

Diagnostic accuracy of hand-held echocardiography for the detection of Rheumatic Heart Disease in school-aged children and adolescents

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a systematic review protocol



Introduction

Rheumatic heart disease (RHD) is an easily preventable and treatable chronic condition which largely affects impoverished populations across the world (1). This acquired cardiovascular disease continues to persist in many developing countries, adding additional strain to what are often already overburdened health systems (2).

Hand-held echocardiography presents an opportunity to address the need for more cost-effective methods of diagnosing RHD in developing countries, where the disease continues to carry high rates of morbidity and mortality. Studies have demonstrated moderate sensitivity as well as high specificity and diagnostic odds for detecting latent RHD (3).

Objective

We describe a protocol for the systematic review of published primary diagnostic test accuracy studies to evaluate the evidence for this portable technology in diagnosing suspected RHD.



Proposed Methods

The proposed systematic review will be conducted in line with established methods and reporting standards as described by the Cochrane Collaboration and 2009 Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement.

Search Strategy

- Data sources to be searched include; PubMed, Scopus, ISI Web of Science and EbscoHost
- Reference lists and citations of relevant articles will be searched
- Experts in the field will be consulted where necessary
- Articles will be identified by a defined search strategy using a combination of MeSH terms and keywords;

(Hand-held OR handheld OR hand held OR hand-carried OR hand carried OR HAND OR HCU OR HHCUC OR pocket size* OR portable OR miniatur* OR focus*) AND (Echocardiograph* OR cardiac ultrasound) AND (Rheumatic Heart Disease OR RHD)

Inclusion Criteria

Participants	Populations of apparently healthy school-aged children and adolescents worldwide in which RHD is prevalent
Index Test	Hand-held echocardiography
Reference Test	Standard echocardiography
Target Condition	Rheumatic heart disease
Study Design	Primary observational studies of diagnostic test accuracy
Publication Types	Published & unpublished including conference proceedings & abstracts
Language	Any

Risk of Bias Assessment

- Two reviewers will independently assess the methodological validity and quality of each study against the QUADAS-2 criteria
- These criteria encompass 4 broad domains (*figure below*); Indicator questions under each domain will be tailored to meet the needs of the review; Risk of bias will be scored as low, high or unclear based on the set of responses given for indicator questions at each domain
- Any discrepancies will be resolved through discussion until a consensus is reached
- Both text and graphics will be used to demonstrate the results

