Office, Home or ABPM:
Which to use for diagnosing and Managing HTN

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Blood pressure measurement

The measurement of blood pressure is the clinical procedure of greatest importance that is performed in the sloppiest manner

Am J Hypertension 1998:11:134-6

2018 ESC/ESH guideline - Office blood pressure measurement

Patients should be seated comfortably in a quiet environment for 5 min before beginning BP measurements.
Three BP measurements should be recorded, 1–2 min apart, and additional measurements only if the first two readings differ by >10 mmHg. BP is recorded as the average of the last two BP readings.
Additional measurements may have to be performed in patients with unstable BP values due to arrhythmias, such as in patents with AF, in whom manual auscultatory methods should be used as most automated devices have not been validated for BP measurement in patients with AF.[a]
Use a standard bladder cuff (12–13 cm wide and 35 cm long) for most patients, but have larger and smaller cuffs available for larger (arm circumference >32 cm) and thinner arms, respectively.

2018 ESC/ESH guideline - Office blood pressure measurement

contd…

The cuff should be positioned at the level of the heart, with the back and arm supported to avoid muscle contraction and isometric exercise-dependant increases in BP.
When using auscultatory methods, use phase I and V (sudden reduction/disappearance) Korotkoff sounds to identify SBP and DBP, respectively.
Measure BP in both arms at the first visit to detect possible between-arm differences. Use the arm with the higher value as the reference.
Measure BP 1 min and 3 min after standing from a seated position in all patients at the first measurement to exclude orthostatic hypotension. Lying and standing BP measurements should also be considered in subsequent visits in older people, people with diabetes, and people with other conditions in which orthostatic hypotension may frequently occur.
Record heart rate and use pulse palpation to exclude arrhythmia.

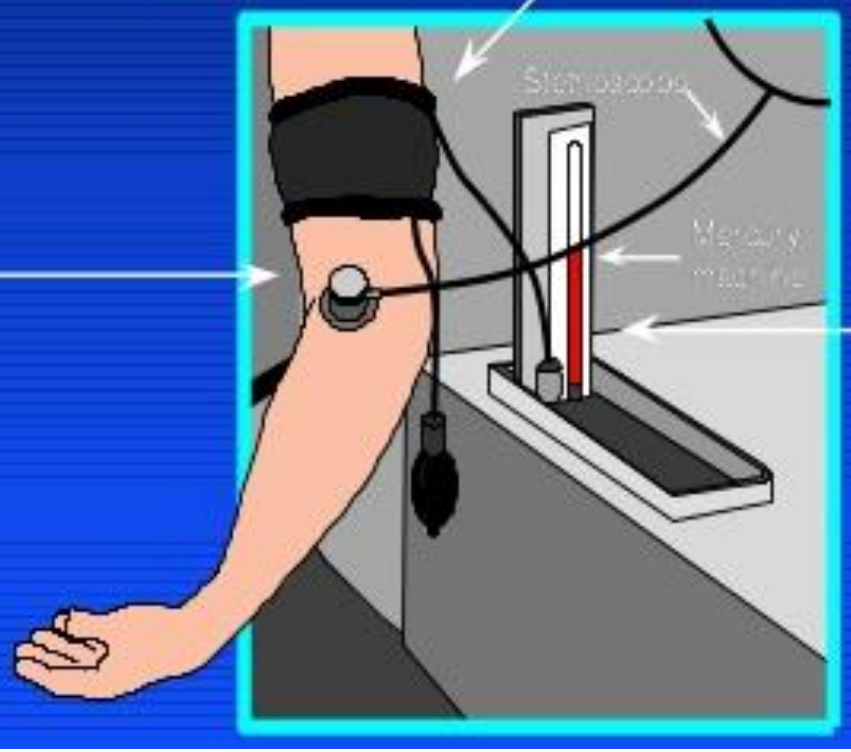
RECOMMENDED BLOOD PRESSURE MEASUREMENT TECHNIQUE

2.

- The cuff must be level with heart.
- If arm circumference exceeds 33 cm, a large cuff must be used.
- Place stethoscope diaphragm over brachial artery.

1.

- The patient should be relaxed and the arm must be supported.
- Ensure no tight clothing constricts the arm.



3.

- The column of mercury must be vertical.
- Inflate to occlude the pulse. Deflate at 2 to 3 mm/s. Measure systolic (first sound) and diastolic (disappearance) to nearest 2 mm Hg.

Factors affect the BP measurement result

Aspect	Different approaches affecting the BP assessment
Setting	Office, work, ambulatory, home
Time	Daytime, nighttime, nocturnal dip, morning, evening, morning surge, postprandial
Observer	Doctor, nurse, technician, relative, self-measurement, automated
Device	Mercury, aneroid, hybrid, oscillometric
Posture	Basal, lying, seated, standing, exercise
Reading	First reading, first day, first visit, several measurements
Calculation	Average, variability, reactivity, maximum

Hypertension 2011;57:1041-2.

Variability	Short term: reading-to-reading (ambulatory monitoring)* Medium term: day-to-day (home monitoring)* Long term: visit-to-visit (office measurements)*
Instability	Maximum BP: office, home, ambulatory monitoring* Morning BP surge: ambulatory monitoring*
Reactivity	Physical tests: isometric or isotonic exercise testing,* cold pressor test, tec Mental tests: arithmetic task, reaction time task, psychologic and emotional challenges, mental stressor test, etc

may carry different clinical implications still poorly understood…

Hypertension 2011;57:1041-2.

Factors associated with BPV

- Average BP levels
- Heart rate
- Temperature
- Diabetes
- Smoking
- Increasing age
- Presence of vascular diseases (stiffness)
- Poor compliance with antihypertensives
  - Subclinical cerebral ischemia
  - Increased arterial stiffness
  - Impaired baroreceptor

Circ Res 1971;29:424.
Cerebrovasc Dis 1997;7:214-19.
Lancet 2010;375:906-15.

Limitation of Clinic BP Measurement

- The inherent variability of BP coupled with the small number of readings taken in the doctor's office
- The white coat effect ((the increase of BP that occurs in the medical care environment)
- The masked effect (a decrease of BP that occurs in the medical care environment)
- An error by human and/or machine

Journal of the American Society of Hypertension 4(2) (2010) 56–61

Indications for home Blood Pressure (BP) monitoring.

Home BP Monitoring
Any patient with hypertension
Rule out white coat hypertension
Rule out masked hypertension
Evaluation of resistant hypertension
Evaluation of medication-related hypotensive symptoms
Evaluation of labile hypertension

Measuring Blood Pressure at Home

- Support for Home Blood Pressure measurement
- Measurements taken by patients at home are often lower than readings taken in the office and closer to the average blood pressure recorded by 24 hour ambulatory monitors.
- Home BP readings predicts risk better than office BP's
- In a 2005 Gallup poll:
    - 35% of hypertensive patients now check their blood pressure at least once per week
    - 86% of patients who had been advised to purchase a blood pressure monitor had done so.
    - 55% of patients were monitoring their blood pressure an increase of 17% from 2000.

AHA-Hypertension 2008

Indications for Ambulatory Blood Pressure (BP) monitoring.

