COCHRANE TRANSLATION STRATEGY AND BUSINESS PROPOSAL

The Translation Strategy Working Group [1]

(with input from the Translation Strategy Advisory Group[2], the Senior Management team and Central Executive staff).

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SUMMARY OF RECOMMENDATIONS, TARGETS, RESOURCE IMPLICATIONS, AND SUCCESS INDICATORS

In March 2013 in Oxford the Collaboration's Steering Group considered a strategic paper calling on the organisation to make a major commitment to translating Cochrane content from English into other languages.[3] The Steering Group committed the Collaboration to meet this challenge and asked a special Translation Working Group to draw up a strategy and plan of action based on the paper tabled in Oxford.

This document delivers on that request. It sets out the key approaches and decisions for the implementation of a long-term Cochrane translation strategy; and includes an indication of the funding required for implementation of the strategy for the next three years (2014-2016) which, if approved by the Steering Group, will be integrated in the Collaboration's budgets for that period.

Whilst this detailed strategy and plan were being developed, the Collaboration reinforced its commitment to translation by putting it at the forefront of its new *Strategy to 2020*, approved in Quebec in September 2013. Objective 2.6 of the Strategy pledges: 'We will translate key content into at least the five other official languages of the World Health Organization (Spanish, French, Russian, Chinese and Arabic); and make it accessible in the same way as English-language content'. In addition, Objective 2.5 of the Strategy commits us to 'simplify and standardise the language used across our content to improve readability and reduce ambiguity'. The translation strategy lays out specific targets for the period 2014-2016, but has been developed with a view to gradually delivering these long-term strategic goals by 2020. In January 2014 the Steering Group is expected to approve the first set of targets for the *Strategy to 2020* objectives. These targets – in turn – have been guided by the work and expected outcomes of the Translation Strategy Working Group; and they are included in the plan and budget presented here. These targets are:

Target	Indicators of success	Timing
Objective 2.6: Multi-lingual Finalise Cochrane's translation strategy, establish a translation management system to integrate all existing workflows, and introduce key digital content and multi-lingual portals in French, Spanish and three other languages.	• Cochrane's translation strategy and business plan has been completed and ready to be implemented. • A translation management system has been established integrating all existing workflows (including those in the Translation Exchange). • Key digital content and translated user interfaces have been made available in French, Spanish and at least three other languages.	• Translation strategy and business plan completed by end of April 2014. • Translation management system and key content available by end of December 2014.

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[3] The Oxford meeting background papers are available at http://www.cochrane.org/community/organisation-administration/minutes-reports/full-meetings-ccsg.

Objective 2.5: Accessible language		
Objective 2.5: Accessible language Simplify and standardise the language used across our content to improve readability and reduce ambiguity. [Target 2.5 of *Strategy to 2020*]	• Guidelines for simplified and standardised language across content have been developed. • An audit for plain language summaries against the new guidelines has been undertaken. • All reviews are produced according to the new guidelines.	• Guidelines and an audit completed by the end of May 2015. • All reviews are using the simplified and standardised language by the end of December 2016.

This Translation Strategy and Plan recommends the following:

(Analysis, explanation and further details on the recommendations are in the respective chapters below. Where noted, targets are included in the proposed *Strategy to 2020* targets for 2014.)

	Recommendations and provisional targets	Resource implications	Indicators of success	Timing
1.	**TRANSLATION FRIENDLY** That Cochrane implements strategies to promote translation-friendly content and technology, including simple and standardised language.	• Central Executive staff • Wiley staff • Possible partnerships and research collaborations and/or consultancies	• Standards and guidelines for simplified and standardised language across content have been implemented. • An audit for plain language summaries against the new guidelines has been undertaken. ***(Strategy 2020 – 2014-15 targets)*** • Translation processes are facilitated by technological choices and developments.	• By end of May 2015.
2.	**MULTI-LANGUAGE ORGANISATION** That Cochrane introduces multi-language communication and content strategies.	• Central Executive staff • Wiley staff	• Multi-language communication and content strategies have been developed for key content. • Key content is translated and disseminated in agreed languages.	• Initial phase by end of December 2014. • Additional content and languages by the end of December 2015.

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	Recommendations and provisional targets	Resource implications	Indicators of success	Timing
3.	**SUSTAINABLE METHODS** That Cochrane applies (and invests in) sustainable translation methods: in particular, machine translation and crowdsourcing.	• Central Executive staff • Research collaborations and/or consultancies	• Translation of Cochrane content is performed using primarily machine translation and crowdsourcing. • Translation project coordinators and/or editors for priority languages have been assigned or employed. • Translation methods are evaluated and informed by research collaborations or consultancy. • Parallel corpora are developed or purchased for priority languages as agreed.	• Methods applied by end of December 2014. • Evaluation and research by end of December 2016.
4.	**TRANSPARENT** That Cochrane is transparent about the methods and quality of its translations.	• N/A	• Translation methods and quality levels are described for different languages and clearly shown alongside the translated material.	• By end of December 2014.
5.	**RELEVANT LANGUAGES** That Cochrane initially prioritises the WHO languages and the languages for which translation projects are on-going or planned. *(Strategy 2020 – Part of 2014 target 2.6)*	• N/A	• Translations of prioritised languages as agreed are available and integrated in our management and publication processes.	• Phase 1 languages by end of December 2014. • Phase 2 languages by end of December 2015.
6.	**RELEVANT CONTENT** That Cochrane initially prioritises key Review content, key content of the platforms on which Reviews are published, and content that facilitates rapid dissemination. *(Strategy 2020 – Part of 2014 target 2.6)*	• N/A	• Key Review content, key content of the platforms on which Reviews are published, and content that facilitates rapid dissemination is primarily translated in agreed languages. • Key content on cochrane.org is translated in agreed languages.	• Review content, Review platform and dissemination content by end of December 2014. • cochrane.org content by end of April 2015 (depending on re-brand).

	Recommendations and provisional targets	Resource implications	Indicators of success	Timing
			• Priorities are evaluated and reconsidered annually.	• Priority evaluation by end of April 2015 and 2016.
7.	**CENTRAL COORDINATION** That Cochrane employs a full time translation coordinator. *Note: This only covers central coordination, not language specific project coordination.*	• 1 FTE	• Translation coordinator has been employed.	• By end March 2014.
8.	**SUSTAINABLE MANAGEMENT** That Cochrane establishes and maintains an efficient Translation Management Infrastructure, integrating all existing workflows. *(Strategy 2020 – Part of 2014 target 2.6)* *Note: This only covers central management and infrastructure, not language specific project management resources.*	• 3 year contract with Smartling, with option for renewal pending evaluation • Central Executive staff • Wiley staff	• 3 year contract signed with Smartling. • Integration of Cochrane, Wiley and translation project workflows.	• Smartling contract agreed and signed by end of March 2014. • Smartling integration with our content and workflows by end of April 2014. • Integration of workflows of prioritised language in Smartling by end of December 2014.
9.	**MULTI-LANGUAGE PLATFORM** That Cochrane and Wiley develop coherent multi-language publication pipelines, web presences and search functionality for Cochrane content. *(Strategy 2020 – Part of 2014 target 2.6)*	• Central Executive staff • Smartling Global Delivery Network (covered in overall Smartling contract) • Wiley staff	• Publication of translations of different types of content established. • Multi-language web presence established. • Multi-language search functional.	• Prioritised content and languages by end of December 2014. • Additional content and languages by end of December 2015.
10.	**POLICIES AND PROCESSES**	• Central Executive staff • Wiley staff	• Translation policies agreed and published.	By end of December 2014.

