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SCIENTIFIC SECTION

Structured abstracts: Do they improve citation retrieval from dental journals?

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Objectives: To assess whether structured abstracts improved the sensitivity, precision and yield of retrieving clinical trials, using electronic searches, for example, MEDLINE, from dental journals.

Design: Retrospective, observational study.

Sample: Clinical trials, published in six dental journals. Three that adopted structured abstracts (*BDJ*, *CPJ, JO)* and three that remained unchanged (*JDR*, *EJO*, *AJODO)* between January 1995 and December 1998 (extended to December 2002 for the *JO*).

Intervention: Adoption of a structured abstract format.

Control: Continued use of a non-structured abstract format.

Method: A combination of handsearching and the Cochrane Collaboration Oral H1ealth Group's Trials Register and/or CENTRAL were used to identify randomised controlled trials (RCTs) and controlled clinical trials (CCTs) over the selected time period. MEDLINE was used to identify clinical trials in the selected journals over the same time period.

Results: There was no significant difference in the sensitivity or yield of clinical trial retrieval in journals with either abstract format over time. However, there was a significant increase in precision in journals that did not change their format (OR=4.96 (95% CI 1.18, 20.86) but not those that did. There was no significant difference in the sensitivity or yield of clinical trial retrieval either before or after the change in format or precision of retrieval before the change. However, in the later period, the precision of retrieval was significantly better in journals with unstructured abstracts compared to those with structured abstracts (OR=0.17 (95% CI 0.04, 0.7).

Conclusion: The use of a structured abstract format does not improve the sensitivity, precision or yield of retrieval of clinical trials from MEDLINE.

Key words: Structured abstract, handsearching, electronic retrieval

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Introduction

In order to carry out systematic reviews of randomised controlled trials (RCTs), the relevant trials must not only be available, but also easily accessible. Systematic reviews of RCTs aim to bring together as much evidence from as many trials as possible to assess the effectiveness of particular interventions. However, if all the relevant trials are not picked up then this will lead to a biased pool of data. Any method that can increase the retrieval of trials' citations from electronic databases is therefore likely to be worthwhile. The use of structured abstracts is one such suggested method.

A structured abstract is an abstract that describes a study using specific content headings rather than paragraph format. Structured abstracts were proposed by the Ad Hoc Working Group for Critical Appraisal of the Medical Literature in 1987.[1] In March 2004, the editors of the Annals of Internal Medicine proposed a new type of structured abstract – a critical one.[2] The reason behind this proposal was a concern that abstracts might give the readers the impression that research has no flaws. A new 'Limitations' section, located immediately before 'Conclusions', was therefore added (Table 1). Reflecting on the limitations of a study can assist readers in deciding whether results apply to their patient or not.

Structured abstracts are now being used by an increasing number of journals and have been included as a recommendation in the CONSORT guidelines for

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reporting randomised clinical trials.[3] Dental and orthodontic journals have lagged behind in adopting a structured abstract format but a number have implemented this format for abstracts of articles reporting original research or reviews. They include the *Journal of Periodontology; Journal of Dentistry*; *Journal of Oral Pathology and Medicine; Journal of Prosthetic Dentistry; Journal of Orthodontics* (formerly British Journal of Orthodontics),[4] *Clinical Orthodontics and Research,*[5] *Cleft Palate Craniofacial Journal* (*CPJ*),[6] and more recently the *American Journal of Orthodontics and Dentofacial Orthopaedics* (*AJODO*).[7]

Figure 1 (Ref. 8) shows the conversion of an unstructured abstract for a randomised clinical trial published in the *AJODO* prior to the adoption of a structured abstract format and the CONSORT guidelines (The AJODO changed to a structured abstract format in January 2005).

There are two main ways in which structured abstracts could improve citation retrieval from electronic databases such as MEDLINE. The first is the addition, by authors, of more details within structured abstracts. This would give more opportunities for 'text-word' searching to retrieve their articles. Secondly, if structured abstracts encourage authors to include details of their study, they may otherwise not have included, indexers may be assisted in selecting more appropriate indexing terms.

The more help authors give by producing good abstracts, the more accurately the article is likely to be indexed and a search will retrieve that article from the database. It is therefore important for editors and publishers to have strict guidelines to ensure that authors are as meticulous in writing these abstracts as they are in conducting the original research.