Ambulatory BP Monitoring
Rule out white coat hypertension
Rule out masked hypertension
Evaluation of resistant hypertension
Evaluation of medication-related hypotensive symptoms
Evaluation of labile hypertension
Assessment of nocturnal blood pressure
Evaluation of autonomic dysfunction

AHA 2017 Hypertension guidelines mention separate BP cut off for diagnosis of hypertension

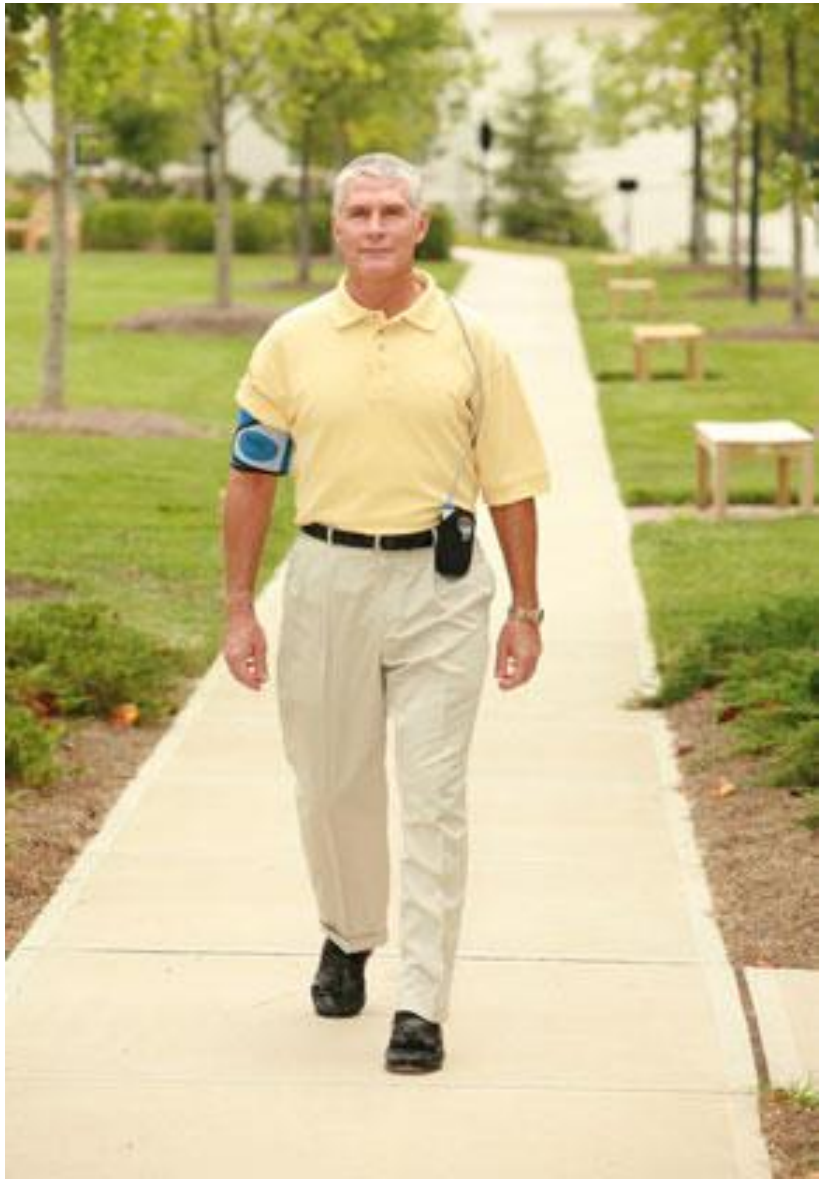
Corresponding Values of SBP/DBP for Clinic, HBPM, Daytime, Nighttime, and 24-Hour ABPM Measurements

Clinic	HBPM	Daytime ABPM	Nighttime ABPM	24-Hour ABPM
120/80	120/80	120/80	100/65	115/75
130/80	130/80	130/80	110/65	125/75
140/90	135/85	135/85	120/70	130/80
160/100	145/90	145/90	140/85	145/90

ABPM indicates ambulatory blood pressure monitoring; BP, blood pressure; DBP diastolic blood pressure; HBPM, home blood pressure monitoring; and SBP, systolic blood pressure.

ABPM

- Ambulatory blood pressure (ABP) monitoring involves measuring blood pressure (BP) at regular intervals (usually every 20–30 minutes) over a 24 hour period while patients undergo normal daily activities, including sleep.



- The portable monitor is worn on a belt connected to a standard cuff on the upper arm
- When complete, the device is connected to a computer that prepares a report of the 24 hour, day time, night time, and sleep and awake (if recorded) average systolic and diastolic BP and heart rate.

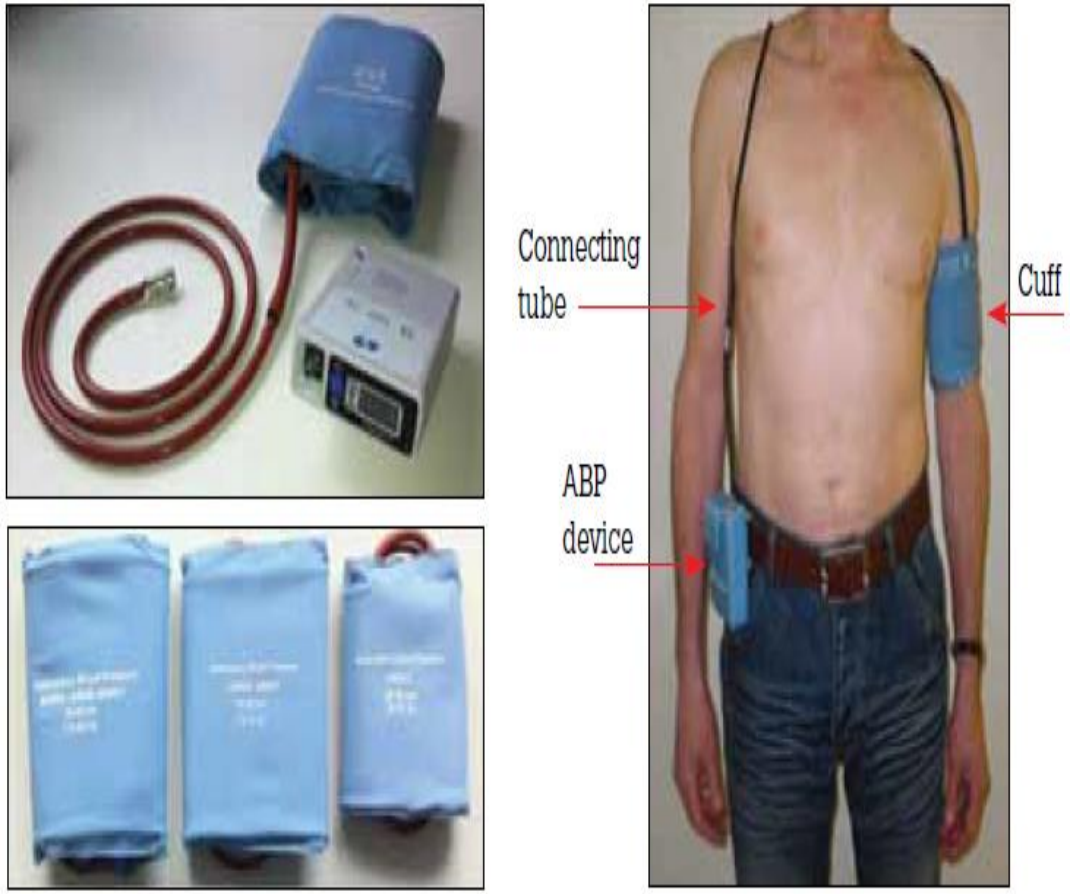


Figure 1. Example of ambulatory monitors (upper left), multiple cuff sizes (lower left) and when fitted to a patient (right)

Table 1. Blood-Pressure Patterns That Can Be Determined by Means of Ambulatory Blood-Pressure Monitoring and Other Methods.

Variable	Ambulatory Blood-Pressure Monitoring	Clinic Blood-Pressure Monitoring	Home Blood-Pressure Monitoring
True, or mean, blood pressure	Yes	Questionable	Yes
Diurnal blood-pressure rhythm	Yes	No	No
Dipping status	Yes	No	No
Morning surge	Yes	No	Questionable
Blood-pressure variability	Yes	No	Questionable
Duration of drug effects	Yes	No	Yes