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	Recommendations and provisional targets	Resource implications	Indicators of success	Timing
	That Cochrane establishes translation policies, standard procedures and guidelines.		• Translation standard procedures, quality assurance and decision-making developed.	
11.	**PARTNERSHIPS** That Cochrane identifies and establishes funding, collaboration and research partnerships for translations. *(Strategy 2020 – Part of 2014 target 2.6)*	• Central Executive staff • Wiley staff	• Two to three partnerships have been secured.	By end of December 2014.
12.	**WORK PLAN** That Cochrane develops a 3-year translation work plan including deliverables and timelines based on the recommendations of this paper.	• Central Executive staff • Wiley staff	• Work plan completed.	By end of April 2014, for annual evaluation and adaption.

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INDICATIVE BUDGET PROPOSAL (FY 2014-15 – 2016-17)

NOTE: This budget predominantly covers central Cochrane resources required to deliver the translation strategy; it does not take into account the substantial resources currently provided by (and in future required from) regional language project teams to produce translations. A minimal contribution towards this language specific cost has been budgeted for under item 6. However, as a reference, the Spanish and French translation projects cost up to €500,000 annually in the past.

	Item	Amount (GBP) 2014-15	Amount (GBP) 2015-16	Amount (GBP) 2016-17
1.	**Translation management system: Smartling contract** - 2014 includes one-time setup fee; - annual amount includes full service and support; - annual amount covers up to 1 million page views of translated pages, and storage of 30 million words, e.g. this would be sufficient if we translate all existing titles, abstracts and PLS into 8 to 9 languages. Page views and words are accounted for on a monthly basis, if we fall below certain tiers, we pay less.			
2.	**Translation Coordinator** 1.0 FTE incl. employment costs, overhead and travel (3% annual increment)			
3.	**Provision for additional Central Executive resources support cost** To support development of: - management and publication infrastructure; - multi-language platform and search; - policies and processes; - content and communication strategies. *(Actual Amounts To Be Confirmed)* *(3% annual increment)*			
4.	**Provision for contribution to the development of simplified and standardised language** *(Actual Amounts To Be Confirmed)* *(3% annual increment)*			
5.	**Provision for partnerships, research collaborations and consultancies** *(Actual Amounts To Be Confirmed)* *(3% annual increment)*			
6.	**Provision for language specific project support**			

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	Native language coordinators and editors for priority languages where we want to guarantee minimum delivery *(Actual Amounts To Be Confirmed; see also Sections 7, 11 and 12 below)* *(3% annual increment)*			
	TOTAL:			
	Less Amounts already authorised by CCSG:			
	Additional Funding Planned:			

IMPACT STATEMENT

Investing in sustainable translation infrastructure and management, enabling multi-language work processes, and providing Cochrane content in different languages will:

- Increase the usage and accessibility of our content in non-English speaking countries, enlarge the impact of Cochrane's work.
- Constitute an investment in new potential markets that is likely to generate new funding from governments, institutions and individuals in those markets.
- Foster Cochrane's role in informing evidence-based decision-making globally.
- Facilitate participation of non-English speakers within Cochrane, and thereby contribute to making us more of a truly global organisation.
- Increase Cochrane's inclusiveness and accessibility generally.
- Provide an opportunity for Cochrane to take a leadership role in this area.

BACKGROUND

Cochrane is an international organisation, but with a mainly English-speaking contributor base and an English product; thus its impact and inclusiveness are limited by its main language. A number of projects translating Cochrane content have been conducted in the past, and several small or bigger projects are currently on-going or planned[4]. All of them have been initiated, co-ordinated, and funded by Cochrane groups or external organisations based in non-English speaking countries, without any resources provided by Cochrane centrally. The results are spread over different platforms, some of them partially outdated and difficult to track.

Cochrane became more interested in translations centrally in 2011, and from there started to put marginal central infrastructure in place in order to support the publication of translations of abstracts and plain language summaries (PLS). Translation has since been identified as a major priority in the 2013 Publishing Agreement with Wiley, and most significantly in Cochrane's new *Strategy to 2020*[5]. A Translation Strategy Working Group and an Advisory Group have been formed following the Oxford Mid-year Meeting to develop a translation strategy for consideration by the Steering Group.

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[4]An overview of past and on-going translation activities is available in Cochrane's Editorial and Publishing Policy Resource, see http://www.cochrane.org/editorial-and-publishing-policy-resource/translation-projects.
[5] Cochrane's Strategy to 2020 is available at http://www.cochrane.org/organisational-policy-manual/appendix-5-cochrane-strategy-2020.

More detailed background information is available in the Oxford Steering Group paper, and in a PLOS Medicine paper published in September 2013[6].

A. SCOPE OF THE TRANSLATION STRATEGY

The main focus of the proposed strategy is the translation of Cochrane content into different languages with the aim to enable better global access to Cochrane evidence, and consequently to increase our global impact in line with our vision and principles[7]. The organisation has already adopted this challenge. Objective 2.6 of *Strategy 2020* commits Cochrane to: 'translate key content into at least the five other official languages of the World Health Organization (Spanish, French, Russian, Chinese and Arabic); and make it accessible in the same way as English-language content'.

The translation strategy should be implemented with a view to addressing non-English speaking audience needs generally, and it must strive to create incentives enabling and encouraging participation of non-English speakers in the process. It will, however, not directly address the issues around engaging and supporting non-English speakers in other capacities, e.g., as Review authors or consumers. We recommend that this should be dealt with by Cochrane centrally as part of its membership and communications strategies.

Nevertheless, Cochrane's commitment to translate its English-language content and become more of a truly global organisation is a major undertaking that will require considerable resources and sustained commitment. The proposed translation approaches set out in this plan affect the priorities of Cochrane's Central Executive and the different Cochrane groups, requiring joint and streamlined action across the organisation. The translation strategy calls for a mind shift in terms of how we approach our aims of global impact and participation. It is an opportunity for Cochrane to take a leadership role in the area of translation and communication in health care, similar to the role it has as a leader in systematic review methods.

B. PROPOSED STRATEGIC APPROACHES

1. PRODUCING TRANSLATION-FRIENDLY COCHRANE CONTENT

The basis of the translation strategy is that we start to think differently about our content, editorial processes, technology and communications: in the future, we develop and optimise them with the aim of facilitating and accommodating multi-language publication, as well as improving and expanding the translation process itself.

SIMPLE AND STANDARDISED LANGUAGE
The use of highly complex and technical English in Cochrane Reviews and most other Cochrane content has negative implications on the production, readability and translation of our content. In order to address these issues, Cochrane must develop approaches to producing its content using

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[6] von Elm E, Ravaud P, MacLehose H, Mbuagbaw L, Garner P, et al. (2013) Translating Cochrane Reviews to Ensure that Healthcare Decision-Making is Informed by High-Quality Research Evidence. PLoS Med 10(9): e1001516. doi:10.1371/journal.pmed.1001516. Available at http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1001516.
[7] The vision and principles are available in Cochrane's Strategy to 2020, see http://www.cochrane.org/organisational-policy-manual/appendix-5-cochrane-strategy-2020.

simplified and standardised language. This has already been recognised by the organisation with Objective 2.5 of *Strategy to 2020* committing Cochrane to 'simplify and standardise the language used across our content to improve readability and reduce ambiguity'. In its proposed new targets for 2014 the ambition is to ensure that 'all reviews are produced according to new guidelines' by the end of 2016, with the 'guidelines for simplified and standardised language across content developed by May 2015' and 'an audit for plain language summaries against the new guidelines' conducted by the same deadline.

