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BRIEF REPORT

Practice Variation in the Evaluation and Management of Asymptomatic Wolff-Parkinson-White Pattern Among Competitive Athletes

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Ventricular pre-excitation (Wolff-Parkinson-White [WPW] pattern) is an established cause of sudden cardiac death (SCD) among young competitive athletes.[1] Athletes with WPW may experience SCD even in the absence of prior symptoms, rendering an effective approach to athletes with asymptomatic WPW a clinical imperative. Clinical consensus recommendations have provided variable approaches for the use of exercise treadmill testing (ETT) and electrophysiology studies (EPS) for risk stratification.[1-4] To date, however, the impact of this heterogeneity of clinical recommendations on practice patterns in this area among active clinicians has not been carefully examined.

What is the clinical question being addressed?
Is there practice variation in the clinical approach to the asymptomatic athlete with WPW pattern?

What is the main finding?
We found significant heterogeneity in the clinical approach to an asymptomatic athlete with WPW pattern, with variation based on provider subspecialty but not by geography.

We performed a survey of clinicians across different cardiac subspecialties and geographies with the goal of defining practice patterns for the evaluation and management of asymptomatic WPW patterns in athletes from May 15, 2024 through November 2, 2024. Inclusion criteria included attending physicians self-identifying as treating athletes with WPW. Surveys were available online in English, Spanish, French, and Italian. This study was approved by Mass General Brigham Institutional Review Board, and all participants gave informed consent. Responses are presented using standard descriptive statistics and compared across subgroups using chi-squared tests. Statistical analyses were performed using Stata (Version 15.1), StataCorp.

The study included physicians self-identifying as general adult cardiologists (21/200, 10.5%), general pediatric cardiologists (7/200, 3.5%), sports cardiologists (38/200, 19.0%), adult electrophysiologists

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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ABBREVIATIONS AND ACRONYMS

EP = electrophysiologist

EPS = electrophysiology study

ETT = exercise treadmill testing

SCD = sudden cardiac death

WPW = Wolff-Parkinson-White

(EPs) (36/200, 18.0%), pediatric EPs (87/200, 43.5%), and other cardiac subspecialists (11/200, 5.5%). North America was the most common site of practice (139/200, 69.5%), followed by Europe (32/200, 16.0%) and other locations (29/200, 14.5%).

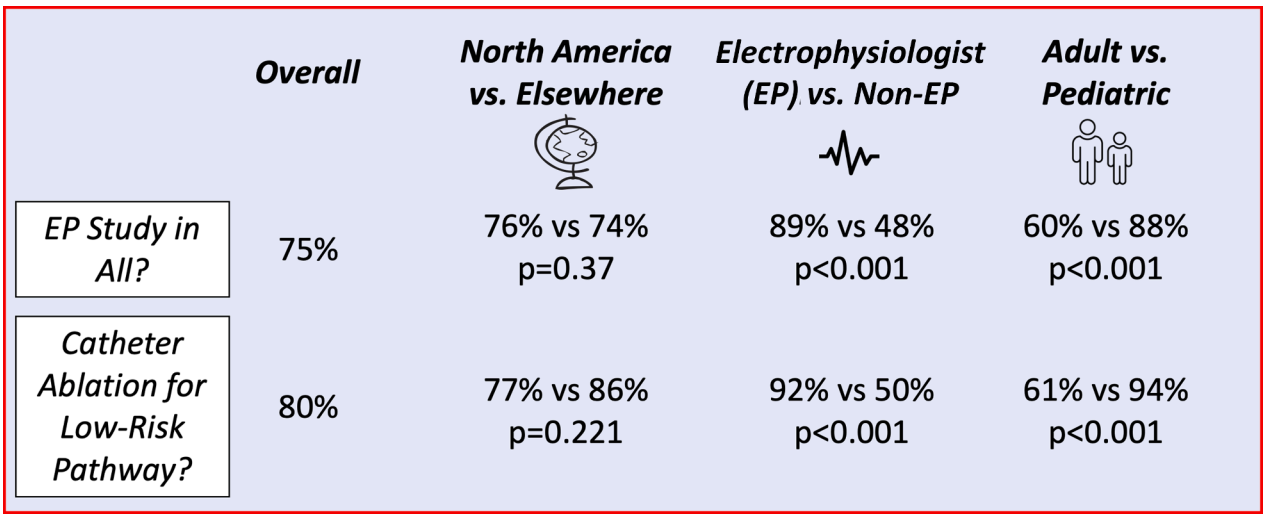
The majority of respondents (179/200, 89.5%) reported performing cardiac imaging in all asymptomatic athletes with WPW, typically an echocardiogram. With regard to arrhythmic risk stratification (excluding 15/200 [7.5%] who refer to EP for diagnostic work-up), 42/185 (22.7%) respondents typically perform an ETT with no additional evaluation if the ETT shows abrupt delta wave cessation, 139/185 (75.1%) perform an EPS in all (either EPS in isolation [63/185, 34.1%] or combined with an ETT [76/185, 41.1%]), and 4/185 (2.2%) do not conduct additional evaluation beyond imaging. Non-EP physicians were more likely to recommend ETT alone (31/63, 49% vs 11/122, 9%; $P < 0.001$), while both EPs and pediatric providers were more likely to recommend EPS in the first-line evaluation (Figure 1). Risk stratification practices did not differ by geography (Figure 1).

