

# Characteristics and Quality of Systematic Reviews of Acupuncture, Herbal Medicines, and Homeopathy

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## Key Words

Systematic reviews · Meta-analyses · Acupuncture · Herbal medicine · Homeopathy

## Summary

**Background:** We aimed to describe the approaches and characteristics of systematic reviews on three major complementary therapies and to assess their methodological quality. **Methods:** Systematic reviews of clinical trials of acupuncture, herbal medicines, and homeopathy were identified from a database developed for the Cochrane Collaboration Complementary Medicine Field. Information on conditions, interventions, methods, results, and conclusions was extracted using a pre-tested form; methodological quality was assessed using the Oxman scale. **Results:** 115 reviews were included (39 on acupuncture, 58 on herbal medicine, 18 on homeopathy). Research questions were most specific in herbal medicine, and tended to be very general in homeopathy. The main comparison in most reviews was with placebo. The methodological quality of reviews was highly variable. Deficiencies were most frequent for the description of the selection process and the summary of the results of primary studies. **Conclusion:** Systematic reviews tend to approach different complementary therapies in different manner. Compared to a set of reviews on analgesic interventions methodological quality was slightly better on the average, but there is ample room for improvement in future complementary medicine reviews.

## Schlüsselwörter

Systematische Übersichtsarbeiten · Meta-Analysen · Akupunktur · Phytotherapie · Homöopathie

## Zusammenfassung

**Ziel:** Beschreibung von Ansätzen und Merkmalen sowie Bewertung der methodischen Qualität der vorliegenden systematischen Übersichtsarbeiten in drei relevanten Bereichen der Komplementärmedizin. **Methoden:** Systematische Übersichtsarbeiten zu klinischen Studien zu Akupunktur, Phytotherapie und Homöopathie wurden mit Hilfe einer für das Komplementärmedizinfeld der Cochrane Collaboration zusammengestellten Datenbank identifiziert. Informationen zu Patienten, Interventionen, Methoden, Ergebnissen und Schlussfolgerungen wurden mit einem Formular extrahiert. Die methodische Qualität wurde mit der Oxman-Skala bewertet. **Ergebnisse:** 115 Übersichtsarbeiten entsprachen den Einschlusskriterien (39 zur Akupunktur, 58 zur Phytotherapie, 18 zur Homöopathie). Die Fragestellungen waren in den Phytotherapie-Reviews deutlich konkreter als in den Homöopathie-Reviews. Der Vergleich erfolgte in allen Therapien am häufigsten zu Placebointerventionen. Die methodische Qualität der Reviews war in hohem Masse variabel. Typische Problembereiche waren die Beschreibung des Selektionsprozesses und die Zusammenfassung der Ergebnisse der Primärstudien. **Schlussfolgerung:** Die drei bearbeiteten komplementären Verfahren werden in systematischen Reviews unterschiedlich angegangen. Im Vergleich zu systematischen Reviews zu (zumeist konventionellen) analgetischen Interventionen war die methodische Qualität der komplementärmedizinischen Übersichtsarbeiten im Durchschnitt etwas besser.

## Introduction

In recent years many systematic reviews of clinical trials of complementary therapies have been published. Reviews play an important role in the assessment of these interventions. Complementary therapies are widely used, but their effectiveness is controversial, and health care professionals need reliable information to consult and answer questions of patients related to these treatments. Because health care professionals generally do not collect and critically appraise the widely dispersed available studies, they rely heavily on systematic reviews.

While systematic reviews are the best tool to summarize available evidence [10], they are inherently retrospective studies and open to numerous problems and biases. In the area of complementary medicine there are a number of additional challenges. For example, a relevant proportion of clinical trials are not published in journals listed in electronic databases, such as Medline or Embase [3, 5]. In addition, the way complementary therapies are approached sometimes differs from conventional medicine because research questions are more fundamental, such as 'is there any evidence that it works' rather than 'is intervention A more effective than B in the treatment of patients with condition C?'

To improve future reviews it is necessary to know how systematic reviews have been conducted in the past and to identify typical shortcomings. For the Cochrane Collaboration Complementary Medicine Field we collected and summarized systematic reviews on three major complementary therapies: acupuncture, herbal medicines, and homeopathy [4, 6, 7]. Within the framework of this project we also aimed to describe the approaches and methodological characteristics of the reviews and to assess their methodological quality.