To achieve this, we propose that the Cochrane Editorial Unit (CEU) drives the development and application of standardised and simplified English for Cochrane Review content as follows:

- Define and describe what we mean by simplified and standardised English for Cochrane Reviews and other content where appropriate (Cochrane simplified English).
- Develop a Cochrane simplified English framework, including standardised terminology; writing guides and tools; standard templates and phrases; tools to measure readability; and relevant policies and guidelines.
- Develop an approach to implement Cochrane simplified English, in the first instance (by the end of 2016) for abstracts, PLS, and authors' conclusions in the main Review. To include:
  - Training and support for editorial teams and Review authors;
  - Integration of the framework within authoring and editorial processes;
  - Exploration of tools to aid the implementation of Cochrane simplified English in RevMan; for example, for immediate feedback on the 'simplicity' of a sentence during the writing process, and suggesting better, i.e., clearer, easier and more translatable sentences.
- Evaluate the development and implementation of the above steps.

Similarly, we propose that Cochrane's Communications and External Affairs Department (CEAD) and Wiley drive the development and application of standardised and simplified English in non-Review content.

CEU, CEAD and Wiley should also collaborate and consult with linguist experts, who have experience in the area of standardised language to inform the development and implementation as needed. This may be done on a consultancy basis or as part of research projects. For example, the French research consortium QUARTET M, which has been assembled through the French Cochrane Centre's initiative to develop strategies to financially sustainable translation, includes linguists with various specialisations relevant to standardised language (see also section 3 below).

The expected benefits of the proposed approach would be to:

- Increase Cochrane's productivity, reducing the editing burden of editorial teams, and facilitating and speeding up authoring (for both native English and non-native English speakers);
- Enable greater global participation and increase our inclusiveness;
- Increase the accessibility, discoverability and readability of our content for both English and non-English speakers, and thus the effectiveness of our communications and global impact;
- Increase the feasibility, accuracy and speed of human and machine translation, and thus reduce the resources needed for translation;
- Enhance the development of derivative products, as simplification and standardisation may facilitate automatic extraction of data;
- Increase the possibility that Cochrane standards and writing aids become the standard in our field, and may constitute a basis for new products.

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EDITORIAL PROCESSES

English will remain the primary production language of Cochrane content for the foreseeable future and translations will be made from English into different languages. However, both our technology and editorial processes should be flexible to allow for multiple source languages to be adopted, if we make the decision to approach production in a multi-language process in the future.

If we want to publish content[8] in multiple languages simultaneously or almost instantly and keep it up to date with the English source, both Cochrane and Wiley need to build translation into their editorial, communications and technology processes. There are editorial decisions to be made within Cochrane and Wiley, when content is prepared and designed for publication: how much of it should be available in which other languages, how soon, and how do we treat content that is non-machine readable and thus more complex to translate and publish in different languages (all taking into account available translation resources)?

Processes need to be set up so that small and moderate modifications can be taken up and translations completed and published within 24 or 48 hours (or what is considered an acceptable delay). Major updates or new additions to our content that we wish to publish in different languages simultaneously or almost instantly need to be scheduled, and translation project coordinators pre-advised so they are able to assign the required resources.

'SIMPLE' AND INNOVATIVE TECHNOLOGY

When we develop our web presence and technology, we should prefer technologies that support and facilitate translation. For example, non-machine readable formats (for example: image types, audio and video) are more complicated to translate and publish from a technical perspective than machine-readable formats. We need to balance the attractiveness of rich-content formats against the desire to provide machine-readable formats, and ensure we can provide translated versions of, or workarounds for, more complicated formats. Linked data technology, including multi-language text mining and ontologies, can facilitate automatic translation, multi-language search and browse.

2. MULTI-LANGUAGE COMMUNICATIONS

Cochrane's Communications and External Affairs Department and Wiley need to start approaching communications and marketing from a multi-language angle, which includes the development and application of standardised and simplified English in non-Review content (see section 1 above), coherent multi-language branding, and internal and external communications.

COCHRANE RE-BRAND

Cochrane will complete an organisational rebrand in 2014, ensuring that all content (on- and off-line) is coherent. As part of the re-brand, all Cochrane content will be audited and re-branded to develop a consistent Cochrane web presence and a coherent user experience. The general approach will include a much more distinct orientation of our content aimed at the public (end user) on the one hand, and the "knowledge base" (the Cochrane community) on the other hand. As part of the re-brand, the goal is for the function currently fulfilled by *Cochrane Summaries* (patient oriented) to be absorbed by a single Cochrane knowledge platform offering Review content prepared for different end users including clinicians, patients and any other public stakeholders.

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[8] Section 6 below provides an overview of Cochrane content that we may translate, and specifies priorities.

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The re-brand has implications for translations and vice versa as follows:

- We need to ensure that the re-brand is thought through and developed not only in English but as a multi-language platform with translated content in mind: i.e., facilitating publication of translations and the translation process itself (see section 1. above), and including multi-language search engine optimisation considerations.
- There needs to be careful consideration of how non-English Cochrane group websites fit into a new multi-language Cochrane web presence.
- Until the re-brand is completed, we need to consider carefully which content to translate in the interim, and not invest a lot of resources into translating content that will not be part of the new platform. Review content will not be affected.

MARKETING AND DISSEMINATION

Existing Cochrane translations are currently not promoted or used for marketing in any strategic way, yet access statistics are already demonstrating their potential. The translation strategy should be accompanied by a marketing and dissemination strategy for translations in different languages both by Cochrane and Wiley in order to maximise usage, impact, sales and funding opportunities.

Strategy to 2020's target 3.4 for 2014 is to: 'Capture and communicate Cochrane's impact on policy and practice, introducing online metrics and stories of impact'. This should include multi-language metrics, and impact stories could be prioritised for translation.

SOCIAL MEDIA

Social media has a particular role in multi-language communication, as it both facilitates rapid dissemination and engages users in the process. Cochrane could generate very brief one-sentence, plain language key messages about the findings of Reviews, have these translated into different languages and disseminate them via its social media channels for uptake by non-English speaking users.

MULTI-LANGUAGE NETWORK

Cochrane translators and non-native English speakers should have an informal forum for them to connect, share experiences, learn from and support each other. Like other Cochrane networks, this group could make use of email lists, discussion forums, social media, etc., to communicate. It could be the go-to place for non-English speakers who need support in their Cochrane activities, but also for English speakers who are looking for translators or people with intercultural communication skills. Different languages could establish their own networks for the purpose of language-specific communication and exchange.

3. TRANSLATION METHODS[9]

We propose to approach translation through a combination of:

(a) machine translation or computer aided translation (CAT) featuring translation memory; followed by
(b) volunteer crowdsourcing. Crowdsourcing can also be used both to obtain an initial translation and for final validation by content or methods experts.

