



National Prescribing Service Limited

Review of the Quality of Complementary Medicines Information Resources: Summary Report

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None of the collaborative teams hold a pecuniary interest in any of the CMs information resources reviewed

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Executive summary

Recent research conducted by the National Prescribing Service (NPS) has shown the need for improving complementary medicines (CMs) information availability and awareness for Australian health professionals and consumers.^{1,2} CMs information resources have been reported to be of variable quality, with some identified as inaccurate or misleading.³⁻⁶ To date, there has been no comprehensive evaluation of available information resources on CMs. In 2008, NPS commissioned an independent evaluation of CMs information resources to help the Australian community make better informed decisions around the quality use of CMs, in order to meet the demand for high quality information on CMs.

Methods

Definitions, criteria, measures and tools were developed for the evaluation, based on a comprehensive literature review. The evaluation involved four phases:

1. Identification of a list of CMs information resources linked from reputable sources.
2. Testing of resources against broad criteria encompassing currency, coverage, transparency and content quality to produce a manageable short-list of CMs information resources.
3. In-depth review of the short-listed CMs information resources conducted for the three domains of quality: technical quality, content quality and clinical utility.
4. Synthesis of findings and making of recommendations: Short-listed resources were scored and compared across the three domains of quality (triangulation), with a total score calculated for each resource. Resources were ranked according to whether their total scores and scores for each domain assessed in Phase 3 were above the upper 95% confidence interval of the mean scores of all individual resources. Key features of each resource, its intended target audience, profile format, strengths, weaknesses and costs were also compared.

Results

A search identified 52 CMs information resources from reputable sources, which were submitted to a brief short-listing process which considered: accessibility and currency, content, transparency, coverage and accuracy. If one resource within a package passed the short-listing process, any other resources which was interlinked within the package was evaluated in the in-depth review. The short-listing process identified resources from 19 information providers, with 26 resource variants for the in-depth review. Of these, there were six resources identified as the highest quality (Tier 1). This ranking was based on their total score, and scores for all domains: technical quality, content quality and clinical utility being above the upper 95% confidence interval of the mean of all short-listed resources. They were (in rank order):

1. *Natural Standard Professional Database package* (includes access to all levels of monographs [Professional, Bottom Line, Harvard, as well as other content that was not short-listed]). This package also allows access to a CM-drug interaction checker.
2. *Natural Medicines Comprehensive Database* (Health Professional Edition) - This package also allows access to a CM-drug interaction checker.
3. *Natural Standard Professional Database* - Professional monographs.
4. *Herbal Medicines & Dietary Supplements package* (each resource can be independently accessed through MedicinesComplete).
5. *Natural Standard Professional Database*. Bottom line monographs.
6. *MedlinePlus: Drugs, Supplements & Herbal Information* - Uses content for a subset of bottom line monographs from *Natural Standard Professional Database*.

There were three resources identified as high quality (Tier 2). This was based on their total score, and two of the scores for the domains: technical quality, content quality and clinical utility being above the upper 95% confidence interval of the mean of all short-listed resources. They were:

1. Barnes et al. *Herbal Medicines* (available as part of MedicinesComplete). 3rd ed. 2007.
2. *Natural and Alternative Treatments: EBSCO*.
3. Braun and Cohen. *Herbs and natural supplements*. An evidence-based guide 2nd ed. 2007.

Table 2 provides an overview of the strengths and weaknesses of each resource.

Discussion

Previous NPS research with consumers, general practitioners (GPs) and pharmacists identified a number of gaps in the quality use of CMs.^{1,2} Individuals in all groups lacked knowledge about the safety and effectiveness of CMs and many were unaware of independent and reliable sources of information on CMs. Busy GPs and pharmacists reported their need to access summary information while consulting with patients. They also reported a need to access more detailed information to answer specific clinical questions. The NPS research recommended that health professionals and consumers have access to independent, regularly updated and evidence-based resources on the Internet, in clinical software, phone advisory services and/or in paper format.^{1,2}

The current evaluation provided a comprehensive review of available CMs information resources, examining each resource against an extensive range of quality criteria in order

to identify resources that are of high quality, are regularly updated and apply evidence about safety and effectiveness. It demonstrated that only a limited number of resources provided quality technical attributes, together with quality content information, good coverage across the range of categories defined as complementary medicines and the ability to answer common questions asked by consumers and health professionals. Areas of deficiency were especially around the safety, efficacy and dosing of CMs. There is also a lack of direct linkage between evidence and the specific CM formulation/extract/salt used and poor coverage of Australian products. In most circumstances this was due to limited scientific evidence being available for many CMs.

As with all evaluations, there is potential for resources to be missed, criteria to be misunderstood and results to vary between individuals rating the various domains of quality. The consortium conducting this evaluation used a range of techniques to ensure a high quality evaluation was conducted. These included the use of more than one reviewer where content quality and clinical utility were rated, the blinding of reviewers to limit preferential scoring of resources, and the conduct of sensitivity analyses to ensure that individual reviewers, or type of CMs reviewed did not have an undue influence.

It should be noted that the results of this evaluation were based on the versions of the CMs information resources accessed in June to October 2008, and that the whole resource or individual monographs may have been updated or altered since that date.

Recommendations

Based on results of this review and the current need for easily accessible, evidence-based information to inform safe and appropriate decisions about CMs by consumers and health professionals, and in consultation with the NPS, we would recommend the following:

- That organisations responsible for providing information to consumers and health professionals about the safety and efficacy of complementary medicines such as drug information services and poisons information centres have access to one or both *Natural Standard Professional Database* or the *Natural Medicines Comprehensive Database (Health Professional Edition)* for use in conjunction with other evidence-based resources.
- That health professional and consumer organisations actively refer health professionals and consumers to the CMs resources, ranked as Tier 1 or Tier 2, as the preferred options for assisting with decisions around the use of CMs.
- That one or more of the Tier 1 or Tier 2 resources should be available to health professionals and consumers in various formats to support decisions about the quality use of CMs. Such formats would ideally include a web-based information resource and the incorporation of monographs and a CMs-drug interaction checker into clinical software. To assist in selecting the most appropriate resource for health professionals and consumers, further assessment of the usability and 'real life' utility for both health professionals and consumers is needed.

Background

Throughout the western world, the health care environment is rapidly changing and the past decade has seen increasing attention given to complementary and alternative medicines and therapies. Consumers can purchase a wide range of complementary medicines (CMs) from a variety of outlets. CMs are increasing in usage, with the 2008 National Prescribing Service (NPS) Consumer Survey revealing 65% of Australians had used one or more CMs in the last twelve months.⁷

Access to quality therapeutic information for both health professionals and consumers is an important component of ensuring Quality Use of Medicines (QUM). The current review is part of wider NPS research around the attitudes, information needs and preferences of consumers and health professionals about CMs.⁸ This research revealed that Australian general practitioners (GPs) and community pharmacists are not currently satisfied with the accessibility of information resources on CMs and found it difficult to easily find evidence-based information and commonly resorted to 'Googling'.¹ Previous research suggests that many sources of information about CMs may be inaccurate, misleading, and potentially lead to harmful events.³⁻⁶ Some professional societies recommend a range of CMs resources but few provide rationale for their recommendations. Identifying sources of evidence-based therapeutic information about CMs has the potential to:

- improve the quality of information available to health professionals and consumers
- improve quality use of CMs, and
- reduce harm associated with inappropriate use of CMs.

Aims and objectives

This review aimed to examine CMs information resources and identify high quality resources that may be suitable for use by Australian health professionals and consumers.

The specific objectives of the review were to:

- identify what CMs resources are available in electronic format (or could be adapted to such) from recognised information providers and academic institutions
- short-list CMs resources for an in-depth quality review, and
- identify the most suitable resource(s) currently available for use in Australia, and their costs.

Methods

Overview

The Mater – University of Queensland – Bond University CMs Collaborative (see Collaborative Team for members) conducted the project between 24th June and 3rd November 2008. The Collaborative was made up of the following:

- Project team (also part of the DI team), including:
 - Project Manager (TM) – organisation and oversight of project conduct and reporting, co-creation of evaluation tools.
 - Project Officer (JW) – conduct of literature review, co-creation of evaluation tools, co-ordinating Validation Panel reviews and assistance in reporting.
- Drug Information (DI) team – five drug information pharmacists who assisted with the clinical utility review and the formation of the methodology of the review.
- Evidence-Based Medicine (EBM) team – two specialists in evidence-based medicine and one in economic analysis who assisted in the development of the review methodology. One team member, a GP, also assisted with clinical utility review.
- Validation Panel – an inter-professional and consumer group, with a range of backgrounds including pharmacists, GPs, medical specialists, consumers and a naturopath. They provided input and feedback into the methodology for the review and assisted with the evaluations of CMs resources. Members of the DI and EBM teams were also members of the Validation Panel.

The project officer (JW) performed a comprehensive review of the literature to identify definitions, criteria, measures and tools prior to conducting the evaluation. The identified literature was used by the DI and EBM teams to develop the methodology and tools for the evaluation. The approach was then discussed via teleconference with the remaining members of the Validation Panel to reach consensus.

The evaluation took place in four phases between June and October 2008, and it should be noted that resources may have been updated since then, or that websites may no longer be active:

- Phase 1 Identify a list of CMs information resources which meet the objectives of the review, and arrange access to each resource.
- Phase 2 Conduct a preliminary assessment of the identified CMs information resources to identify a short-list for an in-depth review.
- Phase 3 Conduct an in-depth review of short-listed CMs information resources in three domains:
- a. Technical quality - Presence or absence of attributes of coverage, currency, transparency and utility in relation to the resource as a whole.
 - b. Content quality - Detailed evaluation of up to ten specific CMs monographs in each resource.
 - c. Clinical utility - Value to the user in answering and providing decision support for ten clinical questions commonly posed by health professionals and consumers.
- Short-listed resources were scored and ranked.
- Phase 4 Synthesise findings and make recommendations:
- A total score was calculated for each resource. The results were compared across the three domains of the in-depth review (triangulation). The project team collated results from the in-depth reviews of each resource, its key features, its intended target audience, profile format, strengths, weaknesses and costs. The Collaborative members assisted with interpreting the results, and making recommendations about suitable CMs resource(s) for use in Australia by consumers and health professionals.

Evaluation development

The bibliographic databases – Medline Ovid, Embase, and Meditext (INFORMIT) – were searched in July 2008, using the search strategy described in Appendix 1. Search terms were initially based on those used in previous studies that had systematically attempted to identify and assess such instruments.⁹⁻¹³ The title and abstract of retrieved English-language citations were screened for apparent relevance, and those accessible as full text were reviewed to locate the presence or absence of an evaluation tool. Further assessment of definitions and measures took place only for those containing an evaluation tool or explicit criteria of 'quality.' The search was extended to include the Internet using search engines Google.com and Altavista.com. The first fifty websites that appeared on each search engine were included.