## Methods

To be included, reviews had to meet the following criteria: 1) Report reviewed prospective (not necessarily controlled) clinical trials of acupuncture, herbal medicines, or homeopathy in humans. 2) Report explicitly described, at least, one of the following issues: a) methods for searching primary studies *and* eligibility criteria for primary studies; b) methods to assess quality aspects; c) methods to summarize the results of the primary studies. 3) Reports were published in journals, books, theses, or the internet. Reviews published before 1989 and as abstracts only were not included. 4) The primary focus of the report was treatment effects (not diagnosis, side effects, risks, etc.). There were no language restrictions.

The primary source for identification of systematic reviews was the register of the Cochrane Complementary Medicine Field. For compilation of this register a variety of databases including Medline, Embase, CISCOP, AMED, and other sources have been searched. In addition, we searched 1) Medline 1989 to July 2000 using a standard strategy to identify systematic reviews combined with the terms for the therapies; and 2) the Cochrane Library (last check in issue 2000, 3). Bibliographies of articles obtained and relevant textbooks were screened for further potentially relevant articles. A more detailed description of the search has been published elsewhere [7].

The literature list from the Complementary Medicine Field register was screened in a first step independently by two reviewers who excluded all references for which they were sure that the papers were not systematic reviews. Abstracts of the publications identified by other means were screened by one reviewer. Full copies were obtained for all potentially relevant papers. One (in 46% of papers), two (53%) or three (1%) reviewers<sup>1</sup> checked eligibility and extracted information (bibliographic details, topic, intervention, inclusion criteria, methodological issues, studies and number of patients included, results, and conclusions) from included reviews using pre-tested forms. The scientific quality of the reviews was assessed using the criteria list by Oxman et al. [11, 12]. This instrument contains the following 10 items: 1. Were the search methods reported? 2. Was the search comprehensive? 3. Were the inclusion criteria reported? 4. Was selection bias avoided? 5. Were the validity criteria reported? 6. Was validity assessed appropriately? 7. Were the methods to combine findings reported? 8. Were the findings combined appropriately? 9. Were the conclusions supported by the reported data? 10. What was the overall scientific quality of the overview? The instrument and instructions were used as published in [1]. Questions 1 to 9 can be answered 'yes' or 'no' with an additional option which is 'partially' in questions 1, 3, 5, 7, and 9, or 'can't tell' in questions 2, 4, 6, and 8. Question 10 is answered using a scale ranging from 1 (extensive flaws) to 7 (minimal flaws). Pre-discussion agreement between reviewers was quantified using intra-class correlation (two-way random effect).

## Results

A total of 115 reviews met the inclusion criteria; 39 were on acupuncture, 58 on herbal medicines, and 18 on homeopathy. The full references and a summary of the reviews has been published in [4, 6, 7]. Figure 1 shows that the publication of systematic reviews has increased greatly since 1989. Eighty-one percent of the reviews were published in journals, 13% electronically in the Cochrane Library, and the remaining reviews were published in reports, theses or the internet (table 1). Almost a third of reviews originate from one group, the department of Complementary Medicine at Exeter University. Twenty-two percent of reviews cannot be located through Medline; for homeopathy this proportion was 39%. Eighty-six percent of the reviews have been published in the English language.

The way research questions were approached differed considerably between the three complementary therapies. As expected acupuncture reviews rarely had a narrow interventions focus. They typically included all acupuncture. Only one review was restricted to a more specific intervention (stimulation of a defined point); however, both acupuncture and acupressure at this point were included. Reviews in herbal medicine were typically focussed on one herb and only rarely on a specific extract or preparation. Because preparations of herbs can be quite variable depending on the exact species, plant

<sup>1</sup> *Conflict of interest:* KL, DM and GtR have been involved in some of the reviews analyzed. These were extracted and assessed by other members of the team.



Fig. 1. Number of systematic reviews published between 1989 and 2000.

part, and extraction method, they can have very different pharmacological properties. The majority of homeopathy reviews, instead, rarely had a narrow condition focus. Twelve out of 18 reviews included studies on homeopathic treatments of a variety of diseases. The primary comparison for homeopathy was almost exclusively with placebo (in 17 of 18 reviews). This was also true for acupuncture and herbal medicine in the majority of reviews. The conditions investigated most often varied greatly between the therapies (table 1). Because reviews often addressed similar topics (for example, 10 reviews addressed *Hypericum* for depression or anxiety disorders), these figures must be interpreted with caution.

