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# Hemodynamic Parameters for Cardiovascular Risk Assessment

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## INTRODUCTION

Hemodynamic parameters have been recognized as important biomarkers for cardiovascular (CV) assessment .Several efforts have been made to develop non-invasive techniques that allow fast, accurate and low cost devices in order to implement in clinical routines. The ability to detect and monitor change in the vital signals that represent the influence of hemodynamic condition, cardiovascular function, and the physical properties of arterial wall, could be a powerful tool for the management of the asymptomatic diseases intensive care patients monitoring and evaluation of therapeutically outcomes [1-5]. Blood pressure (BP) estimation continues to be the most important measurement of the cardiovascular system in all of clinical medicine [6]. The pulse wave velocity (PWV) is an emerging biomarker useful for CV risk stratification of patients [7-8]. However other hemodynamic parameters have been correlated with changes in the cardiovascular system and could help in the non- invasive diagnosis [9-14].

HEMODYNAMIC PARAMETERS Blood pressure is the leading risk factor for mortality worldwide, and several dimensions of BP are associated with an increased risk of vascular disease, such as the systolic and diastolic blood pressure, and mean arterial pressure [15-16]. Recent guidelines have a more integrative approach to estimate the cardiovascular risk, and the PWV is widely accepted as a marker of arterial stiffness .The correlation of PWV with diseases and biological features has been extensively studied in large groups. The influence of hypertension cardiac disease, atherosclerosis, gender, age and smoke effect were evaluated [17-23]. PWV measurements were also used for the assessment of the drug therapy responses, evaluate the efficacy and monitoring the effects [24-25]. Hemodynamically, rather than merely consider its maximum and minimum values, it should be taken into account the overall shape of the arterial pulse pressure curve to describe the mechanical properties of the arterial tree and cardiac function to give an adequate description of the arterial system behaviour [26]. Several indexes such as augmentation index (AIx), subendocardial viability ratio (SEVR), maximum rate of pressure change, ejection time index (ETI) and area under the curve (AUC), can be derived by the descriptive and quantitative analysis of the arterial pressure pulse waveform [9-14]. Consistent characteristics change in the pressure pulse wave shape have been described with aging and disease states predisposing to an increase in vascular events [27]. The correlation between the parameters has been studied, mainly between BP and PWV [28,29]. The determination of the influence between the metrics of hemodynamic signals represents the current great challenge to understand the cardiovascular functions and for developing a useful tool for risk assessment. The assessment of the cardiovascular system condition based on multi-parameters incorporated into risk prediction models allows a more precise and accurate diagnosis of the heart and the arterial tree condition. The appropriate management of classical risk factors such as (age, gender, smoking habits, hypertension, body mass index) together with new hemodynamic biomarkers (BP, PWV, SEVR, ETI, AUC) represent an important improvement of accurate diagnosis.

## CONCLUSION

Previous studies demonstrated that hemodynamic parameters are an independent predictor of changes in the cardiovascular system. The current great challenge is to develop a system that allows the measurement of multi-parameters in non-invasive way and combined with powerful algorithms, which provides the assessment of cardiovascular condition and estimate the risk level.

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