Structure of a DTA Review



Mariska Leeflang, PhD Dutch Cochrane Centre Copenhagen 26 February 2009

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Diagnostic Test Accuracy Reviews

- Question formulation
- Identification of studies
- Selection of relevant studies
- Quality assessment
- Data-extraction
- Data analysis
- Presentation and interpretation of results

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Intervention vs. Diagnostic



Intervention vs. Diagnostic





Titles intervention reviews

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Example of title

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۲	Clinical assessment	for	diagnosing congenital heart disease	in	new born infants with Down syndrome
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Exercise: the right title format?

- Diagnostic accuracy of image-guided biopsy in indeterminate renal masses.
- Physical examination for lumbar radiculopathy due to disc herniation in patients with low-back pain.
- Cell-free fetal DNA for non-invasive prenatal diagnosis of sex.

Text of Review - Background

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Description of the condition	🚽 🖉 Target condition being diagnosed			
Description of the intervention	🚽 🖉 Indextest(s)			
How the intervention might work	Alternative test(s)			
🚽 🥒 Why it is important to do this review	🗕 🚽 🖓 Rationale			
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Background

- Target condition being diagnosed
 - A description of the target condition of interest (frequency, severity, prognosis and possible treatments).
- o Index test
 - A description of the index tests that are being evaluated in this review, including current use and intended roles
- Alternative test
 - Possible tests and strategies that are used in clinical practice, irrespective of whether they are evaluated in this review.
- Rationale

Example?











Text of Review

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	■ Methods
	Criteria for considering studies for this review
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Objectives (example)

Clinical assessment for diagnosing congenital heart disease in newborn infants with Down syndrome

- Protocol for Cochrane Review of Diagnostic Test Accuracy -

William McGuire, Peter W Fowlie, and Johannes B Reitsma

OBJECTIVES

Primary objectives

The objective of this review is to assess the accuracy of clinical assessment in diagnosing congenital heart disease in newborn infants with Down syndrome and specifically to determine how well the absence of abnormal findings on clinical assessment rules out a diagnosis in newborn infants with Down syndrome.



Question formulation

Objective of a DTA SR can be

- To make comparisons between tests concerning their global accuracy
- To estimate the accuracy of a test operating at a particular threshold
- To understand why results of studies vary

Components of a question

For intervention reviews Patients

- Intervention
- (**C**omparative intervention)
- **O**utcome

Components of a question

For diagnostic test accuracy reviews Patients

- Index test
- (**C**omparator test)
- **T**arget disorder

Components of a question

For diagnostic test accuracy reviews

- **P**atients
- **P**resentation
- **P**rior tests
- Index test
- (Comparator test)
- **P**urpose
- Target disorder
- Reference standard

Index and comparator tests

- The **index test** is the "new" test we wish to evaluate. A review may consider and compare several index tests.
- The **comparator test** is the alternative diagnostic management strategy which is standard practice and with which we would like to make comparisons



Target condition and reference standard

- Target disease is the condition we are trying to diagnose
- Reference standard is the best way available of identifying target condition
 - May comprise several pieces of information
 - May only be available subsequently

Methods

- 🕲 Methods

- 🗧 🛍 Criteria for considering studies for this review
 - 🗈 Types of studies 🕊
 - 🖻 Participants
 - 🗎 Index tests
 - 🔊 Comparator tests
 - B Target conditions
 - 🗎 Reference standards
- Search methods for identification of studies
 - 🖹 Electronic searches
 - 🔊 Searching other resources
- 👇 🖺 Data collection and analysis
 - 🖻 Selection of studies
 - B Data extraction and management
 - B Assessment of methodological quality
 - B Statistical analysis and data synthesis
 - Investigations of heterogeneity
 - 🕼 Sensitivity analyses
 - 🕼 Assessment of reporting bias

No RCTs!

Intervention Reviews vs DTA Reviews

- 🗎 Methods

- 👇 🗓 Criteria for considering studies for this review
- Search methods for identification of studies
- 👇 🗓 Data collection and analysis
 - 🔊 Selection of studies
 - 🔊 Data extraction and management
 - 🔊 Assessment of risk of bias in included studies
 - 🔊 Measures of treatment effect
 - 🔊 Unit of analysis issues
 - 🔊 Dealing with missing data
 - Assessment of heterogeneity
 - Assessment of reporting biases
 - 🔊 Data synthesis
 - 🔊 Subgroup analysis and investigation of heterogeneity
 - 🔊 Sensitivity analysis

Identification of studies

Problems in indexing of DTA studies

- No study design terms (MeSH: sensitivity-and-specificity)
- Diagnostic search filters based on terms used to report results
- Filters don't work (loss of relevant articles and not reducing NNR)

Search Strategy: include elements for

- target condition AND index test
- (more titles to screen)

Database of DTA studies is being developed in Sydney

Diagnostic Test Accuracy Reviews

- Question formulation
- Identification of studies
- Selection of relevant studies
- Quality assessment (later)
- Data-extraction
- Data analysis (later)
- Presentation and interpretation of results









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 Image and the second sec	Donas 2000					
- Dijectives	Clinical features and settings	Primary care	; sleep deprivation, loss of concentration, hyperactivity.			
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🗢 🗐 Results	Participants	405 Dutch PhD students; no further information provided				
🕶 🖺 Discussion	Study design	Cross-sectional design; single group with equal suspicion of caffeine addiction;				
🕶 🗎 Authors' conclusions			consecutive enrollments; every student underwent all tests.			
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Quality assessment: diagnosis

