

Simplified Rheumatic Heart Disease Screening Criteria for Handheld Echocardiography

Jimmy C. Lu¹, Craig Sable², Gregory J. Ensing¹, Catherine Webb¹, Janet Scheel², Twalib Aliku³, Justin Godown¹, Andrea Beaton²

¹University of Michigan Congenital Heart Center, Ann Arbor, MI

²Children's National Medical Center, Washington, DC

³The Uganda Heart Institute, Kampala, Uganda

Background: Using 2012 World Heart Federation (WHF) criteria, standard echocardiography (SE) reveals a high burden of rheumatic heart disease (RHD) in resource poor settings, but widespread screening is limited by cost and physician availability. Handheld echocardiography (HHE) may decrease costs, but WHF criteria are complicated for rapid field screening, particularly for non-physician screeners.

Objective: To determine the best simplified screening strategy for RHD detection using HHE.

Methods: HHE (GE Vscan) and SE (GE Vivid q or i or Philips CX-50) were performed in 5 schools in Gulu, Uganda. Borderline or definite RHD cases were defined by 2012 WHF criteria on SE images, by 2 experienced readers. HHE studies were reviewed by cardiologists blinded to SE results. As HHE lacks continuous wave Doppler, pansystolic mitral regurgitation (MR) was defined as MR on 2 consecutive frames. We evaluated single and combined HHE parameters to determine the simplified screening strategy that maximized sensitivity and specificity for case detection.

Results: In 1420 children (10.8±2.6 years old, 47% male) with HHE and SE studies, morphologic criteria and presence of any MR by HHE had poor specificity (Table). MR jet length by HHE correlated with SE ($r=0.54$, $p<0.0001$). Aortic insufficiency (AI) was specific but not sensitive. Combined criteria of MR jet length ≥ 1.5 cm, chosen from receiver operating characteristic analysis, or any AI best balanced sensitivity and specificity; pansystolic MR could be substituted for MR jet length with slightly lower sensitivity for definite RHD. With a prevalence of 4% and subsequent SE screening of positive HHE studies, this would reduce SE studies by 80% from a SE-based screening strategy.

Conclusions: In resource-limited settings, HHE with simplified criteria offers reasonable sensitivity and specificity for RHD screening. Further study is needed to validate HH screening by local practitioners and long-term outcomes.

Table: Sensitivity and specificity of HHE for all disease (borderline or definite), and sensitivity for definite disease, compared to the gold standard of SE.

	Sensitivity (%)	Specificity (%)	Sensitivity for definite RHD (%)
Single criteria			
≥ 1 mitral valve morphologic criterion	71.7	63.1	87.2
Any MR	87.8	49.2	91.5
MR jet length ≥ 1.5 cm	64.4	85.6	85.1
Pansystolic MR	67.2	83.6	85.1
Any aortic insufficiency	15.6	95.8	25.5
Screening strategies			
Pansystolic MR or any AI	75.0	80.4	93.6
MR jet length ≥ 1.5 cm or any AI	73.3	82.4	97.9

MR, mitral regurgitation. AI, aortic insufficiency. RHD, rheumatic heart disease.