Echocardiographic Nomograms for Ventricular, Valvular and Arterial Dimensions in Neonates and Infants.

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Background: A quantitative assessment is essential during the performance of a paediatric echocardiography. Despite this actual nomograms are limited and heterogeneous, particularly for the neonatal age. Aim of the present study is to establish reliable echocardiographic nomograms in a population of healthy neonates, infants and children.

Methods. Two-dimensional and M-mode measurements were made of 22 individual cardiac structures in 368 healthy children (mean age 4.99 ± 8.47 months; 186 F, 182 M) with a body surface area (BSA) <0.6 m². Models using linear ($y = a + bx$), logarithmic ($y = a + b\ln[x]$), exponential ($\ln[y] = a + b\ln[x]$), and square root ($y = a + b\sqrt{x}$) relationships were tested. The presence or absence of heteroscedasticity was tested by White test and Breusch-Pagan test and observing the graphical analysis of standardized residuals. Age, weight, height and BSA (calculated using the formulas by Du Bois and by Haycock) were used as the independent variables in four different linear regression analyses to predict the mean values of each echocardiographic measurement. Between the models that satisfy the assumption of homoscedasticity, the $R^2$ score were used to determine which model best fitted the data. We computed structures Z score by dividing the residual value by the modeled standard error of the residual value.

Results: The use of BSA calculated by Du Bois formula provided the best results, and these are presented in Table 1. According to these data, different equations should be employed for various parameters.

Intra and inter-observer variability was within the 95% tolerance limit.

Conclusions: We present echocardiographic nomograms calculated on the widest population of healthy neonates and infants reported so far. Our data will allow for a more reliable calculation of cardiac z scores for some essential cardiac and vessels dimensions in neonates and infants. Further studies however are required to reinforce these data, as well as to evaluate other parameters.