Microlife® WatchBP O3
Ambulatory Blood Pressure Monitor

Extended manual for explanation and background of blood pressure data
Introduction

Dear healthcare professional,

The present manual is offered to you by Microlife Corporation. It entails explanations of blood pressure data as provided by the Microlife®WatchBP O3 software. In addition, some scientific background is given to indicate the clinical relevance of these data. The Microlife® WatchBP O3 device is validated according to the International Protocol [1] and the reports as provided by the software are developed according to the guidelines of the European Society of Hypertension and American Heart Association. We hope that the present manual will help you for better understanding and interpretation of the blood pressure data of your patient. The recommendations in this manual do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual differences and circumstances, may be appropriate

Yours sincerely,

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Medical Marketing Manager
Microlife Corporation
Blood pressure load: The percentage of blood pressure (BP) readings above a certain threshold Level [2]. On default this is according to the recommended thresholds of 135/85 mmHg during daytime and 120/70 mmHg during the nighttime. However these threshold levels can be changed with the button “report settings”.

Normal values: The recommended levels of normality for ambulatory BP measurement in adults is 135 mmHg and 85 mmHg during daytime (Awake) for systolic and diastolic pressure, respectively. For nighttime (Asleep) these values are 120 mmHg and 70 mmHg for systolic and diastolic pressure [3]. In the PDF graph the normal values are provided with the horizontal grey bars.

Percentage of successful readings: According to European Society of Hypertension (ESH) recommendations the percentage of successful readings should be similar to or more than 70% [4]. When the percentage of readings is lower than 70% the number will be provided in red, which indicates that another 24-hour measurement should be taken.

Dip: The percentage at which blood pressure decreases at night. Dip is calculated with the following formula: (awake BP - asleep BP) / (awake BP) * 100% [5]. Several studies have shown that there is an inverse correlation with cardiovascular risk and blood pressure decrease during the night [6, 7]. Some even have shown that the nocturnal blood pressure is the best prognostic factor for cardiovascular mortality [8, 9]. Patients can be classified as dippers (≥10% decrease in BP at night) and non-dippers (<10% decrease in BP at night) the latter group is expected to have a poorer cardiovascular prognosis than dippers [6]. See also Figure 1 for classification based on calculation.

\[
\text{Dipping} = \frac{(A-B)}{A} \times 100\%
\]

- ≥10%; Dipper
- <10%; Non-Dipper
- <−10%; Reverse-Dipper
- >20%; Extreme Dipper

![Figure 1](image)
**Hourly average:** The average BP values are calculated from the average BP value of each hour separately during 24 hours. This method is chosen to give similar weight to every hour of the day. In practice this means i.e. for the average value of 24h BP measurement a nocturnal hour is just as important as any hour during the day despite the fact that during daytime BP probably was measured more frequently.

**Standard deviation (SD):** This index indicates the absolute variability of the BP or pulse of a given period. It is calculated with the following formula:

\[
\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2},
\]

- \(\sigma\) = Standard deviation
- \(N\) = The number of BP (or pulse) values
- \(\mu\) = The average BP (or pulse) value
- \(\Sigma\) = The total sum

It has been shown that the BP variability correlates closely with target-organ damage and with the incidence of cardiovascular events, independent of absolute BP levels [10].

**24-hour:** The average BP value calculated from the total number of BP values.

**Awake:** The average BP values calculated from BP values as measured when the patient was awake (daytime BP)*.

**Asleep:** The average BP value calculated from all values as measured when the patient was sleeping (night time BP)*.

*Before each measurement the day and night period can be set with the button “Ambulatory Settings”. However, when these time points deviate from those as given by the patient afterwards, the actual awake and asleep period can be programmed with the button “Report settings”. The average awake and asleep values will then be calculated on the basis of these actual time points as provided by the patient.

**Pulse:** Heart rate provided in beats per minute.
**Mean arterial pressure (MAP):** Defined as the average arterial pressure during a single cardiac cycle. Oscillometric devices automatically measure the MAP and calculate the systolic and diastolic pressure from there. For calculating the MAP from systolic and diastolic BP the formula is as follows:

\[
\text{MAP} \approx \text{DP} + \frac{1}{3} (\text{SP} - \text{DP})
\]

**Pulse Pressure (PP):** Calculated with the formula:

\[
\text{PP} = \text{SP} - \text{DP}
\]

PP is a measure of the stiffness of the aorta and large arteries. Increased stiffness leads to an increase in PP through a reduction in arterial compliance and effects on wave reflection [11] PP has been recognized as an independent predictor of cardiovascular risk in a hypertensive [12] and general population [13].

**White coat window:** The maximum reading in the first hour of ambulatory BP measurement. As in this first hour the patient normally is in or has just left the hospital or GP’s practice, the BP values largely reflect the office BP measurement. The white coat window has proven its clinical value for detection of the white coat effect and/or white coat hypertension [14].

**Diary:** Highly recommended to any patient who undergoes 24h ambulatory BP measurement. The actual awake and asleep periods should be based on this diary. With the diary deviating BP values could be explained (i.e. patient has just had his meal, held a siesta, was smoking or was watching a football match) and the time of (antihypertensive) drug intake should be registered, which allows verification of the effectiveness of the drug. For the latter, the WatchBP O3 device is equipped with a button that should be pressed by the patient directly after antihypertensive drug intake.
**Indication for ambulatory BP measurement:** the recommended procedure about when to perform 24h BP measurements is provided in Figure 2. The Table provides indications at which ambulatory BP measurement should and could be considered.

![Figure 2. Schema for evaluating BP status of hypertensive patients [15]](image)

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References


Recommended literature


Recommended websites

www.watchbp.com (also for downloading the newest WatchBP software)
www.dableducational.org
www.bhsoc.org

When you have more questions about the context of this manual or need to know more about blood pressure data that are not mentioned in the present manual, please contact the following email address:

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