Cochrane

Project Transform

Production Models for Cochrane Reviews

How are we producing reviews?
What works? What could we improve?

Trusted evidence.
Informed decisions.
Better health.

Contents

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Key Messages

There are several ways to improve Cochrane's review production models to help ensure Cochrane Reviews are high-quality, relevant and up-to-date.

These include opportunities to:

- clarify roles and expectations of authors and Cochrane Review Groups;
- ensure continuity and consistency of input into reviews;
- actively coordinate the review process;
- centralise some aspects of review production;
- break reviews into smaller 'chunks';
- improve approaches to capacity building and information sharing around review production.

New technologies have the potential to support many of these improvements.

Executive Summary

Cochrane's future relies on ensuring that Cochrane Reviews are high-quality, relevant and up-to-date. To inform discussion about how to best achieve this, we conducted interviews with 26 participants and an online survey with more than 100 respondents.

We aimed to explore the models currently employed to produce systematic reviews both within and beyond Cochrane and to gather ideas about how review production could be improved.

Respondents highlighted the importance and the challenge of creating reliable, timely Cochrane Reviews. They described the difficulties and opportunities presented by current production models, and they shared what they are doing to improve review production.

They particularly highlighted significant challenges with:

- the increasing complexity of review methods;
- the difficulty keeping authors on board and on track (particularly volunteers, but also paid, geographically diverse teams);
- the length of the review process.

Respondents also raised concerns about conflation of review production and editorial processes.

The responses we received suggest that improvements to Cochrane's systematic review production model could come from:

- improving clarity of roles and expectations of authors and Cochrane Review Groups from the outset of all review production processes;
- ensuring continuity and consistency of input throughout the production process, between reviews and between Review groups;
- enabling active management of the review process;
- centralising some aspects of review production;
- breaking reviews into smaller 'chunks';
- improving approaches to capacity building and information sharing around review production.

Respondents noted the important role technology has the potential to play in enabling these improvements.

This information will be used in discussion with the Cochrane community to identify and develop review production models for piloting in the next phase of the Production Models component of Project Transform.

1. Why are we talking about production models?

Cochrane Reviews gather and synthesise the best evidence from research to support informed healthcare decisions by patients, health professionals and policymakers.

The future of Cochrane is dependent on ensuring the quality, timeliness and relevance of Cochrane Reviews.

Producing high-quality, relevant reviews and keeping them up-to-date is challenging. The increasing complexity of the review process, the rapidly expanding body of evidence available for review, the voluntary nature of many author teams and the increasing number of reviews all add to the difficulty, however these same elements are also central to Cochrane's reputation and its impact.

To meet the challenges before us, Cochrane needs to identify and scale-up ways of working that will result in good quality reviews produced quickly and reliably.

Project Transform was funded as a Cochrane Game Changer Initiative with the overarching aim to improve the way people, processes, and technologies come together to produce Cochrane content. Transform has four components: Evidence Pipeline, Getting Involved, TaskExchange and Production Models. The aim of Production Models is to identify, pilot and scale-up effective approaches to producing high-quality, relevant, up-to-date Cochrane Reviews.

1.1 Purpose

This report presents the results of the first phase of Production Models; an exploration of the systematic review production models currently employed within and beyond Cochrane.

The report highlights what people are doing to improve the quality and timeliness of systematic review production, what they find is working, what challenges they face and what is needed to enable further improvement.

This information will be used in discussion with the Cochrane community, key Cochrane groups and decision makers to identify and develop innovative production models for piloting and scale-up.

2. Who did we speak to?

We used a mix of qualitative and quantitative methods to explore participants' experiences with systematic review production models, including an online survey and semi-structured interviews. The methods are described in Appendix 1.

2.1 Interviews

We conducted 26 interviews between July and November 2015.

Participants included: Review Group Managing Editors (6); Cochrane authors (6); external systematic review authors and guideline developers (6); Review Group staff (3); Review Group Co-ordinating Editors (2); Cochrane editors (other than Managing or Co-ordinating Editors) (2) and consumers (1). Interview participants were from seven countries, and included six participants with a first language other than English. Three participants were from low- and middle-income countries (LMICs).