In view of the limitations of electronic searching, where thorough searching is paramount, electronic searching must be extended to databases beyond MEDLINE and also accompanied by handsearching of journals. Handsearching is the inspection of a journal, page by page, in order to detect published and unpublished CCTs and RCTs, or information on trials such as abstracts and correspondence.

Table 1 Critical structured abstract format 2

1.	Background
2.	Objective
3.	Design
4.	Setting
5.	Patients
6.	Interventions
7.	Measurements
8.	Results
9.	Limitations
10.	Conclusions

The Cochrane Oral Health Group is one of the specialty-based groups contributing to the International Cochrane Collaboration. The objectives of this group are to create a database of all clinical trials related to oral health and to prepare systematic reviews of topics of interest. The handsearchers send the information to OHG's Trials Search Co-ordinator. Any trials which have not been identified previously by electronic searching are downloaded into the OHG's trials register, which is in turn uploaded into the CENTRAL database in The Cochrane Library.[9] Thus the OHG's Trials Register is a compilation of trials found by handsearching journals and electronic searching several databases.

The objectives of this study were to assess whether structured abstracts improved the sensitivity, precision and yield of retrieving clinical trials, using electronic searches e.g. MEDLINE, from dental journals.

The null hypothesis was that there is no difference in retrieval of articles reporting clinical trials that were published with structured abstracts compared with those published with non-structured abstracts against the alternative hypothesis of a difference.

Method

Design

This was a retrospective observational study.

Sample and setting

Clinical trials, published in six dental journals between January 1995 and December 1998 were identified. However, the time period examined for the *Journal of Orthodontics* was extended from January 1995 to December 2002 due to the delay in implementation of the change in format. These time periods were chosen so that trials published in the issues a year prior to and a year after the date of change in abstract format were included. This also allowed changes over time to be assessed.

The journals selected included three that had adopted a structured abstract format and three that continued to use unstructured abstracts in this period. There were two general dental journals – *British Dental Journal* (*BDJ*) and *Journal of Dental Research* (*JDR*); three specialist orthodontic journals – *Journal of Orthodontics* (*JO*) [formerly the *British Journal of Orthodontics*], *European Journal of Orthodontics* (*EJO*), *American Journal of Orthodontics and Dentofacial Orthopedics*

Clinical effectiveness of fluoride- releasing elastomers. I: Salivary Streptococcus mutans numbers. Wilson and Gregory (1995)

Abstract as Published

The purpose of this study was to examine the effect of fluoride-releasing elastomers on salivary *Streptococcus mutans* numbers. Twenty-four patients with fixed orthodontic appliances were randomly divided into experimental and control groups consisting of 12 patients each. Conventional elastomers were in place while two baseline whole saliva samples were collected from each subject in both groups at their regular appointments. After the second baseline sample was taken, conventional elastomers were replaced with fluoride-releasing elastomers in the experimental group, whereas conventional elastomers were continued in the control group. Three saliva samples were then collected from all subjects at 1-week intervals. Conventional elastomers were placed in all subjects while two postexperimental saliva samples were collected at regular appointments. Results showed that the control group demonstrated no significant changes ($p > 0.05$) in the percentage of *S. mutans* over the 13-week study period. However, after the fluoride-releasing elastomers were placed, the percent of salivary *S. mutans* decreased significantly ($p < 0.01$) in the experimental group. There was no significant effect after the fluoride-releasing elastomers were in place for 2 or more weeks.

Suggested Structured Abstract

***Background*:** The presence of fixed orthodontic appliances leads to an increase in the absolute number and percentage of salivary *Streptococcus mutans*. This may be responsible for decalcification or white-spot formation during orthodontic therapy. Use of topical fluoride is one possible method of reducing the risk of decalcification during orthodontic treatment.

Objective: To determine the effect of fluoride–releasing elastomers on salivary *S.mutans* numbers.

Design: A randomised controlled clinical trial.

Setting: Orthodontic Dept, Emory University, USA.

Patients: 24 patients, undergoing orthodontic treatment with edgewise appliances, were randomly divided into experimental and control groups each consisting of 12 patients.

Interventions: Patients were assigned to an experimental group with fluoride-releasing elastomers or a control group with conventional elastomers.

Outcome Measures: Number and percentage of *S.mutans* in unstimulated whole saliva samples. Measured at baseline, during intervention period and post-intervention over a 13-week period.

