Longitudinal Study of Anthropometry in Fontan Survivors: PHN Fontan Study

Linda Lambert, Brian McCrindle, Danielle Hollenbeck-Pringle, Victoria Pemberton, Andrew Atz, Chitra Ravishankar, Jay Campbell, Carolyn Dunbar-Masterson, Karen Uzark, Martha Rolland, Nicholas Dagincourt, Felicia Trachtenberg, Shaji Menon

On behalf of the PHN Nursing Research Committee

For the Pediatric Heart Network Investigators

Disclosures

- This study was funded by the Pediatric Heart Network (NHLBI)
- This work is solely the responsibility of the authors and does not necessarily represent the official views of NHLBI or NIH
- No other disclosures or COI

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Background

- Infants with single ventricle typically have abnormal growth
- Growth abnormalities adversely influence QOL and exercise performance
- Knowledge gaps
  - No robust longitudinal data on anthropometric changes in Fontan survivors
  - Effects of anthropometric abnormalities on QOL and exercise performance

Purposes

- Evaluate longitudinal changes in height and BMI in Fontan survivors and compare them to population norms
- Examine changes in height and BMI by survival and ventricular morphology
- Examine the relationship of height and BMI with QOL and exercise capacity

Study Design

- Multicenter, longitudinal analysis
  - PHN Fontan Databases
    - Longitudinal studies
    - PHN Core Centers (7)
- Definitions
  - Ventricular morphology: RV, LV, or mixed
  - QOL: Patient reported PedsQL
  - Exercise capacity: VO_2 max
- Vital status was assessed either by contact or search of the Social Security Death Index