2.2 Surveys

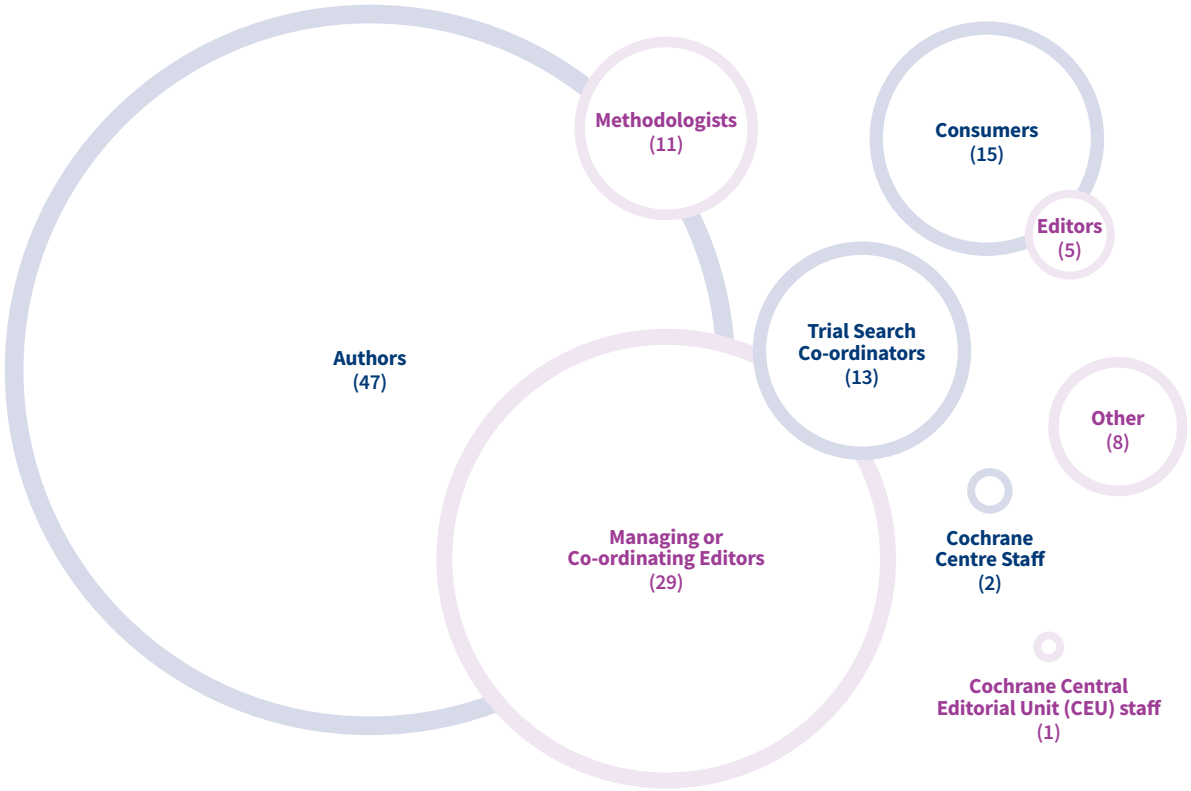
106 people provided online survey responses between August and October 2015.

Participants described themselves as: authors (47); Managing or Co-ordinating Editors (29); Trial Search Co-ordinators (13); consumers (15); methodologists (11); editors (5); Cochrane centre staff (2); Cochrane Central Editorial Unit (CEU) staff (1) and other (8) (multiple responses allowed).

Respondents had a median of 10 years of experience with Cochrane (range 0.4–20).

Responses from the interviews and surveys were strongly aligned and so have been combined.

Survey participants described themselves as:
(Multiple responses were allowed)



3. What did people say?

The people who responded described the importance and the challenge of creating high-quality, relevant, up-to-date Cochrane Reviews. Responses were wide ranging, passionate and considered. Respondents expressed frustration with and commitment to Cochrane in equal measure.

They told us about the importance of authors in the review process, and the challenges and varying approaches used to bring and keep author teams together, and to support them to complete their review. They spoke about the central and varying role of Review Groups in review production. They also shared what they are doing to improve review production. There is much we can learn from what is already underway.

Respondents expressed frustration with and commitment to Cochrane in equal measure. There is much we can learn from what is already underway.

The people we spoke to also described shared challenges that need to be addressed for production models to consistently result in high-quality, timely, relevant reviews. They highlighted significant challenges with:

- the increasing complexity of review methods;
- difficulty keeping authors on board and on track, particularly volunteers, but also paid, geographically diverse teams
- the length of the review process.

Respondents also raised concerns about conflation of review production and editorial processes.

The responses we received suggest improvements to Cochrane's systematic review production model could come from:

- improving clarity of roles and expectations;
- ensuring continuity and consistency of input;
- enabling active management of the review process;
- centralising some review production steps;
- breaking reviews into smaller 'chunks';
- improving approaches to capacity building and information sharing around review production.

In some cases, people provided examples or suggestions of ways to address the issues they are confronting.

