STARD 2015

Section & Topic	Item No	Item	Reported on Page Number/ Line Number	Reported on Section/ Paragraph
TITLE OR ABSTRACT				
	1	Identification as a study of diagnostic accuracy using at least one measure of accuracy (such as sensitivity, specificity, predictive values, or AUC)	Page 2 Line 34-35	Section Abstract Graph 2
ABSTRACT				
	2	Structured summary of study design, methods, results, and conclusions (for specific guidance, see STARD for Abstracts)	Page 1-3 Line 22-45	Section Abstract Graph 1-4
INTRODUCTION				
	3	Scientific and clinical background, including the intended use and clinical role of the index test	Page 3-4 Line 49-99	Section 1 Graph 1-6
	4	Study objectives and hypotheses	Page 5 Line 100-106	Section 1 Graph 7
METHODS				
Study design	5	Whether data collection was planned before the index test and reference standard were performed (prospective study) or after (retrospective study)	Page 5 Line 111-113	Section 2.1 Graph 1
Participants	6	Eligibility criteria	Page 5 Line 114-115	Section 2.1 Graph 1
	7	On what basis potentially eligible participants were identified (such as symptoms, results from previous tests, inclusion in registry)	Page 5 Line 109-115	Section 2.1 Graph 1
	8	Where and when potentially eligible participants were identified (setting, location and dates)	page 5 Line 111-113	Section 2.1 Graph 1
	9	Whether participants formed a consecutive, random or convenience series	page 5 Line 109-111	Section 2.1 Graph 1
Test methods	10a	Index test, in sufficient detail to allow replication	Page 7-11 Line 134-204	Section 2.2 Graph 1-6
	10b	Reference standard, in sufficient detail to allow replication	Page 7 Line 134-137	Section 2.2 Graph 1
	11	Rationale for choosing the reference standard (if alternatives exist)	N/A	The evaluation criteria
	12a	Definition of and rationale for test positivity cut-offs or result categories of the index test, distinguishing pre-specified from exploratory	Page 10 Line 177-179 192-193	Section 2.2.2 2.2.3 Graph 2 1
	12b	Definition of and rationale for test positivity cut-offs or result categories of the reference standard, distinguishing pre-specified from exploratory	Page10 Line177-179 192-193	Section 2.2.2 2.2.3 Graph 2 1
	13a	Whether clinical information and reference standard results were available to the performers/readers of the index test	N/A	Images for each patient
	13b	Whether clinical information and index test results were available to the assessors of the reference standard	N/A	Images for each patient

Analysis	14	Methods for estimating or comparing measures of diagnostic accuracy	Page 12 16-17 Line 206, 212, 259, 262	Secion 2.2.4 3.2 Graph 1 1
	15	How indeterminate index test or reference standard results were handled	N/A	There is no data with uncertain results, so this
	16	How missing data on the index test and reference standard were handled	N/A	The data in this paper includes normal data and
	17	Any analyses of variability in diagnostic accuracy, distinguishing pre-specified from exploratory	Page 10 Line 186-193	Section 2.2.3 Graph 1
	18	Intended sample size and how it was determined	page 5 Line 109-113	Section 2.1 Graph 1
RESULTS				
Participants	19	Flow of participants, using a diagram	Page 6 Line124-126	Section 2.1 Graph 1
	20	Baseline demographic and clinical characteristics of participants	N/A	This study focuses on medical images and does
	21a	Distribution of severity of disease in those with the target condition	N/A	This study focuses on medical images and does
	21b	Distribution of alternative diagnoses in those without the target condition	N/A	This study focuses on medical images and does
	22	Time interval and any clinical interventions between index test and reference standard	N/A	This study focuses on medical images and does
Test results	23	Cross tabulation of the index test results (or their distribution) by the results of the reference standard	Page14,15,17 Line 232, 245, 263	Section 3 Graph2-6
	24	Estimates of diagnostic accuracy and their precision (such as 95% confidence intervals)	Page13-17 Line 222-270	Section 3 Graph 2-6
	25	Any adverse events from performing the index test or the reference standard	N/A	There were no adverse events during
DISCUSSION				
	26	Study limitations, including sources of potential bias, statistical uncertainty, and generalisability	page 20, 21 Line321-330	Section 4 Graph 5
	27	Implications for practice, including the intended use and clinical role of the index test	Page 21 Line 334-341	Section 5 Graph 1
OTHER INFORMATION				
	28	Registration number and name of registry	N/A	This study is not a clinical trial and does
	29	Where the full study protocol can be accessed	Page 11 Line 197-198	Section 2.2.3 Graph 1
	30	Sources of funding and other support; role of funders	Page 22 Line 343-345	Section 6 Graph 1