In many reviews the description of inclusion criteria was incomplete (table 2). Selection criteria regarding participants, interventions, control interventions, and outcome measures were not described in sufficient detail in 35%, 24%, 36%, and 56%, respectively. Whether the language of publication was a criterion was not mentioned in 51% of reviews. Six percent were explicitly limited to studies published in English. Due to the focus on the comparison with placebo, homeopathy reviews were more often restricted to placebo-controlled trials (44% vs. 31% for herbal medicine and 8% for acupuncture).

**Table 1.** Systematic reviews of acupuncture, herbal medicines, and homeopathy: bibliographic characteristics, questions and condition addressed

	Acupuncture	Herbal medicine	Homeopathy	All
<i>Number of reviews</i>	39	58	18	115
Year of publication (19..; median, range)	97 (89–99)	98 (89–2000)	97 (89–99)	98 (89–2000)
Cochrane reviews	4 (10%)	9 (16%)	2 (11%)	15 (13%)
Published as journal article	34 (87%)	45 (78%)	14 (78%)	93 (81%)
Performed by Exeter Compl. Med. Dpt.	11 (28%)	21 (36%)	5 (28%)	37 (32%)
Listed in Medline	30 (77%)	48 (84%)	11 (61%)	89 (78%)
Published in English	33 (85%)	52 (90%)	14 (78%)	99 (86%)
<i>Country of first author</i>				
UK	17 (44%)	27 (46%)	6 (33%)	50 (43%)
Germany	4 (10%)	12 (21%)	7 (39%)	23 (20%)
USA	6 (15%)	12 (21%)	1 (6%)	19 (17%)
Netherlands	9 (23%)	5 (9%)	2 (11%)	16 (14%)
Other	3 (8%)	2 (3%)	2 (11%)	7 (6%)
<i>Question</i>				
Narrow intervention focus	–	26 (45%)	4 (22%)	30 (26%)
Narrow condition focus	17 (44%)	31 (53%)	5 (28%)	53 (46%)
Explicit and testable hypothesis	12 (31%)	20 (35%)	10 (56%)	42 (37%)
Primarily comparison with placebo	20 (51%)	40 (69%)	17 (94%)	77 (67%)
Primarily comparison with other therapy	–	2 (3%)	1 (6%)	3 (3%)
Primarily comparison with no treatment	1 (3%)	1 (2%)	–	2 (2%)
Equivalent vs. placebo and other therapy	5 (13%)	12 (21%)	–	17 (15%)
<i>Most frequently reviewed conditions</i>				
No condition focus	2 (3%)	2 (5%)	8 (44%)	12 (10%)
Neurological	9 (16%)	13 (33%)	1 (6%)	23 (20%)
Cardiovascular	–	16 (28%)	–	16 (14%)
Musculo-skeletal	12 (31%)	2 (3%)	1 (6%)	15 (13%)
Psychiatric	4 (10%)	10 (17%)	–	14 (12%)

**Table 2.** Systematic reviews of acupuncture, herbal medicines, and homeopathy: information on inclusion criteria and literature search

	Acupuncture (n = 39)	Herbal medicine (n = 58)	Homeopathy (n = 18)	All (n = 115)
<i>Explicit inclusion criteria regarding</i>				
Patients/condition	29 (74%)	37 (64%)	9 (50%)	75 (65%)
Intervention	27 (69%)	45 (75%)	15 (83%)	87 (76%)
Control intervention	21 (54%)	37 (74%)	16 (89%)	74 (64%)
Outcome measures	16 (41%)	29 (50%)	6 (33%)	51 (44%)
Publication language	20 (51%)	31 (53%)	8 (44%)	59 (51%)
<i>Important inclusion criteria</i>				
Only placebo-controlled trials	3 ( 8%)	18 (31%)	8 (44%)	29 (25%)
Only randomized trials	21 (54%)	35 (60%)	9 (50%)	65 (57%)
Also uncontrolled trials	4 (10%)	2 ( 3%)	1 ( 6%)	7 ( 6%)
Explicitly only trials published in English	4 (10%)	2 ( 3%)	1 ( 6%)	6 ( 6%)
<i>Literature search</i>				
Not described in detail	–	8 (14%)	2 (11%)	10 ( 9%)
Explicitly in Medline	37 (95%)	51 (88%)	13 (72%)	101 (88%)
Explicitly in Embase	25 (64%)	39 (67%)	11 (61%)	75 (65%)
Explicitly in other databases	28 (72%)	40 (69%)	12 (67%)	80 (70%)
Explicitly screening bibliographies	30 (77%)	46 (79%)	13 (72%)	89 (77%)
Explicitly contacts with authors/experts	20 (51%)	29 (50%)	9 (50%)	58 (50%)
Explicitly contacts with industry	–	38 (66%)	6 (33%)	44 (38%)