3.1 How are we producing reviews?

While the Cochrane review process is very systematic, the way we produce reviews is also variable and creative. There is substantial variation in the approaches to review production both within and between Review Groups. Almost every aspect of the review production process varies to some extent between these groups.

The way we produce reviews is variable and creative.

Similarly, while each individual review ostensibly follows the same process, they are not predictable. Reviews are undertaken in an environment that is volatile and frequently under-resourced, and they are undertaken by people with multiple competing commitments and widely varying levels of skill and availability. Review topics cover the whole gamut from incredibly narrow to courageously broad, and vary, often unforeseeably, in complexity. Each review presents its own unexpected challenges.

Despite this variation, strong themes emerged across respondents about the roles of authors and Review Groups: the central actors in the review production process.

Working effectively with and within author teams is critical and challenging

Cochrane review authors are at the centre of review production. Respondents frequently emphasised that good relationships with and within author teams are crucial to good review production processes.

"that's the 'collaboration' bit of The Cochrane Collaboration... it's all about the human relationships"

"good people drive good processes"

Good relationships with and within author teams are crucial to good review production.

Team formation

Respondents indicated that while the make-up of the author team is the key to successful review production, in most circumstances, formation of author teams and task allocation within author teams are informal and organic. This was not perceived to be problematic.

"Team formation is organic, ask around, bring people together, there is no process"

"[We] have tried a prescriptive process, and wouldn't recommend it"

Author requirements

Requirements for author teams vary, with some Review Groups having very stringent requirements and others determined to accept all comers. Regardless of these differences, respondents agreed on the importance of having an effective review team leader. There was also acknowledgement that while requirements for authors (e.g. having a team member who has previously conducted a Cochrane Review) are often useful, they are not enough to ensure success.

"Some people just get on and do it, and you can't predict who will"

Respondents agreed on the importance of having an effective review team leader.

Linked to this, there was also a clear tension (both within and between Review Groups) between focusing on capacity building, which has the benefits of bringing in new authors and the greater time availability of junior team members, and the benefits of experienced authors, who require less hands-on support. Review Groups held strong and widely varying positions on this.

"Abandon inclusiveness regarding new authors"

"[Our] group will take anybody who wants to do a review, work with the enthusiasm of people…let them do it as long as they do it well."

Many respondents highlighted the importance and difficulty of sourcing timely clinical input throughout the review process, and of not wasting this precious time on tasks like screening search returns.

Payment and incentives

Respondents described a wide range of payment and incentive models for author teams. These included fully paid teams, outsourcing to private review companies, teams with some paid members (often Review Group or partner organisation staff), stipends for travel to the Review Group office or similar, and fully volunteer teams. All of these approaches were perceived to have strengths and weaknesses.

Some funding makes author teams more likely to be successful, but funding does not solve all review production problems.

Paid authors

Having funded, protected research time for the lead author was a frequent suggestion for improving the timeliness of review production.

> *"Having allocated funding to do the review really helps – especially for dedicated time of the lead author"*

At partner organisations

Funding staff at Review Groups' partner organisations to conduct reviews was seen as a good way to build capacity, particularly when the partner organisations were in LMICs. However respondents also highlighted weaknesses with this model, with paid authors likely to end up being responsible for many reviews, potentially across several review groups, leading to difficulties with accountability.

> *"[A] con is [that] one individual ends up being responsible for a lot of reviews. If [they are] employed for several years and do 2 to 4 reviews per year, after 5 years they will have 20 reviews to manage, and these sit across Review Groups, so pressure not just from [our Review Group], but also from other Review Groups."*

> *"I'm not their line manager, and neither is my line manager, [this is a] con in terms of how we work with partners."*

At Review Groups

Employing staff at Review Groups to lead or support reviews was frequently suggested as an effective model, although respondents questioned the feasibility of employing fulltime staff in lower resource settings.

> *"I am a firm believer that Review Groups need to employ researchers to lead reviews, particularly to do the donkey work, like data extraction"*

> *"Our best experiences have tended to come with motivated author teams who have some dedicated time to carry out the review and have an experienced author on the team. This works particularly well when that person is employed at the editorial base and can facilitate good communication between the authors and the editorial base. This has tended to produce the most timely, high-quality reviews."*

> *"the model of commissioning…fulltime researchers… [is] not suitable for LMICs."*

Volunteers

Respondents were quick to point out that while partially or fully funded teams were often more productive, there were both philosophical and practical reasons why volunteers should remain at the heart of Cochrane.

