more commonly, subjects who are normotensive being misdiagnosed as hypertensive and being subjected unnecessarily to what is often lifelong treatment. It is time, therefore, to pay more attention to the methods of measuring blood pressure so as to detect more accurately those people with sustained elevation of blood pressure who need attention to prevent cardiovascular complications. To this end, 24 hour ambulatory blood pressure measurement (ABPM) has now passed from the research laboratories to clinical practice with its major contribution being as a means of detecting subjects with white coat hypertension.

Allowing for advances in methods of detecting individuals with sustained hypertension, there is variation in the way in which different individuals react to elevated blood pressure or, put another way, one person may have quite marked cardiovascular involvement while another with the same degree of blood pressure elevation may show no evidence of target organ involvement. Modern technology is again playing an important role in allowing us to assess target organ involvement and thereby quantify the amount of cardiovascular damage sustained by a hypertensive patient at the time of diagnosis. Such an evaluation may have considerable influence on the physician's approach to management.

Quite apart from its use in diagnosing hypertension more accurately than was previously possible, 24 hour ABPM is also serving as a useful technique for selecting the most appropriate drug for treatment and for judging the 24 hour efficacy of therapy.

TABLE 1 Risk factor score

- Age
- Parental family history
- Tobacco
- Obesity
- Alcohol
- Salt
- Glucose intolerance
- Dyslipidaemia
- Hyperuricaemia
- Hormonal drugs

And so we move to the concept of tailoring drug treatment to suit the individual patient depending on the peculiarities of the circadian blood pressure profile.

These technological advances have led to new concepts and whereas the 1980s saw the introduction of many new antihypertensive drugs it is likely that the remainder of this century will be devoted to a more scientific approach to managing the individual hypertensive patient and utilising more selectively the many drugs at our disposal. However, it would be unreasonable to expect general practitioners to be able to provide the technological facilities already referred to and it would be equally unreasonable to expect specialised hospital units to take on the management of all hypertensive patients. To address these problems, a programme of shared care for hypertensive patients has been initiated at the Blood Pressure Unit in Beaumont Hospital, the purpose of which is to provide sharing of facilities between the unit and general practice, using computer facilities to provide for indefinite joint follow-up and reassessment of hypertensive patients as indicated.

Risk factor profile

The cardiovascular consequences of hypertension, stroke and heart attack are not in reality due to hypertension alone but rather to a combination of risk factors, their interaction with each other and the susceptibility of the subject to such risk factors, which may be genetically determined. Various risk factor scores have been devised, weighting risk factors in order of their contribution to cardiovascular disease. Such factors include family history, smoking, obesity, alcohol and salt intake, the presence of concomitant abnormalities such as glucose intolerance, dyslipidaemia and hyperuricaemia, and the taking of hormonal preparations *(Table 1)*. Each risk factor may be weighted to give a risk factor score (RFS) for an individual patient. Once a RFS has been calculated, the actual risk of developing coronary heart disease and stroke can be calculated on an individual basis.

The advantages of using of the RFS is that the patient sees readily how his or her lifestyle may affect the ultimate prognosis, and compliance to risk factor modification is enhanced. The RFS indicates to the physician the risk factors in need of modification and permits a management strategy directed at total risk rather than concentrating on one risk factor, such as high blood pressure. Most importantly the individuals most likely to benefit from aggressive treatment of hypertension can be identified.

ABPM in diagnosis

Using ABPM in clinical practice enables a more accurate diagnosis to be made. In particular, normalcy over 24 hours can be determined, white coat

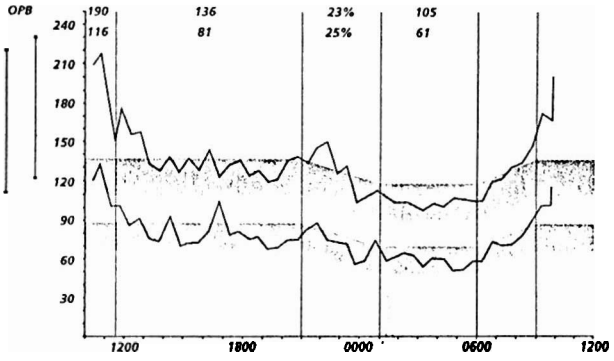


Figure 1: 24 hour ABPM record of 'white coat' hypertensive

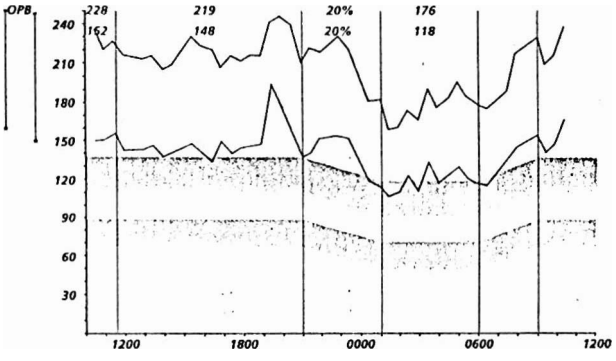


Figure 2: 24 hour ABPM record of a patient with severe hypertension and a normal nocturnal dipping pattern