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[9] An overview of different translation methods has been provided in the Oxford paper and is also available in Appendix 1.

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We recognise the value of professional translation, and would gladly make use of it for the translation of our content, if sufficient external resources were offered to us for this purpose. However, with the resources currently available and expected in the medium term, we cannot build Cochrane's translation strategy on continuous paid-for professional translation, as it is not financially sustainable. In addition, research conducted by the French Cochrane Centre suggests that professional translation is not superior to a combined approach of machine translation and validation by content or methods experts, but generally requires additional validation by content or methods experts, too.[10] A comparison of Spanish Cochrane translations of the Iberoamerican Cochrane Centre (CAT + paid translators and editors) with translations of Epistemonikos[11] (machine translation + volunteer crowdsourcing) similarly revealed that there was no significant difference in quality between the two methods.

However, as we gather experience with variations of the proposed approach we need to conduct cost-effectiveness evaluations taking into account the costs of development, work flow integration and human resources needed for management and validation, against the quality of results. Firstly, to confirm (or not) that our assumptions on the required resources and obtained results are valid, and to adapt our methods, if necessary; and secondly, to justify future investment.

The recommended approach is dependent, though, on Cochrane providing a sophisticated and capable technological infrastructure to manage the translation process using machine and crowd-sourcing methods (for details see section 8 below).

COMPUTER AIDED TRANSLATION

Computer aided translation (CAT) software is based on translation memory, and recognises content that has been translated before (match), or is similar to content that has been translated before (fuzzy match). A crucial component to fast and cost-effective translation using CAT is simple and standardised source content, existing translations and repetition (see section 1. above). CAT software is still widely used to support professional translation, and has facilitated the large volume translation project of the Iberoamerican Cochrane Centre to produce the Biblioteca Cochrane Plus. But it is likely to be more and more replaced by combined methods and machine translation in the future.

MACHINE TRANSLATION

Commonly used machine translation software such as Google Translate is aimed at broad usage for any topic, which in turn means it is not very well fit for returning reliable translations of specialised content such as Cochrane content. Results of machine translation software can however be improved by adapting the statistical and linguistic make-up of the software to fit the specialised content and particular languages, and by 'training' software with existing translations of specialised content and generally increasing the translation memory as content is translated. So called parallel text or parallel corpora[12] can be obtained from existing translations of Cochrane content and Cochrane glossaries, which will likely achieve the best results, or (if Cochrane translations are not available and in addition) other translated health-related content such as the CONSORT statement, 'Testing Treatments', bi-lingual journal publications, EU or WHO publications, etc.[13] As for computer aided translation,

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[10] Tested languages were French, German, Simplified Chinese and Arabic. The report is available upon request.
[11] Epistemonikos is a joint initiative of the Epistemonikos foundation, Santiago, Chile; and the Evidence-based Healthcare Program, Faculty of Medicine, Pontificia Universidad Católica de Chile (Chilean Collaborating Centre of the Iberoamerican Network). Epistemonikos' experience in the area of translations, in particular in relation to crowdsourcing and multi-language search, has informed the strategy development.
[12] See http://en.wikipedia.org/wiki/Parallel_text.
[13] An overview of freely available parallel corpora is available at http://opus.lingfil.uu.se/.

machine translation also achieves better results when the source content is simple, standardised and repetitive.

The French Cochrane Centre is using English-French machine translation software specifically developed for Cochrane translations since September 2013 for its translation project, combined with validation by content and methods experts. The software has been developed by QUARTET M, a multidisciplinary research consortium assembled on the French Centre's initiative, and dedicated to developing financially sustainable translation strategies including machine translation for more than two years.[14] The next steps of the project include:

- Development of Cochrane-trained machine translation software for Spanish using the existing Spanish Cochrane translations;
- Further improvement of the French software;
- Identification of minimum size and best fit type of corpora to achieve a certain quality level.

If value for money can be expected, Cochrane should consider investing into developing Cochrane specialised machine translation software for priority languages. This would need to be done in research collaborations or on a contractual basis with field and language experts, as we don't have this expertise available in-house.

CROWDSOURCING

Cochrane is traditionally relying on many committed people to collaborate and contribute to our work because they believe in our mission, but often without Cochrane paying them for their engagement. Approaching translation via volunteer crowdsourcing is an obvious and natural step to take, and we think will turn out to be a successful way of engaging non-English speakers into Cochrane's work in a more accessible way than their involvement principally as a Review author. Translating Cochrane content initially may also provide a route into Cochrane that can lead to other roles and contributions.

Some translation projects already use a small-scale volunteer approach (French, Indonesian, Portuguese), and could expand their projects to build larger volunteer networks.

Cochrane should consider the following strategies (some of which proved successful from Epistemonikos' experience) in order to facilitate and encourage crowdsourcing:

- Assign or pay content and/or methods experts who can ensure accuracy and consistency in terminology. This role would ideally be assumed by regional Cochrane groups or contributors.
- Assign or pay translation experts who can provide continuous training and feedback to the crowd. For some language projects, the editor and trainer roles may be assumed by the same person(s).
- As part of a general membership scheme, reward volunteer translators, e.g., by providing certified Cochrane translator reference letters, or granting reduced Cochrane conference fees.
- Collaborate with universities to award students with credits for contributing Cochrane translations.

We should collaborate and consult with experts and organisations with experience in translation crowdsourcing in order to identify additional strategies and processes to engaging and managing volunteers.

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[14] QUARTET M includes, among others, linguists, specialists of natural language processing, terminology, corpus linguistics, systemic functional grammar, phraseology, machine learning methods, machine translation and quality assessment of translations. Documentation is available upon request.

4.   QUALITY OF TRANSLATIONS

With the methods approach set out above, Cochrane could define different quality levels of translation as follows:

1.   Machine translation/CAT + human validation by paid content and methods experts.
2.   Machine translation/CAT + human validation by volunteers.
3.   Machine translation only without any validation.

Level 1 should provide the same quality as the English original and would allow for immediate or scheduled publication of translations. Level 2 should only be slightly inferior or equivalent to level 1, but is likely to progress more slowly as it is dependant on the volunteer crowd.

In relation to level 3, Cochrane should evaluate the acceptability of publishing (or providing a facility that a reader can use easily themselves) machine translated content without validation for different types of content in different languages. Machine translation may not be acceptable or useful for Review content generally, but maybe for Review titles; it may not be acceptable or useful for Chinese or Russian, but maybe for Spanish. Research and user surveys should help assess the usability of machine translated Cochrane content.

The quality of translations needs to be transparent, and Cochrane should therefore:

•   Describe and publish the translation process for each language.
•   Clearly flag different levels of quality (similar to Epistemonikos) of published translations; in particular if machine translated content is published.
•   Accompany translations with translated disclaimers on the quality of translations and referring to the English source in case of doubt.
•   Provide an easy option for users to report translation errors.

5.   SELECTION AND PRIORITISATION OF LANGUAGES

Cochrane has already committed itself in *Strategy 2020* to 'translate key content into *at least* the five other official languages of the World Health Organization (Spanish, French, Russian, Chinese and Arabic)' (emphasis added). The decision on what other languages should be prioritised is largely dependent on the following factors:

•   Existence of on-going projects with Cochrane coordination.
•   Availability and interest of Cochrane groups to coordinate a language.
•   Availability of resources.
•   Importance of a certain language (number of speakers).
•   Need for translations in a certain language (native speakers are not usually proficient English-speakers).
•   Prospect of crowdsourcing approach (number of speakers, cultural background, existing Cochrane capacities).
•   Availability of existing Cochrane (and related health) translations in a certain language to feed translation memory and facilitate automatic translation.
•   Potential market and investment return.