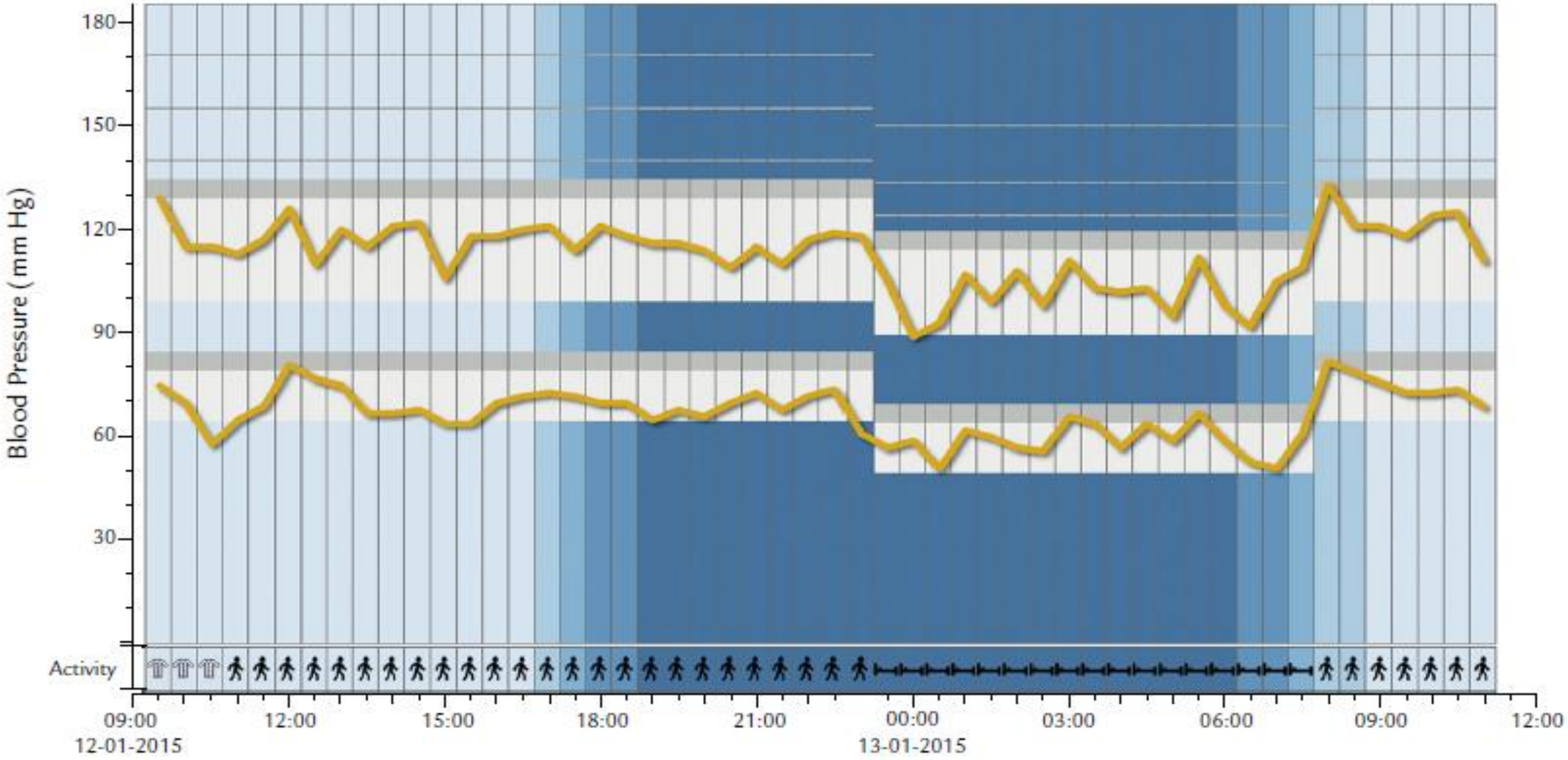


Figure 4. Normal ambulatory blood pressure monitoring pattern. The ambulatory blood pressure monitoring pattern reveals normal 24-hour blood pressure and a normal decrease in blood pressure during sleep. Plot and interpretive report provided with permission from Medasoft.

Clin Ther. 2016;38:2142–2151

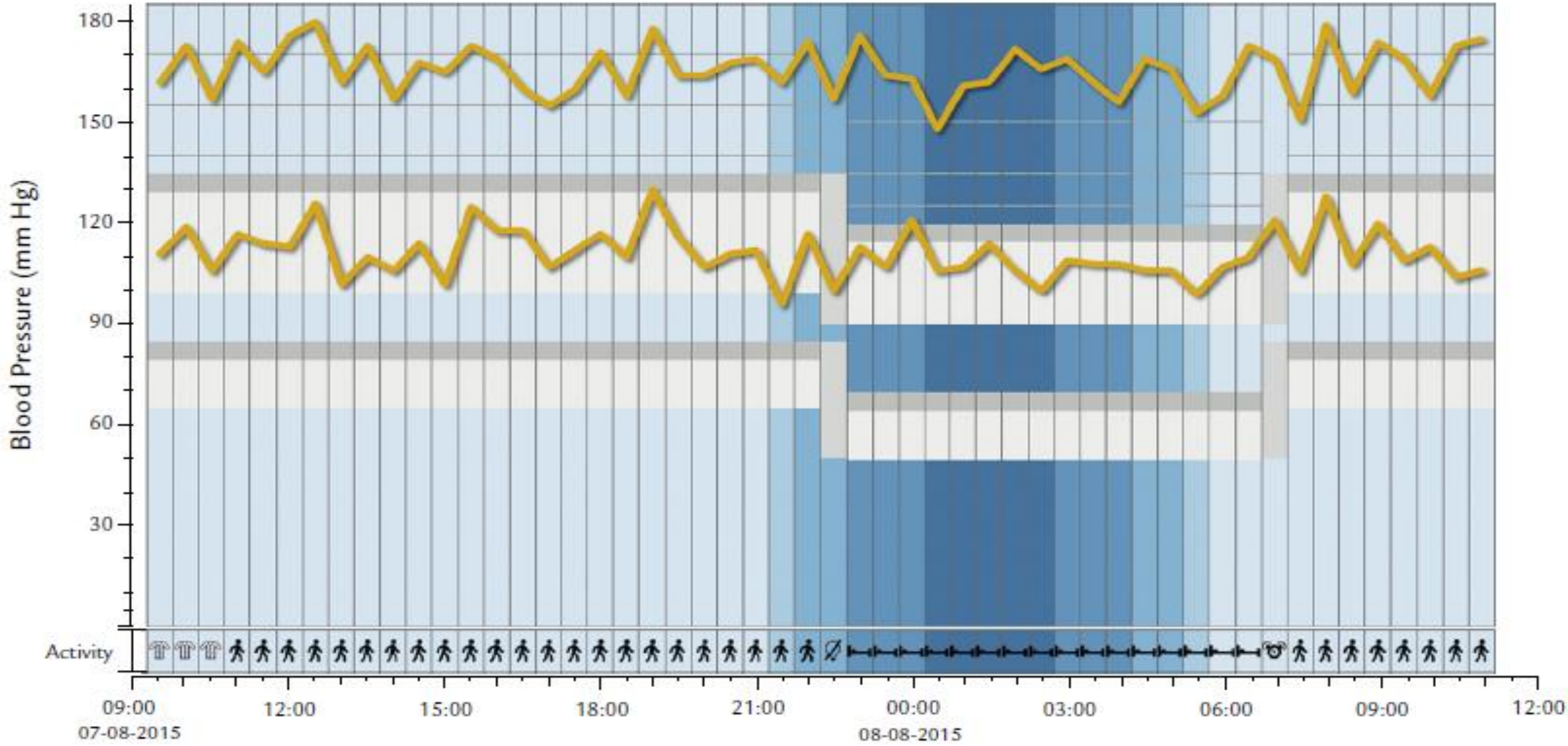
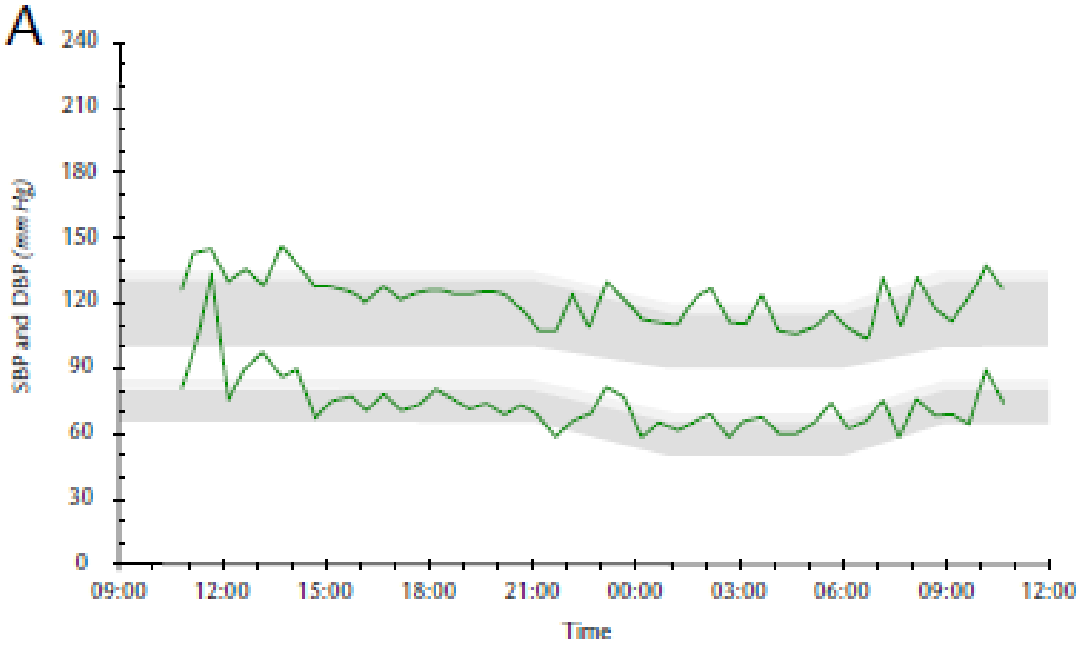


Figure 3. Hypertensive nondipper. The ambulatory blood pressure monitoring pattern reveals significant hypertension during the 24 hours and a reduced decrease in blood pressure during sleep. Plot and interpretive report provided with permission from Medasoft.