> *"[I would] Hate to see Cochrane only having paid staff, but as part of the team it is essential"*

Respondents highlighted the key role of volunteer Cochrane authors in producing the bulk of Cochrane reviews, and producing a wide variety of reviews. They also noted the importance of volunteers in maintaining the connection between clinicians and community members and the research that was of interest to them.

Working with, and as, volunteer authors was acknowledged to be very challenging, but incredibly valuable.

> *"With volunteers it is very difficult, but volunteers are the only way Cochrane can be as productive as it is"*

Respondents highlighted the increasing difficulty of finding volunteers with available, flexible time to work on Cochrane Reviews, both in LMICs and also in high resource settings as funding models change.

> *"It's hard to see how a completely voluntary model is sustainable at scale in those [LMIC] settings."*

Commercial systematic review producers

A small number of Review Groups described their experiences of contracting commercial systematic review producers to complete components of a review or whole reviews. While dependent on the availability of funding, these arrangements were seen to be very efficient at producing high-quality reviews quickly.

> *"Companies are far more efficient than universities, lower overheads, more nimble"*

Incentives and fellowships

Small incentives and fellowships were felt to be useful in providing legitimacy for review work for both Review Groups and authors. Incentives and fellowships facilitate project management by Review Groups, and allow authors to demonstrate the value of review work to their institutions. Fellowships for authors to visit Review Groups were particularly valued for the opportunity they provided to work face-to-face.

"…we have had some success with monetary incentives…that come with non-negotiable publication deadlines. This allows the editorial base to legitimately…set deadlines with the review team, as well as providing the opportunity of offering peer referees a small incentive in return for prompt feedback."

"A previous round of work with that same Cochrane group had been given minimal funding for some updates – a couple of thousand pounds at most. This in no way covered the costs of the work, but it helped to oil the wheels in some universities and allowed one of us to attend a Cochrane symposium."

"Ability to work face-to-face is invaluable"

There was widespread acceptance that having some funding makes author teams more likely to complete their review, largely by leading to a greater sense of accountability. However, this was paralleled by acknowledgement that funding does not solve all review production problems.

"Things move along in a different way where there is a little funding for the review team to justify spending the time"

"[Teams need money for] protected research time – if not, then it's never going to get done, and even with it, it's very difficult"

The role of Review Groups varies widely and can be unclear

Project management

Project management of review production processes emerged as a substantive issue. The extent of project management undertaken by Review Groups varies widely, with some groups providing active, hands-on management by the Managing Editor, a paid lead reviewer (often a member of the Review Group staff) or an unpaid guarantor author. Usually Review Groups provide this level of active project management for a small selection of priority reviews, however some aim to cover all reviews. Other Review Groups describe themselves as "hands-off" and do not provide any project management of review production. There is a sense of an overall trend towards more hands-on management, although this is acknowledged to be resource intensive and sometimes perceived to be unattainable.

There is an overall trend towards more hands-on management of review production.

"If you can find a Review Group where people are less hands-on than we are and are producing good reviews, I'd like to see it"

The role of Review Groups

There is also considerable variation in how Review Groups perceive their wider role in the review production process. This leads to substantial differences in the extent to which Review Groups see their role as providing clinical input, methodological guidance, editorial oversight and/or author support.

Conflation of review publication and review production

A related theme was the conflation of review production and review publishing roles. Respondents were very concerned about the challenges this conflation creates in the production process (as an example, see the discussion of peer review below). This leads to, at the very least, a perceived conflict of interest for Review Groups, which are both responsible for both producing the review and making the decision about when a review can be published. This concern is heightened when Review Group staff are involved in authoring or intensively supporting reviews. There was concern among participants that perverse incentives may exist for Review Groups to publish reviews that were not of the highest possible quality.

"[The] production process is currently confused with publication process"

Many respondents mentioned substantial issues with the peer review processes.

Peer review

Many respondents, both authors and individuals within Review Groups, mentioned substantial issues with peer review processes. These issues include the long time delays introduced by peer review processes, the lack of clarity around the purpose of peer review, the difficulty of sourcing appropriate, high-quality peer review and the challenges with collating and communicating the feedback in a constructive, helpful way for authors.

"Best peer review is from editors. External peer review is cosmetic."

"Peer refereeing process timeframes are terrible. Can be months before feedback is received, then authors respond, then another round of feedback. Can be 6-12 months, which is very demotivating."

3.2 What is needed in a new approach?

The majority of the people we spoke to within Cochrane were either actively looking for or trialing new approaches to review production.

The ongoing, ubiquitous search for new approaches suggests there is shared understanding that solutions are urgently needed to the challenges of review production, and that finding a solution will not be simple.

External respondents were often very familiar with Cochrane Review production and had useful insights about the elements of their own review production approaches that might translate well into the Cochrane context, or could catalyse new ways of producing reviews within Cochrane.