Screening of the identified articles and websites initially found 80 websites/information evaluation tools, with over 400 explicit criteria of "quality".^{10,14-24 13,25-37} However, as there was considerable duplication and overlap between the tools and criteria identified, the final number of generic evaluation tools whose criteria were subjected to further evaluation and incorporation into a draft tool was 18.

The evaluation criteria chosen were those commonly cited in health informatics reviews, and where their criteria or scoring system were frequently incorporated into evaluation tools.

Three major constructs of quality were identified, and the following evaluation tools with explicit criteria and scoring were developed:

- Technical quality evaluation tool – Measured the presence or absence of attributes of coverage, currency, transparency and utility in relation to the information resource, as a whole (see Appendix 2).
- Content quality – Evaluation of representative CMs monograph content of each information resource for coverage (evidence of comprehensiveness of coverage), currency (evidence of current literature being incorporated), transparency (evidence of content being accurate, balanced with no major errors of omission or commission) and utility (within the organisation and language of the monographs) (see Appendix 3)
- Clinical utility – Value to the user in answering and providing decision support for a range of sample clinical questions.

Phase 1: Identify a list of CMs resources linked from reputable sources

A search strategy was utilised to identify a list of CMs information resources from reputable resources by examining the following: an NPS literature review³ and scoping document, updated literature search of bibliographic databases, table of contents of selected journals for reviews, health professional association websites, library catalogues and university websites, and publisher websites and Collaborative recommendations (see Appendix 1 for detailed strategy). The search strategy focused on searching for quality information resources recommended or mentioned by recognised organisations and journals, and as such did not include every available information resource on CMs.

Resources that met the following six key inclusion criteria were sought:

- English language.
- Recently published or updated (2006 to current).
- Contained a collection of profiles/monographs/summaries/synthesised data on a range of individual CMs.
- Accessible in Australia at the time of review (July 2008).
- Had a target audience of health professionals or consumers, and could be used by health professional students, by academics or by researchers.
- Contained an electronic component or could be distributed electronically (even if currently only in hardcopy distribution).

A resource was excluded if it was a bibliographic database, systematic review or database of systematic reviews, journal, or textbook about CMs in general rather than focusing on individual CMs, or a website consisting mainly of links to other websites. Full access to each of the resources was arranged, with most resources being accessible through the University of Queensland library; however, in some cases free trials were organised or the resources were purchased.

CMs information resources identified by the search strategy were then sent to the Validation Panel members to identify any additional resources that met the six inclusion criteria above.

Phase 2: Produce a short-list of resources

The project manager and officer worked with the collaborative members to develop a short-listing process that evaluated the CMs information resources on the list to produce a short-list which met pre-determined criteria. The project officer (JW) reviewed each resource, using the short-listing criteria below. An NPS research officer (JB), independent of the Collaborative, subsequently checked the results to ensure a standard approach to the short-listing process. Resources were checked for the following:

1. Accessibility and currency

- a. Available at the time of review for purchase, subscription or free access in Australia
- b. Evidence that CMs monographs have been updated within the previous two years

2. Content

- a. Monographs in English language
- b. The majority of monographs contain key information about a CM, i.e. botanical/common names, indications/efficacy with some discussion of evidence, safety (side effects, contraindications, drug interactions) and doses

3. Transparency

- a. Identifies author(s)/editor(s)/review board.
- b. All monographs checked contain references or a bibliography.

4. Coverage

- a. Contains monographs with information about CMs from ≥ 3 CMs areas (i.e. herbal medicines, vitamin and mineral supplements, other nutritional supplements, traditional medicines, homoeopathic medicines and aromatherapy oils).

AND

- b. Contains $\geq 75\%$ of monographs for 20 commonly used CMs. Either from:
 - i. a list compiled from three published US studies: ³⁸⁻⁴⁰ aloe, bilberry, cranberry, echinacea, garlic, ginkgo, ginseng, glucosamine, goldenseal, grape seed, green tea, kava, lecithin, melatonin, fish oil/omega-3 fatty acids, saw palmetto, Siberian ginseng, St John's wort, valerian and vitamin C.

OR

- ii. a list of commonly used Australian CMs: Lactobacillus acidophilus, black cohosh, chamomile, coenzyme Q10, cranberry, echinacea, evening primrose oil, fish oil, garlic, ginkgo, ginseng, glucosamine, melatonin, olive leaf, peppermint, St John's wort, valerian, vitamins B, C and E.

5. Accuracy

Resources were included if they passed at least three of the following tests:

- a. Resource and individual monographs must distinguish between Siberian ginseng (*Eleutherococcus*) and *Panax* ginseng.
- b. Monograph for kava must include warnings about potential hepatotoxicity, include hepatotoxicity in a list of adverse drug reactions or include a discussion of case reports of liver toxicity.
- c. Cranberry monograph must not promote cranberry as treatment for urinary tract infection with no warning about lack of evidence or potential danger if the infection is untreated with antibiotics. Evidence only supports cranberry use for prophylaxis of UTI.
- d. Monographs for either feverfew or horse chestnut must include a Cochrane review in references or bibliography. There have been two Cochrane reviews, but as they were published in 2004 and 2006, this is not a test for currency.

While each CMs information resource was initially reviewed separately, some resources formed individual components of a 'package.' Some packages contained stand alone resources, the monographs of which could be searched and browsed in isolation e.g. MedicinesComplete and Natural Standard. Others contained interlinked monographs such as Natural Medicines Comprehensive Database and Sloan Kettering. Resources within interlinked packages, which individually would not have met short-listing criteria, were included in the shortlist, as part of a package. Non-linked CMs resources that did not meet short-listing criteria were not further evaluated.

Phase 3: Conduct an in-depth review of resources

An in-depth review was conducted on each of the short-listed resources in three domains:

- a. Technical quality – Presence or absence of attributes of coverage, currency, transparency and utility in relation to the resource as a whole.
- b. Content quality – Detailed evaluation of up to ten specific CMs monographs in each resource for accuracy and completeness of information (Reviewers were blinded to the source of the monographs).
- c. Clinical utility – Ability to answer and provide decision support for ten clinical questions commonly posed by health professionals and consumers.

The scoring for these domains is explained in more detail below. Standardised scores out of one hundred were calculated for each resource in each domain.

Technical quality

The project officer (JW) conducted the assessment of technical quality, which involved examining for the presence of general characteristics and scope of each resource as a whole, and scoring each resource based on a standardised tool. The DI Team developed a technical quality evaluation tool (TQET) based on the results of the literature review, with revisions following discussions with other members of the Collaborative (a summarised version is provided in Appendix 2). The TQET assessed four broad areas of technical quality, with the adjusted weightings for the total score for technical quality in brackets:

- Coverage (30%) – Amount and range of information covered in the resource. This includes number of different CMs and the types of information present in each monograph.
- Currency (25%) – The resource's updating policy and evidence that the resource has been recently updated.
- Transparency (25%) – The sharing of information in an open and accountable manner. This includes editorial and authorship information and how well the resource is referenced.
- Utility (20%) – Functionality and organisation of the resource.

Content quality

Members of the validation panel conducted the assessment of content quality, performing a comprehensive evaluation of individual monographs for up to ten CMs from each of the resources. The DI team developed a content quality evaluation tool (CQET) which was revised by other Collaborative members; the final version is provided in Appendix 3. Issues evaluated by the CQET included: coverage (evidence of comprehensiveness of coverage), currency (evidence of current literature being incorporated), transparency (evidence of content being accurate, balanced with no major errors of omission [critical information missing], or errors of commission [misleading statements]) and utility (within the organisation and language of the monographs).

Consistent with a previous approach⁴¹, a set of critical facts for each of the ten designated CMs was extracted by the DI team using a range of resources (minimum of three CMs-based and other drug information resources) and a bibliographic search of EMBASE and Medline (2002–current) to identify any new safety or efficacy information.

This information was incorporated into the CQET template to provide an assessment guide for reviewers.

The ten CMs selected represented a range of CMs types, for a variety of indications, in common usage or asked about frequently to Australian drug information services. The CMs selected were cranberry, valerian, selenium, St John's wort, melatonin, lavender, Bach Rescue Remedy, Siberian ginseng, gotu kola and *Lactobacillus acidophilus*. Each member of the collaborative was assigned one or more individual CMs to review and score across the short-listed information resources (which had a monograph on that CM), with a minimum of two members assigned to each CM. In order to minimise bias, materials identifying the origin of each information resource such as name, logos, footers, URLs and hyperlinks were removed by the DI team. However no changes were made to design or layout.

Clinical utility

The assessment of clinical utility involved testing the short-listed resources for their ability to answer ten questions commonly posed by Australian consumers and primary care health professionals. Each short-listed CMs resource was assessed on the depth of its ability to answer a selection of ten common questions received by Medicines Line (consumer) and Therapeutic Advice and Information Service (community-based health professional) drug information phone services that related to CMs.^a

The DI team developed a clinical utility evaluation tool (CUET) which had five standardised criteria to assess and quantify the depth to which each resource was able to answer the question and the clinical applicability of the information. Each reviewer could assign a maximum of three marks to each question. The criteria were:

- Provides information on/states the CM issue(s) of interest/concern to enquirer.
- Describes a rationale (i.e. theory/ mechanism/ pharmacological/ pathophysiological basis) for CM issue of interest/ concern.
- Discusses available evidence (and/or level of documentation).
- In-text referencing on issue of interest.
- Discusses clinical implications to assist decision support.

The questions were devised to involve commonly asked questions about CMs, common enquiry types and recurring questions and involved questions from both consumers and health professionals.

^a Medicines Line provides consumers with independent information on prescription, over-the-counter and complementary medicines. Medicines Line is a phone information service funded by the NPS and operated by pharmacists at Mater Health Services Brisbane Limited. It provides independent, accurate and evidence-based information about medicines to consumers.

The Therapeutic Advice and Information Service (TAIS) is a medicines information line specifically for community-based health professionals including doctors, pharmacists and nurses. It is funded by the NPS, and staffed by a consortium of specialist drug information pharmacists.

Consumer questions

1. Are there any interactions between warfarin and glucosamine?
2. What natural medicines are safe to be used for a cold while pregnant, in particular echinacea, vitamin C and zinc? NB: This was scored as three questions for each CM of interest.
3. Is evening primrose oil effective for premenstrual syndrome?
4. Can saw palmetto cause an increase in blood pressure?
5. Is there an interaction between St John's wort and the oral contraceptive pill?

Health professional questions

1. What evidence is there that vitamin B₁ (thiamine) is effective as a mosquito repellent?
2. What is the recommended washout period between stopping St John's Wort and starting a selective serotonin reuptake inhibitor?
3. Request for information regarding effectiveness, dosage and safety of fenugreek in breast-feeding.
4. Would you expect metformin to interact with a homoeopathic product (which states 30C^b) taken to treat hyperglycaemia?
5. Should ginkgo biloba be stopped before surgery?

