Evidence is growing to support the use of ABPM in all patients with high BP, not just in selected individuals

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Emerging role for nocturnal BP

MUCH HAPPENS to the cardiovascular system during the night and during sleep, especially in relation to blood pressure. These nocturnal occurrences have been largely ignored in clinical practice because the methodology for assessing nocturnal profiles of blood pressure – 24-hour ambulatory blood pressure measurement (ABPM) – has been accepted only slowly in clinical practice, or used only sparingly for the recording of blood pressure during the night.

With the recent publication of the *Dublin Outcome Study* there is now renewed interest in the importance of nocturnal hypertension in clinical practice.[1]

Which measurement of blood pressure is best?

The most commonly used technique of blood pressure measurement in clinical practice is the auscultatory method with a mercury sphygmomanometer and stethoscope.

A meta-analysis of clinic blood pressure measurement (CBPM) in one million adults participating in 61 prospective studies has shown that a systolic CBPM 10mmHg or diastolic CBPM 5mmHg above normal is associated with about 40% higher risk of stroke death and about 30% higher risk of death from ischaemic heart disease and other vascular causes.

There are, however, numerous criticisms of CBPM, which include interobserver and intraobserver variability and terminal digit preferences, all of which may bias the accuracy of measurement. Moreover, CBPM cannot detect white-coat hypertension, a largely innocent condition, which obscures the true level of blood pressure and the prevalence of which can be as high as 30%.

Which measure is best for predicting outcome?

There is no doubt but that ABPM is superior to CBPM in predicting target organ involvement, such as left ventricular hypertrophy, microalbuminuria and cerebral ischaemia, in patients with hypertension.

However, the ultimate prognostic endpoint is cardiovascular death, and evidence that ABPM is superior to other measurements in predicting cardiovascular mortality has been lacking.

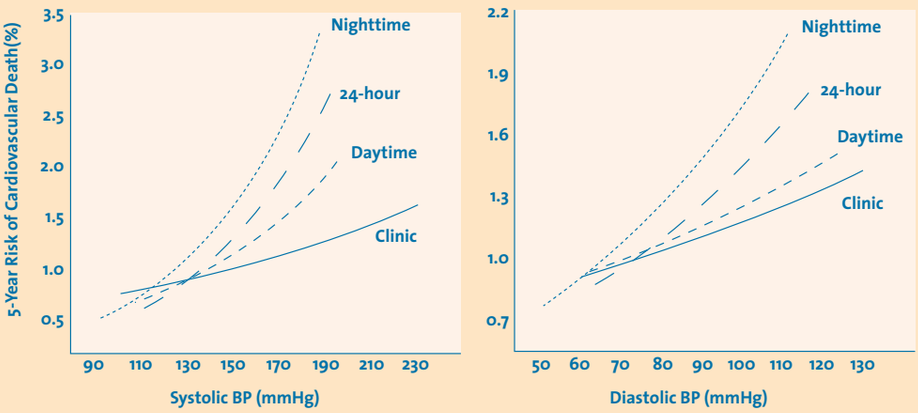
A number of small studies have suggested that ABPM is a better predictor of mortality than CBPM, and similarly, evidence has been accumulating to suggest that night-time pressure might be superior to daytime pressure in predicting cardiovascular outcome.

The Dublin outcome study cohort

The Blood Pressure Unit (formerly located at the Charitable Infirmary and based latterly Beaumont Hospital in Dublin) has been in operation for 22 years. The demographic details and cardiovascular risk factors of more than 20,000 patients have been entered into a database since 1980, making it the largest single centre data-

Figure 1

Adjusted five-year risk of cardiovascuar death



Adjusted five-year risk of cardiovascular death in the study cohort of 5,292 patients for CBPM and ABPM. Using multiple Cox regression, the relative risk was calculated with adjustment for baseline characteristics including gender, age, presence of diabetes mellitus, history of cardiovascular events and smoking status. Five-year risks are expressed as number of deaths per 100 subjects.

base of its kind in the world.

From this cohort, 5,292 untreated patients whose ABPM record included at least 10 daytime and five night-time readings and who had had standardised CBPM constituted the Dublin outcome study.

All data were transferred into a software package (dabl®Cardiovascular, dabl® Limited, Dublin, Ireland), which allows calculation of systolic and diastolic pressures for the daytime period (average of readings between 9am and 9pm, the night-time period average of readings between 1am and 6am) and the 24-hour period without applying any editing criteria.

A methodical search of the death register for these patients showed that there had been 646 deaths, of which 389 were cardiovascular during a median follow-up period of 8.4 years.

Results of the Dublin outcome study

The first point in need of emphasis is that the *Dublin Outcome Study* is the largest single-centre study to date using carefully collected computerised data from a large western population of hypertensive patients, who were not on antihypertensive medication at the time of blood pressure measurement.

Firstly, as might be expected, the prevalence of known cardiovascular risk factors was higher among patients who died of cardiovascular causes.

Confirming the results of smaller studies, the *Dublin Outcome Study* demonstrated beyond any doubt in this large cohort that after adjusting for gender, age, risk indices and clinic blood pressure, higher mean values of ABPM were independent predictors for cardiovascular mortality.

Most interestingly, the *Dublin Outcome Study* showed clearly that night-time blood pressure was the best predictive measurement of cardiovascular outcome, and the hazard ratios for night-time ABPM remained significant after adjustment for daytime ambulatory blood pressure.

The results of the *Dublin Outcome Study* confirm, therefore, the superiority of ABPM over CBPM in predicting cardiovascular mortality.

The relevance of night-time blood pressure

The dipper/non-dipper classification of nocturnal blood pressure was first introduced in *The Lancet* by the Dublin Blood Pressure Unit in 1988, when a retrospective analysis suggested that non-dipping hypertensive patients had a higher risk of stroke than the majority of patients with a dipping pattern.[2]

Since then there have been many studies evaluating morbidity and dipping status, and though there has been some disagreement in the literature, on balance, most large-scale prospective studies support the concept that a diminished nocturnal blood pressure fall is associated with a worse prognosis.

The results of the *Dublin Outcome Study* lay any doubts to rest on this issue – for each 10mmHg rise in mean night-time systolic blood pressure, the mortality risk increased by 21% (*see Figure*).

Clinical relevance of the study

The findings of our study have clinical relevance. Despite the abundance of evidence that ABPM is superior to CBPM, current guidelines generally recommend ABPM only for selected circumstances, such as the exclusion of white coat hypertension. Our findings support the recommendation that ABPM is indispensable to the management of hypertension and that all patients with elevated CBPM should have an ABPM.[3]

Moreover, the emerging importance of nocturnal blood pressure as an independent risk for cardiovascular outcome strengthens the call for 24-hour measurement of blood pressure. Future guidelines will have to address these issues.

This study has important clinical implications. First, we have shown in a large cohort of untreated hypertensive patients that increasing levels of CBPM provide only a modest increase in cardiovascular risk compared to night-time or 24-hour ABPM.

Second, because patients with elevated ABPM are at greater risk, irrespective of CBPM, the ready availability of ABPM in clinical practice would permit treatment to be targeted at the patients likely to benefit most.

Third, the strong predictive value of night-time blood pressure makes it important in clinical practice to direct more attention to nocturnal blood pressure, and this observation raises an interesting hypothesis for a prospective randomised clinical trial to show if treatment based on night-time pressure will improve outcome.

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References

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