While the approaches to improvement being explored by respondents differed, most seem designed to address a similar set of issues.

Improved clarity of roles and expectations

Many of the challenges with current review production processes raised by respondents appeared to be due to underlying lack of clarity about the roles and responsibilities of different contributors to the review process, particularly authors and Review Groups, and to a lesser extent Methods Groups.

Respondents described challenges arising from a lack of clarity around expectations of:

- review quality, in terms of both methodological standards and standard of writing;
- timelines, in terms of turnaround of review stages by both authors and Review Groups;
- roles of author teams and Review Groups in the review production process.

"There is a big difference in expectations of authors. Some don't communicate with the Review Group at all. Some think that we are going to write it for them."

"A clear team leader is key. Also clarity of roles at outset."

There was a feeling that one reason for lack of review timeliness was a lack of clear understanding on the part of authors of the true investment of time and effort required to complete a review.

There is a lack of clarity about the roles and responsibilities of different contributors to the review process.

Ensuring commitment on the part of the author team to complete the review was an important goal for Review Groups, though it was not clear how this could be achieved. Some Review Groups raised the appeal of, but their hesitancy to implement, formal, signed agreements with author teams that explicitly set out expectations, roles and responsibilities for authors. One of the reasons for hesitancy was a recognition of their own inability to respond within agreed timelines.

"If we could guarantee timely feedback [as a Review Group] then maybe we could expect timely input from authors too"

Several respondents emphasised the importance of getting off to a good start by investing time to ensure clarity at the beginning of a review in order to avoid later issues. Approaches to improving clarity and commitment in the early stages of the review production process included increasing the rigour of title registration processes, extending protocol processes and raising author team requirements.

"The perception is that publishing the protocol is straightforward, it's not, and it's an important starting point for the review. Being proactive at this stage is helpful"

"The start has it all."

"[Our approach is] Massive frontloading of input, review proposals and protocols. [We are] Thinking about asking for Summary of Findings tables at protocol stage"

Respondents noted that there was an expectation that reviews would use increasingly complex methods. They highlighted that this complexity led to increased workloads and timelines for both authors and Review Groups, and suggested there should be a renewed focus on simple, reliable, useful reviews.

"Go back to basics…Stop expecting complexity in all reviews"

Increased continuity and consistency of input

Respondents highlighted the vital importance of enabling continuity and consistency of input throughout the review process. They wanted consistent clinical, methodological and editorial input from all contributors to the review, including the author team, Review Group, methodologists and editors (including copyedit), throughout the review lifecycle. They were frustrated when they received conflicting advice, which often led to delays or rework. This idea was linked to the importance of having an effective author team leader (discussed above).

> *"Most important is that [a] project manager is across the whole process so it has continuity"*

Consistency throughout the review production and update process

Authors particularly valued consistency of input in order to ensure that earlier decisions were not revisited, for example, that review methods signed off at the protocol stage were not queried at review submission. Some respondents suggested systems that would allow staged quality assurance sign-off at appropriate points within review production, rather than one final quality assurance assessment, would be beneficial in terms of quality and timeliness of reviews and author motivation.

Respondents suggested it might be useful to extend the idea of the author team beyond a single review, and beyond a single version of that review, to encompass a community responsible for the ongoing life of a review. This would provide a means of ensuring consistency and continuity of input.

> *"We need to reduce dependence on a single author team to see a review from outset through years of updates. Teams should become much more dynamic; if someone has to drop out of a task, then there should be someone else who can take their place. Reviews should be owned explicitly by groups rather than authors. There should be author membership communities formed around topics or CRGs [Cochrane Review Groups]."*

Respondents wanted consistent clinical, methodological and editorial input from all contributors throughout the review lifecycle.

Consistency across reviews

The benefits of ensuring consistency of review content between reviews (and ideally between Review Groups) were emphasised by respondents. Many different approaches to ensuring this consistency were described, such as standardised methods sections, use of review and protocol templates, exemplar protocols and reviews and development of suites of reviews with shared background, PICO elements and methods sections. In some Review Groups, these approaches are standard practice, while in others they are new and potentially controversial. These approaches were felt to improve both the quality and the timeliness of review production, while reducing author workload.

> *"The quality of review improved if authors were given highly structured protocol and review templates. Also, interim editorial checks on risk of bias tables and SoF [Summary of Findings] tables improved quality."*

Consistency across Review Groups

Author respondents often suggested that standardising approaches to review production within and between Review Groups would be an immensely valuable step forward. Authors often struggled with the differing expectations and roles of Review Groups in the production process.

