



# Project Transform

## Final Report 2015–2018

Trusted evidence.  
Informed decisions.  
Better health.





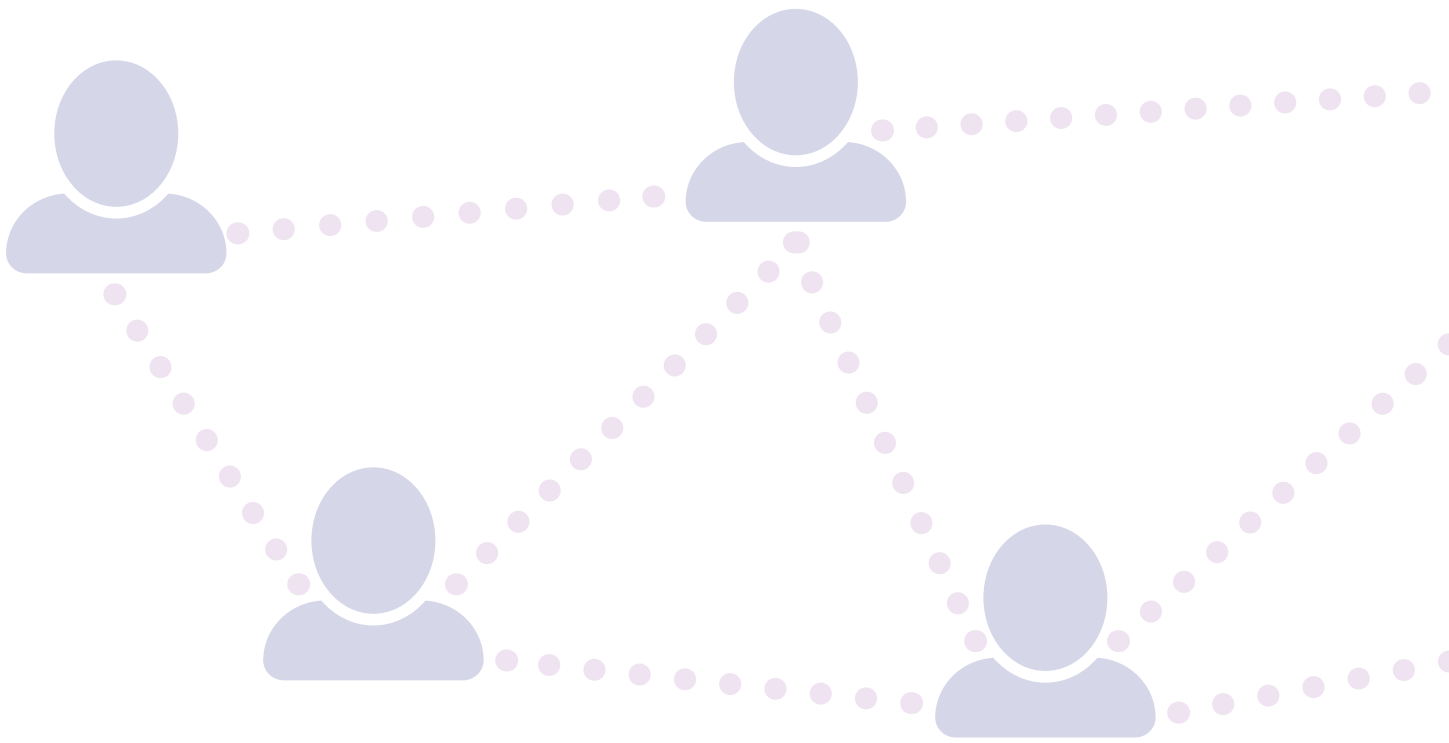
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# Contents

Project Transform: a Game Changer	4
Project overview	6
Key achievements	8
Background	10
Engaging people	11
Finding studies with Evidence Pipeline	16
Living systematic reviews	19
Transforming Australian guidelines	21
Systematic review search and writing tools	23
Communications	25
Publications	26
Project Transform team	27



## Project Transform: a Game Changer

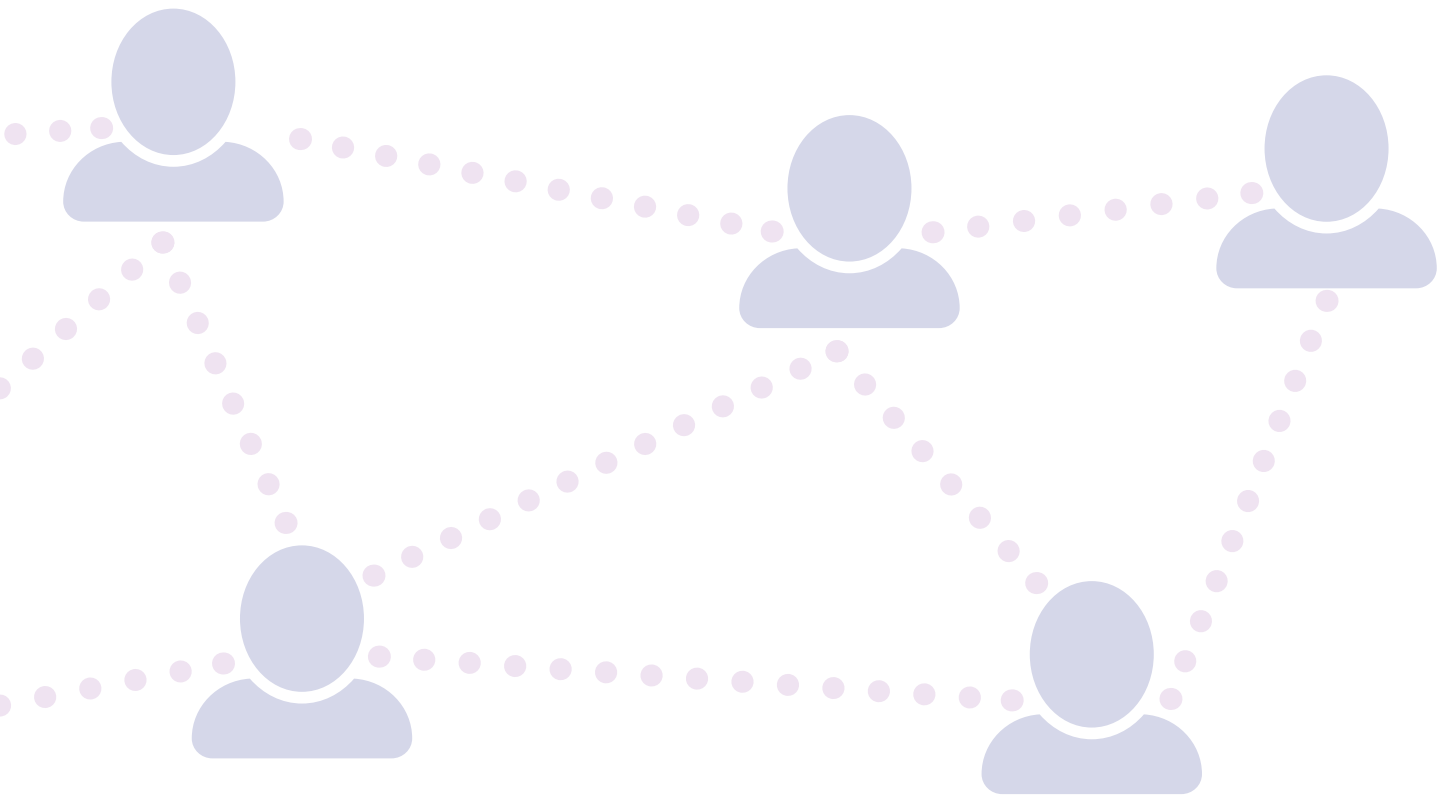
**In 2014, Cochrane called for proposals for its Game Changer Initiative, designed to fund large-scale projects that would materially improve how Cochrane does business and transform Cochrane’s ability to deliver on its vision of ‘a world of improved health’.**

The Project Transform team responded with an innovative, collaborative and ambitious proposal to improve content production, information retrieval and re-use; increase recruitment and retention of Cochrane contributors; and develop the potential of the Cochrane network.