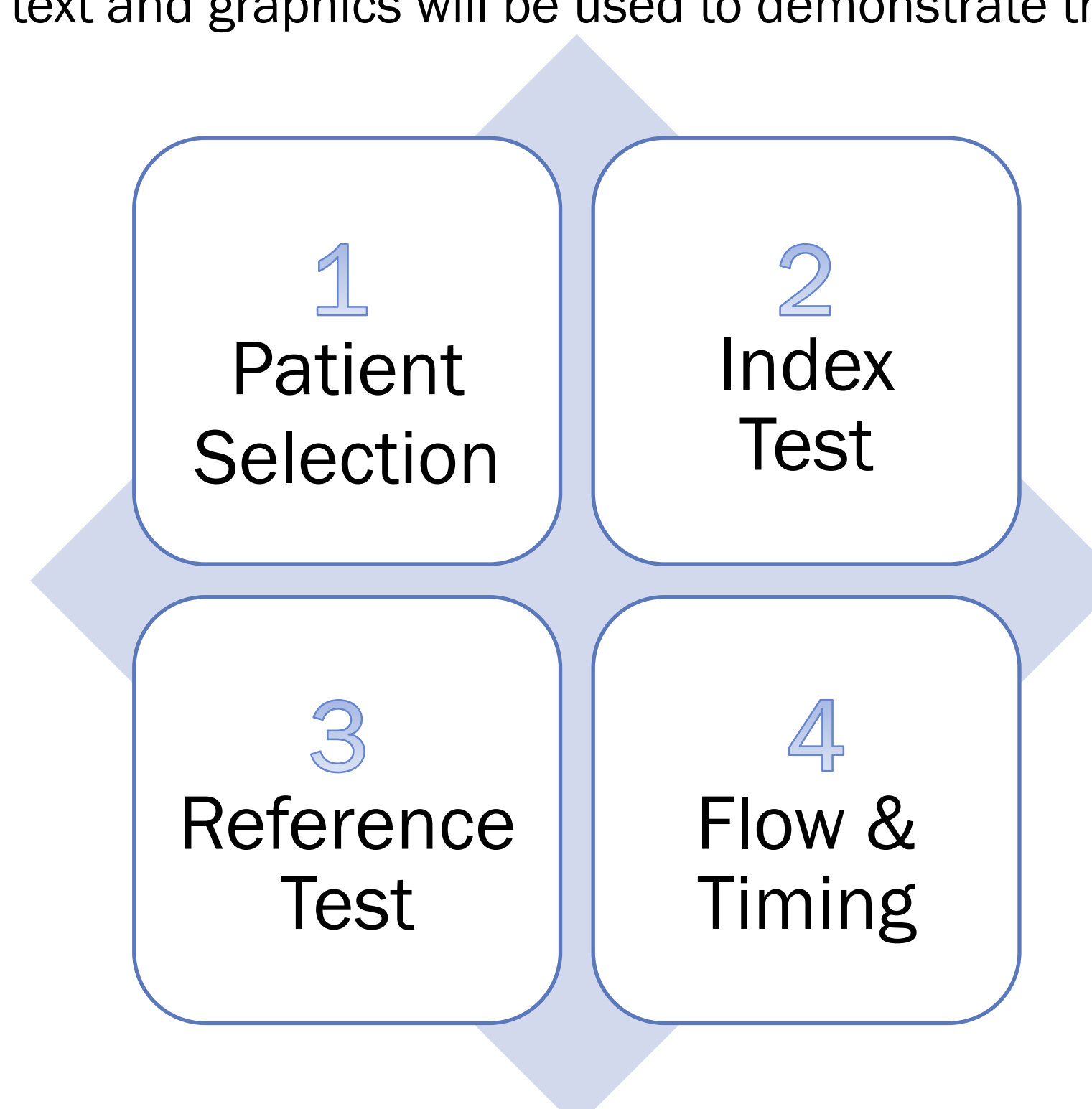


Fig: QUADAS-2 domains

Statistical Analysis

- Data extraction will be undertaken by two reviewers independently
- Information on metrics of diagnostic accuracy and demographics will be extracted.
- Forest plots of sensitivity and specificity as well as a scatter plot in Receiver Operating Characteristic (ROC) space will be used to investigate heterogeneity of studies.
- If possible, a meta-analysis will be conducted to produce summary results of sensitivity and specificity using the Hierarchical Summary Receiver Operating Characteristic (HSROC) method.
- Subgroup analyses will include age, gender, geographical location and echocardiographer expertise.
- A sensitivity analysis will be conducted to investigate the effect of studies with a high risk of bias.

Conclusion & Potential Implications

This systematic review will provide a summary of the diagnostic accuracy of hand-held echocardiography. Results may feed into evidence-based guidelines and should the findings of this review warrant a change in clinical practice, a one-page summary report will be disseminated among leading clinicians and healthcare professionals in the field.

It is anticipated that further studies will be needed to develop a standardised protocol and set of diagnostic criteria for hand-held echocardiographic screening by non-experts.

References

1. World Heart Federation. 2013. Rheumatic Heart Disease (RHD): Neglected NCD of Poverty Is RHD in Your National NCD. 19(3): 2008
2. Zühlke, L. J. and A. C. Steer. 2013. Estimates of the global burden of rheumatic heart disease. *Global Heart*; 8(3): 189-95.
3. Godown, J., J. C. Lu, A. Beaton, C. Sable, G. Mirembe, R. Sanya *et al.* 2015. Handheld Echocardiography Versus Auscultation for Detection of Rheumatic Heart Disease. *Pediatrics*; 135(4): e939-44.