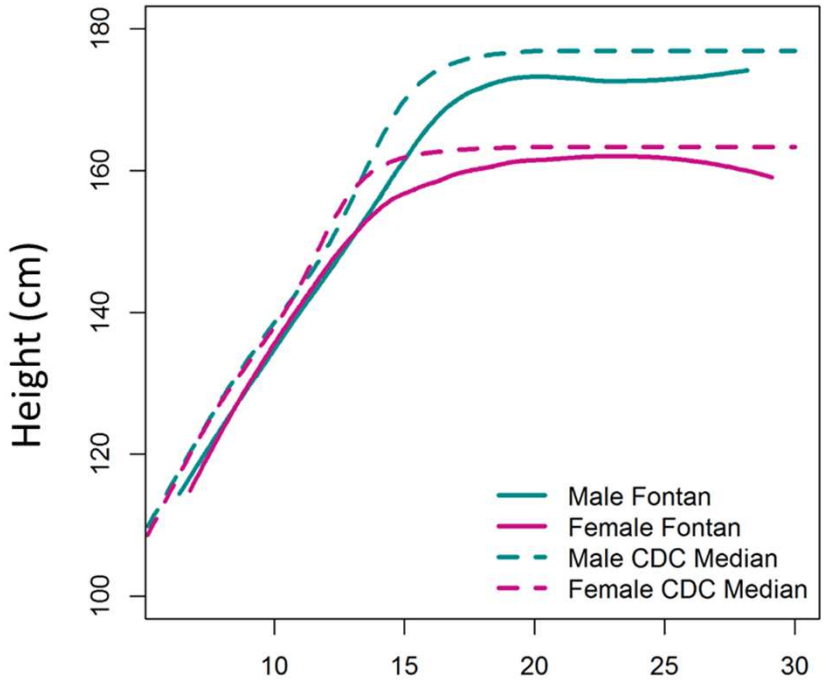
Statistical Analysis

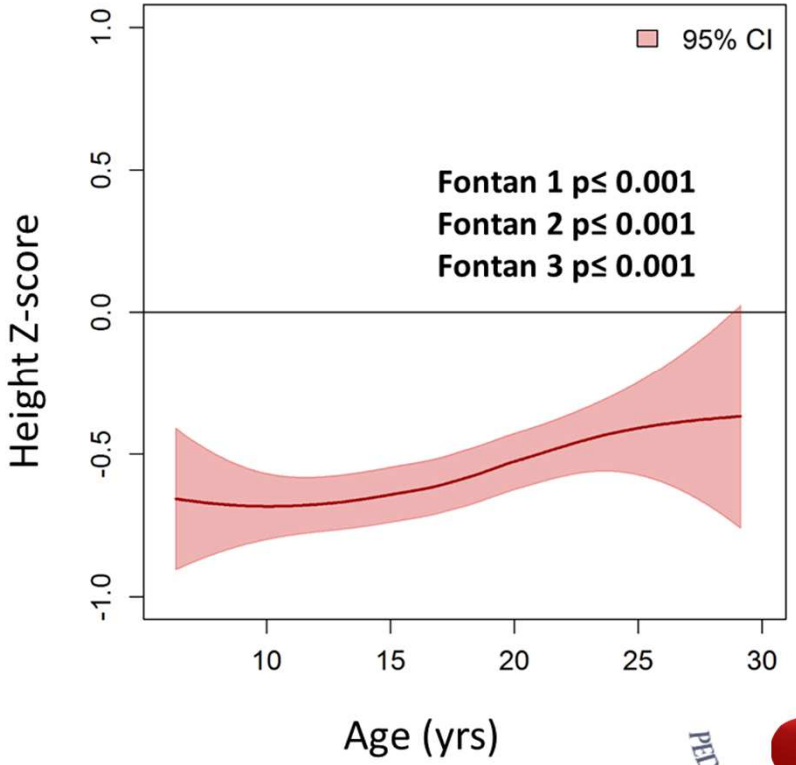
- Height and BMI compared to gender specific population norms (CDC)
  - LOESS non-linear curve fitting
- Differences in height and BMI between survivors vs. non-survivors and among ventricular morphologies
  - Linear regression for repeated measures
- The relationship of height and BMI to QOL
  - Repeated measures multivariable regression
- Impact of BMI and change in height on exercise capacity
  - Repeated measures mixed model with visit included as a random effect

Results: Demographics

	Fontan 1 2003	Fontan 2 2009	Fontan 3 2013
N	546	427	362
Males (n,%)	329 (60%)	249 (58%)	221 (61%)
Mean age yrs (SD)	12 (3.4)	19 (3.4)	21 (3.4)
Dead (n)	NA	18	9
Ventricular Morphology			
RV (n,%)	184 (34%)	140 (33%)	112 (31%)
LV (n,%)	265 (48%)	214 (50)%	186 (51%)
Mixed (n,%)	97 (18%)	73 (17%)	64 (18%)