Clin Ther. 2016;38:2142–2151

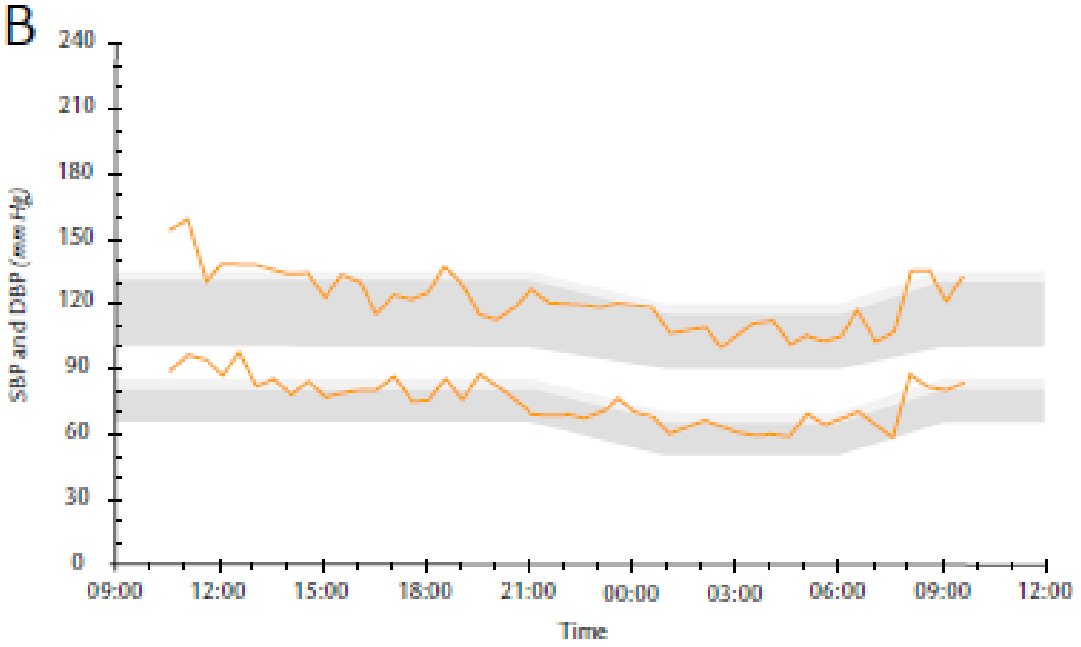
Examples of ambulatory blood pressure measurements (ABPMs) for which office blood pressure measurements (OBPMs) were all 150 / 90 mmHg

A



Description	Normal
OBP	150/90 mm Hg
First ABPM Measurement	127/82 mm Hg
Mean Daytime BP	127/77 mm Hg
Mean Night-time BP	115/65 mm Hg

B



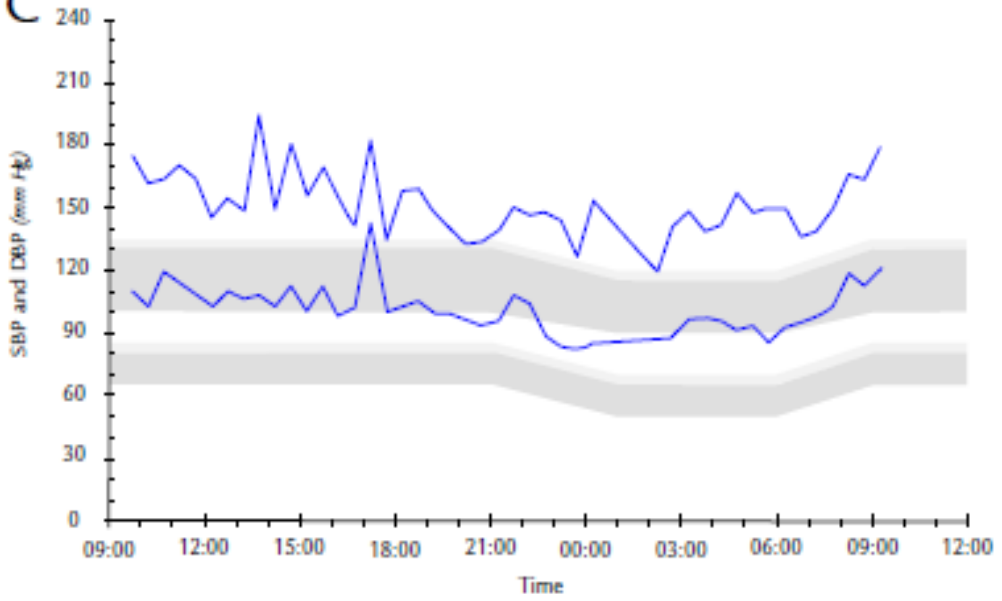
Description	White-coat hypertension
OBP	152/91 mm Hg
First ABPM Measurement	154/89 mm Hg
Mean Daytime BP	128/82 mm Hg
Mean Night-time BP	106/62 mm Hg

BP = Blood Pressure; DBP = Diastolic Blood Pressure; SBP = Systolic Blood Pressure.

Clin Ther. 2016;38:2142–2151

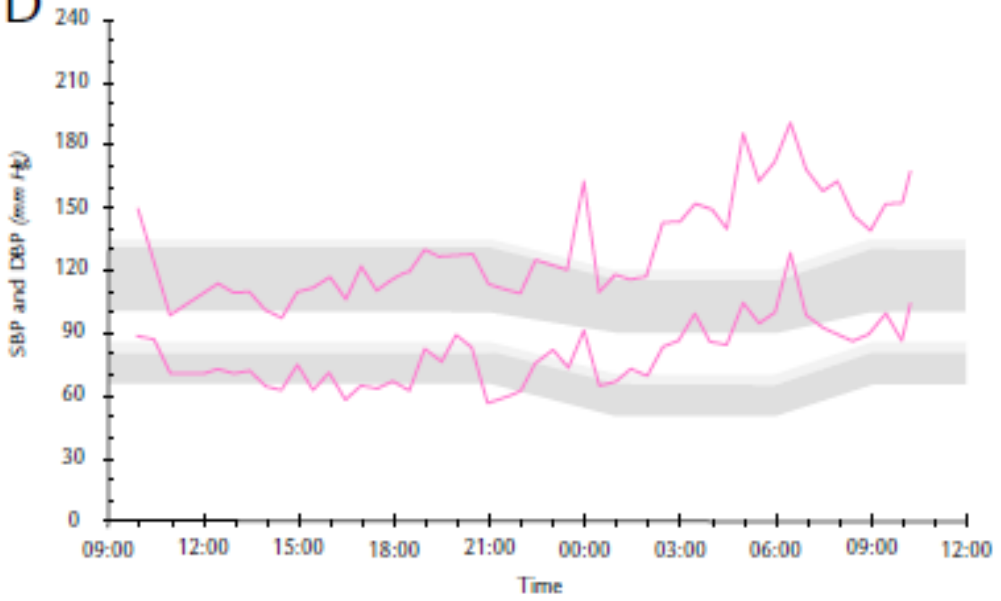
Examples of ambulatory blood pressure measurements (ABPMs) for which office blood pressure measurements (OBPMs) were all 150 / 90 mmHg

C



Description	Hypertension with white-coat effect
OBP	152/90 mm Hg
First ABPM Measurement	175/110 mm Hg
Mean Daytime BP	157/107 mm Hg
Mean Night-time BP	142/92 mm Hg