As this report details, during the four years of Project Transform (2015-2018), Cochrane Crowd grew from a fledgling, proof-of-concept project to a thriving, productive community. In the same period, machine learning approaches to screening went from a bleeding-edge, frontier technology to a standard, validated Cochrane tool.

Taken together as Evidence Pipeline, these two elements of Project Transform have fundamentally changed Cochrane’s approach to identifying the evidence on which we base our reviews. As the basis of Cochrane’s Centralised Search workflow and Screen for Me program, they have substantially reduced workload for authors and increased efficiency for Information Specialists, while ensuring reliability is maintained in the foundational building block of Cochrane’s reviews.

During the same period, Cochrane Crowd and TaskExchange enabled a major shift in how we bring people into the Cochrane community. TaskExchange is now Cochrane’s single source for Managing Editors and authors looking for translators, peer reviewers and consumers, rapidly overcoming what have often been progress-limiting hurdles. By supporting diverse contributions to Cochrane that are not bound by time or place, or limited to those with extensive experience or specific expertise, Crowd and TaskExchange have become the core components of the Cochrane Membership program, supporting and growing our collaboration. Between them, these initiatives have brought over 15,000 new contributors into the Cochrane community.



When Project Transform was funded, the idea of living, continually updated, systematic reviews was just that, an idea. Five years on, Cochrane leads the way in living evidence, publishing growing numbers of living reviews on the Cochrane Library, producing the definitive guidance on methods for living systematic reviews and convening the global Living Evidence Network. Through Transform, Cochrane has again demonstrated its ability to make the most of innovations in methods and technology to improve the value of our reviews to health decision-makers, without sacrificing rigour.

Building on the living systematic review work, the Transform team has been able to establish a model for the development and curation of living guidelines, bringing together guideline developers and Cochrane groups in five major chronic disease areas. This will ensure that Cochrane's evidence remains integral to policy and clinical guidance.

It is vital to emphasise that the outcomes of Project Transform reflect more than the work of just the few people who have been the face of the team. They are the result of the incredible contributions of time, skill, enthusiasm and expertise of the dozens of members of the Project Transform Team and Research Committee; hundreds of members of the Living Evidence Network; thousands of members of TaskExchange; tens of thousands of members of Cochrane Crowd; and the broader Cochrane Community. It is quite a crew.

Importantly, the elements of Project Transform have now become components of Cochrane, and provide the foundation for continuing work to improve the efficiency of our evidence identification; increase the diversity and effectiveness of our collaboration; and harness innovations in methods and technology that increase the usefulness and use of our reviews.

# Project overview

**Project Transform was a major Cochrane project funded by the Game Changer Initiative and the Australian National Health and Medical Research Council. From March 2015 to December 2018, the Project Transform team worked with the Cochrane community to improve the way people, processes and technologies come together to produce Cochrane content.**

A key goal was creating new pathways for people to get involved in Cochrane. This was achieved by establishing Cochrane Crowd and TaskExchange.

Using the power of crowdsourcing, Cochrane Crowd allows citizen scientists to perform a range of micro-tasks to categorise and summarise healthcare evidence. By December 2018, over 12,000 people from 181 countries had identified over 150,000 reports of randomised trials not identified as such in source databases. The platform has expanded to host five core tasks and 15 short-term tasks, and is a key component of Evidence Pipeline (see below).

Launched in August 2016, TaskExchange is Cochrane's online platform to connect people who need help on health evidence projects with people who have the time and skills to contribute, making it easy for global teams to collaborate and for people new to the evidence world to contribute. TaskExchange now has over 3,100 contributors, has hosted almost 900 tasks, and has an impressive response rate consistently around 80%. G-I-N is now a leading partner of TaskExchange, supporting and promoting the platform with its members.

Cochrane Crowd and TaskExchange have become key pillars of Cochrane's Membership scheme, launched in 2017, and will continue to grow beyond the end of the project.

The Evidence Pipeline component of Project Transform aimed to use machine learning and crowdsourcing to identify health evidence efficiently. The 'RCT Classifier' was trained with over 280,000 records from Cochrane Crowd, and achieves over 99% recall (sensitivity) while reducing screening burden by 60–80%. It has been approved by the Cochrane Scientific Committee and is now deployed in CRS. As part of the Centralised Search Service, it has reduced the screening burden to identify RCTs for CENTRAL by 70%. The Screen4Me workflow enables Cochrane Information Specialists to use the RCT Classifier for individual Cochrane Reviews.

Evidence Pipeline also developed topic-based classifiers for each Cochrane Review Group, and classifiers to identify systematic reviews and economic evaluations, which are deployed in the CRS database. Significant progress was made in automated data and PICO extraction.

The ambition for Evidence Pipeline is to classify according to review topic, PICO, and to extent to extraction of data. This will transform the review production process, and enable authors to spend much less time locating studies, and more time on analysis.



Project Transform also explored opportunities to improve Cochrane Review production. Following an initial qualitative study and consultation with the then Cochrane Editorial Unit, the Project Transform team focussed its efforts on review updating, developing a model and methods for the conduct of 'living' systematic reviews (LSR). LSRs are an approach to keeping high-quality evidence syntheses continually up to date. Since 2016, several Cochrane teams and others have piloted LSRs, using Evidence Pipeline to reduce workload. An evaluation suggested LSRs are an acceptable and feasible approach to review updating.

To facilitate the development of the LSR model, we established the Living Systematic Review Network, subsequently renamed the Living Evidence Network to reflect the growing participation of guideline developers. The Network oversaw the development of Interim Guidance and has grown to 230 researchers from around the world. It hosts regular 'state-of-the-science' webinars and face-to-face meetings and workshops.

Funding from Australia's NHMRC enabled the addition of two new project components. First, we were interested in how systematic review innovations might facilitate the development of evidence-based guidelines. We conducted a qualitative needs analysis with Australian guideline developers, which led to the establishment of the Australian Living Evidence Consortium. Led by Cochrane Australia, this partnership spans five major chronic disease areas and is establishing proof-of-concept living guideline projects, supported by additional funding from the Australian Government and Project Transform technologies.

Second, we developed a number of additional tools to improve systematic review production, hosted at Bond University as the Systematic Review Accelerator. This includes Polyglot Search Translator, an award-winning tool to accelerate the translation of a search strategy between databases; SRA Deduplicator, which improves the removal of duplicate references; SRA Helper, which uses hotkey mapping to improve screening and full-text retrieval in Endnote; System for Automatically Requesting Articles, which enables bulk ordering of full-text articles; and RevMan Replicant, which automates the first draft of review.

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Project Transform made substantial contributions to Cochrane Review production during the project period, creating new pathways for people to get involved in Cochrane, improving the author and group experience, and promoting Cochrane's long-term sustainability.