Taking these into account, we propose the following phased approach to language prioritisation, which includes the WHO official languages as per the *Strategy to 2020* commitment.

PHASE 1

Phase 1 would begin with the testing and integration with the new Translation Management System in an introductory stage (March-April 2014, see section 8. below). In the interest of continuous support of on-going projects, this includes all projects that are currently using the Translation Exchange management system in Archie.

Language	Project coordination	Project status	Funding	Native or non-native speakers[15]	Comments
Spanish	Iberoamerican Cochrane Centre	On-going, continuous and large project	Supported by public funding	Among top 3	WHO language
French	French Cochrane Centre	On-going, continuous and large project	Supported by public funding pending grant approval	Among top 20	WHO language; Already using machine translation + volunteer validation approach
Portuguese	Brazilian Cochrane Centre	On-going, continuous, small project	No funding	Among top 10	Already using a volunteer approach
Traditional Chinese	East Asian Cochrane Alliance	On-going, continuous, small project	Center for EBM, Taipei Medical University; Ministry of Health and Welfare, Taiwan	Mandarin is No. 1, Traditional Chinese characters used in Taiwan	
Croatian	Croatian Branch of the Italian Cochrane Centre	On-going, continuous, small project	Supported by public funding	Minority	

PHASE 2

Integration with new Translation Management System once Phase 1 languages and work flows are fully setup (late 2014 or earlier); some of these are subject to more in-depth discussions with potential project coordinators; others may move up to Phase 1 if they progress more quickly than currently anticipated.

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[15] Estimates as per http://en.wikipedia.org/wiki/List_of_languages_by_number_of_native_speakers and http://en.wikipedia.org/wiki/List_of_languages_by_total_number_of_speakers.

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Language	Project coordination	Project status	Funding	Native or non-native speakers	Comments
Simplified Chinese	Chinese Cochrane Centre	Not started	No funding	Mandarin is No. 1, Simplified Chinese characters used in China, Singapore	WHO language; Pilots have been conducted by different groups
Arabic	Egypt Cochrane contributors	Not started	No funding	Among top 5	WHO language; Potentially large network of volunteers available
Russian	N/A	Not started	No funding	Among top 10	WHO language
Japanese	MINDS (Medical Information Network Distribution Service)	In preparation	MINDS	Among top 10	Should involve Japanese Branch of the Australasian Cochrane Centre
Korean	Korea Institute of Oriental Medicine, Pusan National University, Gachon University	In preparation	No funding	Among top 20	Korean Branch of the Australasian Cochrane Centre is aware and may be involved more in the future
Indonesian	Indonesian Cochrane contributors	On-going	No funding	Among top 15	Already using a volunteer approach
German	Individual contributors	In preparation	No funding	Among top 15	Should involve German Cochrane Centre
Turkish	N/A	Not started	No funding	Among top 25	Wiley market priority

Translations in languages that are not currently listed above should generally be encouraged. Additional priorities could be identified post Phase 1 and Phase 2, or new opportunities may emerge as we are approached by people interested in contributing and coordinating additional languages.

6. SELECTION AND PRIORITISATION OF CONTENT TO TRANSLATE

We are highly unlikely ever to have sufficient resources to translate all of our content in the near future. Therefore, we need to prioritise content for translation that provides users with a coherent experience. Cochrane may decide to define minimum thresholds of content that need to be translated before a language is added to our platforms. Translation priorities should be revisited as the Cochrane re-brand is undertaken and completed (see section 2. above); and as derivative products are developed.

1ST PRIORITY: REVIEW CONTENT AND ITS PUBLICATION PLATFORM

Cochrane Reviews are our main product, so they should also constitute the initial priority of our translation efforts. Generally, the focus must be:

• translation of the title, abstract, and PLS before other Review content; and
• translation of certain parts of the platform on which Reviews are published.

We would not promote the translation of entire Cochrane Reviews, but would not want to prevent people from doing it if they want to or can attract resourcing to do so. We would therefore need to be able to facilitate this much more comprehensive scale of translation technically.

Different languages will have different levels of resources available, and in some cases different topic priorities (including topics relevant to their region, or those of their funders). We therefore need to agree an order of priority or different priorities that translation projects can choose from. The following matrix provides an initial, simplified, idea of how priority levels may be defined that translation projects could then choose from. Keeping existing translations up to date should always be a high priority.

Review content prioritisation

Which sections / Which Reviews	Title	Abstract and/or PLS	Other Review sections
Top 100 priority Reviews, e.g., high impact Reviews, most accessed Reviews, regional relevance, funder or decision maker priorities, Special Collections, Evidence Aid	1st	2nd	4th
New and Updated	2nd	3rd	5th
By topic/Review Group	2nd	3rd	5th

For example, a group may be interested in starting a translation project, and doesn't have any funder commitments. We would recommend starting with the title, abstract and PLS of the top 100 accessed Reviews, and new and updated titles as they are published.

Access statistics, user surveys and consultation with the CEU should help identify priorities, including topic priorities or additional Review section priorities, if sufficient resources are available for a specific language to translate sections beyond the title, abstract and PLS.

Platform and related content prioritisation

To enable website navigation and to provide non-English speaking users with a coherent experience, at least the homepage, disclaimer and content relevant to search functionality should be prioritised for translation in languages where Review content is available. Browse options and the feedback form

should be the second order of priority. A strategy for inviting, and replying to, feedback in languages other than English, and potentially translating feedback into different languages, needs to be developed.

2ND PRIORITY: DISSEMINATION AND IMPACT

Translation of content that facilitates rapid dissemination and potentially increases impact should be prioritised. This may include social media updates, impact stories, press releases, editorials, etc. The dissemination of multi-language content should not be the sole responsibility of Cochrane's CEAD, but also supported or driven by regional Cochrane groups and contributors.

3RD PRIORITY: COCHRANE.ORG

In view of the timeline for the Cochrane re-brand, translation of content currently available on cochrane.org would not be a priority for 2014. An interim solution (pre-2015) whereby key information about Cochrane would be made available as part of the multi-language Review platform should, however, be implemented, if it can fit into the overall re-brand development process. Critically, we would need to plan to launch the re-branded web presence in a multi-lingual version, thus plan for certain content to be translated into agreed languages in time for the launch date.

4TH PRIORITY: OTHER POTENTIAL CONTENT

Assuming, we have good infrastructure and processes in place, and enough resources available, Cochrane could consider translating some or all of the following types of Cochrane content in addition to the above (in the following order):

- **Derivative products.** Where the business and sales plans warrant it, Cochrane Innovations could support the translation of its key derivative products (Cochrane Learning, Cochrane Clinical Answers, Cochrane Journal Club, Evidence Aid, Special Collections, etc.).
- **Cochrane apps.**
- **Guides and manuals** (Cochrane Handbook, MECIR Standards, editorial resources, etc.).
- **Training materials**. Some Cochrane groups based in non-English speaking countries already translate training material, or produce their own material in different languages.
- **Podcasts.** Some podcasts are available in other languages, but there is no co-ordinated approach to translation, they are often initiated by the authors of the related Reviews themselves.
- **Promotional videos.** The 20th Anniversary video series has been made available with Google Translate subtitles, the quality of which is, however, rather limited.
- **Official documents** (policies, minutes). Would constitute a statement of transparency, but rather low priority, as it is unlikely to have a high impact.

