

Supplementary Material

Are we missing opportunities to detect acute rheumatic fever and rheumatic heart disease in hospital care? A multijurisdictional cohort study

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SUPPLEMENTARY FILES

Table S1. STROBE checklist of items that should be included in reports of cohort studies

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	A
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	A
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	A-B
Objectives	3	State specific objectives, including any prespecified hypotheses	B
Methods			
Study design	4	Present key elements of study design early in the paper	B
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	B
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	B
		(b) For matched studies, give matching criteria and number of exposed and unexposed	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	B-C
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	B-C
Bias	9	Describe any efforts to address potential sources of bias	B
Study size	10	Explain how the study size was arrived at	B
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	B
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	C-D
		(b) Describe any methods used to examine subgroups and interactions	C-D
		(c) Explain how missing data were addressed	C-D
		(d) If applicable, explain how loss to follow-up was addressed	N/A
		(e) Describe any sensitivity analyses	D
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	D Figure 1
		(b) Give reasons for non-participation at each stage	Figure 1
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	Table 1
		(c) Summarise follow-up time (eg, average and total amount)	D
Outcome data	15*	Report numbers of outcome events or summary measures over time	E Tables 2 and 3
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tables 2 and 3
		(b) Report category boundaries when continuous variables were categorized	Tables 2 and 3
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	E
Discussion			
Key results	18	Summarise key results with reference to study objectives	E
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	F-G
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	E-H
Generalisability	21	Discuss the generalisability (external validity) of the study results	E-G
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	I

Table S2. *Categorisation of ICD-10-AM diagnosis codes considered as mimics of acute rheumatic fever or rheumatic heart disease*

Category 1: High likelihood mimics of ARF only

F95.0 Transient tic disorder
F95.8 Other tic disorders
F95.9 Tic disorder, unspecified
F98.4 Stereotyped movement disorders
G25.5 Other chorea
G25.8 Other specified extrapyramidal and movement disorders
G25.9 Extrapyramidal and movement disorder, unspecified
I30.0 Acute nonspecific idiopathic pericarditis
I30.8 Other forms of acute pericarditis
I30.9 Acute pericarditis, unspecified
I31.9 Disease of pericardium, unspecified
M02.8 Other reactive arthropathies
M02.9 Reactive arthropathy, unspecified
M08.x Juvenile arthritis
M13.0 Polyarthritis, unspecified
M13.1 Monoarthritis, not elsewhere classified
M13.9 Arthritis, unspecified
M25.4 Effusion of joint
M65 Synovitis and tenosynovitis
M67.3 Transient synovitis
M79.0 Rheumatism, unspecified
R25.8 Other and unspecified abnormal involuntary movements

Category 2: High likelihood mimics of either ARF or RHD

I33.0 Acute and subacute infective endocarditis
I33.9 Acute endocarditis, unspecified
I34.0 Mitral (valve) insufficiency
I34.1 Mitral (valve) prolapse
I34.2 Nonrheumatic mitral (valve) stenosis

I34.8 Other nonrheumatic mitral valve disorders
I34.9 Nonrheumatic mitral valve disorder, unspecified
I35.0 Aortic (valve) stenosis
I35.1 Aortic (valve) insufficiency
I35.2 Aortic (valve) stenosis with insufficiency
I35.8 Other aortic valve disorders
I35.9 Aortic valve disorder, unspecified
I36.0 Nonrheumatic tricuspid (valve) stenosis
I36.1 Nonrheumatic tricuspid (valve) insufficiency
I36.2 Nonrheumatic tricuspid (valve) stenosis with insufficiency
I36.8 Other nonrheumatic tricuspid valve disorders
I36.9 Nonrheumatic tricuspid valve disorder, unspecified
I38 Endocarditis, valve unspecified
I40.0 Infective myocarditis
I40.1 Isolated myocarditis
I40.8 Other acute myocarditis
I40.9 Acute myocarditis, unspecified
I41.1 Myocarditis in viral diseases classified elsewhere
I44.0 Atrioventricular block, first degree
I44.1 Atrioventricular block, second degree
I44.2 Atrioventricular block, complete
I44.3 Other and unspecified atrioventricular block
I45.9 Conduction disorder, unspecified
I50.0 Congestive heart failure
I50.9 Heart failure, unspecified
I51.1: Rupture of chordae tendineae, not elsewhere classified
I51.4 Myocarditis, unspecified
I51.7 Cardiomegaly
I51.8: Other ill-defined heart disease
I51.9: Heart disease, unspecified