An explicit restriction to randomized trials was mentioned only in 57% of reviews. In older reviews often ‘controlled clinical trials’ (without specification of the method of allocation) were included. In some reviews double-blinding was an additional criterion. Only 6% of reviews also included uncontrolled studies.

Fifty-five percent of reviews described how many reviewers were involved in the extraction and assessment process (in 49% two or more, in 6% only one reviewer; table 3). In 76% the quality of primary studies was assessed according to predefined methods: 45% used scores, 25% lists with single criteria, 4% both, and 2% other methods. The median number of included primary studies was 10 (range 0–107), the median number of included randomized trials 8 (0–89). There was one review that had not identified a single primary study meeting the inclusion criteria. A quantitative meta-analysis was performed in 40% of the reviews. Positive conclusions were most frequent for medicinal herbs and least frequent for acupuncture.

The quality of the included reviews was highly variable in all three areas (table 4). The description of the selection process was deemed sufficient in only 38% of reviews, the summary of primary study results in only 44%. However, for the latter item and the question whether the conclusions were supported by data, the agreement among assessors was not satisfactory (intra-class correlation coefficients < 0.40). On average the reviews scored 6.2 of 9 possible points on the Oxman scale. For question 10 (overall assessment of the scientific quality ranging from 1 = extensive flaws to 7 = minimal flaws) the average rating was 4.6.

## Discussion

Our analysis demonstrates that 1) the way questions are posed differs considerably between the three therapies; 2) review questions generally focus on comparison with placebo; and 3) many reviews have relevant methodological shortcomings or shortcomings regarding the descriptions of the methods used. A number of limitations should be kept in mind when interpreting our results. The analysis was restricted to three major complementary therapies and it is unclear whether the findings can be extrapolated to other areas. Due to the limited resources almost half of the included reviews were extracted and assessed by a single reviewer. Furthermore, due to the strong heterogeneity and the availability of pooled effect size estimates only in a minority of the reviews, it was not possible to investigate whether differences in approaches and quality had an impact on results and conclusions. Therefore, our analysis only provides some sort of descriptive epidemiology of the available systematic reviews in acupuncture, herbal medicine, and homeopathy.

The research questions addressed by the reviews were most specific in the area of herbal medicine. They are comparably well defined in relation to test and control interventions as well as to the condition (for example, ‘are Hypericum extracts more effective than placebo in the treatment of depressed patients?’). Acupuncture reviews generally define a certain condition focus, but the test intervention is typically all acupuncture (including all strategies with insertion of needles, but often also other means of stimulation at acupuncture points).