Results: The control group showed no significant change ($p > 0.05$) in the percentage of *S.mutans* over the 13-week study period. However, after the fluoride releasing elastomers were placed at the 4-week mark, the percentage of *S.mutans* decreased significantly ($p < 0.01$) in the experimental group at the 5-week period. From week 6 to 13, there was no significant effect.

Limitations: No sample size calculation. No inclusion criteria in terms of oral hygiene, pre-existing periodontal disease and caries. **Conclusions:** Fluoride releasing elastomers will temporarily reduce the levels of *S.mutans*.

Figure 1 Comparison of non-structured and structured abstracts [Clinical effectiveness of fluoride releasing elastomers. I: salivary streptococcus mutans numbers. Wilson and Gregory (1995)][8]

(*AJODO*); and a specialist journal related to orthodontics – *The Cleft Palate-Craniofacial Journal* (*CPJ*). These journals were selected to represent a range of dental journals. They included journals that were of particular interest to the authors and ones with a high impact factor. The journals that had adopted a structured abstract format included *BDJ*, *CPJ* and *JO*. The journals that continued to use a non-structured abstract format included the *EJO*, *AJODO*, and *JDR*.

Sample size

The sample size was determined by the number of clinical trials published in the relevant journals over the test period.

Methods

All RCTs and CCTs were identified through handsearching and use of the Cochrane Collaboration Oral Health Group's Register for each journal over the test period. One author (HAS) handsearched the *CPJ* (1995–1997, January and September 1998) and the *JO* (1999–2002) to update the OHG's Trials Register and include the RCTs and CCTs for the test period of this study. The results for the remaining papers were obtained from the Cochrane Collaboration Oral Health Group's Register.

MEDLINE was used to identify RCTs and CCTs in the selected journals over the relevant time periods. The searches were limited to identifying studies in humans from 1995–1998 for the *BDJ*, *CPJ*, *EJO*, *AJODO*, *JDR* and from 1995–2002 for the *JO*. The identified literature was then further limited to MEDLINE 'Publication Type' – 'clinical trial' and then to 'randomised controlled trial'.

RCTs and CCTs, identified through handsearching, were collated for each journal and the following criteria recorded: *Author(s), Title of article, Reference Classification – CCT or RCT, Year, Identifed up by MEDLINE (Yes/No)*. In addition to this any articles that had been identified by MEDLINE, but not handsearching, were recorded. The full papers of all the aforementioned articles were then obtained and examined in order to determine whether it was a report a clinical trial or if the study had been misclassified.

Reliability

Sixteen clinical trials were reassessed for the reliability study. This represented a random sample of 9% of the total number of clinical trials. A randomisation list was prepared by one author (JEH) and each article was re-evaluated by a second author (HAS), who was blinded to the original findings, at least three months after the initial search.

Statistical analysis

The sensitivity, precision and yield of retrieval of clinical trials by MEDLINE were calculated for each of the six journals before and after the change to a structured abstract format.

Sensitivity is defined as the proportion of positives (clinical trials) that are correctly identified by a method.

$$\textbf{Sensitivity} = \frac{\text{Number of CTs identified by a method}}{\text{Total number of known CTs}}$$

Precision is the number of relevant items (clinical trials) retrieved out of the actual number of items (all reports) identified by a method.

$$\textbf{Precision} = \frac{\text{Number of CTs identified by a method}}{\text{Total number of reports identified by a method}}$$

Yield looks at how the use of a specific method increases the number of clinical trials retrieved.

$$\textbf{Yield} = \frac{\text{Number of CTs added by handsearching}}{\text{Number of CTs identified by MEDLINE}}$$

Key

A method = handsearching or MEDLINE

CTs = clinical trials

Intra-journal comparison. Odds ratios and 95% confidence intervals were calculated to assess whether there was a statistically significant difference in the sensitivity, precision and/or yield, of retrieval of clinical trials by MEDLINE:

1. from each journal, published before and after the introduction of the structured abstract format, or at a midpoint of the time examined i.e. intra-journal comparison;
2. published in journals that remained unchanged (*AJODO, EJO, JDR*) versus those published in journals that adopted structured abstracts (*BDJ, CPJ, JO*), i.e. inter-journal comparison.

Percentage agreement scores were calculated to assess intra-examiner agreement for the MEDLINE retrieval during the reliability study.