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# Key achievements

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## Evidence Pipeline



- Developed machine learning classifiers based on study design and topic area
- Enabled access to the RCT, systematic review, economic evaluation and Review Group classifiers via the CRS
- Developed machine-crowd workflows as part of the Centralised Search Service and Screen4Me
- Developed prototype systems for automated tabular data extraction
- Developed prototype systems for automated PICO extraction
- Undertook research and development of state-of-the-art machine learning systems for PICO classification

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## TaskExchange



- Developed the world's first peer-to-peer platform to facilitate collaboration in research evidence synthesis
- Built engagement and organizational partnerships to build an online community
- Opened TaskExchange to the wider health evidence synthesis community
- Enabled endorsements and acknowledgements
- Broadened platform scope to include guideline-related tasks

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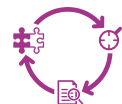
## Cochrane Crowd



- Developed a new platform able to host a range of different crowd tasks
- Developed and evaluated a range of new crowd tasks
- Introduced contributor reward schemes
- Developed task and concept specific training modules for new contributors
- Refined, tested and validated task agreement algorithms
- Generated data to train machine learning classifiers
- Developed partnerships with other organisations interested in citizen science
- Developed machine-crowd workflows as part of the Centralised Search Service and Screen4Me
- Made Cochrane Crowd-generated data free and open

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## Production Models / Living Systematic Reviews



- Analysed existing Cochrane Review production models
- Developed methods and guidance for living systematic reviews
- Supported five Cochrane living systematic reviews through to publication
- Evaluated six living systematic reviews
- Published a series of articles on living systematic reviews in Journal of Clinical Epidemiology
- Formed an international Living Evidence Network, with over 230 members



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## Australian Guidelines



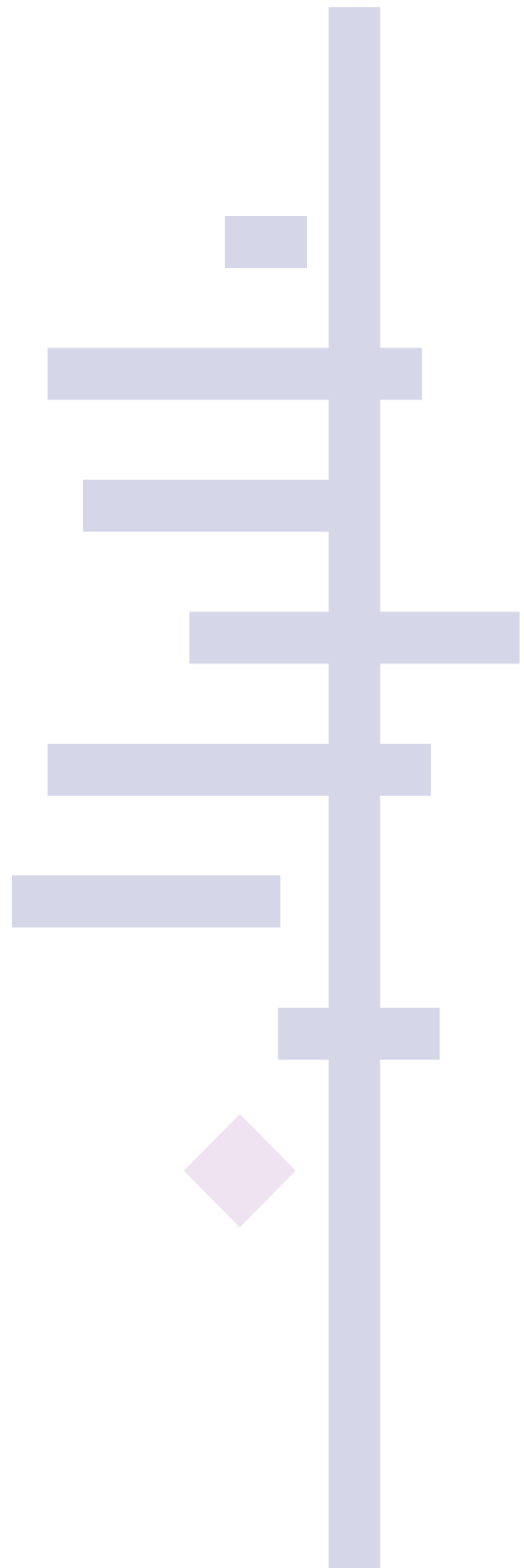
- Formed a partnership with NHMRC to promote the concept of living guidelines
- Analysed guideline developers' evidence needs
- Secured funding for living guidelines proof-of-concept projects with the Australian Stroke Foundation and Australian Diabetes Society
- Formed the Australian Living Evidence Consortium to further develop the methods, tools and partnerships for living systematic reviews and living guidelines
- Developed partnerships with Australian and international guideline developers, Cochrane Groups and the Australian government

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## Systematic Review Accelerator



- Use increased yearly, with 968 users in 2016, 1,632 users in 2017 and 3,776 users in 2018
- Had international impact with users from the United States, Australia, the United Kingdom, Europe, Canada, South America and China
- National recognition with two awards won from the Australian Library and Information Association (ALIA)
- Multiple presentations at National and International conferences





## Background

**In November 2014, the Cochrane Steering Group approved funding for Project Transform, a Game Changer Initiative, for a total of GBP 533,100 from 01 March 2015 to 31 December 2018.**

The Project Transform team, with Cochrane as partner, was successful in securing additional funding: a Partnership Project grant (AUD 928,000; 2016–2018) from the Australian National Health and Medical Research Council (NHMRC).

Project Transform worked with the Cochrane community to improve the way people, processes and technologies come together to produce Cochrane content.

The original Cochrane-funded Project Transform had four components:

- Evidence Pipeline
- Cochrane Crowd
- TaskExchange
- Production Models: Living Systematic Reviews

NHMRC funding enabled an expansion in the original Game Changer deliverables, as well as the addition of two new components:

- Transforming Australian Guidelines
- Systematic Review Search and Writing Tools

# Engaging people

**A key goal of Project Transform was creating new pathways for people to get involved in Cochrane by providing appropriate tasks, training and resources for those new to systematic review.**

Cochrane Crowd and TaskExchange provide these pathways and tasks for diverse contributors. These platforms have become key pillars of Cochrane's Membership scheme, launched in 2017, making it possible for people interested in health evidence to join Cochrane and have their contribution recognised.

## Cochrane Crowd

Using the power of crowdsourcing, Cochrane Crowd allows citizen scientists to perform a range of micro-tasks to categorise and summarise healthcare evidence. The Cochrane Crowd platform built on a prototype developed during the 'Embase Project', a feasibility project that explored the use of crowdsourcing for the identification of randomised trials.

By December 2018, over 12,000 people from 181 countries had joined Cochrane Crowd. The platform now hosts five core tasks and has hosted over 15 short-term tasks. The community has helped to identify over 150,000 reports of randomised or quasi-randomised trials from bibliographic and trial registry sources not identified as such in source databases, as well as supporting screening for individual reviews and living systematic reviews.

## COCHRANE CROWD

Using citizen science to categorise and summarise healthcare evidence so we can make better healthcare decisions.



**181**  
COUNTRIES



**12,000+**  
CONTRIBUTORS



**150,000+**  
TRIALS IDENTIFIED



**5**  
MAINSTREAM TASKS AVAILABLE



**15**  
DISCRETE TASKS COMPLETED

[crowd.cochrane.org](https://crowd.cochrane.org)

## CONTRIBUTORS ARE FROM AROUND 180 COUNTRIES

### TOP 5 COUNTRIES:

- UK (16%)
- USA (14%)
- INDIA (8%)
- AUSTRALIA (6%)
- CANADA (5%)

**56%**

ARE LOWER AND  
MIDDLE INCOME  
COUNTRIES



## Reducing barriers to participation

### Case study: Mike Landau

Mike joined Cochrane Crowd in 2017 during the CitSciChallenge we ran in partnership with two other citizen science initiatives, Mark2Cure and Stall Catchers.

*“I am 54 years old. I have severe cerebral palsy, and I use a wheelchair to get around. I have a PhD in cognitive psychology from the University of Georgia. I enjoy the Cochrane Crowd screening task because it allows me to use some of my knowledge of experimental design while participating in a worthwhile cause.”*

*“The main benefit is to be able to participate...I’ve come to realize that there are many treatments that are prescribed by doctors that actually don’t work a high percentage of the time. Many people believe that just because they read about a treatment in the media, or hear about it from their physician that the treatment is highly effective.”*

New contributors were asked in a survey why they had joined Cochrane Crowd, and many respondents expressed their desire to be a part of the research process in order to improve healthcare. A small sample of responses are given below:

*“I believe in your work. I want to help improve healthcare evidence”*

*“An opportunity to do some biology and make a difference while still in school”*

*“I wanted to contribute more to what I see as a collaborative, public effort to improve healthcare”*

*“Wanted to contribute to the development of evidence-based medicine”*

*“The Cochrane Library is a very useful tool and I would like to aid it”*

*“I think Cochrane does excellent work and I wanted to contribute”*

## Supporting learning

Cochrane Crowd has created an engaging environment where people can learn.