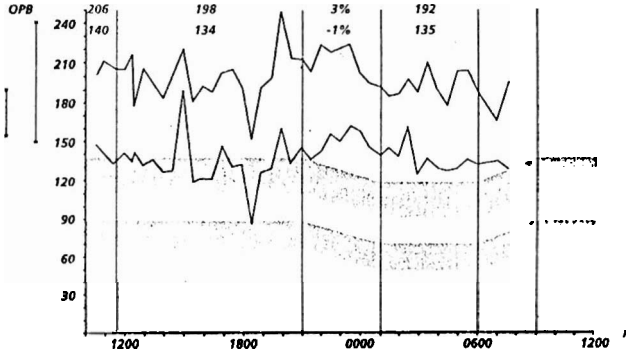


Figure 3: 24 hour ABPM record of a patient with severe hypertension but the usual nocturnal dip in blood pressure is absent

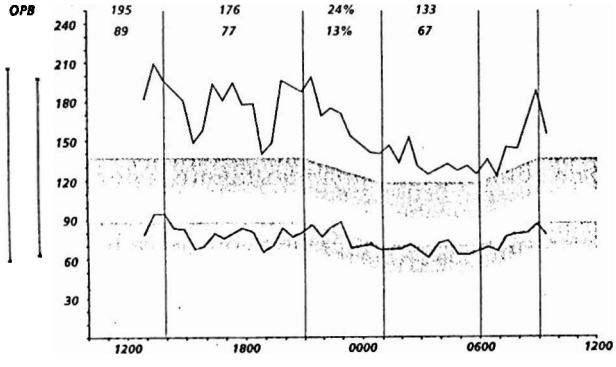


Figure 4: 24 hour ABPM of a patient with sustained isolated systolic hypertension

hypertension can be excluded and the circadian behaviour of patients with hypertension can be characterised.

Normalcy: The normal ranges for ABPM for adults have been defined according to gender and age in the Allied Irish Bank Study. Using this data it is now possible to plot 24 hour pressures for each patient and determine if they fall within the normal bands using either two standard deviations or fifth and 95th centiles to determine the upper and lower limits of blood pressure.

White coat hypertension: The single most important indication for ABPM in practice is the detection of white coat hypertension, a condition in which 20% to 30% of 'hypertensive' subjects diagnosed using conventional office measurement have normal ambulatory pressures outside of the medical environment *(Figure l).*

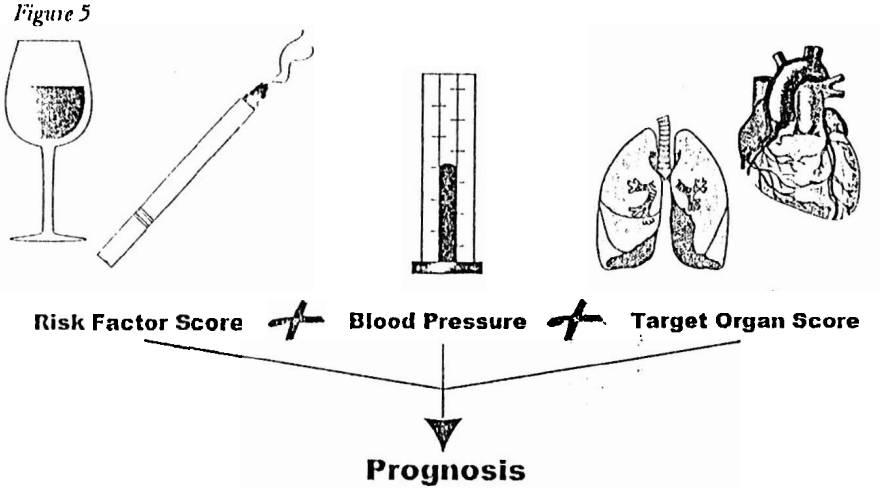
Borderline hypertension: ABPM is particularly helpful in deciding if subjects with borderline elevation of office blood, who may be penalised for insurance cover and employment, should be labelled hypertensive.