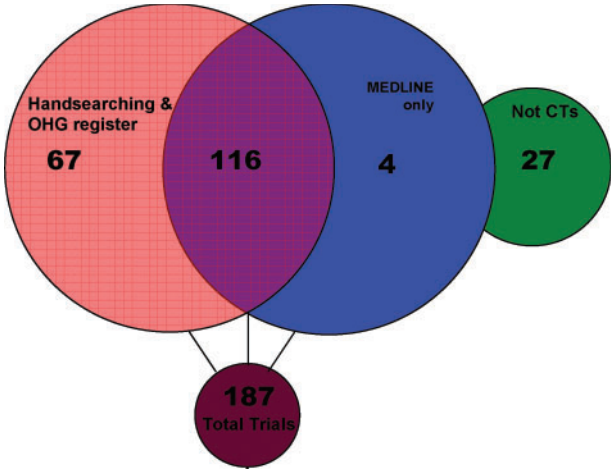

Figure 2 Number of clinical trials identified by hand and electronic searching

Results

Reliability study

The reliability study revealed 100% agreement with the original search.

Total number of clinical trials

The combined results of handsearching each issue of the six chosen journals and the electronic MEDLINE search, between January 1995 and December 1998 (extended to December 2002 for *JO*), identified 187 clinical trials.

Handsearching and the OHG register identified 183 trials. The MEDLINE search identified 116 of the 183 (63.4%) trials that had been found by handsearching journals together with an additional 31 citations. The full papers of the 31 unmatched MEDLINE citations were examined and of these 27 (87.1%) were found not to be clinical trials. These included thirteen observational, nine retrospective and five *in vitro* studies. The remaining four (12.9%) were found to be clinical trials (three RCTs and one CCT; see Figure 2).

Intra-journal comparison

There was no significant difference in the sensitivity of retrieval of clinical trials from MEDLINE in the journals that did not change their format [odds ratio=1.23 (95% CI 0.55, 2.73)] or those that did [odds ratio=1.05 (95% CI 0.40, 2.75)] over the selected time period (Table 2).

There was, however, a statistically significant increase in the precision of retrieval of clinical trials from MEDLINE in the journals that did not change their abstract format over the test period [odds ratio=4.96 (95% CI 1.18, 20.86); see Table 3].

There were no statistically significant differences in precision in the journals that did change their format with time (odds ratio=1.18 (95% CI 0.38, 3.60) or the yield of either the journals that did not (odds ratio=0.90 (95% CI 0.28, 2.94) or those that did (odds ratio=0.62 (95% CI 0.23, 1.68) change their format over the time period studied (see Table 4).

Inter-journal comparison

There was no statistically significant difference in the sensitivity between the journals that remained the same and those that changed format, either before or after the change in format. The odds ratio for the sensitivity was 1.06 (95% CI 0.41, 2.71) before the change and 0.90 (95% CI 0.39, 2.06) after (Table 5).

There was no significant difference in the precision of retrieval between journals that remained unchanged and those that changed to a structured abstract format before the transition (odds ratio=0.71 (95% CI 0.23, 2.24). However, there was a significant difference after the change in format, with the precision being greater in the journals that retained the non-structured abstract format [odds ratio=0.17 (95% CI 0.04, 0.7); Table 6]. Finally, there was no significant difference in the yield

Table 2 Sensitivity for journals that did change and did not change their format

	No change		Change	
Sensitivity	Pre-	Post-	Pre-	Post-
+	24	51	22	23
−	15	26	13	13
Total	39	77	35	36
	Odds ratio= 1.23 (95%CI 0.55–2.73)		Odds ratio= 1.05 (95%CI 0.40–2.75)	

Table 3 Precision for journals that did not change and did change their format

	No change		Change	
Precision	Pre-	Post-	Pre-	Post-
+	24	51	22	23
−	7	3	9	8
Total	31	54	31	31
	Odds ratio= 4.96 (95%CI 1.18–20.86)		Odds ratio= 1.18 (95%CI 0.38–3.60)	

between journals that changed and those that remained unchanged prior to [odds ratio=0.68 (95% CI 0.21, 2.19] or following the change to a structured abstract format [odds ratio=1.25 (95% CI 0.46, 3.37; Table 7].

Discussion

The results of this study suggest that the use of a structured abstract format does not improve the sensitivity, precision or yield of retrieval of clinical trials from MEDLINE.

Limitations of the study

This was a retrospective study, which, by its nature was open to bias. However, all clinical trials were identified by hand searching and electronic searching (using MEDLINE). It is possible that mistakes were made and articles that should have been included in the sample were omitted or not found. Conversely, some studies may have been included that were not clinical trials. However, the likelihood of including non-clinical trials was small, as 97.9% of the clinical trials were identified by handsearching. The remaining 2.1% that were identified by MEDLINE were then handsearched to confirm they were clinical trials.

