What to do with non 2x2 data from a diagnostic systematic review?

An example from a review on identifying the seizure focus in patients with epilepsy

Penny Whiting[1], Rajat Gupta[2], Jane Burch[1], Jos Kleijnen[1], Tony Marson[2], Carol Forbes[1]

[1] Centre for Reviews and Dissemination, THE UNIVERSITY of York , [2] Department of Neurological Science, University of Liverpool.

Background

- Standard diagnostic accuracy studies present results as 2 x 2 tables of test performance (Table 1).
- Methods for the analysis, and meta-analysis, of such data are well developed and are commonly used.
- There has been little work on how to analyse non-standard diagnostic accuracy studies.

Objective

- To present an example of a non-standard diagnostic systematic review and to discuss the methods used to analyse the results.

Methods

- Systematic review of the localisation of the epileptic focus in patients with refractory epilepsy considered for surgical treatment.
- This review is a diagnostic review as studies compare the index test to a reference standard.
- The studies differ from standard diagnostic accuracy studies as rather than identifying whether a disease is present or absent, these tests try to identify the site of the epileptic focus.
- These studies do not report standard 2 x 2 data (Table 1).
- Instead data are provided in a number of different categories (Table 2).
- Patients were divided into two groups:
  1. patients in whom the reference standard identified a seizure focus
  2. patients in whom the reference standard failed to localise the seizure focus

**Table 1:** Standard diagnostic 2 x 2 table of test performance

		Disease	
		Present	Absent
Index test	+	a	b
	–	c	d

Table 2: Classification of study results using seizure localisation as the reference standard

		Reference standard	
		Localised (+)	Not localised (-)
Index test	Correctly localised	a	e
	Not localised	b	f
	Partially localised	c	
	Wrongly localised	d	

- Within the first group patients were further categorised according to whether the index test:
  a. correctly identified the seizure focus
  b. failed to identify a seizure focus
  c. wrongly identified a seizure focus
  d. partially identified the seizure focus: index test correctly identified part of the seizure focus but failed to identify all of the seizure focus or identified the seizure focus but also showed it as covering an additional area not found on the reference standard
- Within the second group patients were classified according to whether the index test:
 e. localised a seizure focus
  f. did not localise a seizure focus

Figure1: Proportion of scans in each localisation category
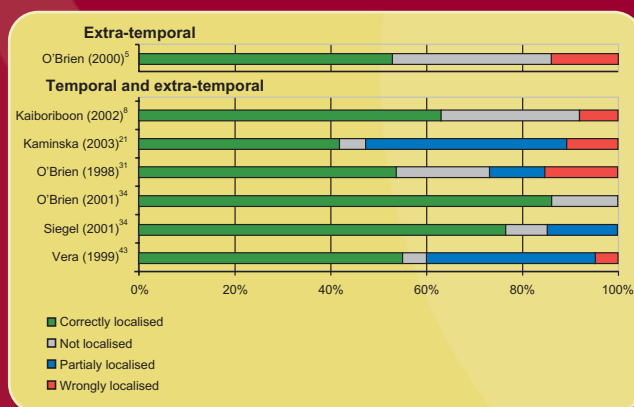
Results

- Very few studies provided data on patients with a non-localising reference standard, and the clinical value of this information is questionable; analysis was therefore not carried out on this data.
- We summarised the proportion of patients in each localisation category for patients with a localised reference standard.
- We did not attempt to equate the data from these studies with 2 x 2 data.
- We graphically summarised the results of studies in a bar chart (Figure 1) and as Forest plots for each localisation category (Figure 2).
- Due to the significant heterogeneity between studies, statistical pooling was not undertaken.
- We did not attempt to calculate standard measures of test performance as these would have been clinically meaningless.

Figure 2: Forest plots for each localisation category
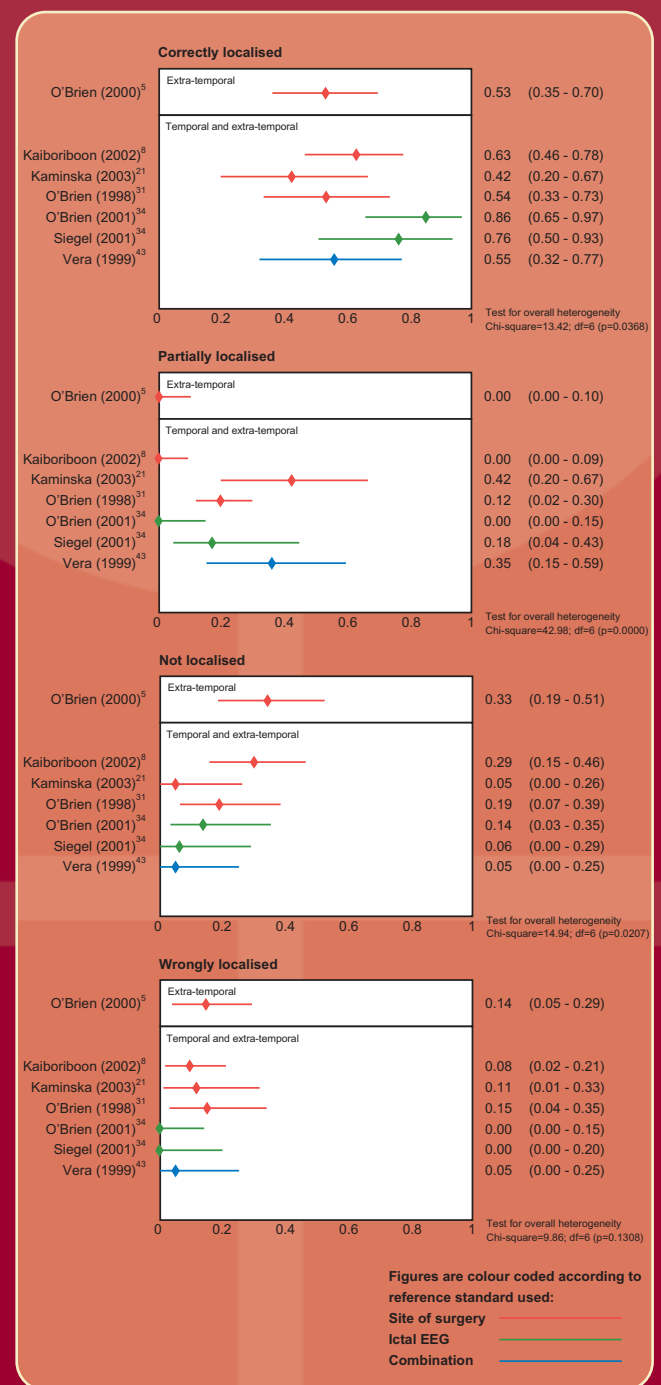
Conclusions

- Not all diagnostic test evaluations provide standard 2 x 2 data.
- Such evaluations should be not be forced into clinically meaningless 2 x 2 tables.
- The clinical question should be carefully considered and results analysed accordingly.