D



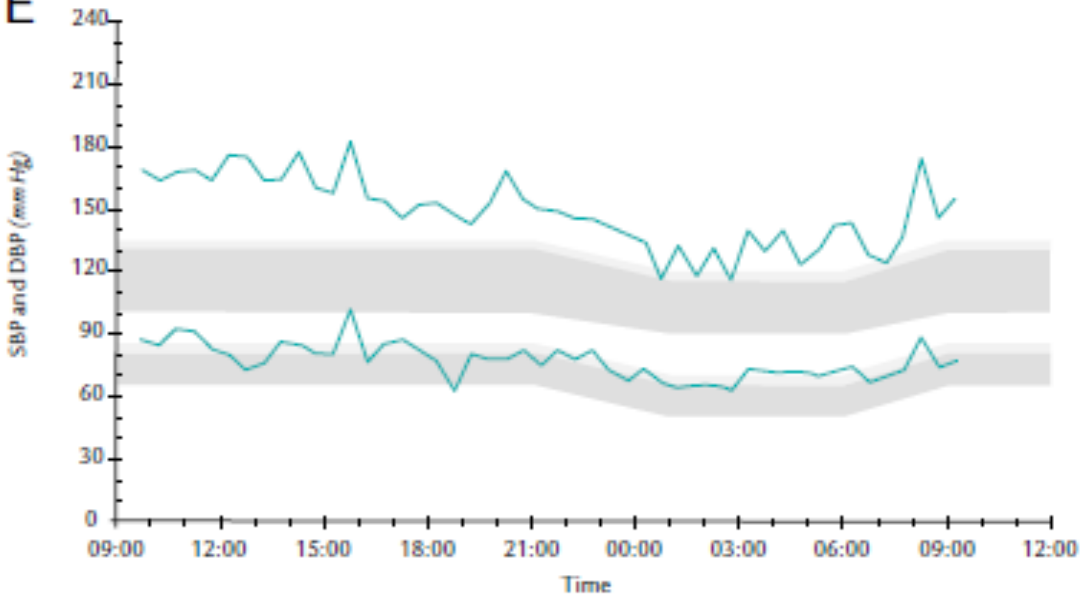
Description	Isolated nocturnal hypertension
OBP	150/90 mm Hg
First ABPM Measurement	150/89 mm Hg
Mean Daytime BP	120/73 mm Hg
Mean Night-time BP	148/88 mm Hg

BP = Blood Pressure; DBP = Diastolic Blood Pressure; SBP = Systolic Blood Pressure.

Clin Ther. 2016;38:2142–2151

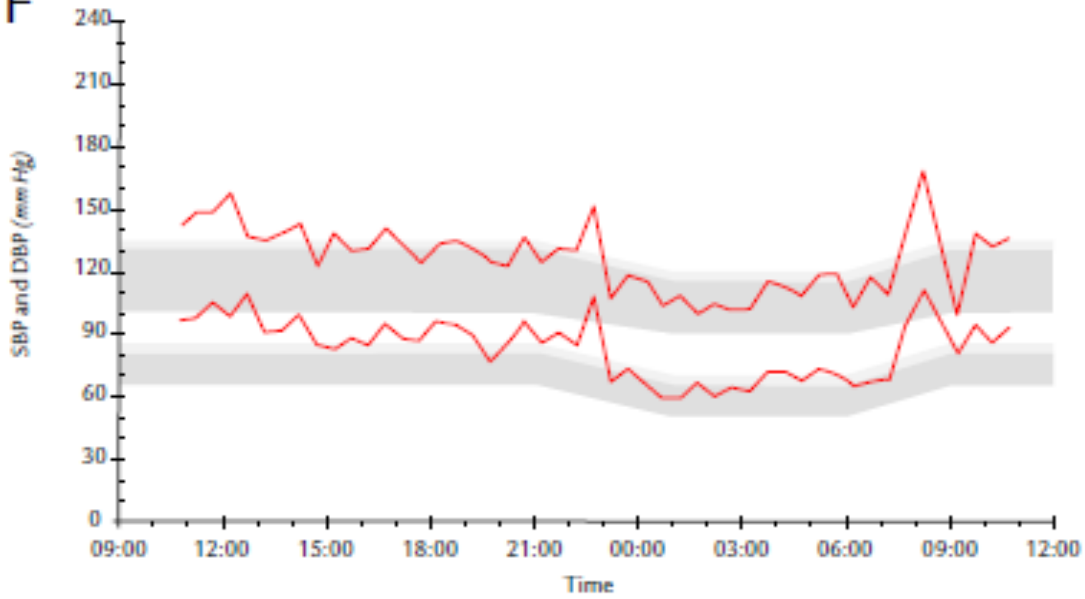
Examples of ambulatory blood pressure measurements (ABPMs) for which office blood pressure measurements (OBPMs) were all 150 / 90

E



Description	Isolated systolic hypertension
OBP	152/94 mm Hg
First ABPM Measurement	169/87 mm Hg
Mean Daytime BP	160/81 mm Hg
Mean Night-time BP	130/69 mm Hg

F



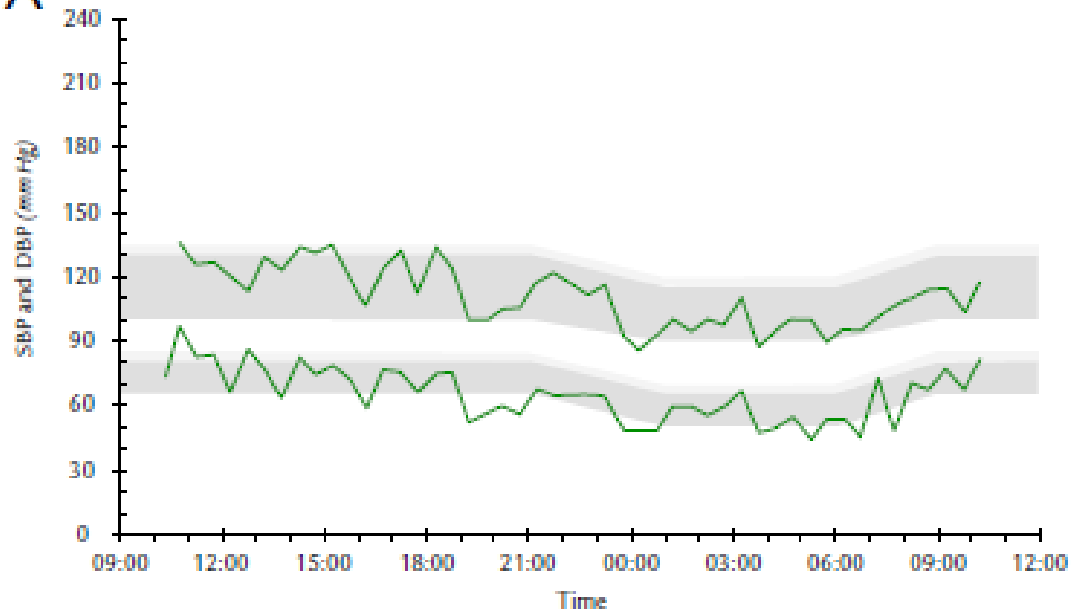
Description	Isolated diastolic hypertension
OBP	150/95 mm Hg
First ABPM Measurement	142/97 mm Hg
Mean Daytime BP	133/91 mm Hg
Mean Night-time BP	109/67 mm Hg

BP = Blood Pressure; DBP = Diastolic Blood Pressure; SBP = Systolic Blood Pressure.