Technology to support consistency

Respondents noted the value of technology in supporting consistency in a variety of ways, including: creating, storing and making available reusable review content; enabling linking between related reviews; providing methods of crosschecking content within reviews to ensure internal consistency and providing an audit trail that captures decisions made during the review production process.

> *"If reviewing process can be made easier [by software and standardisation], people can focus on the bits that need thinking"*

Active, explicit facilitation and management of the review process

Many respondents noted that a major predictor of high-quality, timely review production is coordination of the review process by an experienced person explicitly tasked with overall project management who is appropriately positioned and skilled to overcome any process hurdles. As well as providing (or enabling access to) methodological and content leadership, a key role for this person is to provide a clear channel of communication with the Review Group.

Some respondents suggested a lead author should take this role, while others felt it was better suited to a member the Review Group staff, such as a research fellow or research associate.

A major predictor of high-quality, timely review production is coordination of the review process.

Respondents also highlighted that tools which are designed to support review authoring and allow coordination of the work of multiple independent contributors, have substantial project management benefits in enabling oversight of progress.

"Most author teams do not have a senior person to oversee and manage – technology could provide this"

"One reviewer needs to lead (or project manage) the entire review and consult regularly with others, set deadlines and deliverables. That person needs to be the conduit for the editorial team and manage review submissions and revisions. Communication with the review team is essential."

Centralisation of some aspects of review production

The potential for centralisation of several aspects of review production to improve quality and timeliness of reviews was mentioned by a number of respondents.

Study identification

This included centralisation of elements of searching and other Information Specialist activities. Respondents linked this idea to the need for increased specificity of searches (seen to be vital for improved timeliness of individual reviews) and to the importance of developing trial registries for review production more broadly. Automation and machine learning was seen as a key component of achieving increased specificity of searches.

Methods support

There was a strong desire for centralised methods support. Statistical methods were mentioned most frequently by both authors and Review Groups. Review Groups in particular indicated they often felt unable to access the guidance they needed to advise their authors. Several respondents suggested some form of central statistical support would be very valuable. Other respondents noted that for methods common to most reviews, but 'developed and owned' outside of Cochrane (e.g. Grading of Recommendations Assessment, Development and Evaluation, or GRADE), there needed to be an internal, central source of guidance for how these tools should be applied to Cochrane Reviews.

"[T]here is an opportunity for increased central oversight of key methods"

"We don't have anyone we can ask methodological questions of"

There was a strong desire for centralised methods support.

Peer review

There was also suggestion of the potential for (at least partial) centralisation of peer review processes. However respondents felt that for this to work and for them to be comfortable with centralisation, there needed to be clarity around the purpose of peer review; that is, whether it is intended to address methodological, editorial or clinical issues.

Flexibility in breaking reviews into smaller, skill-specific 'chunks'

A number of respondents introduced the idea that it would be useful to break review production into smaller, skill-specific tasks – chunking – that could be taken on by appropriately skilled people.

Some Review Groups already do this by, for example, giving author teams the option of having some tasks (e.g. Summary of Findings (SoF) tables) completed by Review Group-based specialists.

Chunking of review tasks was seen as a useful approach to ensure there was a good match between the skills and effort required for the task, and the skills and time availability of the person completing the task.

Chunking was perceived as a useful response to the increasing complexity of methods, and as a way of focusing the limited time of clinical authors on the areas of the review where their input was most valuable.

Respondents described the value of technology in enabling chunking by presenting a systematic review as a series of linked tasks, holding and synthesising data from multiple contributors and providing an audit trail for review decisions and processes.

> *"Very important to move on from thinking that everybody has to do every part of the review"*

Chunking of review production into smaller, discrete pieces of work was felt to enable effective communication and understanding of the likely required effort of the review process. As mentioned above, lack of understanding of the effort required to complete a review was perceived to be a major reason for author dropout. Chunking was seen to build motivation by giving authors a sense of progress and achievement throughout the review process, rather than only acknowledging this at the final submission.

> *"Later in review process [I create] a plan for completion that chunks the tasks into pieces that people can understand…Try to give them a sense of the measurable tasks"*

Some respondents linked chunking of review tasks to an increased ability to involve authors and others who have a first language other than English.

> *"Could come to a situation where people do a review, or tasks, in their own language and translate at the end"*

Chunking of review tasks is useful to ensure there is a good match between the skills and effort required for the task, and the skills and availability of the person completing the task.

Improved approaches to capacity building and information sharing

Capacity building

Respondents noted there was a need for upskilling authors and editors, particularly in new review methods, but also in other aspects of the production process, including communication and peer review. Review Groups were seen to be under-resourced or ill-equipped to deliver the kind of training and support needed to upskill authors in these complex areas.