An evidence-based answer of critical facts in the CUET template format was developed by the DI team using a range of resources including previous Medicines Line and TAIS responses, bibliographic databases (*EMBASE*, *Medline*) and *Micromedex*, specialty texts such as *Brigg's Drugs in Pregnancy* and *Stockley's Drug Interactions*, and a variety of CMs information resources. Where a CMs information resource was used in developing the answer, a minimum of three resources were utilised.

Evaluations were conducted independently by members of the DI team (JW, TM, GM) and a GP (MVD). Reviewers assessed the resource's ability to generate practical information that would be relevant within a clinical environment.

To generate a final score of clinical utility, all scores (i.e. for each question and each reviewer) were summed. This total score (maximum of 108 marks, i.e. 45 for health professional questions and 63 for consumer questions) was then standardised as a percentage. The package scores presented in Table 2 (p.19) represent the highest mark which was scored in any of the individual resources it combines. Within this scoring system, absence of information was scored as a zero and included within the summed total scores. This approach aimed to ensure that the capacity of a resource to answer each question was reflected in the total score. This is in contrast to the scoring methods used for content quality, where the quality of available monographs was estimated, and thus a mean score controlling for the number of available monographs was utilised.

^b Serial dilution is one of the core foundational practices of homeopathy. In the centesimal or "C scale", a substance is diluted by a factor of 100 at each stage. The end product is often so diluted that it is indistinguishable from the dilutant (pure water, sugar or alcohol). A 30C dilution is dilution by a factor of 10⁶⁰.

Sensitivity analysis

There were three opportunities to test the robustness of review findings through sensitivity analyses:

- The technical quality assessment involved adjusted weightings for coverage, currency, transparency and utility. The collaborative provided weighting options for these attributes to assess whether a change in weighting would change the de-identified resources' rankings.
- The content quality assessment involved a number of CMs which were evaluated by different reviewers to get a broad perspective of opinions from consumers to a range of health professionals. This approach had the potential to introduce some variability into this part of the review. An NPS research officer, independent of the collaborative, conducted a sensitivity analysis to assess if this occurred. The step-wise removal of one or more CMs was conducted and the ranking of each de-identified resource was re-assessed.
- The clinical utility assessment comprised a common subset of questions to drug information phone services and two of these questions were deemed to be potentially influential on the results as they were not specific to one CM. The questions were about:
 - usage of CMs for a cold in pregnancy
 - interactions with homoeopathic preparations.

An NPS research officer, independent of the collaborative, conducted the step-wise removal of the scores from these two questions and the ranking of each resource was reassessed.

Phase 4: Synthesise findings and make recommendations

A total score for each resource (individual and packages) was then calculated by averaging the scores across the three domains. To allow the differentiation of resources which were clearly above average from other short-listed resources, resources were ranked as follows:

- Tier 1 - Scored above the upper 95% confidence interval for the mean total score of all individual resources^c and all three domains.
- Tier 2 - Scored above the upper 95% confidence interval for the mean total score of all individual resources^c and two of the three domains.
- Tier 3 - Scored above the upper 95% confidence interval for the mean total score of all individual resources^c and one of the three domains.
- Un-tiered - Remaining resources not falling into the above three tiers.

The results were compared across the three domains of the in-depth review (triangulation). The project team collated results from the in-depth reviews of each resource, its key features, intended target audience, profile format, strengths, weaknesses and costs. The collaborative members assisted with interpreting the results, and making recommendations about suitable CMs resource(s) for use in Australia by consumers and health professionals.

^c Where a resource was available in a package format, with individual components which can be combined (Natural Standard Professional Database and MedicinesComplete), the package score was not included in the calculation of the mean of all individual resources.

Results

Phase 1: List of CMs resources

Phase 1 identified 52 CMs information resources, which are included in the list shown in Appendix 4.

Phase 2: Short-list

Nineteen information resources passed the short-listing process. Where an included resource directly linked to consumer or patient information, this information was also assessed for quality. Therefore, some information resources contained more than one monograph to be assessed for content quality. Also some resources could be purchased as a 'package' allowing for greater coverage of CMs and different levels of information. There were also information providers who licensed some of their content to be hosted by websites, which varied in their functionality and number of monographs. This meant that twenty-six resource variants in total were considered for the in-depth evaluation in Phase 3. (Table 1)

Table 1. Short-listed resources

Resource	Abbreviation
Free websites	
Complementary and Alternative Medicine Index (CAM): University of Maryland Medical Center http://www.umm.edu/altmed/ (Content provider: ADAM)	<i>UMMC</i>
Complementary Medicine, Health Library: Edward Hospital and Health Services http://www.edward.org/body.cfm?id=688&oTopId=688 (Content provider: ADAM)	<i>Edward Hospital</i>
Research integrative medicine: ADAM (© Living Naturally) http://www.livingnaturally.com/common/LN_library/DisplayMonograph.asp?name=ConsLookups_Herbs&storeId=9ES5FKAQ17S92ND700AKHLBD345CAAB3 (Content provider: ADAM)	<i>Living Naturally</i>
DrugDigest http://www.drugdigest.org	<i>DrugDigest</i>
Complementary/Integrative Medicine: University of Texas MD Anderson Cancer Center (information from Natural Standard Clinical Bottom Line monographs) http://www.mdanderson.org/departments/cimer/ (Content provider: Natural Standard)	<i>MD Anderson</i>
MedlinePlus: Drugs, Supplements & Herbal Information: (information from Natural Standard Bottom Line monographs)* http://www.nlm.nih.gov/medlineplus/druginformation.html (Content provider: Natural Standard)	<i>MedlinePlus</i>
About Herbs, Botanicals & Other Products: Memorial Sloan-Kettering Cancer Center (Healthcare Professional monographs) http://www.mskcc.org/mskcc/html/11570.cfm	<i>Sloan-Kettering HP</i>
About Herbs, Botanicals & Other Products: Memorial Sloan-Kettering Cancer Center (Consumer monographs) http://www.mskcc.org/mskcc/html/11570.cfm	<i>Sloan-Kettering Cons</i>
Natural & Alternative Treatments (EBSCO) https://healthlibrary.epnet.com/GetContent.aspx?token=af362d97-4f80-4453-a175-02cc6220a387&chunkid=33802	<i>EBSCO</i>

Resource	Abbreviation
Online Subscription resources	
MedicinesComplete package- (combination of Mason P. Dietary Supplements. 3rd edition. and Barnes J, Anderson LA, Phillipson JD. Herbal Medicines. 3rd ed. http://www.medicinescomplete.com)	<i>MedsComplete Pkg</i>
Natural Medicines Comprehensive Database (Health Professional Edition)* http://www.naturaldatabase.com NB: This includes access to 'Patient Handouts' which have been evaluated as "consumer edition"	<i>Nat Meds HP</i>
Natural Medicines Comprehensive Database (Consumer Edition)* http://www.naturaldatabase.com	<i>Nat Meds Cons</i>
Natural Standard Professional Database Package* http://www.naturalstandard.com/	<i>Nat Std Pkg</i>
Natural Standard Professional Database Professional Monographs* http://www.naturalstandard.com/	<i>Nat Std Prof</i>
Natural Standard Professional Database Clinical Bottom Line Monographs* http://www.naturalstandard.com/	<i>Nat Std Btm Line</i>
Natural Standard Professional Database Harvard Monographs* http://www.naturalstandard.com/	<i>Nat Std Harvard</i>
Review of Natural Products (as part of Facts and Comparisons) http://www.factsandcomparisons.com	<i>Rev of Nat Products</i>
IMGateway http://www.imgateway.net	<i>IMGateway</i>
Books and e-books	
Mason P. Dietary Supplements. 3rd ed. 2007, London: Pharmaceutical Press. (CD, book and online through MedicinesComplete)	<i>Dietary Supps</i>
Barnes J, Anderson LA, Phillipson JD. Herbal Medicines. 3rd ed 2007, London: Pharmaceutical Press (CD, book, and online through MedicinesComplete)	<i>Barnes et al.</i>
Braun L, Cohen M. Herbs and natural supplements: An evidence-based guide 2nd ed. 2007 Sydney: Elsevier Mosby (CD and book)	<i>Braun & Cohen</i>
PDR for herbal medicines. 4th ed. 2007 Montvale, NJ:Thomson. (CD available separately) (also included in Health & Wellness Resource Centre; Thomson Gale [part of Electronic Resources Australia (ERA)] Thomson Healthcare and as an additional module to Micromedex through HCN)	<i>PDR</i>
Ernst E, Pittler MH, Wider B. The Desktop Guide to Complementary and Alternative Medicine: An evidence-based approach. 2nd ed. 2006, Edinburgh; Elsevier Mosby (CD and book)	<i>Ernst et al.</i>
Kuhn MA, Winston D. Winston and Kuhn's herbal therapy and supplements, a scientific and traditional approach 2nd ed. 2008. Philadelphia : Lippincott Williams & Wilkins (book only)	<i>Winston & Kuhn</i>
Sanson L. Australian Pharmaceutical Formulary and Handbook. 20th ed. 2006 Pharmaceutical Society of Australia (CD and book)	<i>APF</i>
Skidmore-Roth L. Mosby's handbook of herbs & natural supplements 2006 St Louis: Elsevier Mosby (book only)	<i>Mosby's</i>