R01 Cardiac murmurs and other cardiac sounds

R01.0 Benign and innocent cardiac murmurs

R01.1 Cardiac murmur, unspecified

Category 3: Medium likelihood mimics (ARF only or ARF/RHD)

A54.4 Gonococcal infection of musculoskeletal system

A92.9 Mosquito-borne viral fever, unspecified

B33.1 Ross River disease

B33.2 Viral carditis

G04.9 Encephalitis, myelitis and encephalomyelitis, unspecified

G24.2 Idiopathic nonfamilial dystonia

G24.4 Idiopathic orofacial dystonia

G24.5 Blepharospasm

G24.8 Other dystonia

G24.9 Dystonia, unspecified

G25.0 Essential tremor

G93.4: Encephalopathy unspecified

G96.8 Other specified disorders of central nervous system

G96.9 Disorder of central nervous system, unspecified

G98 Other disorders of nervous system, not elsewhere classified

I30.1 Infective pericarditis

I31.3 Pericardial effusion (noninflammatory)

I37.0 Pulmonary valve stenosis

I37.1 Pulmonary valve insufficiency

I37.2 Pulmonary valve stenosis with insufficiency

I37.8 Other pulmonary valve disorders

I37.9 Pulmonary valve disorder, unspecified

I39 Endocarditis and heart valve disorders in diseases classified elsewhere

I44.4 Left anterior fascicular block

I44.5 Left posterior fascicular block

I44.6 Other and unspecified fascicular block

I44.7 Left bundle-branch block, unspecified
I45.0 Right fascicular block
I45.1 Other and unspecified right bundle-branch block
I45.2 Bifascicular block
I45.3 Trifascicular block
I45.4 Nonspecific intraventricular block
I45.5 Other specified heart block
I45.8 Other specified conduction disorders
I45.9 Conduction disorder, unspecified
I49.1 Atrial premature depolarization
I49.2 Junctional premature depolarization
I49.3 Ventricular premature depolarization
I49.4 Other and unspecified premature depolarization
I49.8 Other specified cardiac arrhythmias
I49.9 Cardiac arrhythmia, unspecified
I50.1 Left ventricular failure
I51.6 Cardiovascular disease, unspecified
M00.9 Pyogenic arthritis, unspecified
M02.1 Postdysenteric arthropathy
M02.2 Postimmunization arthropathy
M03.x Postinfective and reactive arthropathies in diseases classified elsewhere
M06.x Other rheumatoid arthritis
M07.x Psoriatic and enteropathic arthropathies
M10.x Gout
M11.x Other crystal arthropathies
M25.5 Pain in joint
M25.6 Stiffness of joint, not elsewhere classified
M32.8 Other forms of systemic lupus erythematosus
M32.9 Systemic lupus erythematosus, unspecified
M32.x Systemic lupus erythematosus

R07.2 Precordial pain
R25.0 Abnormal head movements
R25.1 Tremor, unspecified
R26.0 Ataxic gait
R26.2 Difficulty in walking, not elsewhere classified
R26.8 Other and unspecified abnormalities of gait and mobility
R27.0 Ataxia, unspecified
R27.8 Other and unspecified lack of coordination
R29.3 Abnormal posture
R29.8 Other and unspecified symptoms and signs involving the nervous and musculoskeletal systems

Category 4: Low likelihood mimics (ARF only or ARF/RHD) (excluded from analyses)