BEYOND OUR SCOPE

TRIAL ASSESSMENT AND DATA EXTRACTION FOR COCHRANE REVIEWS

Cochrane Reviews aim to assess all available research, including non-English trials. Regional Cochrane groups are often the first point of contact for Review authors and CRGs searching for native speakers who can help assess eligibility of non-English trials and extract trial data, and Archie can help find people who have self-identified as translators for a certain language, and sometimes for specific CRGs. There is however no definite route to finding native speakers for this purpose, and Review authors and CRGs sometimes struggle with it.

While this is not part of the main focus of the translation strategy, we should bear in mind, and aim to address, the need for an accessible network of translators that can be contacted for trial assessment and data extraction, and for a clear contact path for a given language. Ideally, we would

have a first point of contact for each language, which would be, wherever possible, the regional Cochrane groups who can then also forward on to topic experts if available. Alternatively, we could have an easy way to source for and contact potential translators based on language and topic skills. Cochrane's network of translators should include both those who actively translate Cochrane content on a regular basis and those who are willing to help with trial assessment and data extraction – some people will assume both roles.

We should explore if it makes sense to include this area of work into the same translation management system that will be used for Cochrane content translations; if Cochrane's members' database can provide better ways of highlighting members' different skills and of establishing contact pathways to access these; and liaise with the IKMD to check how this may fit with ideas and plans on collaborative Review production tools.

7. TRANSLATION COORDINATION

We propose that Cochrane employs a full time central translation coordinator. This person would be in charge of ensuring the implementation of the translation strategy in coordination with the various teams involved including among others:

- Translation project coordinators, translators and editors.
- Cochrane Groups (Centres, Review Groups, Fields and Methods Groups).
- Cochrane Informatics and Knowledge Management Department.
- Cochrane Communications and External Affairs Department.
- Cochrane Editorial Unit.
- Roadmap Committee.
- Wiley.
- External providers.

The ideal person would be a non-native English speaker who can fully grasp the issues around translation. If the person is a native English speaker, non-English speakers need to be involved in the strategy implementation as consultants on a regular basis.

Overall coordination of the translation projects will be the responsibility of the central Translation Coordinator. However, each language also needs a native project coordinator, ideally from a regional Cochrane group or Cochrane Centre. Where local resources are not available, Cochrane may decide to fund native project coordinators for certain priority languages to work closely with the Translation Coordinator to meet certain strategic goals.

8. TRANSLATION MANAGEMENT SYSTEM

Cochrane is currently providing the 'Translation Exchange' in Archie as a means to manage translations of Cochrane abstracts and PLS and to publish them on *The Cochrane Library*. The Translation Exchange does not, however, support the translation of content beyond Review content, and does not support the translation process itself beyond a very limited extent. Translation projects are currently relying on various additional processes, both manual and software supported.

In order to support effectively translation projects with the language and content scope as substantial as is proposed, Cochrane needs to set up a Translation Management System that provides a user-

friendly infrastructure to manage all steps of the translation process (including publication within the same web interface) with the aim of replacing the various existing workarounds. This system must:

- include user management of translators and editors;
- be flexible to accommodate different and combined translation methods (machine translation, crowd-sourcing, professional translation) and work flows;
- facilitate translation of regularly occurring updates to the source content;
- facilitate long-term translation of similar content by building up a translation memory; and
- be able to handle all required types of content.

Preferably, the system also needs to be able to offer automated solutions to integrating external software if needed (e.g., Archie, and the French machine translation software).

We have searched widely for Translation Management Systems that meet our requirements and have come to the conclusion that the system that best fits our needs is available from a company called Smartling (http://www.smartling.com/). Contracting with Smartling would allow us to set up a translation management infrastructure that meets all of the requirements set out.

Critically, in addition the Smartling system allows us to publish multi-language websites within weeks with very low additional development costs needed from Cochrane and Wiley. Smartling offer a unique multi-language website publication system called the 'Global Delivery Network' (GDN), which will publish the translated versions of our websites for us and will thus make it unnecessary for us to set up our websites as multi-language sites for the content that is published using the GDN. Using any other tool would require Wiley to develop *The Cochrane Library* as a multi-language website first; and this is not going to be possible in the short to medium term.

The Smartling GDN also enables us to easily control and integrate various source and translated material on the translated pages of our websites in a way that ensures viewers are not presented with translations of material that do not meet our quality criteria. For instance, the full text Cochrane Systematic Reviews could be presented in English (because there is no translation of sufficient quality available) at the same time that other parts of the presented web page (such as titles, abstracts and PLS) are drawn from Cochrane-approved translations, whilst other parts of the web page (for example, parts of the general shell text from the website) are translated via machine translation (such as Google Translate or Cochrane-trained software). This gives Cochrane tremendous flexibility and control over the presented content on our website(s).

We have therefore had prolonged and in-depth discussions to explore our needs with Smartling, and been very impressed with the technical expertise and levels of engagement and responsiveness they have shown. As a result of these interactions, Smartling have provided an impressive draft implementation plan (appended as a separate document). We have demonstrated the Smartling system to the Spanish, French and Portuguese translation coordinators to date and their feedback has been very positive, indicating that it would constitute a substantial improvement to their current processes. From our experience to date, Smartling provides a product that is superior to those of others on the market; and also – critically – is able to provide levels of professional support, speed of response and engagement with us that Cochrane needs for such a complicated and multi-faceted translation project, especially in these early stages. This assumption is backed by the quality of Smartling's customers' list compared to those of other companies.[16]

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[16] Smartling clients include TED, The Economist, SlideShare, SurveyMonkey, Sony Music, Spotify, Vimeo, Nokia, Kodak, and many more. A selected list is available here: http://www.smartling.com/clients.

In our search of different translation management systems, some of Smartling's competitors offer additional translator tools (e.g., spellchecking) and interactive community tools (e.g., chats); but we concluded that these did not outweigh the much greater advantages Smartling's systems offered. In addition, these extra tools are not technologically demanding and could be implemented by Smartling relatively easily, so we can explore their plans in this area, or if they would be willing to add certain functionality in the future if we need it.

The Translation Strategy Working Group did consider the option of conducting an open call for tender for a translation management system, and normal practice would lead to the development of an RFP against a set of technical requirements. However, Cochrane's translation management system and publication needs are so unique that we do not think that any other company can meet them in such a comprehensive, integrated and reliable way. As a result, the Translation Working Group decided that there would be no benefit in investing resources and time into a tender process at this stage. Smartling's sophisticated product and excellent support service does come at a substantial cost, but they are very keen to contract with us and we have negotiated an excellent discounted not-for-profit rate.