Results: Comparisons with Normal Population for Height





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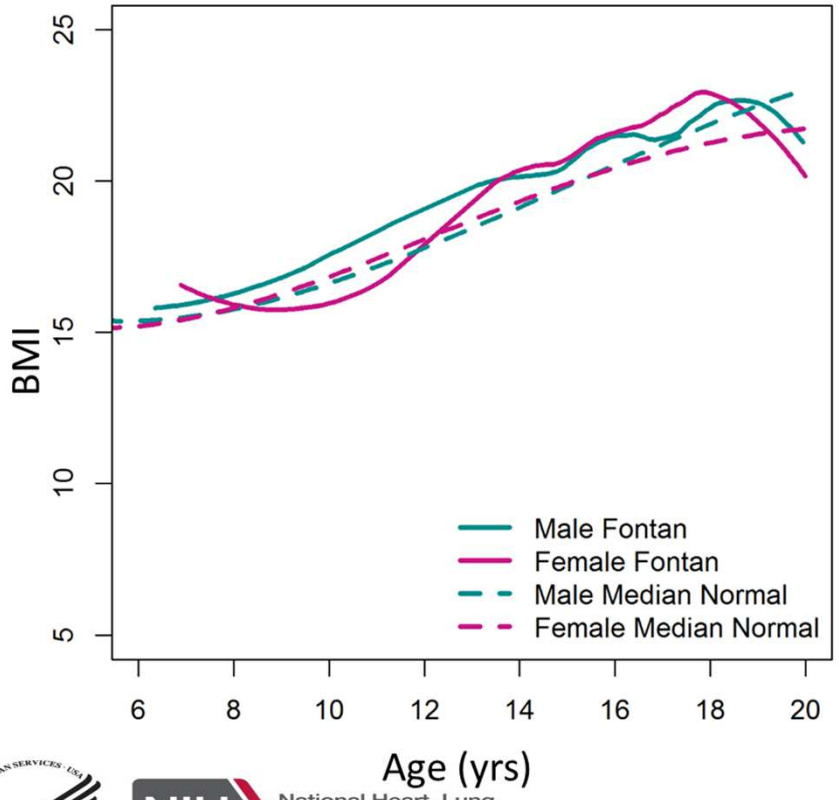
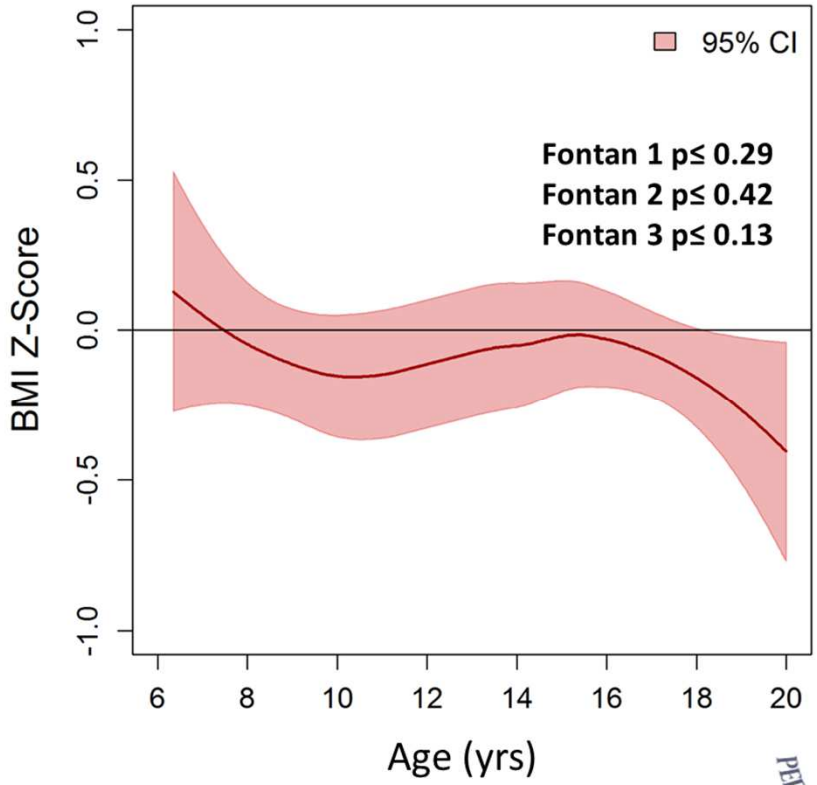
Results: Comparisons with Normal Population for BMI