The survey also queried respondents regarding whether they would pursue catheter ablation for a low-risk pathway (based on EPS characteristics) in a low-risk anatomic location. A substantial majority (138/173, 79.8%) indicated they typically pursue ablation in this scenario. This response was most common among EPs and pediatric providers (Figure 1). Notably non-EP respondents were evenly split as to whether they would pursue ablation (25/50, 50% vs 25/50, 50%). The likelihood of pursuing ablation did not differ by geography (Figure 1), although among non-EPs, North American clinicians were less likely to recommend ablation (9/30, 30% vs 21/30, 80%; $P = 0.001$).

Among respondents who had been in practice ≥5 years, 110/154 (71%) reported that their management of asymptomatic WPW had changed over their careers, with 84/110 (76%) indicating that they had previously recommended a different diagnostic/risk stratification evaluation. Among those providing detail of this evolution, most (63/75, 84%) indicated a transition from a prior recommendation for ETT alone toward recommending EPS in the first-line evaluation. In total, only 7/75 (9%) reported pursuing less diagnostic testing overall. Key factors cited by respondents as influencing this management evolution included evolving research (48/84, 57%), provider experience (33/84, 39%), and society guidelines (23/84, 27%) (respondents could select multiple answers).

This study assessed clinicians' approaches to the evaluation and management of asymptomatic WPW in competitive athletes, with the following key findings. First, there is significant heterogeneity in clinicians' core risk stratification approach, with important differences between EP vs non-EP

FIGURE 1 Practice Variation in Management of Asymptomatic Wolff-Parkinson-White in Athletes



Key differences in management of asymptomatic Wolff-Parkinson-White in athletes are shown across subspecialties and geographies. Percentages indicate affirmative ("yes") response to each clinical scenario. EP = electrophysiologist.

physicians as well as between adult vs pediatric providers, although not by geographic site of practice. Second, similar differences were observed with respect to providers' decision to pursue ablation for lower risk bypass tracts. Finally, most respondents indicated that their approach to WPW had evolved during their careers, with emerging research and provider experience but notably not society guidelines cited as major influences on this change.

The true absolute risk associated with asymptomatic WPW among athletes remains uncertain, and WPW may be underestimated as a SCD etiology due to the challenges of establishing this diagnosis in the postmortem setting. Furthermore, cessation of a delta wave on ETT is not universally associated with a low-risk EPS, and even a low-risk EPS does not completely abrogate risk of SCD.[1] Heterogeneity of provider risk stratification strategies likely reflects ongoing uncertainties in the absolute risk of SCD from WPW pattern, an increased risk for arrhythmias among children,[5] and uncertainties and limitations of diagnostic risk stratification modalities (eg, ETT vs EPS) in the prediction of SCD.

Both the 2025 American College of Cardiology/American Heart Association and 2024 Heart Rhythm Society clinical practice recommendations for athletes were created in collaboration between sports cardiologists and EPs and acknowledge that age should be a consideration for shared decision-making in the risks and benefits of noninvasive (ETT) vs invasive (EPS with or without catheter ablation) diagnostic risk stratification and management of athletes with WPW pattern.[1,4] This guidance stems from studies which have demonstrated that children have been shown to have a higher risk of arrhythmic events from WPW,[5] which may explain appropriate differences between adult and pediatric providers in the current study regarding the likelihood of referring for invasive EPS and of pursuing ablation in the setting of a "low-risk" pathway by EPS.

Limitations of our study include self-reported data regarding respondents' clinical practice and expertise as well as the use of specific clinical case scenarios that could not fully encompass the heterogeneity of patient presentations and clinical decision-making. We also could not explore all areas of clinical uncertainty and practice variation (ie, clinicians' approach to intermittent preexcitation). Despite these limitations, these data illustrate significant practice variation in this challenging clinical area and highlight areas in which the sports cardiology and EP communities can work collaboratively to refine best practices and optimize patient care.

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