### Task-focused training modules

Task-focused training accompanies each of the tasks hosted on Cochrane Crowd, and must be completed before a task is started. These training modules have received very positive feedback.

### Cochrane Crowd’s Learning Zone<sup>1</sup>

Cochrane Crowd’s Learning Zone provides seven standalone micro-training modules. They were launched in April 2018, and to date over 1,000 people have completed them. Many have found them to be an innovative, light-hearted approach to learning key concepts underlying evidence synthesis, helping contributors build their research literacy.

Mike Landau had this to say about the micro-training modules developed by the team at Cochrane Crowd:

*“I think that the learning modules that are being developed for the website are very important for getting out the word that testing treatments with randomized control groups is very important.”*

Ihsan Fadilah, MD and epidemiologist in training, told us:

*“[I] have just completed the micro-training modules on @cochrane\_crowd! I was so amazed how you could simplify things without much compromising the core concepts.”*

<sup>1</sup> The Robert Wood Johnson Foundation provided additional funding for Cochrane Crowd micro-training module development.

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## CLASSMATE

Create exciting, interactive tasks to help your students learn about evidence production.



**>100**  
CHALLENGES CONDUCTED



**2,000+**  
PARTICIPANTS



**400,000+**  
CLASSIFICATIONS MADE

[crowd.cochrane.org/classmate](https://crowd.cochrane.org/classmate)

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### Classmate

Classmate was launched in 2016. It enables people to use Cochrane Crowd tasks in a variety of learning environments by creating ‘challenges’ for students. As students learn, they also help Cochrane to identify health evidence. To date over 100 challenges have been created around the world, with hundreds of thousands of classifications being made across Cochrane Crowd tasks.

#### Case study: The ECAton FM-UAS Challenge

In December 2018, Giordano Perez-Gaxiola set up a 72-hour challenge in Cochrane Crowd using Classmate. He invited medical students in his faculty to join the challenge, offering certificates of participation and Cochrane Membership as incentives. The challenge was a resounding success, with over 450 students taking part and over 300,000 classifications made. After the challenge, Giordano said:

*“A Cochrane Crowd challenge run through Cochrane Classmate is a simple way to engage students, to help them learn about Cochrane and about clinical trials. It is very easy to set up (takes about 10 minutes) and easy for the students to participate. It can be a useful teaching tool, too. And if you make it a competition, it can be fun.”*

His thoughts echo countless other testimonies we have received from teachers and trainers in the field, including this one from another lecturer who tried out Classmate on a group of her students in November 2018:

*“That [Classmate] is wonderful! Thank you so much. My students really enjoy participating in this activity, and we will definitely be back. Some students have told me they intend to stay involved and keep reviewing, so I am keeping my fingers crossed that they will stay connected with the Cochrane Crowd.” — Megan Finck (Nova Southeastern University)*

The twin impacts of reducing barriers to participation and helping to create learning opportunities should not be underestimated. Together they create an environment where the next generation of evidence producers can start their journey with Cochrane, whether that be as Cochrane authors, or in becoming Cochrane (and evidence) advocates amongst friends, family, colleagues.

### Where to next for Cochrane Crowd?

Over the last few years, Cochrane Crowd has grown quickly in terms of task development. We now plan to focus our efforts on making sure the contributor experience is as good as it can be with particular focus on improving integration with Cochrane’s Membership Initiative and developing clear pathways for students, trainees and others. In the summer of 2019 we hope to roll out an improved version of Cochrane Crowd, based on a user research project currently underway.

Cochrane Crowd has also attracted the attention of other organisations hoping to incorporate citizen science into their processes. During 2018, Cochrane Crowd worked with The Health Improvement Studies (THIS) Institute at the University of Cambridge, completing three pilot tasks. We will continue to build our collaborations with THIS and other partners, each of which helps to make Cochrane Crowd a globally recognised success.

## TaskExchange

Launched in August 2016, TaskExchange is Cochrane's online platform to connect people who need help on health evidence projects with people who have the time and skills to help out. TaskExchange plays an important role by enabling global, multidisciplinary teams to collaborate, facilitating the efficient production of high-quality, relevant, up-to-date evidence syntheses to inform health policy and practice.

TaskExchange makes it easy for people new to the evidence world to contribute to evidence syntheses (Cochrane and non-Cochrane) by providing beginner tasks to build a profile and gain experience, as well as a diverse range of tasks that enable people to be active and engaged contributors to Cochrane and the global evidence community.

TaskExchange now has over 3,100 contributors with diverse skills, including medical and allied health students, Cochrane Crowd members, experienced methodologists, review authors, and people with a general interest in evidence but limited experience.

Since its 2016 launch, TaskExchange has hosted almost 900 tasks, with around 40 tasks added per month and a response rate consistently around 80% — an impressive achievement for a peer-to-peer platform of this kind.

The five most sought-after tasks are translation, consumer input, data extraction, screening and risk of bias assessments, with 50 of Cochrane's 52 Review Groups now represented in the TaskExchange community.

Jan Witowski is a fourth year medical student from Poland. His experience is a common one:

*"I had started to work on reviews, and I noticed TaskExchange somewhere on the Cochrane webpage when browsing. I saw that an author team wanted help translating a Polish trial article, so I volunteered to do that, and was acknowledged in the publication which was a bonus for my CV. The authors have offered me more translation work, which is fantastic. I'd like to gain more skills in other aspects of reviewing and I'm planning to seek opportunities through TaskExchange to meet my learning goals. TaskExchange has made it easy to get involved with more SRs and I'd recommend it to anyone wanting more experience."*

Juliane Ried, Cochrane's Translations Co-ordinator, also highlights how TaskExchange has developed new pathways for people to become involved:

*"We receive a lot of interest from volunteers who want to contribute to Cochrane and make use of their language skills. TaskExchange has already proven to be a great platform to help these people put their skills to work. TaskExchange has become an instrument to facilitate the multi-lingual nature of Cochrane's community and research."*

## TASK EXCHANGE

Connect with the global health evidence community to get your work done more quickly.



**78%**  
RESPONSE RATE TO POSTED TASKS



**866**  
TASKS HOSTED



**3,100+**  
USERS

### Top five tasks:

- 1 TRANSLATION
- 2 CONSUMER INPUT
- 3 DATA EXTRACTION
- 4 SCREENING
- 5 RISK OF BIAS ASSESSMENT

[taskexchange.cochrane.org](https://taskexchange.cochrane.org)

Rather than individual Cochrane Review Groups needing to devote time and resources responding to interested newcomers and finding the right help for their author teams, TaskExchange now provides both an entry and meeting point for these interactions.