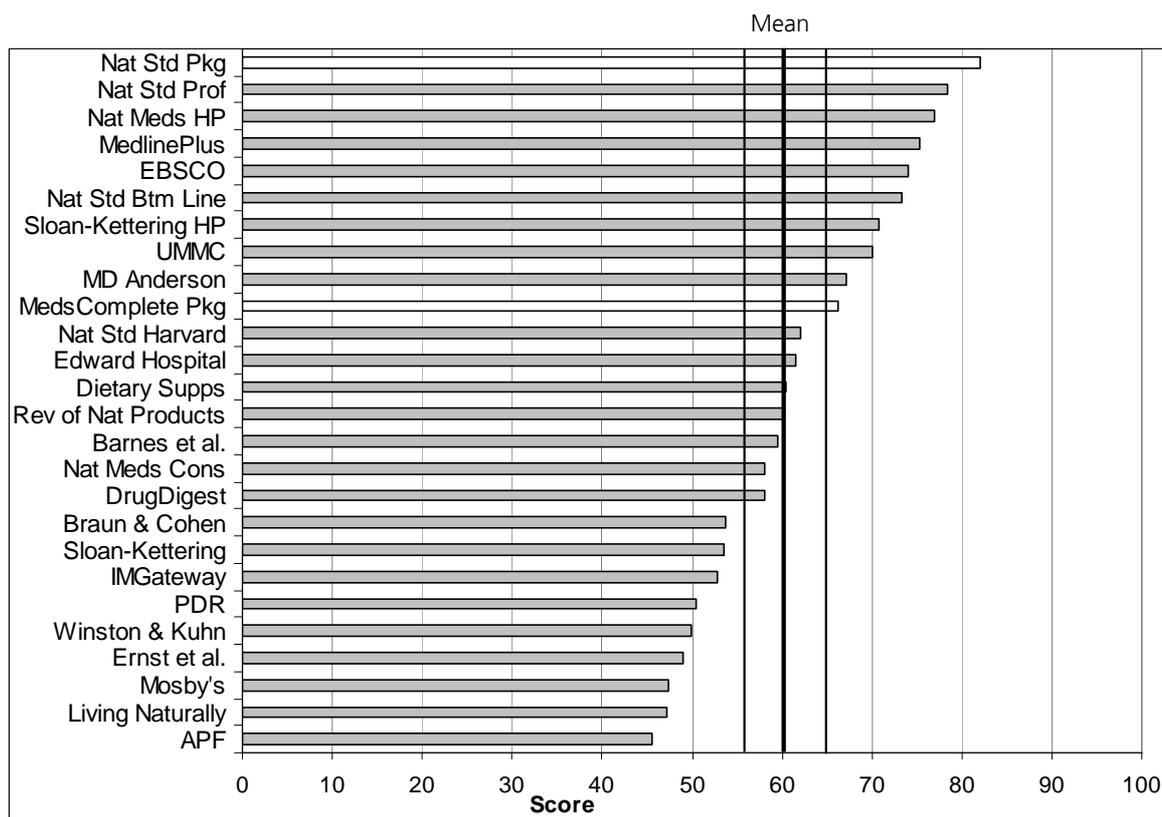
* Natural Standard Professional Database includes non-linked types of herb/supplement monographs: of which in-depth professional monographs, abbreviated bottom line monographs, and further abbreviated Harvard monographs met short-listing criteria. Some of this information has been licensed to other websites where it can be freely accessed. Some information is available in books, PDA format or by institutional subscription.

Phase 3: In-depth review

Technical quality

Figure 1 shows the scores for technical quality with those above the upper 95% confidence interval being *Nat Std Pkg*, *Nat Std Prof*, *Nat Meds HP*, *MedlinePlus*, *EBSCO*, *Nat Std Btm Line*, *Sloan-Kettering HP*, *UMMC*, *MD Anderson* and *MedsComplete Pkg*.

Figure 1. Technical quality scores (mean 60.7, 95% confidence interval 56.3–65.1)



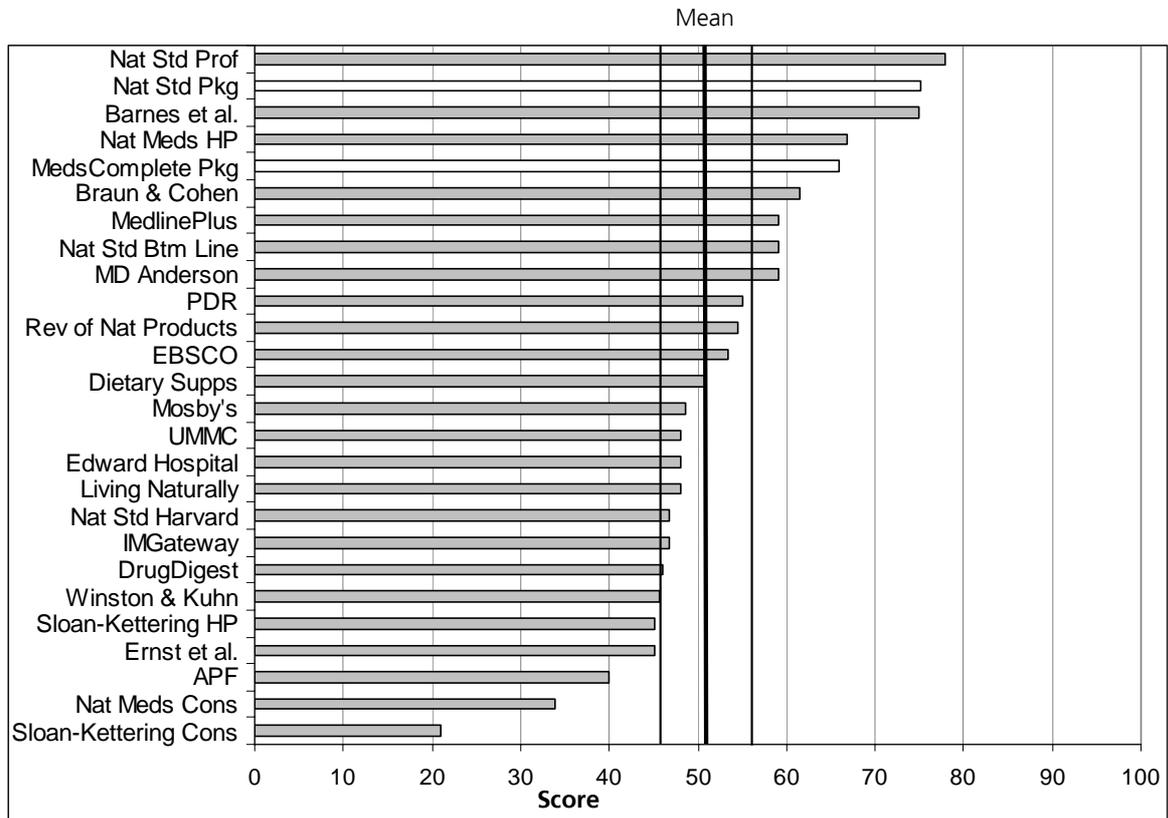
NB: Package resources are indicated by white bars.

The scores for the packages were not included in the calculation of the means and confidence intervals.

Content quality

Figure 2 shows the scores for content quality with those above the upper 95% confidence interval being *Nat Std Prof*, *Nat Std Pkg*, *Barnes et al.*, *Nat Meds HP*, *MedsComplete Pkg*, *Braun & Cohen*, *MedlinePlus*, *Nat Std Btm Line* and *MD Anderson*. One resource, *Sloan-Kettering Cons* scored well below the average.

Figure 2. Content quality scores (mean 51.5, 95% confidence interval 46.4–56.6)

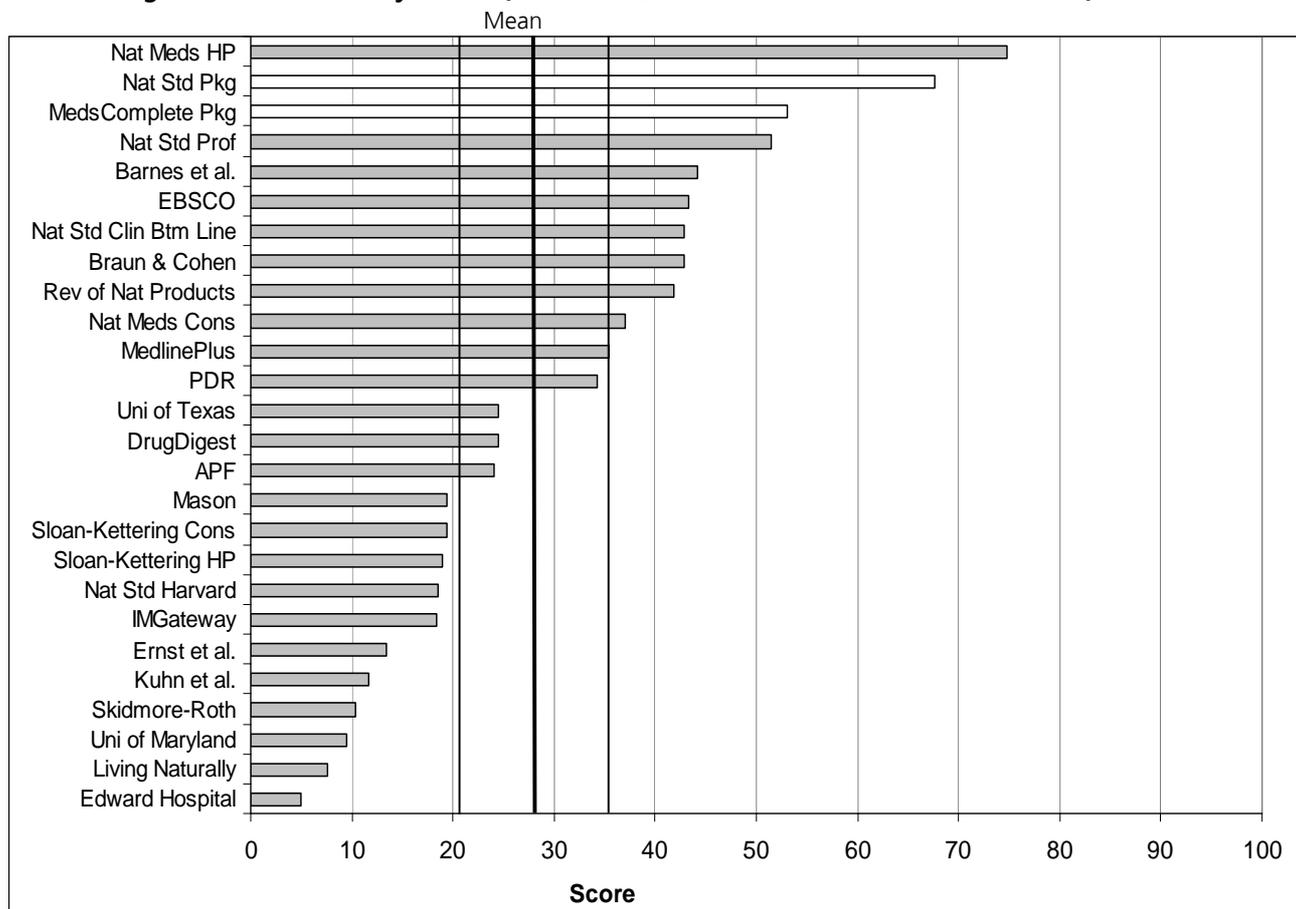


NB: Package resources are indicated by white bars.
The scores for the packages were not included in the calculation of the means and confidence intervals.

Clinical utility

Figure 3 shows the scores for clinical utility with those above the upper 95% confidence interval being *Nat Meds HP*, *Nat Std Pkg*, *MedsComplete Pkg*, *Nat Std Prof*, *Barnes et al.*, *EBSCO*, *Nat Std Btm Line*, *Braun & Cohen* and *Rev of Nat Products*. Of note, there was great variability in clinical utility scores with a range of 4.9 to 74.8, reflecting a range of issues: lack of detail in monographs, lack of range of information pertinent to Australians, lack of monographs on CMs in usage in Australia.

Figure 3. Clinical utility scores (mean 28.0, 95% confidence interval 20.9–35.2)



NB: Package resources are indicated by white bars.

The scores for the packages were not included in the calculation of the means and confidence intervals.

