

Title: Are Formulas for Estimating Body Surface Area Valid?
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INTRODUCTION: Body surface area (BSA) correlates better with metabolic rate, cardiac output, oxygen consumption, renal plasma flow, urea clearance, GFR, and organ size better than other direct physical measurements such as weight. There have been numerous attempts to describe formulas for BSA based on height, weight, chest circumference, abdominal circumference, limb length, and circumference, or a combination of some of these dimensions. The most widely utilized formula, DuBois & DuBois¹ (D&D), is based on direct measurement of BSA of 10 patients, several of whom had skeletal deformities. Because the formula had been derived out of a small number of subjects and included only one child, we questioned its validity and accuracy for infants and extremes of body habitus or stature. We have applied modern statistical techniques to evaluate 15 proposed formulas for BSA and 395 complete measurements in the literature. We attempted to determine:

1. If the formula accurately predicted BSA over a wide range of heights and weights.
2. Whether there were limitations by age or sex to the formula.
3. Whether any of the other 14 proposed formulas for BSA provided a better fit to the available data.

We further obtained height and weight measurements on 60 women in their third trimester of pregnancy and 140 neonates in order to ascertain whether there is sufficient evidence to warrant the application of the D&D formula to patients with these diverse body habituses.

RESULTS: The D&D formula appeared as one of the most accurate of the 15 formulas that were evaluated. (6 formulas had RMSE of <7%.) While absolute errors were largest for patients with large stature, the

percent error was relatively constant. (fig 1) Neither gender nor categories of baby, child, or adult had significant influence on the regression analysis. A least squares analysis of the available complete data sets yielded a slightly better fit.

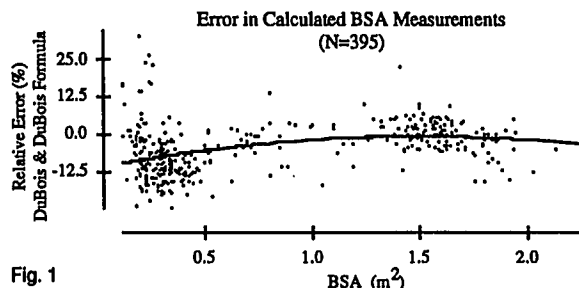


Fig. 1

DISCUSSION: The original data on which the D&D formula is based could not have been expected to predict its validity over the wide range of height-weight pairs. Nevertheless our statistical analysis suggests that the D&D formula adequately expresses BSA over a wide range of patients, including both infants and pregnant women. This formula systematically underestimates measured BSA by a constant error of 5%. There is a slightly larger bias in infants but it is unlikely to be clinically relevant. When the measured and predicted data are segregated by gender, age, or group (baby, adult or child) the underestimate appears constant. Thus, there appears to be no reason to segregate BSA determination based on these factors.

REFERENCES

1. DuBois D & DuBois EF: Arch Intern Med 17:863-871, 1916

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Title: Is Viral Myocarditis an Asymptomatic Disease?
Authors: M.F. Roizen, M.D., J. Apfelbaum, M.D., D. Coalson, M.D., G. Rupani, M.D., R. Finn, M.D., R. Roberts, M.D., J. L. Lichtor, M.D., B. Schreider, M.D., Ph.D.
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Recently a case of alcoholic cardiomyopathy and another of viral myocarditis have been reported to have resulted in one near disaster and one postoperative death.^{1,2} Three cases of presumed viral myocarditis have been diagnosed in the approximately 3,500 patients who underwent preoperative evaluation in our clinic. We sought to identify the symptoms or specific signs presented by our three patients to determine whether these symptoms were present in the reportedly asymptomatic patients described in the literature.

After institutional approval and with patient consent, 3,500 patients took the HealthQuiz, an automated device with which patients responded to questions about their health histories. Twenty-six questions in HealthQuiz are related to cardiac function, and positive responses to these questions indicate the need for a preoperative electrocardiogram. The charts of the three patients in whom a diagnosis of viral myocarditis was made were reviewed for the symptoms that might have warranted the diagnosis.

Of the three, all had at least one symptom or sign suggesting the need for an ECG preoperatively. Two patients experienced a recent decrease in exercise tolerance. Of these two, one had a new onset of chest pain, and the other, an unexplained heart rate of 116/beats/min. The third patient had an unexplained heart rate of 120 beats/min.

Review of the cases in the literature revealed that the patient with a presumed asymptomatic cardiomyopathy had an unexpected heart rate of 115 beats/min with infrequent premature ventricular contractions.¹ The other patient described in the literature was confined to bed for an unspecified time, and no further history was reported.

It therefore appears that recent change in exercise tolerance, the new onset of chest pain or fatigue, or unexplained tachycardia should alert the clinician to the possibility of viral myocarditis. Thus, of these five patients, at least four were not asymptomatic.

References:

1. Anesthesiology 71:982-984, 1989
2. Anaesthesia 45:215-217, 1990.