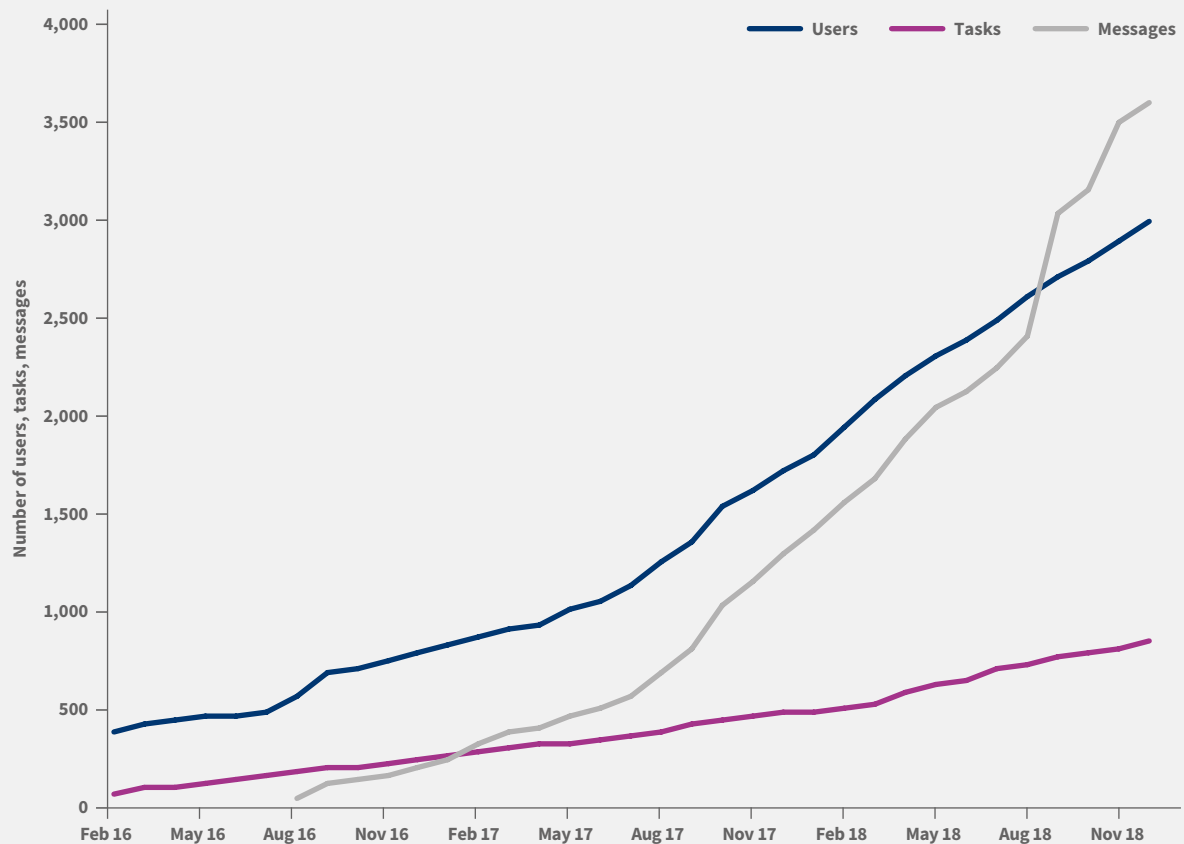
Melina Willson, Managing Editor for Cochrane Breast Cancer, told us:

*"We used TaskExchange late last year and had a quick and positive response. Four articles were translated within a week for one of our Cochrane Reviews on breast reconstruction. TaskExchange is a great platform to speed up what could otherwise be a laborious process of finding people to help on a review."*

Sheila Wallace, Cochrane Information Specialist for Cochrane Incontinence, also uses TaskExchange to source skilled translators:

*"At one time review groups really only had access to a very limited number of translators but I would like to highlight that because we use TaskExchange we now have access to help from a large pool of translators (how wonderful)."*

## TASK EXCHANGE 2016–18



Following the introduction of the new Cochrane Peer Review Policy, the TaskExchange team has focused on opportunities for consumers (patients, care-givers, family members and service users), working with the Cochrane Consumer Network to encourage more consumers to join the platform, find opportunities that meet their interests and contribute to Cochrane's work.

TaskExchange is increasingly recognised globally as a platform for sharing evidence synthesis tasks and a community of people with skills and enthusiasm for evidence synthesis work. Our partnership with G-I-N was established in 2017, helping to increase the number of tasks on TaskExchange, building the position of TaskExchange as the go-to community for evidence synthesis tasks and promoting Cochrane and Cochrane membership to a broader audience.

## Where to next for TaskExchange?

Cochrane's Senior Management Team recently approved the following areas of focus for in 2019, ensuring TaskExchange continues to grow and provide engaging, meaningful and rewarding pathways for Cochrane contributors.

- developing a TaskExchange activity reward program
- enabling portability of profiles across TaskExchange and Crowd
- connecting TaskExchange with Cochrane learning systems
- increasing the focus on engagement of Members and partner organisations
- building features that enable better data on activity of Cochrane Members within TaskExchange

# Finding studies with Evidence Pipeline

**Project Transform set out to create a more efficient way of identifying health evidence of relevance to Cochrane’s work through the development and use of machine learning classifiers and crowdsourcing.**

Sensitive searches often result in thousands of search hits creating a significant workload for study identification. Over 90% of Cochrane reviews include only randomised controlled trials, creating an opportunity to reduce screening burden by sifting out non-RCTs. We therefore focused much of our effort on developing a robust machine learning classifier to distinguish RCTs from non-RCTs.

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## RCT IDENTIFICATION

Use the power of machine learning and Cochrane Crowd to identify reports of randomised controlled trials.

### How can I access?

Information Specialists: CRS-Web



**>99%**  
RECALL



**60%–80%**  
REDUCTION IN EFFORT



**>135,000**  
RCTs IDENTIFIED

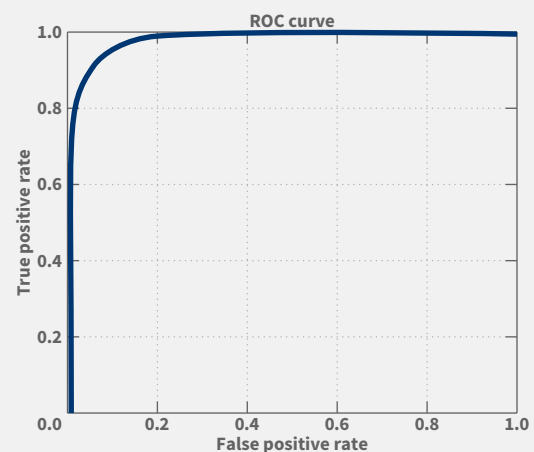
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## RCT Classification

The earlier Embase Project demonstrated a proof-of-concept workflow in which a crowd accurately screened citations for randomised or quasi-randomised controlled trials. Project Transform built on this work to create a human-machine workflow in which the Cochrane Crowd generated the first large, high-quality data set used to train the RCT classifier. As the crowd-generated data grew, the RCT classifier improved. Several evaluation projects demonstrated robust performance, with a sensitivity (recall) of over 99% while reducing the number of citations needed to be screened by 60–80%. These findings were included in a submission to the Cochrane Scientific Committee and the RCT Classifier was approved by the Committee for widespread use in April, 2018.

The RCT classifier was built from over 280,000 records from Cochrane Crowd, and the quality of the training data is reflected in the accuracy of the resulting classifier (depicted in the ROC Curve below). In consultation with the Information Retrieval Methods Group, the team calibrated the classifier to achieve a 99% recall against the McMaster ‘Hedges’ dataset — a dataset which has been used to validate many search filters. This is a relatively old dataset, and newer records (no doubt thanks in part to reporting standards such as CONSORT) are more likely to describe themselves clearly as being RCTs, so the classifier will comfortably exceed this recall threshold on new records. Against all (RCT) studies included in Cochrane Reviews, the classifier achieves a recall of 99.6%.

### RCT CLASSIFIER ACCURACY





## Review Group Classifier

In addition to the RCT classifier, the Evidence Pipeline component of Project Transform also developed topic-based classifiers for each Cochrane Review Group, which are deployed in the CRS database. Thanks to the University of York sharing its DARE and NHSEED databases, we also developed classifiers to identify systematic reviews and economic evaluations (also deployed in the CRS). Work is in progress to further develop a diagnostic test accuracy classifier in conjunction with the Crowd task in this area.

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## REVIEW GROUP CLASSIFIER

Identify new research relevant to your Cochrane Review Group.