Sensitivity analyses

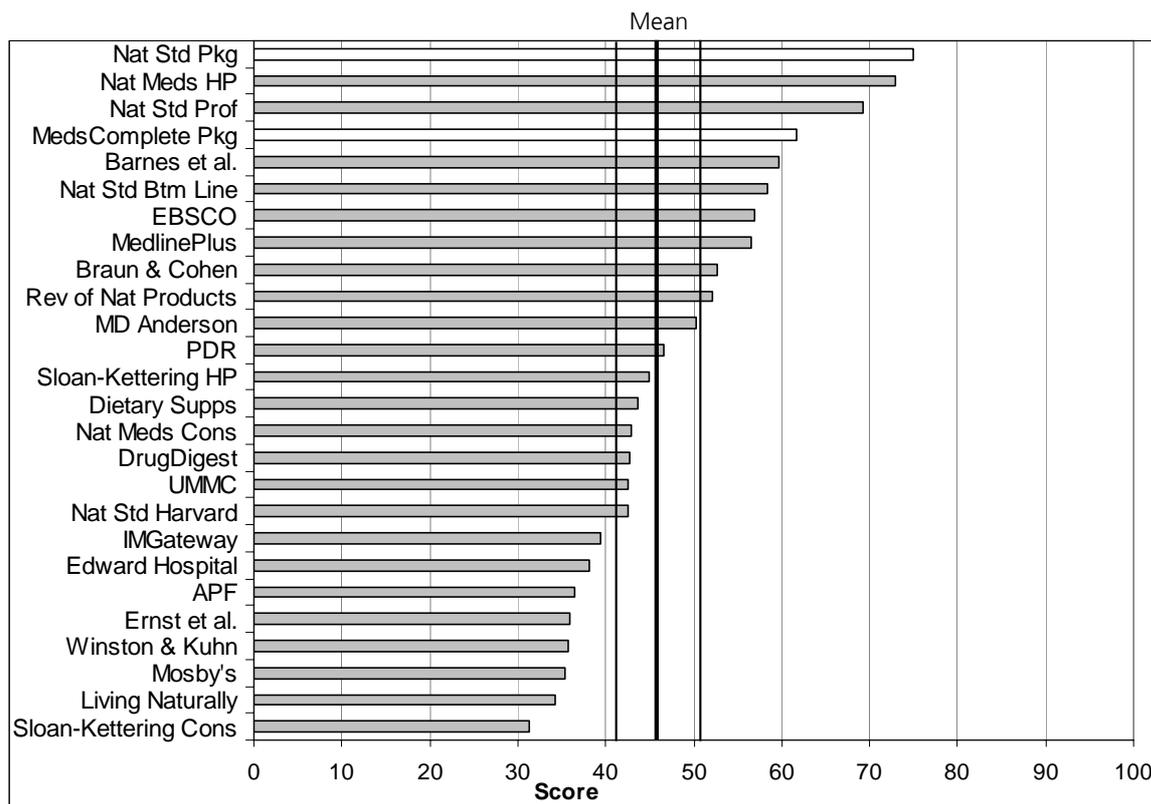
The sensitivity analysis to assess the impact of changes in weightings to the components of technical quality showed that, regardless of the change in weighting of these attributes, the top six ranked resources remained in the top six. The analysis to investigate the removal of one or more monographs from the content quality assessment revealed only small variations in scores. There were no significant alterations in ranking for content quality, with slight changes of one to three ranks, at most, for some models. The top three individual resources (*Nat Std Prof*, *Barnes et al.*, *Nat Meds HP*) consistently scored above the other resources. The stepwise removal of two clinical utility questions showed changes in scores of up to 15% for resources that lacked information on the topics covered by the questions. The top four ranking resources (*Nat Meds HP*, *Nat Std Pkg*, *MedsComplete*, *Nat Std Prof*) scored consistently above the other resources. Middle ranked resources had a little more variability. The sensitivity analyses confirmed that the ranking of top tier resources remained robust.

Phase 4: Synthesise findings

Total scores

Figure 4 shows the total scores (equally weighted average of the three domains) with those above the upper 95% confidence interval being *Nat Std Pkg*, *Nat Meds HP*, *Nat Std Prof*, *MedsComplete Pkg*, *Barnes et al.*, *Nat Std Btm Line*, *EBSCO*, *MedlinePlus*, *Braun & Cohen* and *Rev of Nat Products*. As might be expected, packages scored highly as they combined the benefits of their components.

Figure 4. Total averaged scores (mean 46.7, 95% confidence interval 42.0–51.4)



NB: Package resources are indicated by white bars.

The scores for the packages were not included in the calculation of the means and confidence intervals.

Synthesis of findings

Six resources were classified as Tier 1, three as Tier 2 and one as Tier 3 resources.

The resources were classified as Tier 1 (highest quality) if their total score, and all three of the scores for the domains: technical quality, content quality and clinical utility were above the upper 95% confidence interval of the mean of all short-listed resources. The six resources, ranked in order, were:

1. *Natural Standard Professional Database package* (includes access to all levels of monographs [Professional, Bottom Line, Harvard, as well as other content that was not short-listed] – This package also allows access to a CM-drug interaction checker.
2. *Natural Medicines Comprehensive Database* (Health Professional Edition) – This package also allows access to a CM-drug interaction checker.
3. *Natural Standard Professional Database* – Professional monographs.
4. *Herbal Medicines & Dietary Supplements package* (each resource can be independently accessed through MedicinesComplete).
5. *Natural Standard Professional Database* – Bottom Line monographs.
6. *MedlinePlus: Drugs, Supplements & Herbal Information* – Uses content for a subset of bottom line monographs from *Natural Standard Professional Database*.

There were three resources identified as high quality (Tier 2). This was based on their total score, and the scores for two of the domains: technical quality, content quality or clinical utility being above the upper 95% confidence interval of the mean of all short-listed resources. They were:

7. Barnes et al. *Herbal Medicines* (available as part of MedicinesComplete). 3rd ed. 2007.
8. *Natural and Alternative Treatments: EBSCO*.
9. Braun and Cohen. *Herbs and natural supplements*. An evidence-based guide 2nd ed. 2007.

One resource was identified as Tier 3. This was based on total score, and the score for one of the domains: technical quality, content quality or clinical utility being above the upper 95% confidence interval of the mean of all short-listed resources. The resource was:

10. *Review of Natural Products* (in Facts and Comparisons).

A summary of the scores and strengths and weaknesses of the Tiered resources can be found in Table 2. Information about the un-tiered resources is shown in Appendix 5.

Table 2. Summary of results for top-tiered resources (NB: Shading indicates resource scored above the upper 95% confidence interval of the mean)

Resource	Format	Target audience (health professional/consumer)	Monograph profile	Interaction checker tool	Number of CMs monographs	Evaluation scores				Evidence rating	Strengths and weaknesses	Costs US\$0.668 = A\$1 (31/10/08)	
						Technical quality /100	Content quality /100	Clinical utility /100	TOTAL /100			Individual user	Up to 5 users in an institution

TIER 1 RESOURCES

Natural Standard Professional Database <i>package*</i>	online subscription database	Both	Detailed	✓	~600	82.0	75.2	67.6	74.9	✓	Evidence-based; All levels of monographs plus information on medical conditions; Frequently updated	N/A	~ US\$1495 per year (subject to size of institution)
Natural Medicines Comprehensive Database (Health Professional Edition)	online subscription database, book	Health professional + consumer summary	Detailed + consumer summary	✓	~1100	77.0	66.9	74.8	72.9	✓	Evidence-based; strengths in safety information, detailed drug interactions info; Frequently updated; Some Australian CMs trade names; Includes consumer summary	US\$92 per year	~ US\$3000 – \$4000 per year (subject to size of institution)
Natural Standard Professional Database* – Professional monograph	subset of an online subscription database, book	Health professional	Detailed		~600	78.4	77.9	51.4	69.2	✓	Evidence-based; strengths in efficacy, safety and dosing information Most detailed and comprehensive monographs within the <i>Nat std pkg</i> Provides links to PubMed/abstracts	N/A	Available only as part of a package (see above)
Herbal Medicines & Dietary Supplements <i>package</i> (MedicinesComplete)	online subscription	Health professional	Detailed + limited summary		~225	66.2	66.0	53.0	61.7		The package allows access to a broader range of CMs; Some Australian CMs trade names.	US\$295 per year	~ US\$3800 per year
Natural Standard Professional Database* – Bottom Line monograph	subset of an online subscription database, book	Both	Detailed		~600	73.4	59.1	42.8	58.4	✓	Strengths in efficacy, safety and dosing information; Briefer monograph than the professional version; less detail on evidence of efficacy; Bibliography links to Pubmed and abstracts; no in-text referencing	N/A	Can be hosted on a website – fee by negotiation
Drugs, Supplements & Herbal Information: <i>MedlinePlus</i>	website	Both	Detailed		~85	75.4	59.1	35.4	56.6	✓	Contains monographs sourced from <i>Nat std btm line</i>		Free

Resource	Format	Target audience (health professional/consumer)	Mono-graph profile	Inter-action checker tool	Number of CMs monographs	Evaluation scores				Evidence rating	Strengths and weaknesses	Costs US\$0.668 = A\$1 (31/10/08)	
						Technical quality /100	Content quality /100	Clinical utility /100	TOTAL /100			Individual user	Up to 5 users in an institution

TIER 2 RESOURCE

Barnes et al. Herbal medicines (part of MedicinesComplete)	online subscription (e-book)/, book, CD	Health professional	Detailed + limited summary		~150	59.6	75.0	44.2	59.6		Evidence-based, rated strongly on efficacy and safety information Only information on herbal medicines. Some Australian CMs trade names. Monographs on individual CMs thorough with extensive discussion of evidence	US\$155	~ US\$2000 per year
EBSCO – Natural & Alternative Treatments	website	Both	Detailed		250–300	74.1	53.4	43.3	56.9		Rated well across the range of evaluations Very current; frequent updates Good descriptive language Brief information on adverse effects and drug interactions Facility for emailing information	Free	Information can also be hosted on a website – fee by negotiation
Braun L, Cohen M. Herbs and natural supplements: An evidence-based guide	book with CD	Health professional	Detailed		~120	53.7	61.6	42.8	52.7		Australian Rated well on content quality Limited reporting of negative findings within some monographs Rated well on clinical utility and has useful clinical notes Did not rate well on technical quality due to format (unable to print from CD)	A\$84 = US\$56	N/A

TIER 3 RESOURCE

The Review of Natural Products (in Facts and Comparisons)	online subscription database, book	Health professional	Detailed + limited summary		~400	60.2	54.5	41.9	52.2		Available as part of the Facts and Comparisons database Links to PubMed abstracts Layout cumbersome and difficult to read Poor coverage of adverse effects and drug interactions	US\$500 per year	US\$400 per concurrent user
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Discussion

There is currently no CMs information resource that performs perfectly in all areas of quality tested. Despite the variable quality of the resources evaluated, this review has identified a number of Tier 1 and Tier 2 resources that performed well, and are worthy of further usability testing. All Tier 1 resources showed content strength in relation to safety information, with evidence to support efficacy for most Tier 1 resources.