Circadian blood pressure: There is growing evidence that subjects whose blood pressure does not decline at night – non-dippers – may be at higher risk than the majority of subjects who have a nocturnal fall in blood pressure – dippers. These non-dippers need careful blood pressure control. The only way of determining dipper status is by performing 24 hour ambulatory measurement *(Figures 2 & 3).*

ABPM in the elderly: ABPM is proving particularly useful in the diagnosis of isolated hypertension in the elderly. In patients with this condition ABPM allows identification of two groups of patients – those with sustained isolated elevation of systolic pressure *(Figure 4)* who probably need treatment and those in whom the clinic elevation of systolic blood pressure is transient and not present on ABPM; such patients merit observation but not antihypertensive medication. ABPM is also useful in the elderly in diagnosing symptoms due to postural of post-prandial hypotension, particularly when autonomic or baroreflex failure is present.

Other diagnostic uses: Ambulatory measurement may also be helpful in identifying episodic hypertension in phaeochromocytoma, in characterising blood pressure behaviour in patients with secondary hypertension in whom the diurnal dipping pattern may be lost, and in diagnosing hypertension in special sub-groups such as blacks, children and pregnant women.

Figure 5



Target organ evaluation

The level of blood pressure, as has been pointed out, is only one parameter in a galaxy of possible risk factors. Moreover, the response of individuals may depend on a number of factors, the not least of which may be genetic. So it is that two individuals with identical blood pressures and even identical 24 hour patterns may have entirely different target organ involvement. It is now possible to assess target organ involvement in the heart, the brain the blood vessels and the kidney. We are currently devising a target organ score (TOS) for patients with hypertension which, taken together with the risk factor score (RFS), will provide a broader canvas on which the prognosis of the hypertensive patient may be painted and management chosen accordingly *(Figure 5).*

The heart: Hypertension associated with left ventricular hypertrophy carries a poor prognosis. Left ventricular hypertrophy is a stronger independent predictor of complications than either systolic or diastolic blood pressure or age. Furthermore, it is a strong predictor of uncomplicated hypertension in both sexes independently of casual blood pressure and other risk factors. Echocardiography should now be used to assess left ventricular size in all newly diagnosed hypertensive patients and to assess the efficacy of drug treatment from time to time in those patients requiring antihypertensive medication.

The brain: Recently the use of MRI scanning has shown the brain to be a sensitive target organ in hypertension and the emphasis may shift from the heart to the brain in the future as MRI scanning becomes more widely available.

The kidney: Urinary albumen excretion is a sensitive measure of renal dysfunction and 24 hour urinary albumen excretion which provides another index of target organ status

The blood vessels: Methods for assessing arterial blood vessels for end-organ damage are being

increasingly developed and there are a variety of methods available which enhance further the assessment of target organ status.

We may ask, of course, if it is acceptable to substitute these so-called surrogate end-points for the more substantial ones of morbid events and death? In answering this question we might apply the scheme of reasoning outlined in *Figure 6*.

ABPM in antihypertensive drug selection

ABPM is proving particularly useful in giving the prescribing physician insight into the efficacy or otherwise of antihypertensive medication.

Efficacy of treatment: Efficacy of blood pressure control with antihypertensive drugs should be based on the 24 hour blood pressure profile rather than on sporadic measurements. ABPM can be particularly helpful in assessing drug efficacy in patients in whom office blood pressures indicate poor control – the resistant hypertensive.

Selection of drug and dosing regimen: Reference to the plot of 24 hour pressures enables the prescribing doctor to select the drug with a duration of action appropriate to the rise in pressure for that particular patient. There is some evidence that different groups of drugs may have different effects on the 24 hour blood pressure profile. Hypertensives on ACE inhibitors have been shown in one study to have had markedly accentuated systolic and diastolic dipping patterns compared to untreated hypertensives and patients on beta-adrenergic blocking drugs, whereas hypertensive patients treated with beta-blockers, calcium antagonists or diuretics had similar diastolic and systolic dipping patterns to the untreated groups. Whatever the explanation for these varying effects of different groups of antihypertensive drugs, which need to be assessed in more detail in prospective studies, the fact that some drugs may accentuate nocturnal dipping, that others may blunt the normal nocturnal fall in blood pressure and that others have no effect on diurnal rhythmicity, raises important questions in assessing antihypertensive drug effect and in choosing a drug for an individual patient.

Withdrawal of antihypertensive medication: Patients whose blood pressure was initially diagnosed by office measurement and whose blood pressure has been well controlled may merit a drug free period for reassessment with ABPM. In this way white coat responders originally diagnosed as hypertensive using conventional measurement can be identified and treatment discontinued.

Assessment of symptoms on treatment: Excessive reduction in blood pressure with antihypertensive drugs below the lower limit of normal – the 'leese' of pressure – may carry risk for hypertensive patients and this phenomenon, which may occur most often at night in extreme dippers, can be readily detected with ABPM.