### How can I access?

Information Specialists: CRS-Web



**53**

REVIEW GROUP CLASSIFIERS



**700,000+**

STUDIES IN CSR CLASSIFIED BY REVIEW GROUP

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## PICO identification

Finally, we made significant progress in automated data and PICO extraction. We have deployed two PICO classifiers for research and evaluation purposes, and are still improving these models (at the time of writing we have a third model under development, which promises to be substantially better than the other models).

As well as providing essential training data for the above machine learning work, Cochrane Crowd has also helped to generate gold standard datasets for the development of an RCT methodological filter for the CINAHL bibliographic database, led by Julie Glanville at the York Health Economics Consortium.

## Screen4Me

Screen4Me is a workflow that enables author teams to make use of Cochrane Crowd and the RCT Classifier to reduce the citations needing to be screened for a specific Cochrane review by between 50–80%.

The workflow can be self-managed by Cochrane Information Specialists (CIS) within the Cochrane Register of Studies.

### Case study 1 — Oral Health:

**400+ citations, reduced by 75% to 1,000**

*“Wow — thanks so much. 75% reduction is huge! The author team is delighted.” — Anne Littlewood (CIS Oral Health)*

### Case study 2 — Developmental and Psychosocial Learning Problems:

**6,200+ citations, reduced by 70% to 1,943**

*“That is fantastic. The team will be delighted with that reduction.” — Margaret Anderson (CIS Developmental and Psychosocial Learning Problems)*

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## SCREEN4ME

Send your results to the machine classifier and Cochrane Crowd to identify RCTs and diagnostic test accuracy studies.

### How can I access?

Contact your Information Specialist.



**1 DAY**

AVERAGE CROWD SCREENING TIME PER 1,500 CITATIONS

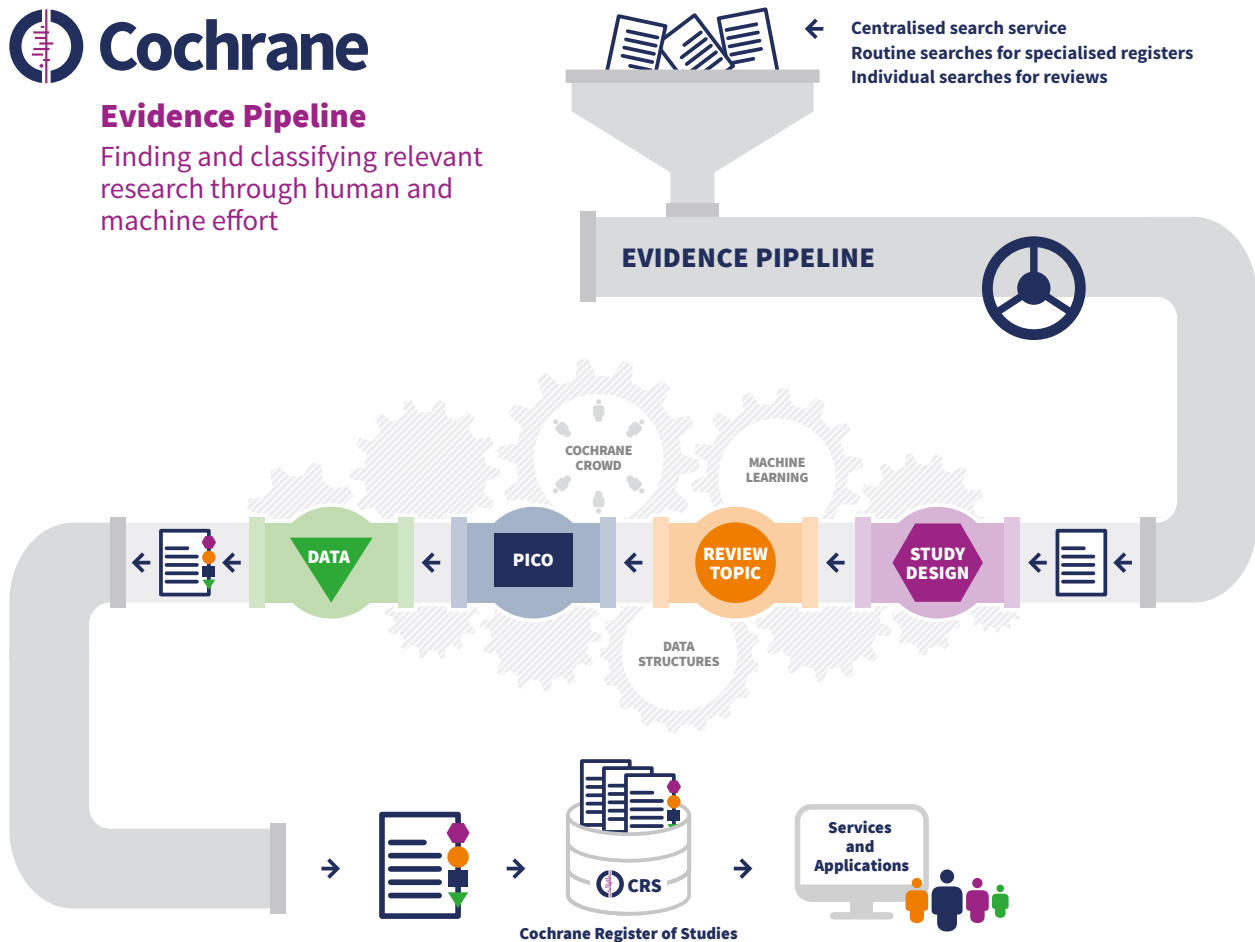


**25**

AVERAGE NUMBER OF SCREENERs PER REVIEW BY REVIEW GROUP

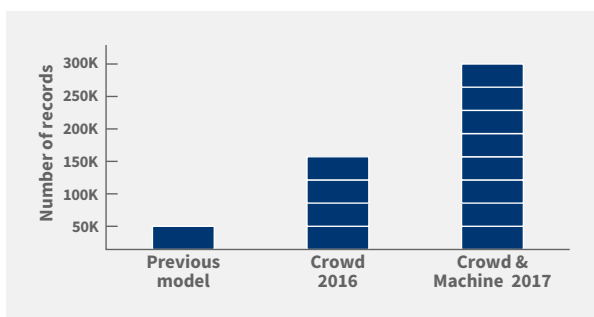
## Evidence Pipeline

Finding and classifying relevant research through human and machine effort



## Evidence Pipeline and Centralised Search Service

Project Transform machine-crowd workflows has also supported the growth of Cochrane’s Centralised Search Service. In January 2016, we began to use the RCT Classifier as part of the CSS process. Records identified from bibliographic databases are run through the RCT classifier and those that receive a score below a predetermined cut-point are included in CENTRAL as an RCT. The impact of adding the RCT Classifier into this workflow was significant with a human workload reduction of around 70%. Cochrane Crowd also helped to incorporate four new data sources into CSS (KoreaMed, ClinicalTrials.gov, ICTRP, and recently, CINAHL), which has significantly enriched CENTRAL.



The ambition for the Centralised Search Services does not stop at the identification of RCTs. As the figure above depicts, RCT identification is the start of a workflow which involves the classification of RCTs according to review topic, their PICO, and even the extraction of data. This will quite literally transform the review production process, and enable authors to spend much less time locating studies, and focus their energies on analysis.