This review, however, identified some weaknesses in CMs information resources. Many lacked detailed information in regards to dosage, particularly in special populations such as in children. This is not necessarily a failing of the resources, but is because of a lack of controlled trials on the majority of CMs. It presents a research need. Coverage of Western herbal medicines generally seems to be the focus of many CMs information resources, with lesser information available on traditional medicines, homoeopathy, aromatherapy and nutritional products. Another weakness in information available for the Australian environment is the poor coverage of Australian products and the lack of direct linkage to the specific CM formulation/extract/salt used in clinical trials referred to in the monographs (whether to an Australian or an overseas product). The only resources that had some Australian product names were Natural Medicines Comprehensive Database (Health Professional Edition) and *Barnes et al.* Herbal Medicines (part of MedicinesComplete). As consumers and health professionals find it difficult to distinguish which CMs products have been clinically tested, information resources should not only comment on study outcome but explicitly identify the brand, active constituent, salt, strength and dose form researched in the clinical trial.

NPS research has revealed that many GPs and pharmacists prefer information in a brief and clear format where they do not have to spend time searching for the information they require.¹ The research also reported the health professional need, at times, to access more detailed information to answer specific clinical questions and to better understand how CMs may be used safely and effectively in their practice. Survey and focus group participants suggested resources could be integrated into existing dispensing and prescribing software, or included in existing drug information resources such as the Australian Medicines Handbook and Therapeutic Guidelines.

In the current review, most highly ranked resources presented information in a detailed monograph which had fairly comprehensive coverage on individual CMs and had word counts ranging from approximately 1000 to 5500 words. Of Tier 1 and Tier 2 resources, only MedicinesComplete and Review of Natural Products also contained summary profiles (of 360 and 200 words respectively), providing some information on efficacy and risks. Of the nine information resources that contained a summary profile, all except Review of Natural Products omitted dosing information. Integration of brief yet comprehensive summaries of Tier 1 or Tier 2 resources into existing dispensing and prescribing software would therefore require considerable publisher modification.

In contrast, a number of health professionals, especially those working in community pharmacy, noted interest in hard copy resources.¹ This can be facilitated as many of the highly ranked resources are also available in book format. The results of the current review present an opportunity to publishers and producers of existing tools and resources to work together in order to meet potential client needs for CMs information.

Consumer research has shown that Australians desire CMs information from their healthcare providers, particularly doctors and pharmacists, and also complementary medicine practitioners.² Australian consumers also commonly access CMs information from places which may not be evidence-based, such as the Internet, friends, family and the media.² Research, including the current review, confirmed that many Internet-based

CMs information sites are commercial, with a significant proportion failing to provide current, independent information and in some cases providing misleading or dangerous information.³ The difficulty in assessing what is reliable information on the Internet through search engines, for both consumers and health professionals, necessitates the need for clear recommendations of trustworthy websites that can be accessed for CMs information.

Costs varied considerably among resources reviewed and the number of potential users of the subscription. Some free resources performed well; however, all but one of the highest ranking resources involved paid subscriptions (approximate prices shown in Table 2 and Appendix 5). A number of publishers of the online, subscription-based CMs resources offer the ability to organise a free trial of their database to allow individuals or organisations to test these resources without cost. This allows consumers and health professionals to test the resource and see if it meets their needs.

Features and layout differ among CMs resources, and the information can sometimes slightly vary due to a different level of detail or the omission of some published data. Therefore, a single resource cannot be exclusively recommended for all people and all situations, and if time allows, accessing more than one resource is always recommended.

As with all evaluations, there is potential for resources to be missed, criteria to be misunderstood and results to vary between individuals rating the various domains of quality. The evaluation used a range of techniques to ensure a high quality evaluation was conducted. The evaluation involved more than one reviewer to assess content quality and clinical utility, the blinding of reviewers to limit preferential scoring of resources, and sensitivity analyses to ensure that individual reviewers, or type of CMs reviewed did not have an undue influence. Information provided in many resources was incomplete especially around the safety, efficacy and dosing of CMs. In most circumstances this was due to limited scientific evidence being available.

It should be noted that the results of this evaluation are based on the versions of the CMs information resources accessed in June to October 2008 for the review and the whole resource or individual monographs may have been updated or altered since that date.

Conclusions

This review has identified a number of CMs information resources which can be recommended and actively promoted to health professionals and consumers. However, they require modifications to improve their applicability to the Australian environment. An important starting point is the inclusion of Australian brand names and reference to specific formulations of CMs in these resources. Special attention should be given to the inclusion of clear, reproducible dosing information, based on evidence. Further research to assess the usability of the highly rated CMs resources for consumers and health professionals in everyday practice is recommended.

Recommendations

Based on results of this review and the current need for easily accessible, evidence-based information to inform safe and appropriate decisions about CMs by consumers and health professionals, and in consultation with the NPS, we would recommend the following:

- That organisations responsible for providing information to consumers and health professionals about the safety and efficacy of complementary medicines such as drug information services and poisons information centres have access to one or both *Natural Standard Professional Database* or the *Natural Medicines Comprehensive Database (Health Professional Edition)* for use in conjunction with other evidence-based resources.
- That health professional and consumer organisations actively refer health professionals and consumers to the CMs resources ranked as Tier 1 or Tier 2 as the preferred options for assisting with decisions around the use of CMs.
- That one or more of the Tier 1 or Tier 2 resources should be available to health professionals and consumers in various formats to support decisions about the quality use of CMs. Such formats would ideally include a web-based information resource and the incorporation of monographs and a CMs-drug interaction checker into clinical software. To assist in selecting the most appropriate resource for health professionals and consumers, further assessment of the usability and 'real life' utility for both health professionals and consumers is needed.

Appendix 1: Search strategies

Search strategy to identify evaluation tools to assess information quality

The search strategies used to identify articles in MEDLINE (OVID) and Meditext (1966–current), and EMBASE.com (1974–current) are:

MEDLINE (Ovid) and Meditext (INFORMIT) (1966–current)

(Evaluation Studies as Topic/ OR Evaluation Studies/)

AND (exp Reference Books/ OR [website* or internet or (online and database)].ab,ti)

EMBASE.com (1974–current)

'evaluation'/exp

AND (website*:ab,ti OR internet:ab,ti) OR (online:ab,ti AND database:ab,ti)

AND quality:ab,ti

The search strategy used to identify articles on web information resource **evaluation tools** in both Google and Altavista are:

Google.com and Altavista.com

quality OR criteria OR reliability OR accuracy OR readability OR assess OR evaluat
OR rating OR rate OR rank OR ranking OR critique

Search strategy to identify complementary medicines information resources

The search strategy to identify CMs information resources for review was conducted in the following order (I to VI). As there was considerable duplication, only newly identified resources were added to the progressive list:

- I. A recent literature review prepared for the NPS on CMs: attitudes and information needs of consumers and healthcare professionals³ and an NPS scoping document provided an initial list of potential resources.
- II. A literature search of bibliographic databases Embase.com (incorporating Medline and Embase 1974–current) and a citation search of Web of Science (2004–current) was conducted on 26th June 2008, to retrieve recently published evaluations of CMs information resources, in order to identify any additional relevant resources.

For example in Embase.com:

'alternative medicine'/exp OR 'phytotherapy'/exp OR 'diet supplementation'/exp OR 'herbal medicine'/ OR complementary medicine':ab,ti OR cam:ab,ti

AND 'book'/ OR website*:ab,ti OR (information:ab,ti AND resource:ab,ti)

AND evaluat*:ab,ti OR assess*:ab,ti OR reliable:ab,ti

AND [2003-2008]/py

- III. The tables of contents of selected journals were searched to find any CMs book reviews or reviews of online or electronic resources from 2006 to current. These journals included:
- Medical Journal of Australia.
 - FACT (Focus on alternative and complementary therapies).
 - Complementary Therapies in Medicine.
 - Evidence-based Complementary and Alternative Medicine.
 - BMC Complementary and Alternative Medicine.
 - Journal of Alternative and Complementary Medicine.
 - Journal of Complementary Medicine.
 - Charleston Advisor (holds reviews of online resources).
- IV. Pharmacy, Medical, Nursing, and CMs practitioner association websites in Australia, New Zealand, United Kingdom, United States and Canada were searched. These websites included:

Medical associations

- Australian Medical Association.
- American Medical Association.
- British Medical Association.
- Canadian Medical Association.
- Royal Australian College of General Practitioners.

Pharmacy associations

- American College of Pharmacy Practice.
- American Society of Hospital Pharmacists.
- American Society Consultant Pharmacists, American Pharmaceutical Association.
- Canadian Society of Hospital Pharmacists, Canadian Pharmaceutical Association.
- New Zealand Healthcare Pharmacists' Association.
- Pharmaceutical Society of Australia, Society of Hospital Pharmacists of Australia.
- Pharmaceutical Society of New Zealand.
- Royal Pharmaceutical Society of Great Britain.

Nursing associations

- Australian Nursing and Midwifery Council Inc.
- Royal College of Nursing Australia.
- Royal College of Nursing (UK).
- Canadian Nurses Association.
- American Association of Colleges of Nursing.

Complementary medicines associations

- Australian College of Phytotherapy.
- Australian Natural Therapists Association.
- Australian Association of Acupuncture and Chinese Medicine.
- Complementary Medical Association (Australia).
- British Association of Complementary Medicine.
- British Association of Nutritional Therapists.
- British Society for Allergy Environmental and Nutritional Medicine).
- Committee for Alternative Medicine/KAM (Sweden).
- Complementary Medical Association (UK).
- Guild of Complementary Practitioners (UK).
- Institute for Complementary Medicine (UK).

Other

- National Prescribing Service (Australia).

- V. Library catalogues and websites of universities with collections about CMs were searched to locate resources in their collections and websites recommended to students; these included:
- University of Queensland.
 - Southern Cross University.
 - University of Iowa.
 - Monash University.
 - University of Sydney.
 - University of Adelaide.
- VI. Publishers' websites were checked for new or forthcoming editions of books and e-books. Book reviews and descriptions from Doody's review service (comprehensive book and software review database with over 70,000 in-print titles) were included.

Appendix 2: Summary of items assessed by the technical quality evaluation tool

Four dimensions of technical quality were assessed and scored (on the degree to which they met tool criteria, encompassing: coverage, currency, transparency and utility).

A. Coverage (the amount and range of information included)

Coverage of the resource and individual monographs within the resources was assessed using the following parameters.