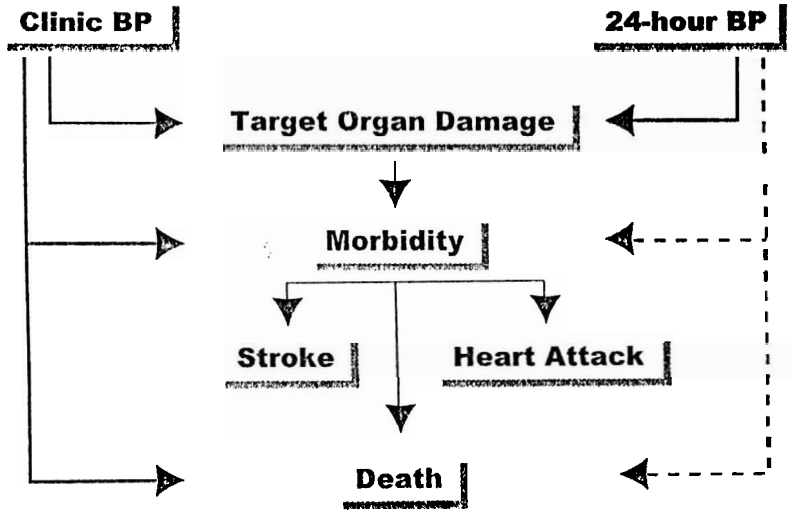
Shared care in hypertension management

Shared care is based on the principle that patients with a 'chronic' illness, who are at risk from the long term complications of such illness, need careful management for the rest of their days to ensure that complications are averted and that such management is best provided by sharing the resources of a specialist unit and general practice by using computer technology to provide the linking mechanism for follow-up.

The shared care programme for the management of hypertension at the Blood Pressure Unit in Beaumont Hospital was planned in early 1990. It consists of two phases. In phase one the reorganisation of outpatient facilities was commenced and a computer programme was designed to accommodate entry of patient details and investigative data; 1,500 patients have now been entered through this first phase.

Patient attendance at the Blood Pressure Unit: The patient's first attendance at the hospital is to a specially trained nurse in the Blood Pressure Unit rather than to the consultant in the outpatient department. The nurse takes a history from the patient and enters all essential data directly into a computer. The nurse measures blood pressure, height and weight and performs dip-stick urinalysis. Arrangements are made for the patient to visit the hospital on one day within the following 10 days to have all investigations performed on the one attendance, viz: biochemistry, lipid analysis, electrocardiography, echocardiography and 24 hour ambulatory blood pressure measurement. The nurse acquaints the patient as to the nature of the investigations and the procedure that will be followed by the consultant. It is

Figure 6



emphasised to the patient that there will be no more than 15 to 30 minutes waiting time for the consultant appointment, the importance of attending on time and the necessity to cancel if unable to attend so that the appointment can be used for others.

Patient attendance at the consultant in outpatients: Within two to three weeks of the nurse assessment at the Blood Pressure Unit and completion of all investigations, the patient attends the consultant. The patient's notes contain the relevant facts relating to the history, the measurements recorded and the results of all investigations. With this information, the consultant can concentrate the consultation on salient features of the patient's presenting problems and having the results of all investigations, a definitive opinion can usually be provided at this consultation thereby reducing the number of visits required. The facility of managing appointments from the Blood Pressure Unit has also resulted in appointments being planned carefully by computer for all doctors participating in the clinic. Each doctor has an appointment list detailing in advance the number of patients he/she will have to see with the result that patient delay is greatly reduced and patients rarely have to wait more than 15 minutes.

Advantages of the shared care programme: The benefits to patients comprise:

- improved communication and an unstressed visit to hospital through initial contact with a nurse rather than doctor
- an early management decision
- fewer attendances at hospital
- less waiting time
- long term hospital/GP liaison.

The advantages to the health care system are:

- fewer patient attendances at hospital
- saving of consultant time by planning investigations and employing a nurse to gather preliminary information
- fewer hospital visits are made by patients and waiting time at these visits is reduced
- as the number of return visits to the consultant is also reduced waiting lists are shortened
- the hospital/GP relationship is enhanced and overall satisfaction expressed by patients is improved
- the nurse plays a key role including history taking and data acquisition with resultant improvement in job satisfaction.

The full benefits of the shared care programme will not be realised until phase two is in operation.

Phase two of the shared care programme: In this phase, which just commenced in January 1994, computer generated letters will be sent at pre-determined intervals to both patients and their GP seeking details on progress. In this way the consultant will be able to discharge patients more freely to GP management and the GP will be more ready to accept management, each knowing that long term management will, in fact, be shared. Should the response from patient or general practitioner be such as to suggest less than optimal management, an appointment to attend the Blood Pressure Clinic for more detailed assessment can be arranged. In this way the long-term management of the hypertensive patient is carefully observed with the aim of preventing the debilitating consequences of poor management, namely stroke and heart attack. This phase offers a means of direct contact with hypertensive patients whereby health educational strategies aimed at modifying lifestyle behaviour can be reinforced regularly.

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