

Quintero stage correlates with cardiac disease but does not fully capture cardiovascular burden in TTTS

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Introduction

Quintero staging is the most widely used classification system for twin–twin transfusion syndrome (TTTS)

Study Question

Does Quintero stage accurately reflect cardiovascular disease severity across the spectrum of TTTS?

Objective

To evaluate the relationship between Quintero stage and recipient cardiovascular disease burden, including the independent influence of gestational age.

Methods

- Retrospective cohort of monochorionic diamniotic twin pregnancies with TTTS evaluated at a level III fetal center.
- Stage 0: amniotic fluid discordance / preclinical disease not meeting Stage I criteria.
- Cardiovascular status: CHOP CV score (0–20), categorized into 4 CV stages.
- Kruskal–Wallis tests compared Quintero stages; Spearman coefficient assessed correlation.
- Linear and ordered logistic regression evaluated Quintero stage, gestational age, and CV severity.

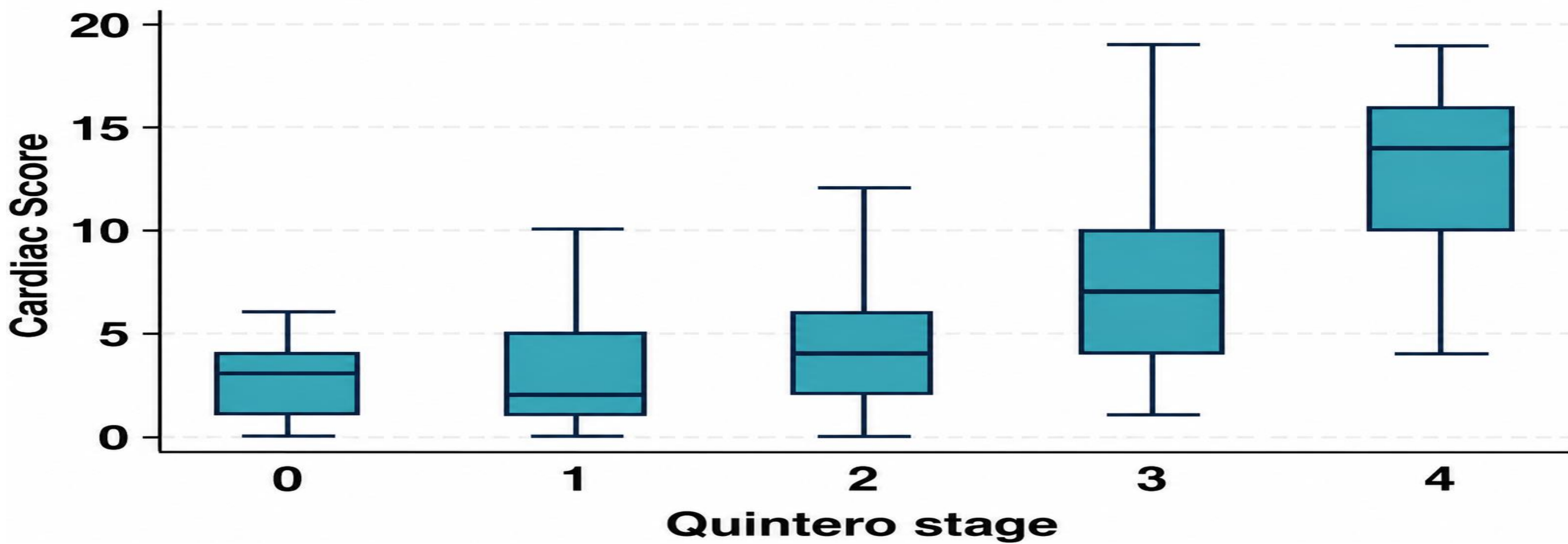
Cohort at a glance

471

TTTS pregnancies

Quintero Stage	N	Median Cardiac Score	IQR	Mean
0	37	3	3	2.46
1	86	2	4	2.94
2	194	4	4	4.05
3	131	7	6	7.51
4	23	14	6	13.17

Median CHOP cardiovascular score by Quintero stage



Overall difference across stages: $p < 0.001$

A. CV BURDEN ROSE WITH HIGHER STAGE

$\rho = 0.58$

Spearman correlation between Quintero stage and CV score • $p < 0.001$

B. QUANTIFYING THE UNADJUSTED ASSOCIATION

+2.34

CV-score points per Quintero stage

$p < 0.001$ • Model $R^2 = 0.34$

CONCLUSION

- Quintero stage strongly—but incompletely—reflects cardiovascular disease burden.
- Gestational age adds independent information; early stage does not exclude meaningful cardiac dysfunction.

ADJUSTED LINEAR MODEL

+0.29

CV-score points per week of gestation

$p < 0.001$ • Model $R^2 = 0.46$

GA WAS AN INDEPENDENT PREDICTOR

C. STAGE-SPECIFIC ADJUSTED EFFECTS

Quintero stage	Adjusted β
Stage II	+1.3
Stage III	+4.6
Stage IV	+9.7

Stage 0 was the reference category; Stage I was not independently associated with CV score.

D. ODDS OF A HIGHER CV STAGE

3.99×

higher odds of a more severe CV stage per Quintero-stage increase

95% CI 3.09–5.15 • $p < 0.001$

1.21×

higher odds per additional gestational week

95% CI 1.13–1.31 • $p < 0.001$

INTERPRETATION

Within-stage overlap—greatest in Stages II and III—shows why Quintero stage alone cannot fully characterize recipient cardiovascular disease burden.

CLINICAL TAKEAWAY • Assess recipient cardiovascular status across all Quintero stages—especially in early and preclinical TTTS.