Clin Ther. 2016;38:2142–2151

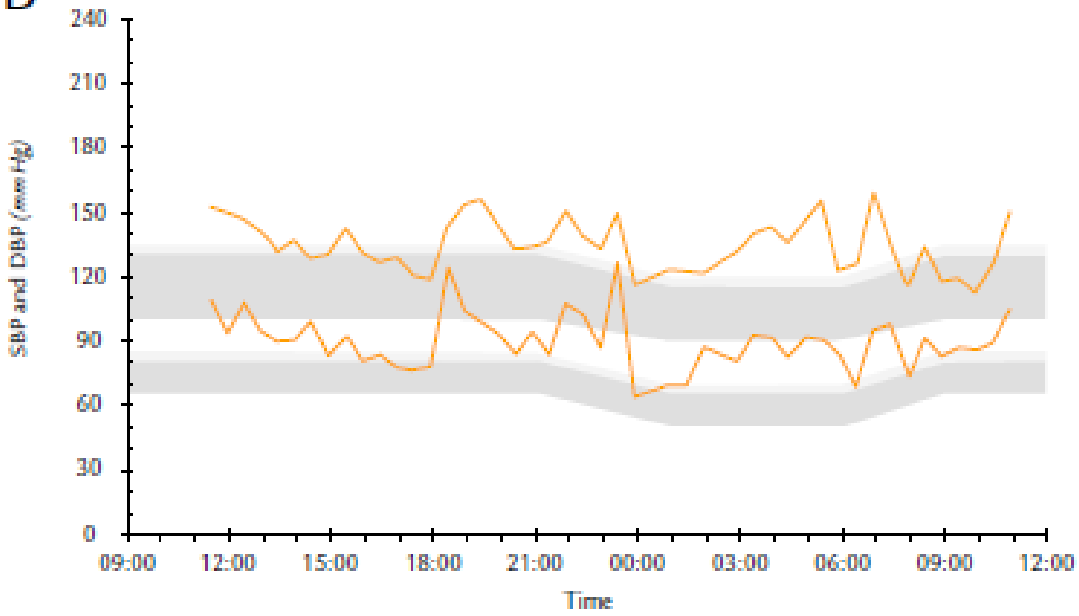
Examples of ambulatory blood pressure measurements ABPMs for which office blood pressure Measurements (OBPMs) was 130 mmHg systolic blood pressure (SBP) and 70 mm Hg Diastolic blood pressure (DBP).

A



Description	Normal
OBP	130/70 mm Hg
First ABPM Measurement	122/74 mm Hg
Mean Daytime BP	119/71 mm Hg
Mean Night-time BP	98/56 mm Hg

B

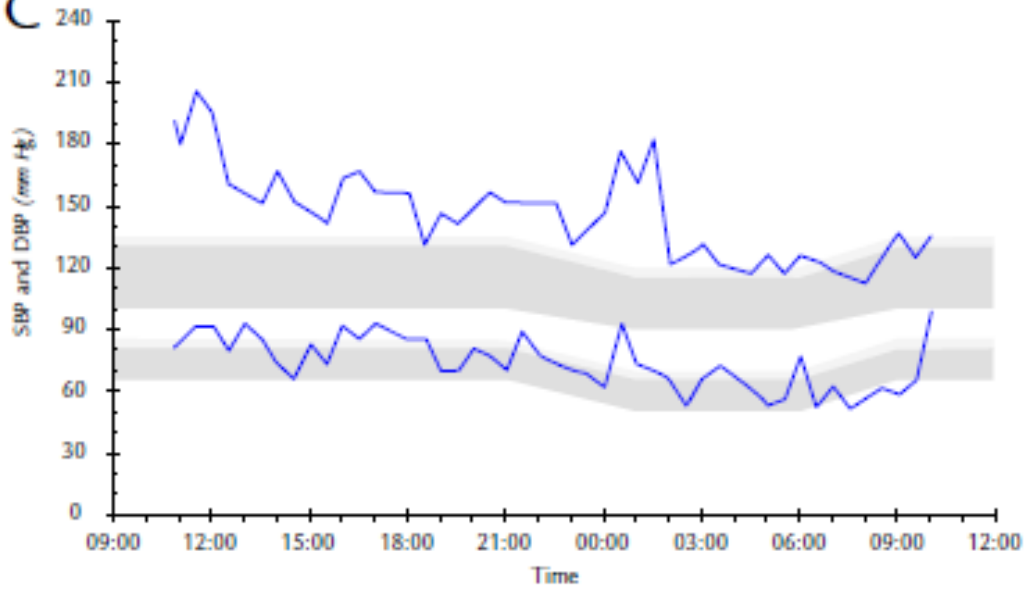


Description	Daytime diastolic and nocturnal hypertension
OBP	130/70 mm Hg
First ABPM Measurement	153/109 mm Hg
Mean Daytime BP	134/91 mm Hg
Mean Night-time BP	135/86 mm Hg

Clin Ther. 2016;38:2142–2151

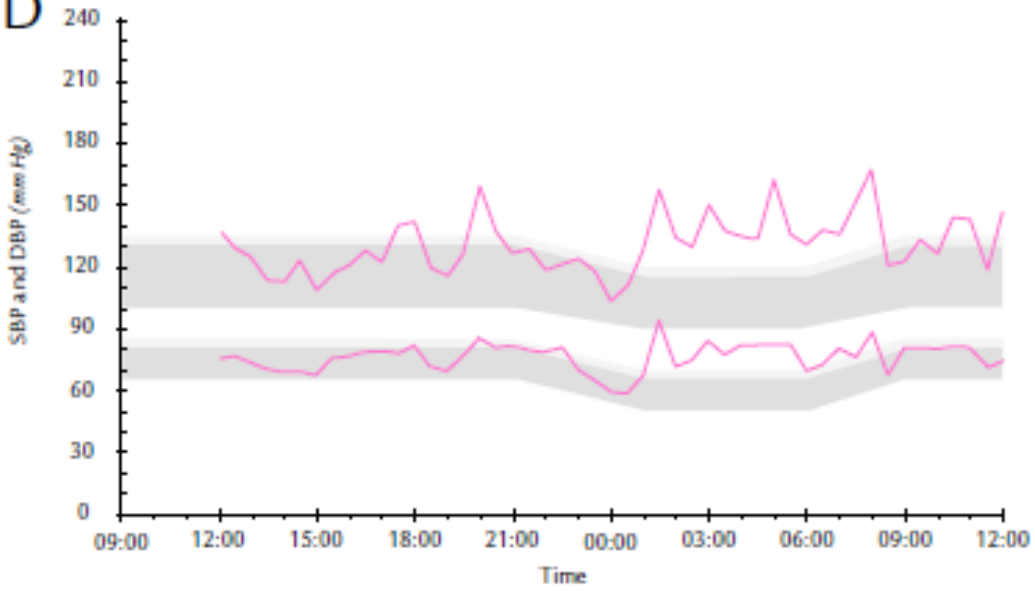
Examples of ambulatory blood pressure measurements ABPMs for which office blood pressure Measurements (OBPMs) was 130 mmHg systolic blood pressure (SBP) and 70 mm Hg Diastolic blood pressure (DBP).

C



Description	Masked isolated systolic hypertension with white-coat effect
OBP	130/70 mm Hg
First ABPM Measurement	191/81 mm Hg
Mean Daytime BP	152/80 mm Hg
Mean Night-time BP	132/64 mm Hg

