Editorial

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Mean Heart Rate Factors of Shock Patients

Rabindra Nath Das

Department of Statistics, The University of Burdwan, Burdwan, West Bengal, India

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Corresponding author:
Rabindra Nath Das

rabin.bwn@gmail.com

University of Burdwan, Burdwan, West Bengal, India.

Tel: +91-9232638970

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Introduction

The number of heartbeats per minute (HBPM) is known as heart rate. It is really very difficult to identify the individual heart rate changes by an experienced heart specialist. Heart rate changes according as the body's need for oxygen changes. In practice, there are many determinants for a heart rate to go slow down, or speed up, or vary inexplicably [1-3]. The heart rate measurement is generally used by medical practitioners to assist in the diagnosis, or prescribe the medicine, or tracking of medical conditions, or the intensity of exercise [4-6]. Heart rate determinants of some dobutamine stress echocardiography patients are given in [7]. The current report aims to examine the mean heart rate determinants of some shock patients [8]. It aims to examine the following hypotheses. What are the mean heart rate determinants of the shock patients? For these patients, how are the determinants associated with the mean heart rate? What are the effects of the determinants on the mean heart rate? These issues are little known in the literature. The current report examines these hypotheses based on a real data set given in [8].

The considered data set is given in [8], and it can be found at the sites: http://www.umass.edu/ statdata/statdata/ data/shock.txt, or https://www.statcrunch.com/app/index.php?dataid=1327401. The data set contains 20 factors/variables on 113 subjects which are obtained at the Shock Research Unit, The University of Southern California, Los Angeles, California. Two measurements (one at admission time, and the other at just before death or discharge time) on the same 113 critically ill subjects and factors/variables were obtained. The shock types, patient population, data collection method is given in [8]. The random response heart rate is a positive heterogeneous continuous variable. The present report has analyzed the heart rate using both the joint generalized linear Log-normal and gamma models. Based on the best fitted model, the mean heart rate determinants of shock patients are presented in the report.

The considered shock data set contains the following 20 factors/ variables. These are gender (male=0, female=1), age, height, shock type (non-shock=1, hypovolemic=2, cardiogenic=3, bacterial=4, neurogenic=5, other=6), survival status (survived=1, death=2), diastolic blood pressure (DBP), systolic blood pressure (SBP), mean central venous pressure (MCVP), mean arterial blood pressure (MAP), body surface index (BSI), heart rate (HR), cardiac index (CI), mean circulation time (MCT), urinary output (UO), appearance time (AT), plasma volume index (PVI), hemoglobin (HG), red cell index (RCI), hematocrit (HCT), card sequence (initial=1, final =2) (RCORD). The heart rate of the shock data set is treated as the response variable, and the remaining others are considered as the dependent variables. The joint generalized linear gamma model analysis of the heart rate on the remaining other factors/variables reveals the following associations:

1) The mean heart rate (HR) is directly correlated with age ($P<0.001$), indicating that the mean HR increases at the older ages of the shock patients.

2) The mean HR is directly partially correlated with the gender (male=0, female=1) ($P=0.140$), indicating that the mean HR is higher for female shock patients than male.

3) The mean HR is directly partially correlated with the shock type (non-shock=1, hypovolemic= 2, and cardiogenic, bacterial, neurogenic, other=3) at level (hypovolemic= 2) ($P=0.157$) and at level (cardiogenic, bacterial, neurogenic, other=3) ($P=0.106$), indicating that the mean HR is higher of the shock patients with shock levels at 2 or 3 than the non-shock patients.

4) The mean HR is directly correlated with systolic blood pressure (SBP) ($P=0.028$) of the shock patients, indicating that the mean HR increases as SBP increases.

5) The mean HR is inversely correlated with the mean arterial blood pressure (MAP) ($P<0.001$), implying that HR increases as MAP decreases.

6) The mean HR is directly correlated with diastolic blood pressure (DBP) ($P<0.001$) of the shock patients, indicating that the mean HR increases as DBP increases.

7) The mean HR is inversely partially correlated with the body surface index (BSI) (P=0.136), implying that HR increases as BSI decreases.

8) The mean HR is directly correlated with cardiac index (CI) (P<0.001) of the shock patients, indicating that the mean HR increases as CI increases.

9) The mean HR is inversely correlated with the appearance time (AT) (P<0.001), implying that the mean HR increases as AT decreases.

10) The mean HR is directly correlated with mean circulation time (MCT) (P=0.060), implying that the mean HR increases as MCT increases.

11) The mean HR is directly correlated with mean hematocrit (HCT) (P=0.018), implying that HR increases as HCT increases.

12) The mean HR is inversely correlated with card sequence (initial=1, final =2) (RCORD) (P=0.059), indicating that the HR is higher at the initial stage.

There are many determinants of the heart rate variance of shock patients. These are not pointed in the current report. Only the mean determinants of the heart rate of shock patients [8], and their associations are pointed in the report. Full discussion of the mean and variance determinants of the heart rate of shock patients will be reported in our subsequent article. In the current report, it is observed that both the systolic and diastolic blood pressures are positively correlated, while the mean arterial blood pressure is negatively associated with the mean heart rate of the shock patients. Age, sex, cardiac index, mean circulation time, hematocrit and shock types are positively, while body surface index, appearance time and card sequence are negatively associated with the mean heart rate. Therefore, it is really very difficult to locate the causality of individual heart rate changes of shock patients without knowing the effects of the determinants. So, medical practitioners and every individual should care on blood pressure, age, cardiac index and others to identify the causality of individual heart rate changes. Researchers, medical practitioners, and heart patients will be benefited from the article.

Conflict of Interest

The author confirms that this article content has no conflict of interest.

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