For the resource:

- Total number of products (representing active ingredients) included in the resource.
- Inclusion of monographs on CMs that Australian health professionals and consumers seek information about (from NPS research and CMs most frequently enquired about on TAIS or Medicines Line).
- Range of types of CMs included (herbal CMs, non-botanical dietary supplements, traditional medicines, vitamins/minerals, homoeopathy or aromatherapy).
- Inclusion of ten CMs which may be uncommon or difficult to find information about, including CMs unique to Australia and Pacific region.
- Cross-referencing of CMs by health condition (in index, appendix or searchable by health condition including some content).
- Comparison of CMs as grouped by health condition.
- Additional useful information included in the resource (other than individual monograph content).

For individual monographs:

- Nomenclature: common name, botanical name and any additional common names or synonyms.
- Indications for use. Indications with some evidence of efficacy and traditional or folkloric uses.
- Evidence for efficacy.
- Details of clinical trial evidence on which indication is based including details of extract and species used, type of clinical trial, population studied (including disease state & severity), outcomes and critical appraisal.
- 'Bottom-line statement'/summary re evidence of efficacy i.e. RCTs have shown 'x' to be effective in treating 'y'.
- Level or rating system included and consistent across monographs.
- Proposed mechanism of action.
- Adverse effects. Listing common and serious adverse effects and including discussion of case reports, differentiation between theoretical and reported effects.
- Contraindications/precautions.

- Potential and reported drug–herb and herb–herb interactions (including discussion of proposed mechanism of interaction, severity and level of documentation; reports of absence of interaction in interaction studies).
- Recommended doses.
- Doses for indications supported by evidence.
- Paediatric dosing.
- Dosing in renal or hepatic impairment.
- Dosing in the elderly.
- Pharmacokinetics (e.g. bioavailability, metabolism, renal excretion, half-life).
- Safety in pregnancy and lactation.
- Use in paediatrics.
- Use in the elderly.
- Legal issues/availability in Australia.
- Listings of Australian brand names.

It was also noted whether the resource contained a summary monograph and/or detailed profile, although this was not scored.

B. Currency

The currency of the resource and individual monographs within the resources was assessed using the following parameters:

- Resource as a whole recently updated.
- Individual monograph recently updated.
- How often information is regularly updated based on a statement specifying procedure for review and/or search for new information.
- Resource has a described process in place to include important new or recently published information into a monograph outside the routine maintenance schedule.
- News or links to newly published studies included in the resource (other than individual monograph content).

C. Transparency

The transparency of the resource and individual monographs within the resources was assessed using the following parameters:

- Referencing is appropriate (e.g. monograph includes bibliography, and/or in-text citations, links to studies or abstracts where possible).
- Primary references are cited (references are to original studies, systematic reviews, case reports rather than other textbooks/ websites).

- Authority of the resources based on:
 - identification of the authors/editors (originator) with details of qualifications/background provided
 - identification of peer review group/editorial board
 - inclusion of contact details for feedback or questions
 - transparency of search methods for information retrieval.
- Disclosure of any potential conflict of interest and source of funding/support.
- Resource does not contain advertising.

D. Utility

The utility of the resources was tested using the following parameters:

- Search functionality:
 - Ability to search or browse by active ingredients, botanical names, synonyms, trade names and/or health conditions to find monographs.
 - Ability to search across full-text of content of a monograph.
 - Advanced or 'field' searching available.
 - Supports Boolean searching.
 - Supports truncation (searching on part of a word).
 - Makes suggestions for spelling mistakes or has a 'fuzzy' or similar search.
 - Copes with apostrophes/full stops in search terms.
 - Availability of an drug–CM, CM-CM interaction checker.
- Layout and Organisation:
 - Legible text when viewing screen or page.
 - Content fits screen (or page) horizontally.
 - Organisation by monograph and/or condition.
 - Browsible listings appear in alphabetical order and/or by subject grouping.
 - Graphics which are useful and related to content.
 - Consistency in formatting exists throughout the resource (or differences are used to differentiate content).
 - Any existing hypertext links are obvious.
- Ease of use:
 - There is an obvious search box (or obvious table of contents/index in a book).
 - Searching and/or browsing instructions are available on screen.
 - There are links to help and how to use.
 - Hypertext links, both intrasite and to other websites, work.
 - There is the facility to print, copy or directly email information.
 - Includes advice on how to correctly reference information from the resource.

Appendix 3: Content quality evaluation tool

Four dimensions of content quality of a sample of monographs from each resource were assessed with this tool for quality of content, currency, transparency and utility.

A. Quality of content

Panel members involved in the content quality rating were given supporting information sheets for each monograph assessed and a scoring sheet. They were then asked to assess the accuracy and completeness of the following information provided in each monograph:

- Nomenclature: common name, botanical name, synonyms.
- Parts of the entity used (if applicable).
- Active constituents.
- Mechanism of action.
- Pharmacokinetic data.
- Therapeutic uses including indications with some evidence of efficacy, discussion of evidence, a bottom-line or summary statement, evidence level or rating.
- Traditional uses.
- Recommended doses for individual indications, in children, in renal/hepatic impairment, in the elderly.
- Australian availability, Australian brand name listings.
- Safety information.
- Common and serious adverse effects, detailed descriptions of case reports, reports of absence of adverse effects.
- Potential or reported interactions (drug–herb, herb–herb, drug–lab test), discussion of proposed mechanism of interaction, severity, level of documentation, and reports of absence of interaction.
- Precautions and use in special populations: pregnancy, lactation, paediatrics, elderly; patients with co-morbidities, risk factors.

B. Currency

- Individual monograph recently updated or evidence of inclusion of new information.

C. Transparency

- Monograph includes bibliography, in-text citations.
- Primary references are cited.

D. Utility

- Layout is easy to read with clear text and suitable font size.
- Language is clear and concise.
- General organisation/format of monograph. There is logical flow of information within a monograph with sections that are easy to follow.

E. Relevance to target audience (not scored)

- **For health professionals** – Language and technical detail suitable for a health professional, depth and quantity of information suitable for a health professional; provides practice points, provides counselling points.
- **For consumers** – Language suitable for a consumer (no medical jargon), depth and quantity of information suitable for a consumer, terms are defined where necessary, refers consumer back to a primary health carer where appropriate/if condition does not improve.

Following assessing the accuracy and completeness of the monograph, the panel member makes a recommendation about suitability for target audience – health professional and/or consumer.

F. Is there a summary? (Not scored)

- Availability of a summary and/or detailed profile for the CM.

Appendix 4: Results of short-listing process (Phase 2)

Resource	Phase 2 tests results**
Free websites	
About Herbs, Botanicals & Other Products: Memorial Sloan-Kettering Cancer Center Resource (Healthcare Professional & Consumer monographs) http://www.mskcc.org/mskcc/html/11570.cfm	Short-listed based on healthcare professional monographs; failed one test of quality 5d
Complementary and Alternative Medicine Index (CAM): University of Maryland Medical Center (content provider A.D.A.M.) http://www.umm.edu/altmed/ Complementary Medicine, Health Library: Edward Hospital and Health Services (content provider: ADAM) http://www.edward.org/body.cfm?id=688&oTopId=688	Short-listed
Research integrative medicine: ADAM (© Living Naturally) http://www.livingnaturally.com/common/LN_library/DisplayMonograph.asp?name=ConsLookups_Herbs&storeId=9ES5FK_AQ17S92ND700AKHLBD345CAAB3	Short-listed
cam.org.nz: An evidence-based resource about complementary and alternative medicine http://www.cam.org.nz/default.htm	Excluded; failed 2b (contains only very brief evidence summaries)
Complementary & alternative medicine: Aetna IntelliHealth http://www.intelihealth.com/IH/ihIH/WSIHW000/8513/31402.html	Excluded; failed 4b and 4c
Complementary Therapies Natural Health Encyclopedia (the natural pharmacist) http://healthychoice.epnet.com/getcontent.asp?SiteID=ehosp&DocID=/choice/ehosp/TheNaturalPharmacist-consumer&DocType=4	Excluded; failed 1b
DrugDigest http://www.drugdigest.org	Short-listed
Health Canada: Drugs and Health Products: Compendium of Monographs http://www.hc-sc.gc.ca/dhp-mps/prodnatur/applications/licen-prod/monograph/index-eng.php	Excluded; failed 2b, 3a Not designed as consumer or health professional information
Herbal Remedies: vitacost.com (information from Healthnotes) http://www.vitacost.com/science/hn/Food_Guide	Excluded; failed two quality tests (5c and 5d)
HerbMed & HerbMedPro http://www.herbmed.org/	Excluded; failed 2b
Herbs at a Glance: NCCAM (National Center for Complementary and Alternative Medicine), National Institutes of Health http://nccam.nih.gov/health/herbsataglance.htm	Excluded; failed 2b, 3a, 4a, 4b limited content and coverage

Resource	Phase 2 tests results**
HealthWorld online (Herbal medicine Center) http://www.healthy.net/scr/center.asp?centerid=24	Excluded; failed 2b, 3b
Healthy Ingredients (American Botanical Council) http://cms.herbalgram.org/healthyingredients/index.html	Excluded; failed 2b, 4a, 4b limited content and coverage (herbal products only)
The Longwood Herbal Task Force http://www.longwoodherbal.org/	Excluded; failed 2b
medic.direct : complementary medicine http://www.medicdirect.co.uk/alt_medicines/default.ihtml	Excluded; failed 2b No safety information
National Library for Health: Complementary and Alternative Medicine Specialist Library http://www.library.nhs.uk/cam/	Excluded; failed 2b (does not include monographs on CMs)
National Institutes of Health. Office of Dietary Supplements http://ods.od.nih.gov/Health_Information/Information_About_Individual_Dietary_Supplements.aspx	Excluded; failed 2b (does not include monographs on CMs)
Natural & Alternative Treatments (EBSCO) https://healthlibrary.epnet.com/GetContent.aspx?token=af362d97-4f80-4453-a175-02cc6220a387&chunkiid=33802	Short-listed - failed one test for quality
Natural Standard Herb & Supplement Database (hosted by American Nutraceutical Association) ((Content provider: Natural Standard Flashcards) http://www.ana-jana.org/herbs.cfm	Excluded; failed 3b
Complementary/Integrative Medicine: University of Texas MD Anderson Cancer Center (information from Natural Standard) http://www.mdanderson.org/departments/cimer/	Short-listed
Drugs & Supplements* (from Natural Standard - hosted by MayoClinic.com) http://www.mayoclinic.com/health/drug-information/DrugHerbIndex	Excluded; failed 2b, 4b (interactions missing & limited coverage)
Drugs, Supplements & Herbal Information: MedlinePlus (information from Natural Standard) http://www.nlm.nih.gov/medlineplus/druginformation.html	Short-listed
PDRhealth.com: Herbals, Supplements & Alternative Therapies http://www.pdrhealth.com/drugs/drugs-index.aspx	Excluded; failed 2b, 3a, 3b (evidence of efficacy and plant name missing, dosing information inadequate; no identified author & poor referencing)
RxList: The internet drug index http://www.rxlist.com/alternative.htm	Excluded; failed 2b, 3a, 3b
University of Michigan Health System: Healthwise Knowledgebase (information from Healthnotes) http://health.med.umich.edu/healthcontent.cfm?id=344	Excluded; failed 2 quality tests (5c and 5d)
Wholehealthmd.com http://www.wholehealthmd.com	Excluded; failed 3b (as no referencing)
Worst pills, Best pills http://www.worstpills.org	Excluded; failed 2b
Subscription databases	
AltMedDex (as part of Micromedex)	Excluded; failed 1b (as no further assessment)
Facts and Comparisons (includes Review of Natural Products)	Short-listed; failed 1 quality test (5c)