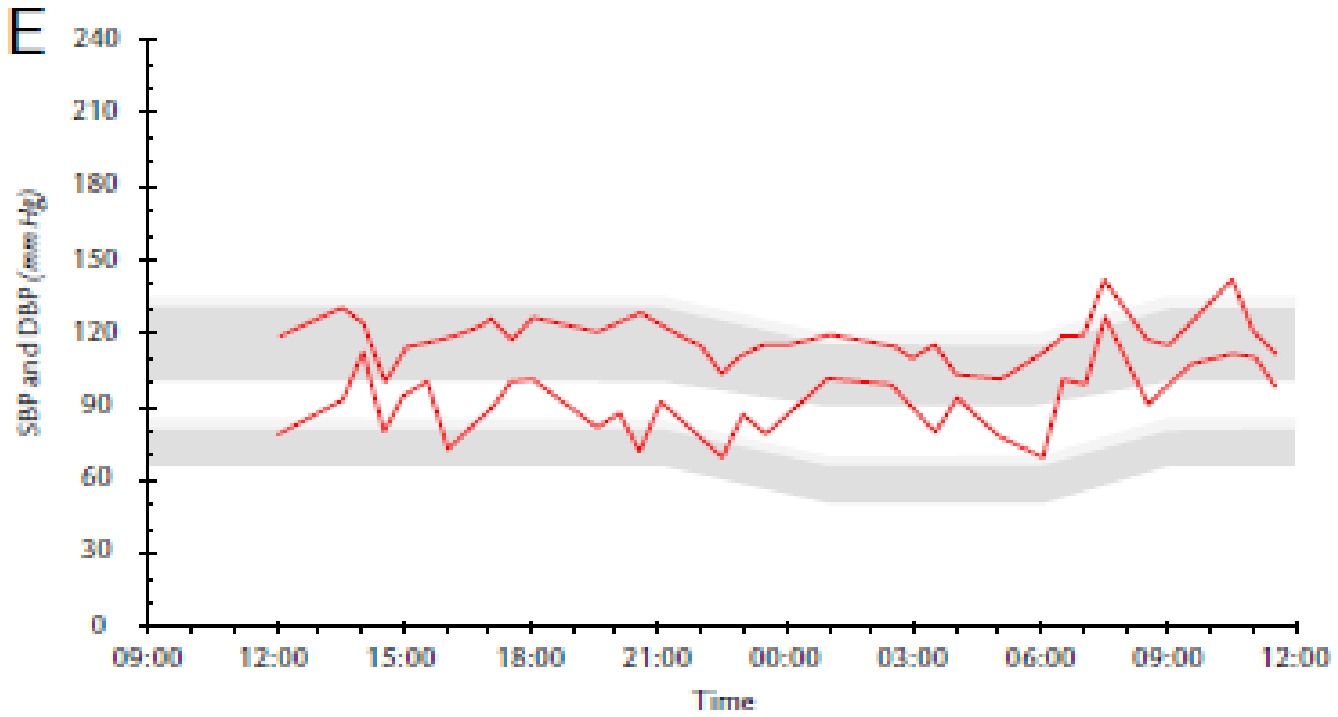
D



Description	Isolated nocturnal hypertension
OBP	130/70 mm Hg
First ABPM Measurement	137/76 mm Hg
Mean Daytime BP	129/77 mm Hg
Mean Night-time BP	141/80 mm Hg

Clin Ther. 2016;38:2142–2151

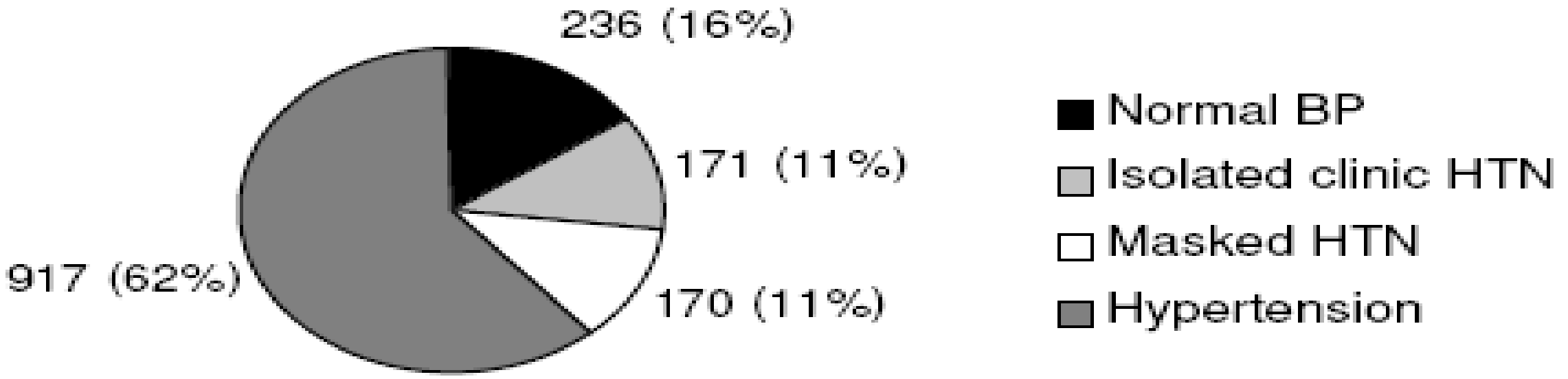
Examples of ambulatory blood pressure measurements ABPMs for which office blood pressure Measurements (OBPMs) was 130 mmHg systolic blood pressure (SBP) and 70 mm Hg Diastolic blood pressure (DBP).



Description	Isolated diastolic hypertension
OBP	130/70 mm Hg
First ABPM Measurement	119/79 mm Hg
Mean Daytime BP	122/94 mm Hg
Mean Night-time BP	110/88 mm Hg

Clin Ther. 2016;38:2142–2151

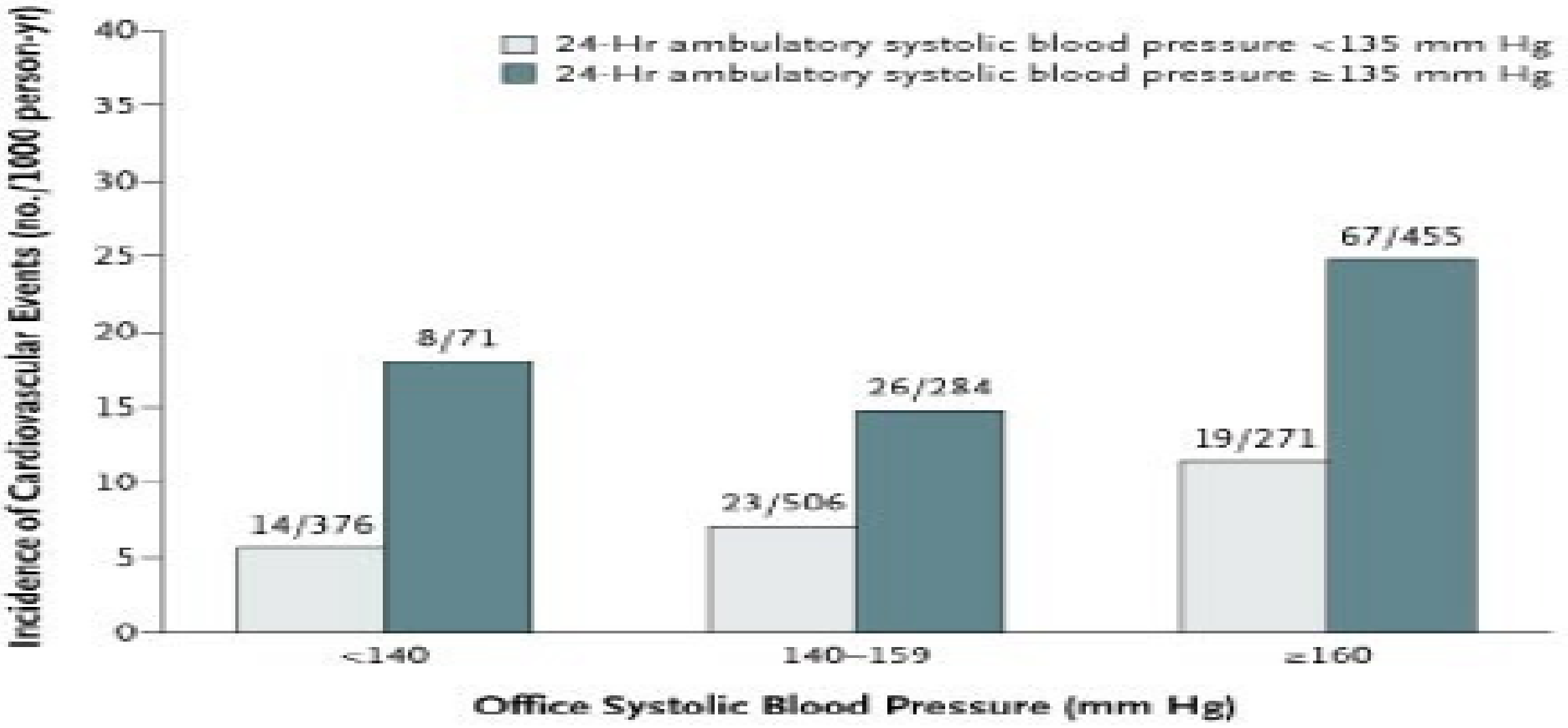
White Coat and Masked Hypertension



Four groups of subjects among the total population (n=1494)