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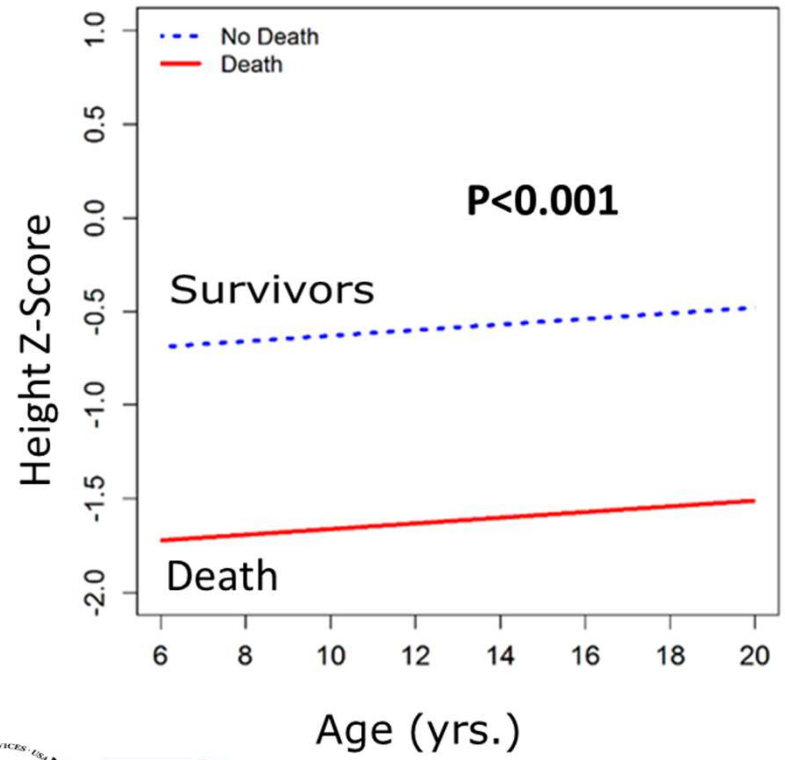
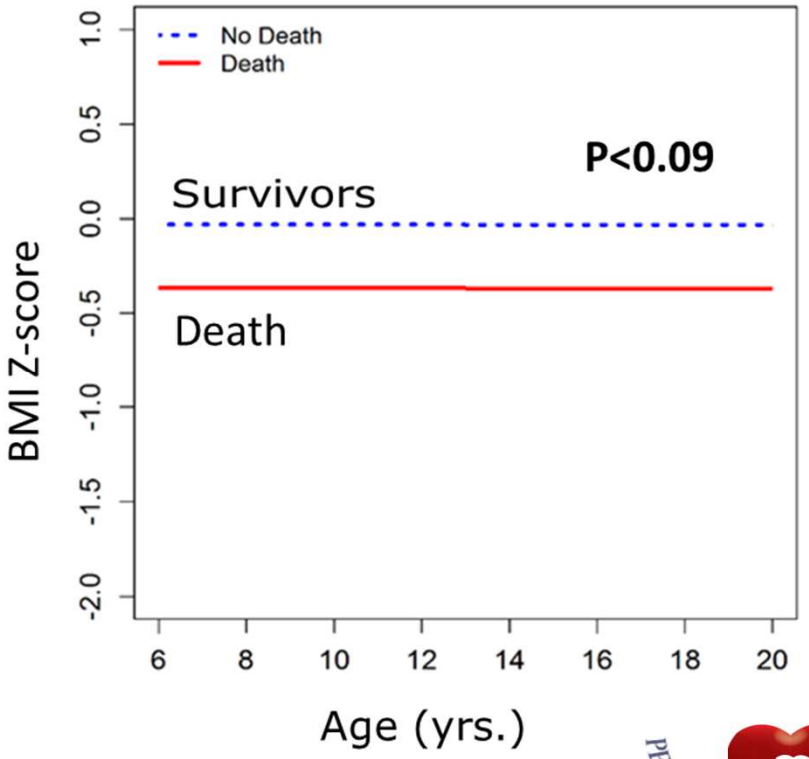
Results: Comparisons for Survivors vs. Non-survivors (n=27)