The study was open to an element of human and computer error. Care was needed when recording the comparisons of the OHG handsearching results with the MEDLINE search results. To minimise such error each

Table 7 Yield before and after change to structured abstract format

	Pre-		Post-	
Yield	No change	Change	No Change	Change
+	19	13	26	13
−	9	9	25	10
Total	28	22	51	23
	Odds ratio= 0.68 (95% CI 0.21, 2.19)		Odds ratio= 1.25 (95% CI 0.46, 3.37)	

Table 4 Yield for journals that did not change and changed their format

	No change		Change	
Yield	Pre-	Post-	Pre-	Post-
+	15	26	13	13
−	9	25	9	10
Total	24	51	22	23
	Odds ratio=0.90 (95% CI 0.28, 2.94)		Odds ratio=0.62 (95% CI 0.23, 1.68)	

Table 5 Sensitivity before and after change to structured abstract format

	Pre-		Post-	
Sensitivity	No change	Change	No Change	Change
+	24	22	51	23
−	15	13	26	13
Total	39	35	77	36
	Odds ratio=1.06 (95% CI 0.41, 2.71)		Odds ratio=0.90 (95% CI 0.39, 2.06)	

Table 6 Precision before and after change to structured abstract format

	Pre-		Post-	
Precision	No change	Change	No Change	Change
+	24	22	51	23
−	7	9	3	8
Total	31	31	54	31
	Odds ratio=0.71 (95% CI 0.23, 2.24)		Odds ratio=0.17 (95% CI 0.04, 0.7)	

assessment was limited to 15 clinical trials at any one time. This was then followed by a rest period.

Computer error was minimised by performing a reliability study on a random sample of 9% of the total number of clinical trials. There was 100% agreement with the original search suggesting 100% reliability of the MEDLINE search strategy. This was carried out at least three months after the original searches to take into account any changes with time in the principal investigator's searching ability and memory of having identified particular trials previously.

Comment should also be made about the different time period for the *JO* sample. The original editorial in the *JO*[4] announced the intent to change to a structured abstract but the actual change didn't occur until September 2001 following a change in Editor. This is in contrast to the editorials in the other journals[5–7] that announced the change in format of the abstracts that occurred in that edition of the journal. It is for this reason that the time period for the *JO* was extended to December 2002.

The sample size was determined by the number of clinical trials published in the relevant journals over the test period. However, the numbers in each journal were relatively small. A study by Markey and Harrison[10] highlighted the difficulty in selecting dental journals that contained sufficient numbers of clinical trials for use in research. They revealed the limited number of clinical trials that are available in the various dental journals.

The small sample size in the present study could have resulted in the study having insufficient power to detect a difference, resulting in a type II error. Lack of evidence of a difference in effect does not necessarily mean that that there was no difference in effect.[11] This then raises the question, could extending the time period over which the study was set and therefore increasing the sample size, have lead to a significant difference in retrieval of clinical trials between the non-structured and structured abstract groups? To test this theory the number of trials was firstly increased by a factor of 10 and then 20, etc. It was only when increased by a factor of 100 that a significant difference in the yield was found. The number of trials required to turn the non-significant results to significant is very high and is unlikely to be attainable in terms of the number of trials currently available for the post change data because most of the journals that changed to a structured abstract format only did so in the last 5–9 years. This suggests that to date, the results are a true negative, but that in time may become positive in favour of structured abstracts, once significant numbers of clinical trials have been published but this may be several years hence. By undertaking a retrospective power calculation this study had a power of 80% to detect a 20% increase in sensitivity.

The increase in precision of retrieval in the journals that did not change there format over time is an interesting finding. However, the exact reason for this is difficult to explain. There was no change in editor for the respective journals over this time period.

Comparison with other studies

In comparing our findings with those of previous studies there are areas of both agreement and disagreement. Dickersin *et al.,*[12] found that approximately half of relevant controlled trials on a topic may be missed by an electronic search even though most of the missed citations were in the database. Similarly, Bickley and Harrison[13] searched four leading orthodontic journals on MEDLINE using the indexing terms, 'Randomised controlled trial' or 'Controlled Clinical Trial' in the *Publication Type* field. They then compared the results to handsearching the four journals. They found that MEDLINE picked up 39.5% of the citations that had been found by handsearching together with an additional 12.5% of unmatched records. Of the unmatched records 82.4% were found not to be clinical trials. The remaining 15.8% were clinical trials and had been missed by handsearching. This took the percentage of trials retrieved by MEDLINE to 40.8% and those missed to 59.2%.