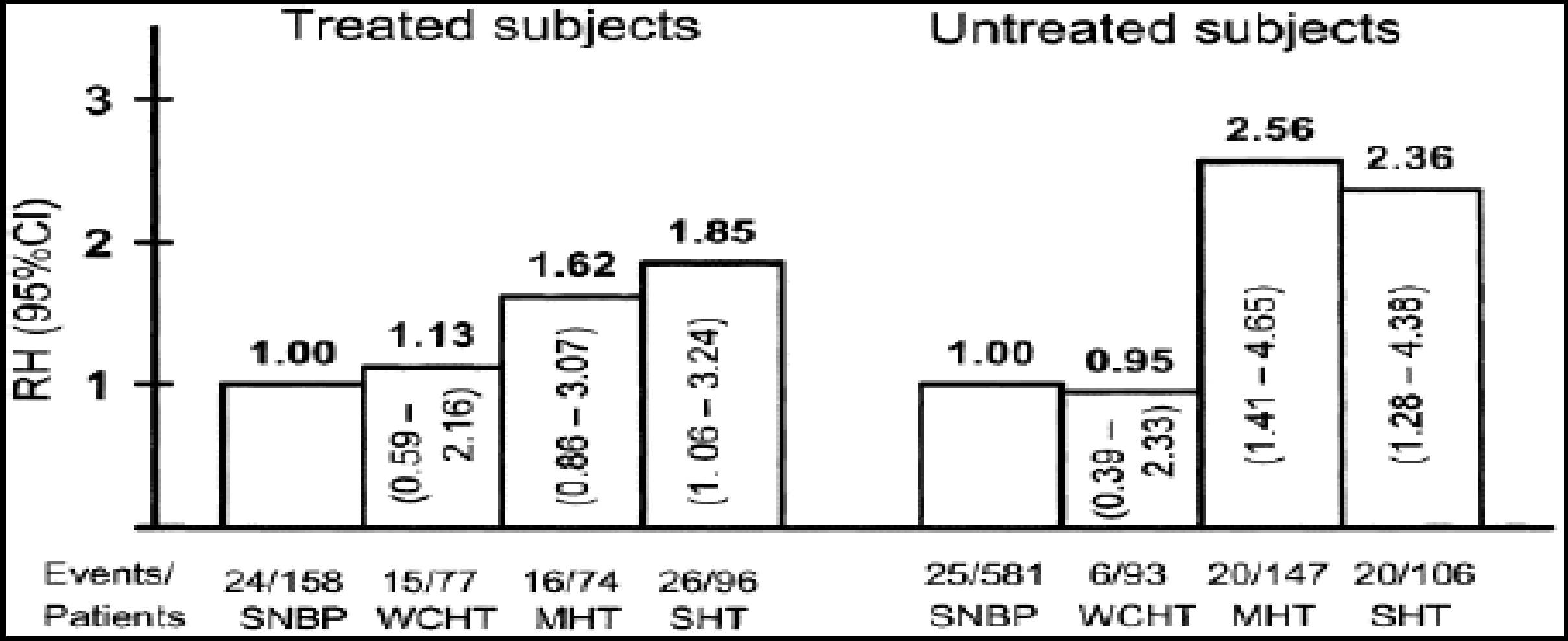
Ben Dov IZ, Am J Hypertens. 2005;18:589-93

Prognostic Value of ABPM Recordings in Patients with Treated Hypertension



Clement DL, NEJM 2003;348:2407-15

Prognosis of "Masked" and "White-Coat" Hypertension Detected by 24-h ABPM



Ohkubo T, J Am Coll Cardiol 2005;46:508-515

Wider use of ABPM / HBPM recommended by ESC 2018 guidelines to confirm Hypertension

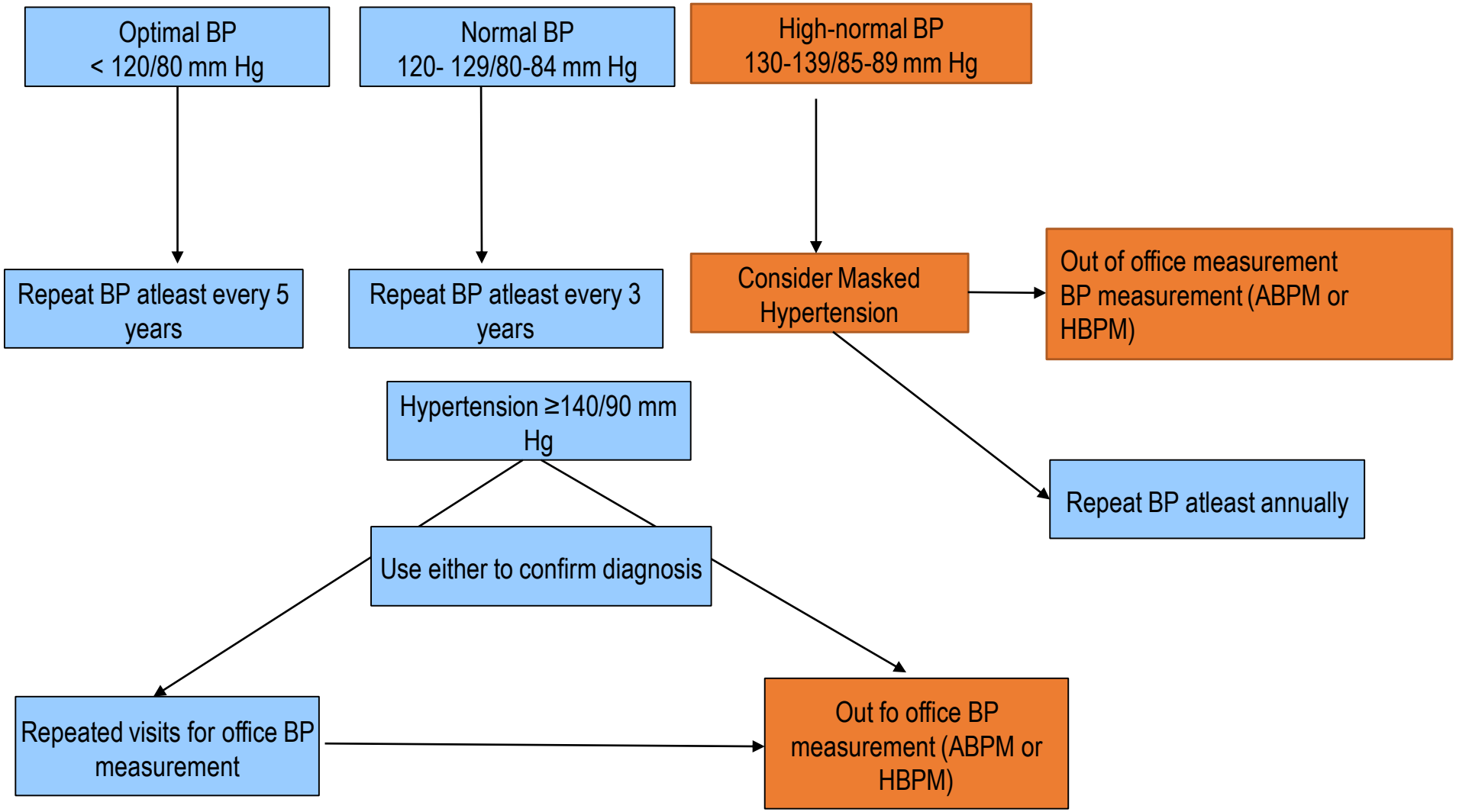
- Screening is recommended in all adults > 18 years of age and thereafter every 5 years

Advantages and Disadvantages	ABPM	HBPM
Identify white coat & masked HTN	Y	Y
Prognostic evidence	Stronger	
Night time readings	Y	N
Measurement in	Real life setting	Home setting May be more relaxed
Potential for measurement error	N	Y
BP Variability information	Short term BPV	Day to day BPV
Availability	Sometimes limited	Widely available
Cost	Expensive	Low
Comfortable	N	Y

ESC 2018 Hypertension Guidelines
Clinical indications for ABPM/HBPM

- Conditions in which White coat HTN is more common
  - Grade I HTN on office BP measurement
  - Marked office BP elevation without TOD
- Conditions in which Masked HTN is more common
  - High normal office BP
  - Normal office BP with TOD/high total CV risk
- Postural and post prandial hypotension in untreated patients
- Exaggerated BP response to exercise
- Assessment of nocturnal BP and dipping status

ESC 2018 guidelines: ABPM/HBPM to evaluate masked hypertension



Take Home Messages

- Both ABPM and HBPM can provide important information regarding BP control.
- ABPM is now accepted as being indispensable to good clinical practice for the diagnosis of hypertension
- ABPM are very useful to evaluate masked/white coat hypertension
- ABPM has more prognostic significance for CV events than office BP.
- Both ABPM/HBPM can supplement office BP measurement.

Thank You