The Z-Score--Misleading Clinical Science?

John A. Elefteriades, MD, PhD (hon)
William W.L. Glenn Professor of Surgery
Director, Aortic Institute at Yale-New Haven
Yale University School of Medicine
New Haven, Connecticut, USA
Measurement modalities

- Re-read all ECHOs for standardization
- 361 ECHOs in children screened
- 27 “normal” children with serial ECHOs
- 26 untreated Marfan children with serial ECHOs
“Aortic Z-Score” Basics

- \( Z = \frac{x - \mu}{\sigma} \)
  
  - \( x \) = observed measurement
  - \( \mu \) = expected measurement (population mean)
  - \( \sigma \) = population standard deviation

How many standard deviations above or below the mean.
Depends on the BSA.
Does not take age into account.

Calculations now done on-line.

Boston Children’s Hospital is most popular.

Methodological details are secret.
Z-Score used extensively in aortic outcomes studies

The NEW ENGLAND JOURNAL of MEDICINE

Atenolol versus Losartan in Children and Young Adults with Marfan’s Syndrome

IS THE Z-SCORE AN ACCURATE, RELIABLE INDICATOR ON WHICH WE CAN BASE CLINICAL OUTCOMES STUDIES?

THREE IMPORTANT QUESTIONS:

• Does z-score decrease naturally with age in “normal children”?
• Does z-score decrease as the BMI of the growing child increases?
• Does z-score decrease naturally in untreated Marfan children?
Does z-score decrease naturally with age in “normal children”? **YES!**
Does z-score decrease as the BMI of the growing child increases?  YES!
Does z-score decrease naturally in untreated Marfan children?  YES!
Does z-score decrease naturally with age in “normal children”?  **YES!**  
Does z-score decrease as the BMI of the growing child increases?  **YES!**  
Does z-score decrease naturally in untreated Marfan children?  **YES!**  

SO, DOES A DECREASING Z-SCORE IN A DRUG TRIAL OF AORTIC ANEURYSM RX HAVE ANY REAL MEANING?  **APPARENTLY NOT**
THIS IS ONE REASON WE VOICED A WORD OF CAUTION ON ONE TRIAL CLAIMING TO HAVE DEMONSTRATED A DRUG EFFECT

Take the Z-score in aortic outcomes studies with a huge grain of salt!