The findings of the present study are higher in terms of retrieval of clinical trials by MEDLINE at 64.2% with 35.8% being missed. However, the figures for false positives (not clinical trials) retrieved by MEDLINE in the present study (18.4%) are lower than those found by Bickley and Harrison (82.4%).[13]

The results of the present study confirm the view that electronic searching alone is likely to miss a substantial proportion of the clinical trials available as well as picking up a high percentage of trials that are not relevant. It also highlights the fact that handsearching, although regarded as the 'gold standard' is not 100% effective. Both electronic and handsearching should therefore be used in order to maximise retrieval of all the available evidence when undertaking systematic reviews.

To date, research on structured abstracts has focused on information content and has reported improvements in the information contained in them when compared to traditional abstracts. A recent study by Sharma and Harrison[14] found that scores for the abstracts from journals that maintained the use of a non-structured abstract did not increase significantly with time whereas the scores for the abstracts from the journals that adopted the structured abstract format did increase

significantly. It was, therefore, likely to be the change in abstract format that had a positive effect on the quality score rather than an improvement occurring over time irrespective of format. They concluded that structuring abstracts does improve their quality.

One of the main reasons for the introduction of a structured abstract format was to aid accurate indexing and retrieval of reports from computerised databases such as MEDLINE and EMBASE.[15] However, research assessing a structured abstract format and associated citation retrieval is not abundant.

The character of structured abstracts in biomedical journals indexed in MEDLINE over a three-year period, was studied by Harbourt *et al.*[16] The authors concluded that the presence of structured abstracts may be associated with other article characteristics leading to the assignment of higher numbers of MeSH headings, or may itself contribute to this phenomenon. However, the additional searchable terms are likely to assist in bibliographic retrieval. A further point highlighted by this article was that only two of the six journals required the original format of structured abstracts as published in the Annals of Internal Medicine in 1987. The remaining four specified a modification of this format. The authors felt that variations in the structured abstract formats were probably inconsequential to the reader, but will complicate more sophisticated use of structured abstracts in automated retrieval systems.

Wilczynski *et al.*[17] found improvements in the retrieval characteristics of some MeSH and text-words associated with the use of structured abstracts, but they also found improvements over time. The authors, therefore, concluded that structured abstracts improved the retrieval properties of some, but not all, text-words and medical subject headings.

In comparing the findings of the present study with previous studies, the first point to note is the different method. The previous studies investigated whether structured abstracts improved citation retrieval by assessing the assignment and retrieval performance of MeSH terms within search strategies, whereas the current study assessed the retrieval of clinical trials using the indexing field 'Publication type'.

The previous studies mentioned did not reach any definite conclusions about citation retrieval and the use of structured abstracts. Both studies[16,17] alluded towards an improvement associated with the use of structured abstracts, but were unable to exclude other confounding variables such as changes with time.

Electronic searches mainly rely on two things – the controlled vocabulary (in MEDLINE MeSH) terms assigned to the article by professional indexers and descriptors (text-words) used by the author/s in the title and abstract. By producing informative abstracts containing systematic information authors will assist indexers in assigning the appropriate MeSH that may help to increase citation retrieval. Furthermore, all journals should specifically request the use of the new critical structured abstract format as proposed by the editors of the Annals of Internal Medicine (2004), in their instructions to authors.[2]

Implications in practice

The results of this study suggest that changing the format of abstracts doesn't improve the retrieval of clinical trials from Medline which was one of the original reasons for introducing them.[1,2,6] Nevertheless, we still advocate the use of structured abstracts because they have been shown to improve the information provided in abstracts[14] and therefore make it easier for readers to evaluate whether an article is methodologically sound and applicable to their clinical situation which was another stated reason for introducing them.[1,6]

Conclusions

- The use of a structured abstract format does not improve the sensitivity, precision or yield of retrieval of clinical trials from MEDLINE.
- The null hypothesis was therefore accepted and we concluded that there is no difference in the sensitivity, precision and yield of retrieval of articles reporting clinical trials that were published with structured abstracts compared with those published with non-structured abstracts against the alternative hypothesis of a difference.

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