A92.8 Other specified mosquito-borne viral fevers
B27.0 Gammaherpesviral (Epstein Barr) mononucleosis
B27.1 Cytomegaloviral mononucleosis
B27.8 Other infectious mononucleosis
B27.9 Infectious mononucleosis, unspecified
F95.1 Chronic motor or vocal tic disorder
F95.2 Combined vocal and multiple motor tic disorder [de la Tourette]
G04.0 Acute disseminated encephalitis
G04.1 Tropical spastic paraplegia
G04.2 Bacterial meningoencephalitis and meningomyelitis, not elsewhere classified
G04.8 Other encephalitis, myelitis and encephalomyelitis
G05.0 Encephalitis, myelitis and encephalomyelitis in bacterial diseases classified elsewhere
G05.1 Encephalitis, myelitis and encephalomyelitis in viral diseases classified elsewhere
G05.2 Encephalitis, myelitis and encephalomyelitis in other infectious and parasitic diseases classified elsewhere
G05.8 Encephalitis, myelitis and encephalomyelitis in other diseases classified elsewhere
G10: Huntington's disease
G24.0 Drug-induced dystonia
G24.1 Idiopathic familial dystonia
G24.3 Spasmodic torticollis

G25.1 Drug-induced tremor
G25.2 Other specified forms of tremor
G25.3 Myoclonus
G25.4 Drug-induced chorea
G25.6 Drug-induced tics and other tics of organic origin
G92: Toxic encephalopathy
I41.0 Myocarditis in bacterial diseases classified elsewhere
I41.2 Myocarditis in other infectious and parasitic diseases classified elsewhere
I41.8 Myocarditis in other diseases classified elsewhere
I42.x - I43.x cardiomyopathy
I47.x Paroxysmal tachycardias
I48 Atrial fibrillation and flutter
I49.0 Ventricular fibrillation and flutter
I49.5 Sick sinus syndrome
M01.x Direct infections of joint in infectious and parasitic diseases classified elsewhere
M02.0 Arthropathy following intestinal bypass
M02.3 Reiter disease
M09.x Juvenile arthritis in diseases classified elsewhere
M12.x Other specific arthropathies
M13.8 Other specified arthritis (e.g., Allergic arthritis)
M14.x Arthropathies in other diseases classified elsewhere
M25.8 Other specified joint disorders
M30.x Polyarteritis nodosa and related conditions
M31.x Other necrotizing vasculopathies
M32.0 Drug-induced systemic lupus erythematosus
M32.1 Systemic lupus erythematosus with organ or system involvement
M33.x Dermatopolymyositis
M34.x Systemic sclerosis
M35.x Other systemic involvement of connective tissue
M36.x Systemic disorders of connective tissue in diseases classified elsewhere

M65.9 Synovitis and tenosynovitis, unspecified
M79.6 Pain in limb
O99.3: Mental disorders and diseases of the nervous system complicating pregnancy
R07.1 Chest pain on breathing
R07.3 Other chest pain
R07.4 Chest pain, unspecified
R25.2 Cramp and spasm
R25.3 Fasciculation
R26.1 Paralytic gait
R29.0 Tetany
R29.6 Tendency to fall, not elsewhere classified
R50: Fever
S53.4 Sprain and strain of elbow
S59.9 Unspecified injury of forearm
S63.5 Sprain and strain of wrist
S69.9 Unspecified injury of wrist and hand
S73.1 Sprain and strain of hip
S79.9 Unspecified injury of hip and thigh
S83.6 Sprain and strain of other and unspecified parts of knee
S89.9 Unspecified injury of lower leg
S93.4 Sprain and strain of ankle
S99.9 Unspecified injury of ankle and foot

ARF = Acute rheumatic fever. RHD = rheumatic heart disease

Table S3. Percentage and clinical grouping of mimic diagnosis codes extracted from discharge record