## Where to next for Evidence Pipeline?

- The science of machine learning (sometimes called ‘artificial intelligence’) is continually evolving, so we expect to see new services and improvements to existing ones over the coming months and years
- While the RCT classifier is probably as good as it can get in terms of recall, we will continue to try out new technologies for RCT identification in order to reduce manual workload as much as possible
- We will continue support and monitor closely the progress of the Screen4Me workflow, as this promises to be quite transformative for review authors
- The most significant technical developments will come in the area of PICO classification, where we hope to have a machine/crowd workflow in place that will prospectively classify studies according to their PICO as soon as they are published

# Living systematic reviews

**At the inception of Project Transform we initiated an exploration of Cochrane Review production by investigating existing models and emerging opportunities to improve the efficiency and sustainability of these processes. We did this through surveys and interviews with key Cochrane stakeholders.**

Respondents particularly highlighted significant challenges with increasing complexity of review methods; difficulty keeping authors on board and on track; and the length of time required to complete the process. Strong themes emerged about the roles of authors and Review Groups, the central actors in the review production process.

The **results** suggested that improvements to Cochrane's systematic review production models 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', and improving approaches to building capacity of and sharing information between authors and Review Groups. These **findings** were published in Systematic Reviews.

Following consultation with the Cochrane Editorial Unit (CEU), the Project Transform team focussed its efforts on the challenges of review updating, developing a model and methods for the conduct of living systematic reviews (LSR). LSRs are an approach to keeping high-quality evidence syntheses continually up to date, so the most recent, relevant and reliable evidence can be used to inform policy and practice, resulting in improved quality of care and health outcomes.

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## LIVING SYSTEMATIC REVIEW

A systematic review that is continually updated, incorporating relevant new evidence as it becomes available.



**230+**

LIVING EVIDENCE NETWORK MEMBERS



**5**

LSRs PUBLISHED ON COCHRANE LIBRARY



LSR GUIDANCE PUBLISHED  
LSR PROTOCOL APPROVED

[cochrane.org/lsr](https://cochrane.org/lsr)

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## Pilot living systematic reviews

Since 2016, several Cochrane teams and others have piloted living systematic reviews, using machine learning, crowdsourcing and online platforms developed in Project Transform to reduce workload, as well as new author and editorial workflows.

The pilot LSRs below were published as Cochrane reviews.

1. Interventions for increasing fruit and vegetable consumption in children aged five years and under
2. Parenteral anticoagulation in ambulatory patients with cancer
3. Oral anticoagulation in people with cancer who have no therapeutic or prophylactic indication for anticoagulation
4. Anticoagulation for the long-term treatment of venous thromboembolism in people with cancer
5. Delayed antibiotic prescriptions for respiratory infections

## Pilot evaluation

Ensuring these high-quality evidence syntheses are continually up to date requires some modifications to existing authoring and editorial processes, and poses a number of technical and publishing challenges. We undertook an evaluation to explore the experiences of those conducting pilot living systematic reviews and to assess the feasibility and acceptability of this approach in order to refine future living systematic review production models.

Across six pilot living systematic reviews (three Cochrane; three non-Cochrane), we interviewed 27 participants (authors, editors, information specialists and peer reviewers) up to three times and tracked living systematic review progress with monthly surveys. The pilot period ran between September 2017 and August 2018.

Participants described overwhelming enthusiasm for involvement in the living systematic reviews pilot.

*“We (Cochrane) can be more reactive. When new information is available, a group can respond and update review; reducing the lag and improving the responsiveness of Cochrane reviews. Overcoming the criticism that we are too slow” (Cochrane coordinating editor).*

*“The evidence base for our topic was very small...There is now a large amount of information to inform practice, many of which have been integrated highlighting the live ability of research” (Cochrane author).*

*“It has been very interesting to see the evidence base change over a short period of time” (Cochrane author).*

*“The concept is really interesting and such a good idea. It seems helpful for Cochrane more broadly to keep pace with the literature and ensure they are making appropriate developments to make their content useful for decision-makers” (Cochrane managing editor).*

*“It is a very interesting area and a great learning opportunity. It is also an opportunity to influence how they [LSR’s] are being done” (Cochrane author).*

*“For me, LSR’s are an interesting, novel concept. I am intrigued about the notion that it might reduce workloads compared to standard reviews” (Cochrane Information Specialist).*

The participants highlighted the importance of a motivated, efficient team to manage the monthly requirements of a living systematic review; the value of using machine learning and citizen science approaches to screening to manage workflow and reduce time commitment; the ongoing, continuous commitment required of a living systematic review and the translation of this process into a reliable, efficient, streamlined operation; and the potential for time and effort saving in the long run.

Participants highlighted challenges with the current publication processes and the lack of resources to support living systematic reviews in the long term. They also raised concerns about the ongoing workload.

*“The living systematic review team were constantly providing support, encouragement, pushing, motivating and keeping everyone moving. My question is to what extent that will be able to be there in the future?” (Cochrane author).*

The full report of this evaluation is available [here](#). As a result of these early findings, the Cochrane Editorial Board has committed to supporting the next round of development of LSRs, enabling each Network to have at least one LSR by end 2019.

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Living systematic reviews appear to be both an acceptable and feasible approach to keeping high-quality evidence synthesis continually up to date. Challenges that need to be addressed include issues with current publication processes and availability of resources to support living systematic reviews in the long term.

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## Living Evidence Network

To facilitate the development of the living systematic review model we established the Living Systematic Review Network in 2016. This is an informal network of researchers in and beyond the Cochrane community with an interest in living approaches to updating. In 2018 the network was renamed the Living Evidence Network to reflect the growing participation of guideline developers. The Network now has over 230 members, is governed by a Steering Group and supported by a secretariat based at Cochrane Australia.

The Network oversaw the development of Interim Guidance for the development of Cochrane LSRs. Led by Annie Synnot at Cochrane Australia, this is the key document describing the why, when and how of LSRs during this period of early development and evaluation. The Network also hosts regular ‘state-of-the-science’ webinars and face-to-face meetings and workshops at Cochrane conferences. More information on the work of the Network can be found at [cochrane.org/lsr](http://cochrane.org/lsr)

## Where to next for living systematic reviews?

In 2019 we will:

- update Cochrane’s interim guidance on LSRs
- support the development of at least one LSR in every Cochrane Network
- continue to build the Living Evidence Network, by running webinars, facilitating information exchange and convening LSR workshops and meetings at the Colloquium
- continue to collaborate with related initiatives, such as the Australian Living Evidence Consortium (see below)

# Transforming Australian guidelines

## We wanted to make it easier and more efficient for Australian guideline developers to find, do and use systematic reviews to support evidence-based clinical guidelines.

From the beginning of Project Transform, we worked closely with NHMRC to promote awareness of the broad aims of the project and to establish relationships with guideline groups keen to explore how the outputs of Transform could influence their guideline processes and help with the transition to more living approaches to updating guidelines. In March 2016 we facilitated a one-day meeting of the Guideline Developers Forum, convened by NHMRC, which laid the groundwork for future activities in the guidelines area.

Arising from the Forum was the opportunity to conduct a needs analysis of the evidence needs of guideline developers. We conducted interviews with 16 guideline groups with the aim of exploring how they manage processes for identifying, appraising and synthesising relevant evidence, and what the implications are of the development of new technologies (of the kind arising from Transform) to support guideline development.

We partnered with the Stroke Foundation to secure funding from the Australian Government (2018–20) to support the transition of the national stroke guidelines to living guidelines. This is an overarching program of work that will include the integration and evaluation of Transform tools (e.g. evidence pipeline, living review methods) but also pilot and evaluate other aspects of living guidelines (topic prioritisation, publishing, knowledge translation, etc.).

Building on the Stroke Foundation partnership, and drawing on existing relationships with Cochrane groups and guideline activity in Australia, we established the Australian Living Evidence Consortium in May 2018. The **Consortium** brings together leading experts in evidence synthesis, automation technologies, guideline development, consumer engagement and knowledge translation who are committed to making the task of finding, analysing, interpreting and using evidence faster, more efficient and more effective.