The Translation Working Group also considers the investment is essential in order to be able to deliver the rest of the translation strategy with the speed, scope and likely level of efficiency and effectiveness. However, the Group also recommends contracting with Smartling with the following reservations:

- That we sign a shorter term contract for three years (even though deeper discounts were on offer for a five-year period) given that technology advances may create a very different market in 2017; and new opportunities and competitors to Smartling may emerge so we can reconsider and explore different options in the relatively short term future.
- Together with translators, we will evaluate Smartling functionality and usability over the next three years and assess alternatives as they emerge.
- We will explore over the same period if it would be possible and cost-effective to develop an in-house translation management system that could offer the same scope and sophistication. At the moment, we do not have the resources and (translation related) expertise to develop such a system in the short term.

9.   PUBLICATION, PRESENTATION AND SEARCH OF TRANSLATIONS

PUBLICATION
Under the assumption that we will be contracting with Smartling, we would have three routes to publication of translations:

1. Review content: Via Archie, in line with the publication process of the English Reviews. Translation versions are stored in Archie and linked to the English Review versions in order to track updates.
2. Web interface content: Via Smartling's Global Delivery Network (GDN). Smartling detect and retrieve new content and updates for translation automatically as agreed.
3. Documents and special formats (e.g., PowerPoint, audio, video): On a case by case basis either via Smartling's GDN, automated import/export or manual upload/download.

MULTI-LANGUAGE COCHRANE PLATFORM

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Cochrane should aim at publishing all available translations in any language on a multi-language platform together with the English source content, featuring a user-friendly interface, search and browse in all available languages. The make-up and design of this multi-language platform will need to be developed as part of the Cochrane re-brand (see section 2. above).

The key principles and specifications are:

• Translated content is made available to users in the same way as the English source content.
• Easy navigation between the different languages is ensured by a one-click language switch that is available in a prominent position from any page of the platform.
• For content where there are no translations available, we may decide either to provide the source content only, or machine translated content, if the quality is considered acceptable, and the content flagged as machine translated accordingly.
• We will explore the usability of publishing Review translations side by side to the English source.[17] This could serve as a control mechanism and allow users to feedback in case of translation errors; however, it may not be practical, possible or cost-effective to provide this.

MULTI-LANGUAGE SEARCH

Multi-language search should allow a user to search the Cochrane platform in any of the available languages and retrieve all relevant content.

The key principles are:

• The search experience and functionality aims to be equivalent or at least comparable in every language.
• A search should return all relevant content in whichever language it is published, i.e., content in the search language first, and additional content in the source language where no translation in the search language is available.

Detailed multi-language search requirements for *The Cochrane Library* are currently being developed by the Roadmap Committee in consultation with the Translation Strategy Working Group. An initial set of specifications is available in Appendix 2. For content that is not part of *The Cochrane Library*, Cochrane's CEAD and IKMD will be in charge of developing and implementing the search functionality based on the key principles outlined above.

10. TRANSLATION POLICIES, STANDARD OPERATING PROCEDURES AND GUIDELINES

We need to establish official policies, standard procedures and guidelines, covering licensing arrangements, co-publication permissions, decision-making, quality standards and procedures in relation to translations of our content. People interested or involved in translations need to be provided with guidance, and be able to draw from the experience of past or on-going projects. Language project specific needs will be considered in the establishment of policies, processes and guidelines; and we will aim to accommodate different requirements, where they fit with the overall objectives and developments of the strategy.

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[17] See example on French Cochrane Centre website:
http://cochrane.fr/index.php?option=com_k2&view=item&id=5039&recherche=&Itemid=537.

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The development of translation policies for inclusion in Cochrane's Editorial and Publishing Policy Resource is in progress under the lead of the CEU in consultation with the Translation Strategy Working Group and Wiley, and a first set of policies should be published within the next few months.

The following points are being considered initially:

- Translation permission: Awarded and agreed by signature of a translation agreement (to be developed) that outlines rights and obligations as per the policies. No charge is made for the permission to translate, unless the requesting party is a commercial company.
- Copyright in the translated text: Translations of Cochrane content are to be owned by Cochrane.
- Publication of translations: All translations of Cochrane content are published on our platform. In addition, translations may be published on external sites via automatic feeds, so it can be guaranteed that they are kept up to date, and provided that the copyright is stated, and that Cochrane's open access or license agreements are adhered to.
- Translation licencing: Translated abstracts and PLS are freely available along with the English originals. Translations of other Review sections will be subject to the same access arrangements as the English full text.
- Standard citation for translations: Translations should be cited using the English citation.
- Minimum quality standards for Cochrane translations.
- Translation policies for derivative products.

11. FUNDING

Cochrane should fund the following components of the proposed translation strategy (a detailed budget is available above):

- The establishment and maintenance of central translation management and publication infrastructure, including a partnership with Smartling and the resources that will be required within the Central Executive to set it up and support it.
- Resources required within the Central Executive for the development of simplified and standardised language, and multi-language content and communication strategies.
- Employment of a full time translation coordinator.
- Partnerships (which may involve cash or in-kind resources from Cochrane) or even explicit consultancies may be required to support our work in the areas of standardised language, machine translation, crowdsourcing, multi-language search, etc.
- Optionally, employment of translation project coordinators or editors for priority languages.

As our Publisher, we would expect that Wiley would also invest into publication, presentation and search developments, and be involved in editorial and communication strategy development.

The listed measures constitute a long-term investment towards any language, not only specific languages. This investment will allow us to build sustainable translation infrastructure to provide our content in different languages, which in turn will:

- Open up new markets for our products in non-English speaking countries, thus potentially increase sales (for instance, in Japan, Turkey, Croatia, China and Taiwan).
- Put us in a better position to attract funders from non-English speaking countries and globally acting funders to return and continue the investment, including the investments made by local Cochrane groups.

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It is important to note, that the requested budget and the items outlined above *only* cover central Cochrane resources required to deliver the translation strategy; they do not take into account the substantial resources currently provided by - and in future required from - regional language projects to coordinate and perform translations. If we want to guarantee a certain translation production capacity for specific languages, Cochrane will need to allocate additional resources for language project support, e.g., part time native language translation coordinators.

In order to compensate the resources spent on translation centrally, and in particular those spent regionally by language projects, Cochrane should actively approach potential funders with a particular interest in translations, and funding agreements could be combined with licence agreements. Potential funders include:

• National governments.
• Regional public health organisations.
• Regional patient associations.
• WHO, PAHO and other not-for-profit and humanitarian health organisations.
• EU and other multi-national governing bodies.

Commercial funders without conflicts of interest could be approached as well.

In this context, Cochrane should work with Wiley to offer license or funding models in non-English speaking countries that take into account that the service and product currently offered cannot be considered the same as that in an English-speaking country. If a funder or subscriber, theoretically or practically, has to provide the resources to translate our content into a different language to make them accessible in its region, then it shouldn't be charged the same price as a funder or subscriber in an English-speaking country. Nonetheless, subscriptions in non-English speaking regions should always include access to both the English and translated content to ensure access to the source content.

12. PARTNERSHIPS

The translation strategy provides opportunities for and would largely benefit from various partnerships that Cochrane should actively pursue. In many ways strong partnerships will be crucial to the success of the translation strategy generally, and will impact on the speed and extent of the translation project that we can achieve. This is, in particular, true in relation to the following points:

• Language specific conduct and coordination of translations: All larger translation projects (French, Spanish, Traditional Chinese, Japanese) have to date spent their own resources to translate Cochrane content.
• Areas that are beyond our in-house expertise: for example, research in standardised language and machine translation, crowdsourcing processes, multi-language search, etc.