> *"It is often left to editorial bases (and MEs in particular) to ensure that Cochrane developments (e.g. RevMan updates; RoB/SoF/GRADE) are implemented by review teams and incorporated into current and future reviews; it would be nice to think that support for us is considered in any future models."*

Information sharing

Several respondents noted that improvements were needed to the way Review Groups shared information about what they were doing to improve review production processes. A number of respondents from Review Groups indicated they were undertaking pilot activities designed to improve review production, and they were unaware other groups were undertaking similar initiatives.

> *"[I am] not clear how Review Groups are sharing materials about review production management. [Our Review Group] has materials, many Review Groups have these, how can we better share these, so that we are not duplicating effort on both technical and management information?"*

Table 1. What did people say? Highlights

	Pain points	Suggestions for improvement	Next steps in Project Transform
Clarity of roles and expectations	• Variation in the role of Review Groups in review production • Inaccurate expectations of review workload by authors • Conflation of review production and publication processes leading to a conflict of interest within Review Groups, with potential negative impacts on review quality	• Clear descriptions of the roles and expectations of all stakeholders in review production signed before review kick-off • Describe reviews as a set of smaller tasks to enable effective communication of likely required effort throughout the review process • Separate responsibility for review production from review publication process	
Consistent guidance and advice	• Consistent guidance and advice • Project management of the review process • Skills, workload and inclusion	• Standardised methods sections; review and protocol templates; exemplar protocols and reviews; and suites of reviews with shared background, PICO elements and methods sections • Staged quality assurance sign-off during review production rather than one final approval process • Centralised methods support • Centralise elements of peer review	→ Centralisation of elements of peer review to be piloted by the CEU with support and evaluation from Production Models
Project management of the review process	• Lack of effective mechanisms for project management of review production with limited ability to track progress • Inadequate communication between authors and Review Groups	• Designate author team leader or Review Group staff as project manager with a responsibility and authority to enable access to methods and content guidance, and facilitate communication between authors and Review Group • Use review production software to track review progress	→ Improved methods of review coordination, including use of review production software and designated project management, to be piloted by Cochrane Response with support and evaluation from Production Models
Skills, workload and inclusion	• Increasing complexity of review methods and requirement for high-level skills few authors have • Long review processes • Skills gaps for authors and editors that extend beyond review production methods • Low involvement of low- and middle-income country authors • Huge search returns	• Support simple reviews when appropriate • Clearly document expectations about when more complex methods are required • Focus on title registration and invest in protocol processes to ensure reviews get off to the right start • Standardised methods sections, review and protocol templates and exemplars • Chunk review production into a series of linked, skill-specific tasks using appropriate online software • Chunk reviews to identify review tasks that can be undertaken in author's first language • Enable contributions from broad interest groups rather than relying small author teams • Upskill authors and editors in new review methods and other aspects of review production, including communication and peer review • Centralisation and automation of search	→ Chunking of reviews to be piloted by Cochrane Response with support and evaluation from Production Models, and enabled for individual reviews via Cochrane Crowd and TaskExchange → Centralisation and automation of searching to be enabled by Evidence Pipeline and Cochrane Crowd.
Sharing innovations in review production	• Duplication of effort in and lack of awareness of improving review production processes	• Improve coordination and communication of innovations in review production processes	→ Production Models to work with the CEU to coordinate sharing of innovation approaches to review production

4. What is next?

The discussion above largely describes what might be done to improve review production. With a few important exceptions, we have less information on how these could or should be implemented.

This is where the next phase of Production Models will be important.

The findings of this report will be shared widely. The Transform team will work with CEU and the Cochrane community to ensure we:

- continue to have a robust discussion about how we can best improve review production;
- take practical steps to improve our approaches; and
- effectively share information about these improvements and what we are learning.

In the next phase of Production Models, we will identify some innovative models for review production based on the findings of this report, and pilot these to learn more about how we can best produce high-quality, relevant reviews quickly. It is anticipated that we will identify five or more potential models to pilot.

Potential pilot projects will be prioritised in collaboration with the CEU and interested Review Groups and author teams. Project Transform will work with the CEU to ensure the selected pilot projects align with Cochrane's strategy; support Review Groups and author teams during the pilot process; and evaluate the effectiveness of the piloted production models. Some proposed pilot projects include:

- Making technologies to support efficient review production (such as those being developed in other components of Transform, such as Evidence Pipeline and Cochrane Crowd) available in author support tools to enable use of these technologies in individual reviews
- Providing support for groups undertaking Living Cochrane Reviews
- Working closely with Cochrane Response and CEU on pilots that include elements of centralisation, or other innovative features.