- Relation between quality items and bias is not as straightforward as it is for interventions
- Many more items: 11 mandatory and >10 facultative (QUADAS)
- Methodological Quality Table
 "Risk of Bias Table"

Assessment of methodological quality

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Data and analyses




Data and Analysis

In diagnostics, less straightforward than RCT:

Additional challenges are:

 <u>Pairs</u> of sensitivity and specificity
 Cut-off problems
 Heterogeneity is rule rather than exception

NB: Apart from sources of heterogeneity known from the therapeutic field, we have to deal with the many different research designs used

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- Background	Study A	TP FP FN TN	Sensitivity	Spe	Sensitivity	Specificity
🗢 🖺 Objectives	Egberts 2001	0 0 0	0 Not estimable	N		
🕶 🖺 Methods	Gunnink 2003	0 0 0	0 Not estimable	N		
► 🗒 Results	Havelaar 2005	0 0 0	0 Not estimable	N		
► 🗎 Discussion	Kanis 2007	0 0 0	0 Not estimable	N		
- 🗐 Authors' conclusions	Van Nelle 1999		0 Not estimable	N		
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← III Abstract ← III Plain language summary	Test: 1 Spectrometry								🖥 🛷 🖬 🖨 4
- Background	Study /	TP	FP	FN	TN	Sensitivity	Specificity	Sensitivity	Specificity
🕶 🗐 Objectives	Egberts 2001	189	15	66	67	0.74 [0.68, 0.79]	0.82 [0.72, 0.89]	-	
🕶 🖺 Methods	Gunnink 2003	23	4	1	9	0.96 [0.79, 1.00]	0.69 [0.39, 0.91]		
► 🗒 Results	Havelaar 2005	0	0	0	0	Not estimable	Not estimable		
► <a>Image Discussion ► <a>Image Discussion	Kanis 2007	0	0	0	0	Not estimable	Not estimable		
- B Acknowledgements	Van Nelle 1999	18	8	32	92	0.36 [0.23, 0.51]	0.92 [0.85, 0.96]		
Contributions of authors									
 B Declarations of interest 									
🗕 🖹 Differences between protocol and									
🕒 🖹 Published notes									
🕶 🛄 Tables									
🕈 🕼 Studies and references									
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— 🎆 Gunnink 2003 📃 📃									
— 🎆 Havelaar 2005									
— 🎆 Kanis 2007									
- 🐻 Van Nelle 1999									
🕶 🛄 Data tables by study 📃 👻	Footnote:								

🌠 METAVIEW 4.1 [Review: Human albumin solution for resuscitation and volume expansion in critically ill patients]

<u>File Display Sort Statistics</u> Previous Outcome Next Outcome <u>Help</u>

<u>____</u>



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Outcome: 01 death Study	albumin n/N	control n/N	RR (95%Cl Fixed)	Weight %	RR (95%Cl Fixed)	
03 hypoalbuminaemia						
Bland 1973	9/50	12/50		16.5	0.75[0.35,1.62]	
Bland 1976	4/14	1/13		→ 1.4	3.71[0.47,29.06]	
Brown 1988	6/34	4/33		5.6	1.46[0.45,4.70]	
Foley 1990	7/18	6/22	_	7.4	1.43[0.58,3.49]	
Golub 1994	12/116	6/103		8.8	1.78[0.69,4.56]	
Greenough 1993	6/20	4/20		5.5	1.50[0.50,4.52]	
Kanarek 1992	3/12	2/12		2.8	1.50[0.30,7.43]	
Nilsson 1980	1/29	0/30 -	.	→ 0.7	3.10[0.13,73.15]	
Rubin 1997	2/16	1/15		→ 1.4	1.88[0.19,18.60]	
< Wojtysiak 1992	0/15	0/15		0.0	Not Estimable	
Subtotal(95%Cl)	50 / 324	36/313	-	50.1	1.38[0.94,2.03]	
Test for heterogeneity chi-sq	uare=3.94 df=8 p=0.8	6				
Test for overall effect z=1.63	3 p=0.10					

• //

💐 Forest plot



X

ROC Plot



Parameters from external software

Parameter	Estimate
Lambda	Loundo
Theta	
beta	
Var(accuracy)	
Var(threshold)	
<u>B</u> ivariate model parameters	
Parameter	Estimate
E(logitSe)	1.1005 🔺
E(logitSp)	2.2949
Var(logitSe)	0.9851
Var(logitSp)	0.9203
Cov(logits)	0.2679 🗸
Confidence and prediction regions	
Parameter	Estimate
SE(E(logitSe))	0.3758
SE(E(logitSp))	0.3133
Cov(Es)	-0.02231
Studies	12
Display summary curve	
☑ Display summary point	
✓ Display 95% confidence region	

When all the results are analyzed...

... then we can build the Summary of Results Table

- What are the results of our search, inclusion and quality assessment?
- What are the results of our metaanalysis?
- How sure are we about these results?

SoF versus SoR



SoF versus SoR

Intervention reviews

- Format for SoF table is clear and predefined
- You can use GRADE software to build SoF table

DTA reviews

- There is no predefined format
- Authors are explicitly invited to be creative
- There is no existing software to help you



Summary

• No Plain Language Summary

- Methodological Quality (not RoB)
- Summary of Results (not SoF)
- Differences in background
- Differences in methods: see upcoming presentations