**Table 3.** Systematic reviews of acupuncture, herbal medicines, and homeopathy: methods, results and conclusions

	Acupuncture (n = 39)	Herbal medicine (n = 58)	Homeopathy (n = 18)	All (n = 115)
Extraction explicitly by > 1 reviewer	19 (49%)	31 (53%)	6 (33%)	56 (49%)
Extraction explicitly by 1 reviewer	1 (3%)	3 (5%)	3 (17%)	7 (6%)
<i>Formal quality assessment of trials</i>				
None	9 (23%)	14 (21%)	4 (22%)	27 (24%)
Score	16 (41%)	29 (50%)	7 (39%)	52 (45%)
Checklist	11 (28%)	13 (22%)	5 (28%)	29 (25%)
Score + single items	3 (8%)	1 (2%)	1 (6%)	5 (4%)
Other	–	1 (2%)	1 (6%)	2 (2%)
N included primary studies (median, range)	13 (2–51)	9.5 (0–53)	9.5 (3–107)	10 (0–107)
N included RCTs	8 (0–51)	7.5 (0–45)	7.5 (0–89)	8 (0–89)
<i>Calculation of effect size estimates</i>				
For single studies	11 (28%)	26 (46%)	11 (61%)	48 (42%)
Pooled	10 (26%)	26 (46%)	9 (50%)	45 (40%)
<i>Main conclusion</i>				
Clearly positive	–	10 (18%)	2 (12%)	12 (11%)
Positive with reservations	14 (39%)	36 (63%)	7 (41%)	57 (52%)
Ambivalent	14 (39%)	10 (18%)	4 (24%)	28 (26%)
Negative with reservations	5 (14%)	1 (2%)	4 (24%)	10 (9%)
Clearly negative	3 (8%)	–	–	3 (3%)
Unclear	3 (8%)	1 (2%)	1 (6%)	5 (4%)

Regarding the control interventions inclusion criteria are typically varied, as well (for example, all non-acupuncture interventions). A typical research question would be ‘is acupuncture effective for treating low back pain?’ For homeopathy the questions tend to be even broader, for example ‘is homeopathy any different from placebo?’ The way research questions are posed reflects the different plausibility of the therapies as well as their specific characteristics. For acupuncture the restriction to defined intervention strategies is difficult in most cases, similar to non-drug interventions such as physiotherapy. However, it should be clear that the different way of approaching intervention strategies implies that results and conclusions of these reviews cannot be used in the same manner for clinical decision making. The focus on the comparison with placebo reflects the generally low a priori credibility and the fact that for most conditions investigated only ‘soft’ and subjective outcomes can be measured.

The methodological quality of the systematic reviews was highly heterogeneous. The description of the selection process and the summary of primary study results were deemed insufficient (mainly due to frequent use of vote counting methods) in more than half of the reviews. The average quality in our review set was rated slightly higher than in a set of 80 systematic reviews of analgesic interventions [1] using the same instrument with the same instructions. Still, there is ample space for improvement in complementary medicine reviews.

Our experiences with the quality assessment instrument by

Oxman et al. [11, 12] were mixed. Originally, the scale was developed to assess the scientific quality of review articles, not of systematic reviews only. The original rating instructions published in [1] are not very detailed and leave considerable room for interpretation. We added a few specifications to rule out major discrepancies, but we tried to keep these specifications at a minimum as we thought it problematic to modify a systematically developed instrument. While pre-discussion inter-rater agreement was good for the overall assessment and four single items it was only fair or poor for the remaining five. The lack of detail in the instructions is the most likely explanation for the discrepancies.

In 2000 Jadad et al. [2] published an assessment of systematic reviews on asthma treatments which included also two of the reviews included by us and performed by the first author of this article. While the assessments for these two reviews were similar for most of the single items, the overall rating of scientific quality was totally discrepant. Jadad et al. kindly provided us with the instructions they used; these included relevant additions and specifications to the original instructions which resulted in a significantly more severe rating, particularly for item 10 rating the overall scientific quality. It is problematic to modify the instructions of a scale in such a relevant manner, as the resulting assessments can not be compared with those based on the original instructions. However, we agree that most of the specifications and additions made by Jadad et al. make sense. Over the past 10 years systematic reviews have