AIM

STARD stands for “Standards for Reporting Diagnostic accuracy studies”. This list of items was developed to contribute to the completeness and transparency of reporting of diagnostic accuracy studies. Authors can use the list to write informative study reports. Editors and peer-reviewers can use it to evaluate whether the information has been included in manuscripts submitted for publication.

Explanation

A **diagnostic accuracy study** evaluates the ability of one or more medical tests to correctly classify study participants as having a **target condition**. This can be a disease, a disease stage, response or benefit from therapy, or an event or condition in the future. A medical test can be an imaging procedure, a laboratory test, elements from history and physical examination, a combination of these, or any other method for collecting information about the current health status of a patient.

The test whose accuracy is evaluated is called **index test**. A study can evaluate the accuracy of one or more index tests. Evaluating the ability of a medical test to correctly classify patients is typically done by comparing the distribution of the index test results with those of the **reference standard**. The reference standard is the best available method for establishing the presence or absence of the target condition. An accuracy study can rely on one or more reference standards.

If test results are categorized as either positive or negative, the cross tabulation of the index test results against those of the reference standard can be used to estimate the **sensitivity** of the index test (the proportion of participants with the target condition who have a positive index test), and its **specificity** (the proportion without the target condition who have a negative index test). From this cross tabulation (sometimes referred to as the contingency or “2x2” table), several other accuracy statistics can be estimated, such as the positive and negative **predictive values** of the test. Confidence intervals around estimates of accuracy can then be calculated to quantify the statistical **precision** of the measurements.

If the index test results can take more than two values, categorization of test results as positive or negative requires a **test positivity cut-off**. When multiple such cut-offs can be defined, authors can report a receiver operating characteristic (ROC) curve which graphically represents the combination of sensitivity and specificity for each possible test positivity cut-off. The **area under the ROC curve** informs in a single numerical value about the overall diagnostic accuracy of the index test.

The **intended use** of a medical test can be diagnosis, screening, staging, monitoring, surveillance, prediction or prognosis. The **clinical role** of a test explains its position relative to existing tests in the clinical pathway. A replacement test, for example, replaces an existing test. A triage test is used before an existing test; an add-on test is used after an existing test.

Besides diagnostic accuracy, several other outcomes and statistics may be relevant in the evaluation of medical tests. Medical tests can also be used to classify patients for purposes other than diagnosis, such as staging or prognosis. The STARD list was not explicitly developed for these other outcomes, statistics, and study types, although most STARD items would still apply.

DEVELOPMENT

This STARD list was released in 2015. The 30 items were identified by an international expert group of methodologists, researchers, and editors. The guiding principle in the development of STARD was to select items that, when reported, would help readers to judge the potential for bias in the study, to appraise the applicability of the study findings and the validity of conclusions and recommendations. The list represents an update of the first version, which was published in 2003. More information can be found on http://www.equator-network.org/reporting-guidelines/stard.

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*As the checklist was provided upon initial submission, the page number/line number reported may be changed due to copyediting and may not be referable in the published version. In this case, the section/paragraph may be used as an alternative reference.