Standard echocardiography versus handheld echocardiography for the detection of subclinical rheumatic heart disease: a systematic review and meta-analysis of diagnostic accuracy

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Introduction & Objectives

Rheumatic heart disease (RHD) is an acquired permanent heart valve condition which can remain asymptomatic for many years.[1] Echocardiographic screening for subclinical disease has been advocated as a means to support secondary prevention, yet its feasibility remains hindered by high costs.[2,3] Handheld echocardiography (HAND) presents an opportunity to address the need for more cost-effective methods of detecting RHD in resource-limited and remote settings.[4] This review sought to summarise the accuracy of handheld echocardiography which, if shown to be sufficiently similar to that of the current gold standard, could usher in a new age of RHD screening in endemic areas.

Methods

➢ A search of the electronic sources - PubMed, Scopus, Web of Science and EBSCOhost - without language restriction was performed to identify studies conducted from 2012 onwards.
➢ Two authors independently assessed the methodological quality of included studies against review-specific QUADAS-2 criteria and extracted information on metrics of diagnostic accuracy.
➢ A meta-analysis was conducted to produce summary results of sensitivity and specificity for three disease categories (Any RHD, Definite RHD and Borderline RHD) using the Hierarchical Summary Receiver Operating Characteristic (HSROC) method.
➢ Forest plots and scatter plots in Receiver Operating Characteristic (ROC) space in combination with subgroup and sensitivity analyses were used to investigate heterogeneity.
➢ Publication bias was not investigated.

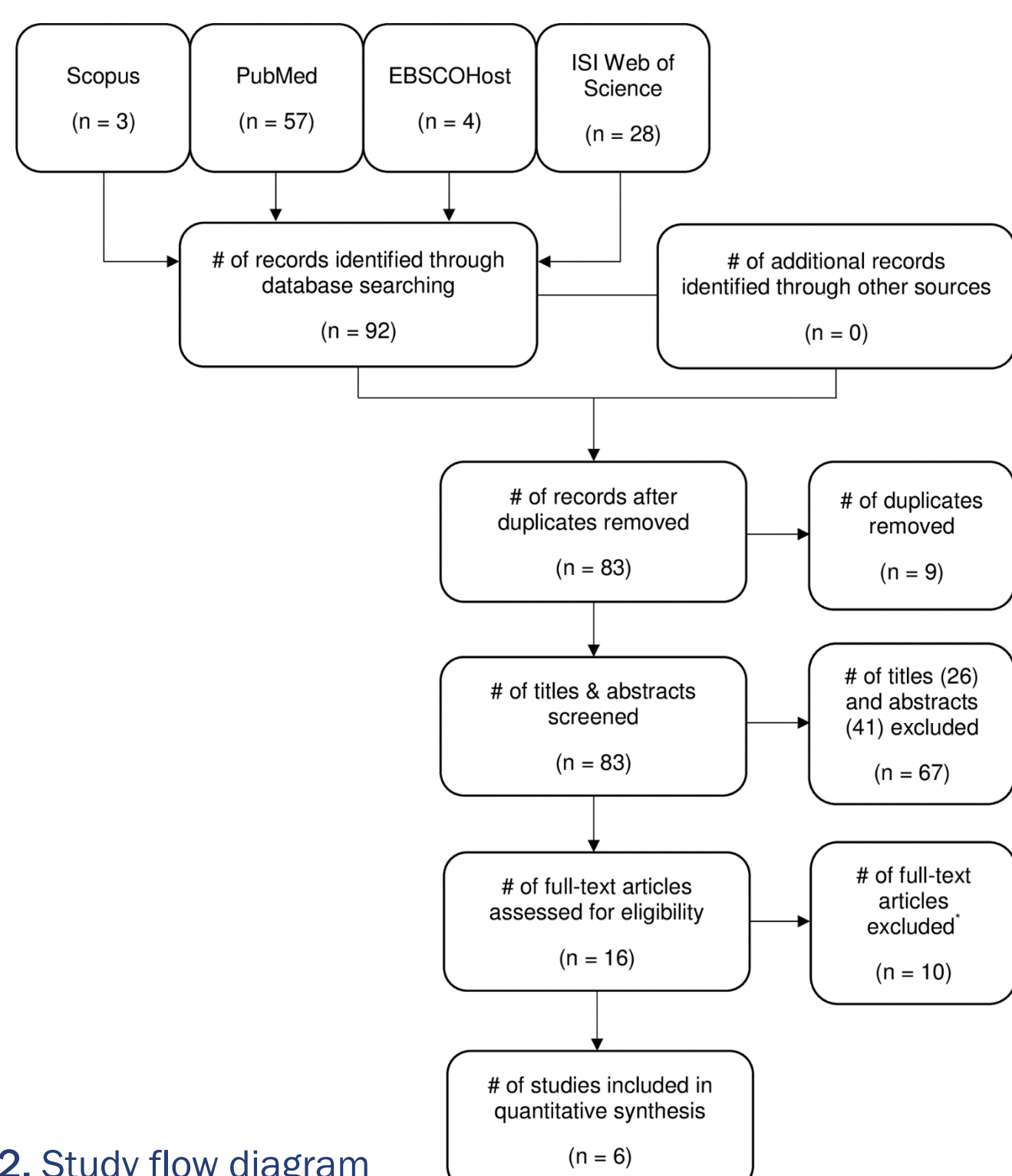Fig 1. A handheld echocardiographic device

Results

Of the 92 records identified by the search, 16 full text articles were assessed for eligibility, six of which met the inclusion criteria. Meta-analytical results from the six included studies (N = 4208) are presented in the table below.

Table 1. Meta-analysis results

Test	N	Sensitivity (95% CrI)	Specificity (95% CrI)
Any RHD	6	81.56% (76.52 – 86.61)	89.75% (84.48 – 95.01)
Definite RHD	5	91.06% (80.46 – 100)	91.96% (85.57 – 98.36)
Borderline RHD	5	62.01% (31.8 – 92.22)	82.33% (65.15 – 99.52)
Abbreviations: N, number of studies; CrI, credible interval			

➢ HAND displayed good accuracy for detecting Definite RHD and modest accuracy for detecting Any RHD but demonstrated poor accuracy for the detection of Borderline RHD.
➢ Findings from this review provide some evidence for the potential of HAND to increase access to echocardiographic screening for RHD in resource-limited and remote settings.

Fig 2. Study flow diagram

Conclusion & Potential Implications

Our findings highlight the need for a new set of evidence-based guidelines tailored to the capabilities of HAND in order to maximise the device's diagnostic potential. Further studies assessing the diagnostic accuracy of HAND when using a standardised protocol are needed as is further research into the feasibility, cost-effectiveness and consequences of implementing large scale RHD screening programs. We conclude that while HAND has been shown to be sufficiently accurate for the detection of RHD there is still a need for further research before its wide-spread use can be endorsed.

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