Resource	Phase 2 tests results**
Hyperhealth www.hyperhealth.com/	Excluded; failed 2b, 3a
IMGateway www.imgateway.net	Short-listed; failed 1 quality test 5c
MDConsult: Drugs (from GoldStandard)	Excluded; failed 3a
Lexi-Natural (from Lexi-Comp)	Excluded; failed 2 tests of quality (5c and 5d)
MedicinesComplete package – (combination of Mason P. Dietary Supplements. 3rd ed. and Barnes J, Anderson LA, Phillipson JD. Herbal Medicines. 3rd ed.) http://www.medicinescomplete.com	Short-listed; individual components do not meet short-listing criteria due to limited coverage, but combined package does.
MIMS online	Excluded; failed 2b, 3a, 3b
Natural Medicines Comprehensive Database (Health Professional Edition – includes monographs for health professionals and patient handouts) http://www.naturaldatabase.com	Short-listed as HP edition (patient handouts do not include references, thus consumer edition alone would be excluded (failed 3b)
Natural Standard Professional Database http://www.naturalstandard.com/ (contains different levels of monographs aimed at different populations with varying depth of information)	Short-listed (except for flashcards which failed 3b – contain no references; flashcards are not interlinked with other monographs which are referenced)
Phytotherapies.org www.phytotherapies.org	Excluded; failed 2b, 3b (as safety information and references missing)
Books and e-books	
American Herbal Pharmacopoeia. http://www.herbal-ahp.org/titles.htm	Excluded; failed 1b, 4a, 4b
Sansom, L. Australian Pharmaceutical Formulary and Handbook. 20th ed. 2006 (Available as CD, book)	Short-listed; failed 1 test of quality (5d)
AusDI (including Complementary Medicines Monographs)	Excluded; failed 1b (CM monographs not recently updated)
Rankin-Box. D. Williamson, EM. Complementary medicine: a guide for pharmacists Churchill Livingstone Elsevier Edinburgh 2006 (book only)	Excluded; failed 2b
The Commission E Monographs (Online e-book) (hosted by American Botanical Council) http://content.herbalgram.org/abc/commissione/	Excluded; failed 1b
Herbal Medicine: Expanded Commission E Monographs (hosted by American Botanical Council) http://content.herbalgram.org/abc/herbalmedicine/	Excluded; failed 1b
Braun L, Cohen M. Herbs and natural supplements: An evidence-based guide 2nd ed. 2007 Elsevier Mosby (book & CD)	Short-listed
Skidmore-Roth L. Mosby's handbook of herbs & natural supplements 2006 St Louis: Elsevier Mosby (book only)	Short-listed; failed 1 test of quality (5d)

Resource	Phase 2 tests results**
PDR for herbal medicines. 4th ed. 2007 (CD available separately) (also included in Health & Wellness Resource Centre; Thomson Gale (part of Electronic Resources Australia [ERA]) Thomson Healthcare and as an additional module to Micromedex through HCN)	Short-listed
WHO monographs on selected medicinal plants. 3 volumes 1999-2007 http://whqlibdoc.who.int/publications/2002/9241545372.pdf http://whqlibdoc.who.int/publications/1999/9241545178.pdf http://www.who.int/medicines/publications/traditional/MedPlantsMonograph3.pdf	Excluded; vol 1 & 2 failed 1b; volume 3 failed 4a and 4b
Ernst E, Pittler MH, Wider B. The Desktop Guide to Complementary and Alternative Medicine: An evidence-based approach. 2nd ed. 2006, Elsevier Mosby	Short-listed
Mason P. Dietary Supplements. 3rd ed. (Available as book and online as part of Medicines Complete)	Excluded initially as failed 4b (limited coverage) short-listed as part of the MedicinesComplete package
Barnes J, Anderson LA, Phillipson JD. Herbal Medicines. 3rd ed. (Available as book, CD and online as part of Medicines Complete)	Excluded initially as failed 4a & 4b (limited coverage) short-listed as part of the MedicinesComplete package
Kuhn, Merrily A; Winston, David. Winston and Kuhn's herbal therapy and supplements, a scientific and traditional approach 2nd ed. 2008. Philadelphia: Lippincott Williams & Wilkins (book only)	Short-listed

** Once a resource failed a Phase 2 test and was excluded from the short-list, no further assessment was routinely conducted.

Appendix 5: Summary of results for un-tiered resources

(NB: Shading indicates resource scored above the upper 95% confidence interval of the mean)

Resource	Format	Target audience	Mono-graph profile	Inter-action checker tool	Number of CMs monographs	Technical Quality /100	Content Quality /100	Clinical Utility /100	Averaged TOTAL /100	Strengths and weaknesses	Costs US\$0.668 = A\$1 (31/10/08)	
Complementary/Integrative Medicine: University of Texas MD Anderson Cancer Center (from Natural Standard)-	website	Both	Detailed	No	~70	67.2	59.1	24.5	50.3	Sources material from a number of resources with majority from Natural Standard Limited number of CMs included	Free	
PDR for herbal medicines	book (earlier editions are available as an e-book)	Health professional	Detailed	No	~700	50.5	55	34.3	46.6	All e-versions of this resource trialled were not the latest edition Book is large and heavy Confusing indexes and tables of contents	A\$120 (single user) = US\$80	N/A
About Herbs, Botanicals & Other Products (Sloan-Kettering Cancer Centre) (health professional monograph)	website	Health professional	Detailed + limited summary	No	~225	70.8	45.2	19	45.0	Although contains a large number of CMs monographs and numerous indications, focus is on cancer Strong on technical quality due to its comprehensive range of CMs, authority, searching and emailing facilities, but monographs have limited information with especially on dosing Provides links to PubMed abstracts of references where possible	Free	
Dietary Supplements (part of MedicinesComplete)	website (ebook), book, CD	Health professional	Detailed	No	~80	60.4	50.9	19.4	43.6	Limited number of CMs included with focus only on non-plant-based dietary supplements (e.g. vitamins and minerals) Evidence-based but did not rate well on safety information	\$US155	~ US\$2000 per year
Natural Medicines Comprehensive Database (Consumer Edition)	online database	Consumer	Summary	Yes	~1100	58.1	33.9	37	43.0	Also called 'patient handouts' in the professional database package Very brief with no referencing Includes brand names of Australian products within database	US\$49 per year	Negotiable

Resource	Format	Target audience	Mono-graph profile	Inter-action checker tool	Number of CMs mono-graphs	Technical Quality /100	Content Quality /100	Clinical Utility /100	Averaged TOTAL /100	Strengths and weaknesses	Costs US\$0.668 = A\$1 (31/10/08)	
<i>DrugDigest</i>	website	Consumer	Detailed + limited summary	Yes	-160	58.0	46.0	24.5	42.8	CMs monographs contain a good general overview but limited information especially on dosing, evidence of efficacy and adverse effects.	Free	
Natural Standard Professional Database* – Harvard monograph	website	Consumer	Detailed	No	-600	62.1	46.8	18.5 (3)	42.5	The most summarised monographs within the Natural Standard Database	N/A	~ US\$1495 per year
Complementary and Alternative Medicine Index (CAM): University of Maryland Medical Center (from A.D.A.M.)#	website	Consumer	Detailed	Yes	- 150	70.1	48.0	9.5 (1)	42.5	Sophisticated searching facilities and the ability to email information Monographs contain bibliographies but no in-text referencing Limited detail on adverse effects and drug interactions	Free	
IMGateway	website	Health professional	Detailed + limited summary	No	-150	52.9	46.8	18.4	39.4	Australian-based resource Some material out of date and not evidence-based Did not rate well on safety information	A\$199 per year = US\$133	Negotiable
Health Library hosted by Edward (from A.D.A.M.)#	website	Consumer	Detailed	No	-150	61.5	48.0	4.9	38.1	Monographs contain bibliographies but no in-text referencing Limited detail on adverse effects and drug interactions	Free	
Australian Pharmaceutical Formulary and Handbook. 20th ed.	CD, book	Health professional	Summary	No	45	45.6	40	24.0	36.5	Australian-based resource Limited number of CMs included Limited depth of information especially in evidence of efficacy Contains some useful practice points	A\$45 for book/CD = US\$30	N/A
Ernst E, Pittler MH, Wider B. The Desktop Guide to Complementary and Alternative Medicine. An evidence-based approach	book with CD	Health professional	Detailed	No	50	49	45.2	13.4	35.9	Limited number of CMs included Focuses on efficacy with only the evidence of efficacy section of each monograph referenced Limited information on dosing, adverse effects and drug interactions CD provides links to PubMed abstracts of references where possible	A\$110 = US\$74	N/A
Kuhn MA; Winston D. Winston and Kuhn's herbal therapy and supplements, a scientific and traditional approach. 2nd ed.	book	Health professional	Summary	No	220	49.9	45.6	11.6	35.7	Concise layout in a small handbook format but information within each monograph is quite brief and may be insufficient in many cases especially in terms of dosing and safety information	A\$59 = US\$39	N/A

Resource	Format	Target audience	Monograph profile	Interaction checker tool	Number of CMs monographs	Technical Quality /100	Content Quality /100	Clinical Utility /100	Averaged TOTAL /100	Strengths and weaknesses	Costs US\$0.668 = A\$1 (31/10/08)	
Mosby's Handbook of Herbs & Natural Supplements	book	Health professional	Detailed	No	~275	47.3	48.6	10.4	35.4	Very brief, with unsubstantiated statements. Weak in evidence of efficacy	A\$64 = US\$43	N/A
Research integrative medicine: A.D.A.M. (hosted by Living Naturally)#	website	Consumer	Detailed	No	~150	47.2	48.0	7.6	34.3	Monographs contain bibliographies but no in-text referencing Limited detail on adverse effects and drug interactions	Free	
About Herbs, Botanicals & Other Products (Sloan-Kettering Cancer Centre) (consumer monograph)	website	Consumer	Summary	No	~225	53.6	21.0	19.4	31.3	Contains a large number of CMs monographs and numerous indications but information is focused around cancer Monographs are very brief Does not contain any dosing information Has no referencing	Free	

NB: Shading indicates resource scored above the upper 95% confidence interval of the mean

~ This resource uses selected monographs from Natural Standard – Clinical Bottom Line and content quality was evaluated once only (as there were numerous versions).

These resources use selected monographs from the same source, A.D.A.M. and content quality was evaluated once only.

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