**Table 4.** Systematic reviews of acupuncture, herbal medicines, and homeopathy: quality

Item	Acupuncture (n = 39)	Herbal medicine (n = 58)	Homeopathy (n = 18)	All (n = 115)	Agreement (ICC <sup>1</sup> )
Search methods reported	38 (97%)	44 (76%)	12 (67%)	94 (82%)	0.86
Comprehensive search	30 (77%)	44 (75%)	13 (72%)	87 (76%)	0.69
Inclusion criteria reported	23 (59%)	37 (64%)	10 (56%)	70 (61%)	0.73
Selection bias avoided	18 (46%)	22 (38%)	4 (22%)	44 (38%)	0.47
Validity criteria reported	28 (72%)	40 (69%)	13 (72%)	81 (70%)	0.80
Validity assessed appropriately	30 (77%)	45 (78%)	14 (78%)	89 (77%)	0.56
Methods for combining reported	18 (50%)	29 (56%)	11 (61%)	58 (55%)	0.49
Findings combined appropriately	13 (38%)	23 (44%)	9 (53%)	45 (44%)	0.37
Conclusions supported by data	26 (68%)	50 (88%)	12 (71%)	88 (79%)	0.39
<i>Overall scientific quality (range 1–7)</i>					
Mean (standard deviation)	4.6 (1.5)	4.7 (1.5)	4.6 (1.5)	4.6 (1.5)	0.72
Median (range)	4 (2–7)	5 (1–7)	5 (2–7)	5 (1–7)	
<i>Sum of single items (range 0–9)</i>					
Mean (standard deviation)	6.4 (2.2)	6.2 (2.4)	6.0 (2.4)	6.2 (2.3)	0.85
Median (range)	6.5 (2.0–9.0)	6.5 (0.5–9.0)	5.5 (2.0–9.0)	6.5 (0.5–9.0)	

<sup>1</sup> ICC = Intra-class coefficients (two-way random effect model).

almost replaced narrative reviews and quality standards have become higher. Therefore, the original instrument by Oxman et al. might no longer be sufficiently discriminative. One might consider repeating the validation process for a modified instrument using the new instructions.

In 1999 guidelines for the reporting of meta-analyses were published [9]. These guidelines should lead to an improvement in the future. Some of the recommendations, however, are only applicable to quantitative meta-analyses addressing clearly defined and narrow questions. Similar guidelines for systematic reviews with broader questions – as often posed in complementary but also in conventional medicine – are desirable.

Our findings that the majority of herbal medicine reviews had positive conclusions should be interpreted with caution. Several topics were addressed by more than one systematic review. About half of the herbal medicine reviews addressed Ginkgo, Hypericum or garlic. The often ambivalent or careful conclusions on acupuncture might be due to the strong heterogeneity of acupuncture and control interventions, and to the insufficient sample size in the overwhelming majority of acupuncture studies [7].

Based on the results as well as on experiences and impressions collected during our analysis we would like to present a number of proposals which might help to improve future reviews.

1) Given the relative paucity of primary research, complementary medicine reviews often have broad questions and wide selection criteria. Such ‘state of the art’ reviews are important, however, their main objective should be primarily descriptive (to summarize the available data as trans-

parently as possible). Firm conclusions are better derived from hypothesis-testing meta-analyses with a very narrow question and tight inclusion criteria. We propose to make more explicit in future whether a systematic review is intended to be hypothesis-proving or descriptive.

- 2) The selection criteria and the actual process of eliminating potentially eligible studies are crucial in the review process. Particularly the selection process has often been described insufficiently. As a minimum requirement reviewers should at least report references and reasons for exclusion for studies checked in more detail for eligibility.
- 3) The quality of primary studies has been assessed almost exclusively from a methodological perspective. In many reviews it seems questionable whether reviewers had expertise in regard to conditions and interventions covered. We recommend a review team should include experts for methodology, the treatment, and the condition under scrutiny.
- 4) While many of the available reviews have reported in great detail the results of their quality assessment, the summary of the actual results of the primary studies has often been insufficient. Summarizing disparate data is a difficult task; large tables will be necessary in most cases. Even if these tables are not very attractive they should be considered as essential.
- 5) Although systematic reviews aim to minimize bias and subjective judgement, readers should be aware that they are far from objective. We have shown that discrepancies between systematic reviews addressing the same questions are frequent [8]. Therefore, reviewers should interpret

their findings cautiously. It would be desirable that persons with very different a priori credit in the hypothesis investigated collaborate for a review to ensure that different viewpoints are reflected.

Descriptive empirical studies on sets of systematic reviews have been comparably rare up to now. With the large increase of meta-analyses in recent years this is about to change. Within the Cochrane Collaboration a number of such studies are underway (see the Cochrane Methodology Register in the Cochrane Library). Such meta-meta-analyses should contribute to further develop research synthesis methodology.

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## Note for Readers

References and summaries of the systematic reviews included in this analysis are available freely in the internet [see references 4, 6, and 7]. An SPSS file with the information extracted from the reviews and the quality assessment is available for private use from the corresponding author.

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