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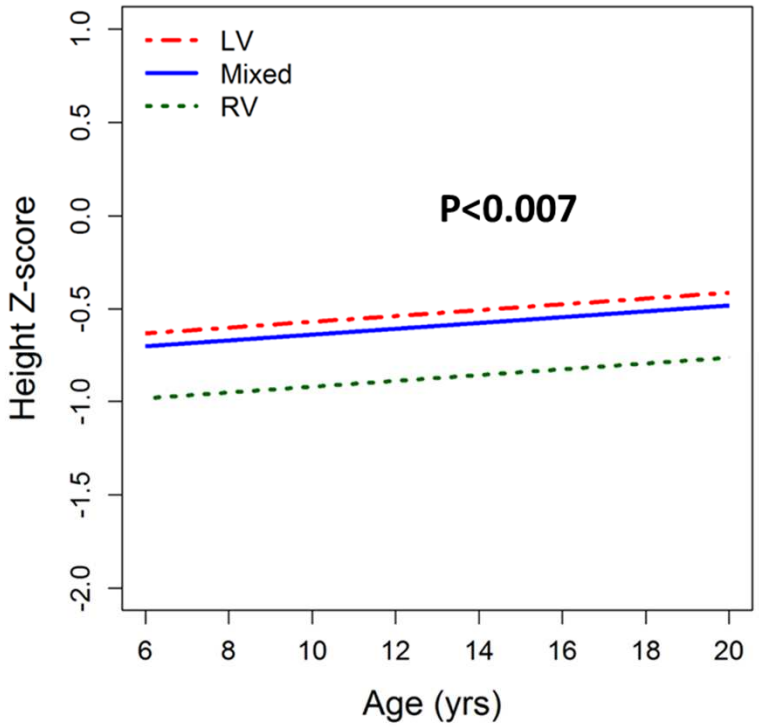
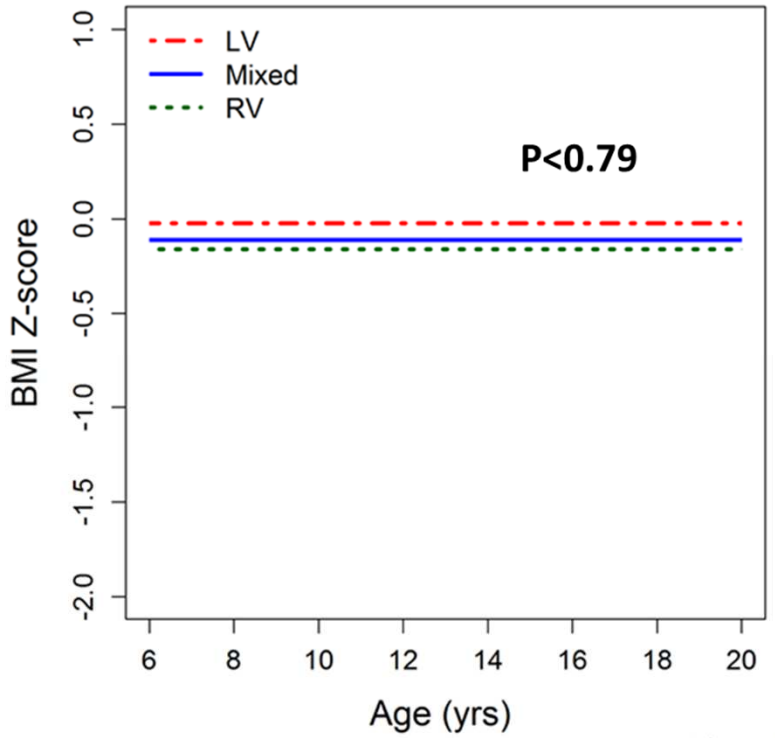
Results: Comparisons by Ventricular Morphology





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Results: Relationship between anthropometry and QOL

- **PedsQL total score**
  - ↑ Height z-score was associated with ↑ PedsQL
    (SE-0.35±0.14, **p<0.001**)
  - ↑ BMI z-score was associated with ↓ PedsQL
    (SE 2.83±0.51, **p<0.001**)
- **Physical function scores**
  - ↑ Height z-score was associated with ↑ Phys Fxn
    (SE -0.49±0.16, **p<0.003**)
  - ↑ BMI z-score was associated with ↓ Phys Fxn
    (SE 2.82±0.52, **p<0.001**)

Results: Relationship between Anthropometry and Exercise Capacity

- ↑ Height z-score is associated with ↑ VO_2 max
  (SE 2.61±1.08, **p<0.02**)
- ↑ in BMI z-score is associated with ↓ VO_2 max
  (SE-1.28±0.28, **p<0.001**)

Conclusions

- Compared to the population norms, Fontan survivors are shorter but have similar BMI
- Height is most severely affected in Fontan survivors with RV morphology
- Survivors were taller than non-survivors
- Being taller was associated with better QOL and exercise capacity but having a higher BMI was associated with the opposite effects

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