Partnership building for translations would be in line with Cochrane's 2014 strategic target 3.2: 'Identify and establish partnerships with three to five international strategic stakeholders to advance evidence-informed health decision-making.' Potential partners include:

• Regional Cochrane groups as the first choice partners to coordinate translation projects, to provide content and methods validation of translations, to help engage volunteer translators, inform multi-language communication strategies and attract regional funders. We are dependent on

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- Institutions, organisations and companies involved in and interested in research around standardised content and machine translation in health. The preferred partners would be academics, as they generally have no commercial interests and access to large scientific networks.
- Organisations and companies that can provide parallel corpora that could help improve our machine translations and vice versa. Cochrane should also be open to sharing our parallel corpora and glossaries, free of charge, for research and not-for-profit purposes, or for a fee for commercial purposes.
- Not-for-profit translation crowdsourcing initiatives, e.g. Translators Without Borders, Taghreedat.[18]
- Institutions, organisations and companies that can provide multi-language ontologies, text mining tools, and search advice, or are interested in joint research in these areas including, for example, Epistemonikos. Cochrane should also be open to sharing these kinds of content and tools if we develop them ourselves.
- Philanthropic organisations and foundations. For example, Google.org (Google's philanthropic arm) conducted a crowdsourcing health translation project in 2010 (Health Speaks).
- Existing partnerships with the WHO, PAHO and BIREME, who publish their own Cochrane Review translations, should be reviewed to avoid duplication of effort, prevent publication of different translations of the same Review, and explore funding opportunities for our translations.

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[18] Such organisations have access to large volunteer translator networks that can contribute translations, but they do not supersede quality assurance by content and methods experts, and a sustainable translation management and publication infrastructure.

APPENDIX 1: TRANSLATION METHODS

Translation method	Details	Quality	Resource implications
1. Professional translation (+ human validation)	Pay a company specialised in medical translations, and editors specialised in the content area or methods.	High in particular in terms of language and grammar, but due to our specialised content, human validation by content or methods experts is required.	Highest cost compared to the other models, thus least sustainable. In addition to the cost for the company and editors, the multi-step process requires a high level of coordination.
2. Computer aided translation (CAT, e.g. *Déjà Vu*)	Pay translators and editors specialised in medicine/methods and capable of using CAT software. The most recent versions of CAT combine its output sequentially with machine translation (see below).	High, especially when the software's translation memory has grown after a while to include many identical or similar sentences. Nonetheless, human validation by content or methods experts is required.	High cost, but the price is graded depending on the number of repetitions and fuzzy matches with content in the memory. The multi-step process requires a high level of coordination, but new technologies and software can facilitate some of that effort.
3. Machine translation (without human validation)	Use automated software. Many free or paid for online or desktop solutions exist.	Lowest compared to the other models, but depending crucially on the software's translation memory and the complexity of the original content. Software can be trained with existing Cochrane or health content translations, which will increase the quality greatly, especially as a lot of Cochrane's content is repeating the same sentence structures and has a relatively limited and specialised vocabulary.	Low cost and long term solution. Cost implications mainly for developing the software and the translation corpora, if there isn't sufficient translated content available.
4. Machine translation + human validation	Use automated software, and paid for or volunteer editors specialised in the content area or methods.	Very good, likely better than option 1.	Moderate, but much lower than option 1 and less than option 2. Compared to option 3, there is an increased need and cost for co-ordination, infrastructure, and the editors if paid.

5. Collaborative network of volunteers	The Wikipedia principle: provide the infrastructure for a network of volunteers, a social community, where everyone can contribute as much or little as they like.	Likely to vary, but probably good, as it can be presumed that mostly committed people would contribute and correct each other. Style guides, glossaries and training may facilitate more standardised results. There may be a risk that conflicted people try and modify evidence, so there is need for some kind of central control mechanism and/or initial qualification examination of each volunteer.	Low cost, but also unreliable. Costs mainly for setting up and maintaining the infrastructure.

APPENDIX 2: MAIN PRINCIPLES AND REQUIREMENTS FOR *THE COCHRANE LIBRARY* SEARCH

1. For each language for which we decide to publish translations, we will also offer search functionality.
2. The interface language defines the default search language.
3. Ideally, search in different languages should be able to retrieve information from all databases and cochranelibrary.com content in *The Cochrane Library* (as it does for English), even if databases beyond *CDSR* are not translated. At the very minimum, multi-language search needs to work for *CDSR*.
4. A search in a non-English language has to return all relevant content. This means: all translated results for the respective language, plus the relevant original titles (English or whatever the original publication language may be), when a translation does not exist.
5. We are working to the principle that the display of non-English language content should always be prioritised above the English-language content if available. Consequently, when a search is conducted, the order of priority of returned results is:
   i. Results in the language in which the user is searching should be displayed first.
   ii. Results in the original language (i.e. English for now) should be displayed for relevant results where there is no translation available.

   The results that are returned in the translated language should not be duplicated in the English-language results. Possible stock phrases (which would be in the language of the search) could be:

   "There are 20 results from your search on "headache" available in French. There are 205 additional results from your search on "headache" available in English."

   Cochrane and Wiley need to make decisions on further criteria for prioritisation (order) of results, e.g. amount of translated content for a given result (title only vs. abstract + PLS vs. entire Review), relevance etc.
6. A user should be able to switch between all available search languages easily, and re-run the same search in a different language or display the same results in a different language (without having to know the translation for the previously applied search term(s)). Possible stock phrases (which would be in the language of the search) could be:

   "There are 0 results from your search on "headache" available in French. There are 205 results from your search on "headache" available in English. Click here to view results in other languages."
7. If feasible, users should be able to combine search terms of different languages (e.g. 1 English word, 1 Spanish word). The order of returned results would remain as described above.

SEARCH PARAMETERS IN DETAIL

Simple Search

Feature	Notes
Phrase searching using quotation marks	Should function the same way as in English i.e. Finds content in non-English language and also same content in English translation
Truncation	
Boolean operators "AND" and "OR"	? Boolean logic in non-English languages
Nesting (i.e. explicitly grouping search terms); order of precedence rules mirror English language interface	

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Proximity operators (NEAR, NEXT)	These don't work in the English language version of the Search tab, only in the Search Manager tab.
Automatic stemming	Same rule to turn it off as in the English interface - quotation marks
Auto-complete	
Auto- correct: "did you mean?"	
Field limiting available as a dropdown: Title, Author, Title/abstract/keywords, Search all text	The other dropdowns on the English language interface are less relevant if the results remain limited to title, abstracts and PLS in non-English. This set of field limits also still covers the needs of most novice/casual users, in view of the requirement to have both translated and English content returned.
Transfer a search to the Search Manager tab where it can be named, saved and rerun	Currently this is the only mechanism for saving a search so some work on Search Manager tab is inevitable, even if we focus on the Search Tab initially.
Export records	How would non-English character sets be displayed on export?
Reference Guide	
Search tips embedded in the search interface	Preferable but may be limited depending on language

Advanced Search

Feature	Notes
Advanced search functionality equivalent to the English-language interface: ability to build complex multi-line strings, ability to incorporate MeSH, full syntax options (incl. proximity), add/delete lines, save & re-run searches, etc.	For discussion. May be implemented as a phased project?
Implementation of MeSH	'Phase 2'? The scale of this would be determined by however many non-English language versions of MeSH there are.