ICD-10-AM code	ICD-10-AM Description	Frequency	Clinical group
Category 1: High likelihood ARF-only mimics			
M25.4x	Effusion of joint	36.4	Joint inflammation
M13.9x	Arthritis, unspecified	14.5	Joint inflammation
M13.0x	Polyarthritis, unspecified	7.3	Joint inflammation
G25.5x	Other chorea	5.5	Likely Sydenham chorea
G25.9x	Extrapyramidal and movement disorder, unspecified	5.5	Likely Sydenham chorea
M02.8x	Other reactive arthropathies	5.5	Joint inflammation
M65.8x	Other synovitis and tenosynovitis	5.5	Joint inflammation
I31.9x	Disease of pericardium, unspecified	3.6	Likely pericarditis
M65.9x	Synovitis and tenosynovitis, unspecified	3.6	Joint inflammation
M02.9x	Reactive arthropathy, unspecified	1.8	Joint inflammation
M08.0x	Juvenile rheumatoid arthritis	1.8	Joint inflammation
M08.8x	Other juvenile arthritis	1.8	Joint inflammation
M08.9x	Juvenile arthritis, unspecified	1.8	Joint inflammation
M13.1x	Monoarthritis, not elsewhere classified	1.8	Joint inflammation
M65.1x	Other infective (teno-)synovitis	1.8	Joint inflammation
R25.8x	Other and unspecified abnormal involuntary movements	1.8	Likely Sydenham chorea
Category 2: High-likelihood mimics of either ARF or RHD			
I50.0x	Congestive heart failure	24.1	Heart failure other than LVF
R01.1x	Cardiac murmur, unspecified	24.1	Likely cardiac valve lesion
I34.0x	Mitral (valve) insufficiency	18.5	Specified cardiac valve lesion
I35.1x	Aortic (valve) insufficiency	5.6	Specified cardiac valve lesion
I33.0x	Acute and subacute infective endocarditis	3.7	Infective endocarditis
I34.1x	Mitral (valve) prolapse	3.7	Specified cardiac valve lesion
I44.0x	Infective myocarditis	3.7	Myocarditis
I51.8x	Other ill-defined heart disease	3.7	Unspecified cardiac disorder
R01.0x	Benign and innocent cardiac murmurs	3.7	Likely cardiac valve lesion

I35.0x	Aortic (valve) stenosis	1.9	Specified cardiac valve lesion
I38.x	Endocarditis, valve unspecified	1.9	Infective endocarditis
I44.1x	Myocarditis in viral diseases classified elsewhere	1.9	Myocarditis
I50.9x	Heart failure, unspecified	1.9	Heart failure other than LVF
I51.7x	Cardiomegaly	1.9	Heart failure other than LVF
Category 3: Medium-likelihood mimics (ARF only/either ARF or RHD)			
M25.5x	Pain in joint	68.5	Joint pain, inflammatory basis not specified
M32.9x	Systemic lupus erythematosus	7.4	Named non-ARF arthritis
M06.4x	Other rheumatoid arthritis	6.2	Named non-ARF arthritis
I50.1x	Left ventricular failure	3.1	Left ventricular failure
M00.9x	Pyogenic arthritis, unspecified	3.1	Named non-ARF arthritis
M10.9x	Gout	3.1	Named non-ARF arthritis
I31.3x	Pericardial effusion (non-inflammatory)	2.5	Non-inflammatory pericardial disease
R26.8x	Other and unspecified abnormalities of gait and mobility	1.9	Possible Sydenham chorea
M32.1x	Systemic lupus erythematosus	1.2	Named non-ARF arthritis
I49.3x	Ventricular premature depolarization	0.6	Cardiac dysrhythmia
I49.4x	Other and unspecified premature depolarization	0.6	Cardiac dysrhythmia
I49.8x	Other specified cardiac arrhythmias	0.6	Cardiac dysrhythmia
I49.9x	Cardiac arrhythmia, unspecified	0.6	Cardiac dysrhythmia
M32.8x	Systemic lupus erythematosus	0.6	Named non-ARF arthritis