Production Models will also work with CEU to develop more effective ways of sharing innovations in review production.

We are very keen to hear from all members of the Cochrane community about what practical next steps we can take to improve review production. We look forward to hearing from you.

Appendix 1. Description of methods

A mixed methods approach drawing on both quantitative and qualitative methods was used. Ethics approval was provided by the Monash University Human Research Ethics Committee – Project Number CF15/2995 – 2015001229.

Survey

Objective	To identify and document the variety of content production models employed within Cochrane.
Participants	Potential participants were associated with Cochrane Review production and included: review authors, editors and staff of Cochrane Review Groups; members of the Cochrane Editorial Unit; members of the Cochrane Central Executive and members of Cochrane Innovations. We exceeded our planned 30-50 survey respondents.
Participant Recruitment	Participants were invited to complete the survey through existing communication channels for Cochrane entities, including the Cochrane website, newsletters, email lists, social media and other similar methods. Individuals known to the investigator team were also directly emailed invitations to participate in the survey, and encouraged to forward the invitation to other potential participants.
Consent	• Participation was voluntary. Potential participants were invited to visit the survey webpage which provided a participant information statement. Choosing to proceed with the survey constituted informed consent.
Data Collection	• Data were collected using an online survey tool. Both quantitative and qualitative data were collected. • Participants could choose whether to provide their contact details to enable participation in a follow-up interview.
Data Items	Data were collected on • How review teams are formed, managed, and motivated. • How communication with and within review teams is coordinated. • How review processes (searching, screening, etc.) are conducted. • How technology is used to facilitate review processes. • The 'pain points' and gaps associated with review processes. • Potential changes to production models to improve quality, currency, relevance and breadth of reviews.
Data Analysis	• Quantitative data were analysed using simple descriptive statistics. • NVivo 10 was used to analyse qualitative data and to extract quotes. The full text of survey responses were analysed using open coding to identify key concepts, which were then collapsed into emerging themes. Data from interviews were initially analysed independently of the survey data, however as the similarity of themes became apparent the analysis was combined. • Both forms of data were used to identify strengths and weaknesses of existing and potential new production models.
Data Use	• Data will be used to inform development of new production models, and, where the participant provides consent, to identify potential interviewees to enable more detailed exploration. • Data may also be used to develop publications for Cochrane meetings, journals or other relevant academic or industry conferences.

Interviews

Objective	To explore and understand the variety of content production models employed within Cochrane.
Participants	Potential participants were from two groups. 1. Participants associated with Cochrane Review production. This group included review authors, editors and staff of Cochrane Review Groups; members of the Cochrane Editorial Unit; members of the Cochrane Central Executive and members of Cochrane Innovations. 2. Participants associated with non-Cochrane systematic review production. This group included professionals working in systematic review production for private systematic review firms, health technology assessment groups, clinical practice guideline development groups and other associated activities.
Participant Recruitment	Potential participants were invited to participate in an interview through existing communication channels for Cochrane entities, including the Cochrane website, newsletters, email lists, social media and other similar methods. Individuals known to the investigator team were also directly emailed invitations to participate in the interview, and encouraged to forward the invitation to other potential participants.
Consent	• Participation was voluntary. Potential participants were provided with a participant information statement by email prior to the interview. They provided evidence of informed consent by return email.
Data Collection	• Data were collected using a semi-structured interview in person, or by phone, Skype or similar technology. • Interview questions were loosely based on a predetermined interview schedule, with questions varied to be relevant to the interviewee's role and experience, and to the responses to preceding questions. • Notes were taken during the interviews.
Data Items	Data were collected on • How review teams are formed, managed, motivated and rewarded. • How communication with and within review teams is coordinated. • How review processes (searching, screening, etc.) are conducted. • How technology is used to facilitate review processes. • The 'pain points' and gaps associated with review processes. • Potential changes to production models to improve quality, currency, relevance and breadth of reviews.
Data Analysis	• NVivo 10 was used to analyse qualitative data and to extract quotes. Interview notes were analysed using open coding to identify key concepts which were then collapsed into emerging themes. Data from interviews was initially analysed independently of the survey data, however as the similarity of themes became apparent the analysis was combined. • Both forms of data were used to identify strengths and weaknesses of existing and potential new production models.
Data Use	• Data will be used to inform development of new production models, and, where the participant provides consent, to identify potential interviewees to enable more detailed exploration. • Data may also be used to develop publications for Cochrane meetings, journals or other relevant academic or industry conferences.

Cochrane

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