The founding members are:

- Cochrane Australia (Consortium lead organisation)
- Stroke Foundation
- Australian Diabetes Society and Diabetes Australia
- Kidney Health Australia
- Australia and New Zealand Musculoskeletal Clinical Trials Network

Within the Consortium, there are close links between the partners and the respective Cochrane Groups, as well as with other international guideline organisations. In the case of stroke, we've had several conversations about aligning the PICO in the stroke guidelines with Cochrane review updates and identifying potential new living reviews. Specific funding within the project is available to support this partnership with Cochrane Stroke.

## User stories — Stroke Guidelines

The partnership between Cochrane Australia and the Stroke Foundation brings together several components of Transform and will provide a model for how Cochrane groups, systematic review authors and guideline developers can collaborate to produce high quality, up-to-date evidence.

**Evidence Pipeline:** An exponential increase in research evidence means that an efficient evidence surveillance system is critical to the feasibility of living guidelines. The stroke guidelines rely almost exclusively on evidence from systematic reviews (including 80 Cochrane reviews) and randomised trials. An evaluation of the current stroke guidelines (presented at the Edinburgh Colloquium) revealed the potential time and resource savings of automation tools.

From over 100,000 citations screened by members of the working groups, 184 randomised trials and 230 systematic reviews were included as references to the guideline recommendations. The Cochrane RCT Classifier accurately identified all RCTs at the recommended threshold and could potentially have saved the screening of tens of thousands of citations. We are currently establishing the prospective evidence surveillance workflows and will evaluate the ongoing time and cost benefits of using tools like the Cochrane RCT Classifier.



**100,000+**  
CITATIONS SCREENED



**184**  
RCTs INCLUDED



**230**  
SYSTEMATIC REVIEWS INCLUDED



**RCT CLASSIFIER IDENTIFIED ALL RCTs**

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**Partnerships and collaborations:** Links with Cochrane Stroke and other groups involved in producing evidence syntheses are central to the success and feasibility of the living guidelines approach. We have liaised with Cochrane Stroke about the process for identifying priority topics (for new, updated or living reviews) that will address gaps in the guidelines. On the surveillance front, we have worked with their Information Specialists to access the Cochrane Stroke register so that we can have a much more pragmatic approach to searching and screening.

Another key area of collaboration is with other international guideline groups. Building on the Stroke Foundation's existing links with UK and European guideline groups, we have begun to explore how we might work more closely on processes like topic prioritisation and evidence surveillance. There is potential in these partnerships to use and evaluate different Cochrane tools, including machine learning classifiers and PICO annotation.

## Where to from here for Australian guidelines?

The two funded guidelines projects (with Stroke Foundation and Australian Diabetes Society) are in the establishment phase. Over the course of the funding (2019–20), the evaluation framework around both projects will provide valuable insights into the feasibility, opportunities, and barriers and enablers of the living guidelines approach. Although encompassing tools, methods and approaches that are broader than Cochrane, the evaluation will demonstrate those areas where Cochrane can benefit organisationally (e.g. stronger links with guideline groups and funders) and the development of tools and services (e.g. evidence surveillance, PICO Finder, Cochrane Response).

The Australian Living Evidence Consortium is gaining momentum and attracting interest from many groups looking to transition their guidelines to more sustainable living mode. We are continually looking for ways to fund the work of the Consortium so we can provide a platform of tools, services, methods expertise that will facilitate take up, feasibility and acceptance of living guidelines. One component of this is the ongoing work with NHMRC to ensure living approaches can fulfil their endorsement criteria.

We have submitted a proposal to run a half-day course on living evidence at the G-I-N Meeting in Adelaide in October 2019.

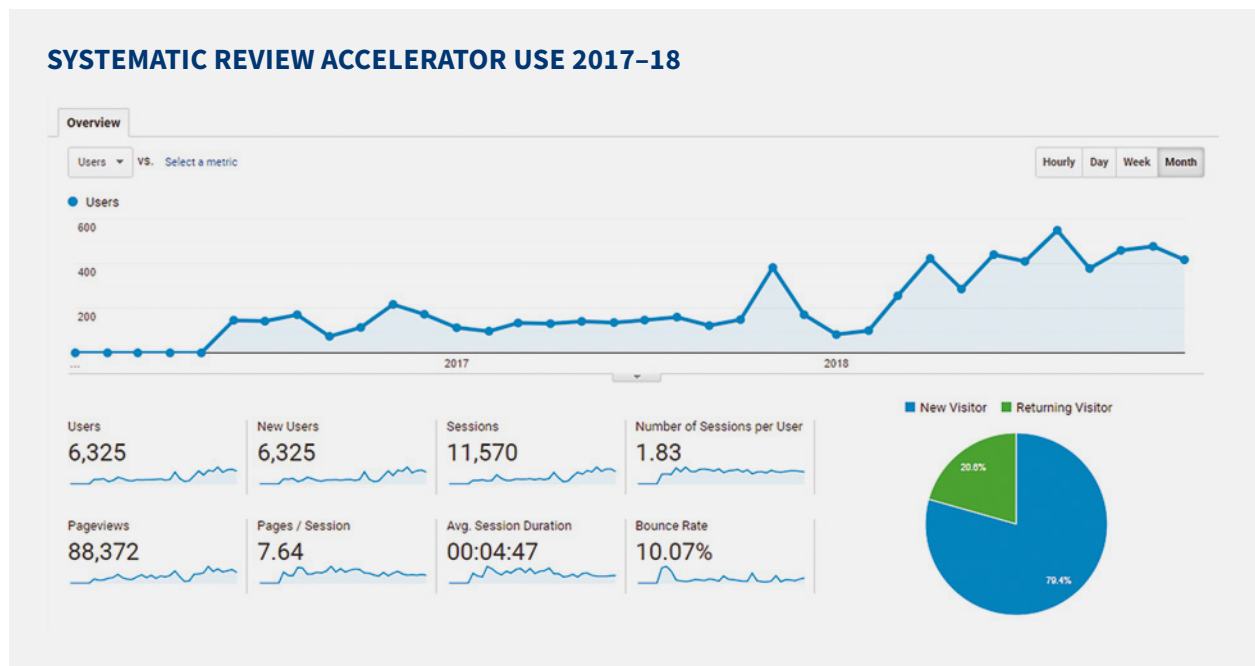
# Systematic review search and writing tools

## The Systematic Review Accelerator (SRA)

The SRA is a set of tools available to help researchers by automating or semi-automating some of the tasks involved in the conduct of a systematic review. Use of the SRA has increased every year, with 968 users and 12,095 page-views in 2016, 1,632 users and 29,860 page-views in 2017 and 3,776 users and 45,607 page-views in 2018. The SRA has international reach and appeal. The top 10 countries using it are: 1) the United States; 2) Australia; 3) the United Kingdom; 4) France; 5) Canada; 6) the Netherlands; 7) Brazil; 8) China; 9) Spain; and 10) Germany.

## The Polyglot Search Translator

Designed to improve the speed with which a systematic search of the literature can be done for a systematic review. A trial involving 16 participants and 366 search translations showed the Polyglot reduces the time required to conduct a search by 33% and the number of errors by 40%. The Polyglot was presented at multiple National and International conferences and won two National awards from the Australian Library and Information Association (ALIA) Health Libraries Australia group, these awards were the **Anne Harrison award** and the **HLA/Medical Director Digital Health Innovation Award**.



## The SRA Deduplicator

Built for the purpose of removing duplicate references from the results of a systematic search of the literature for a systematic review. Deduplication done using the SRA Deduplicator was superior to deduplication done using the EndNote software. Testing done on three biomedical literature searches demonstrated it consistently achieved higher sensitivity than EndNote (90% vs 63%), (84% vs 73%) and (84% vs 64%) with a specificity of 100%, compared to 99.75% for EndNote. It is available online and as a stand-alone tool that can be run on a desktop computer. The source code is available online and has been provided to the other project transform team members.

## SRA Helper

A tool that interfaces with the EndNote software, which is a piece of software commonly used during systematic reviews. The SRA Helper tool provides hotkey mapping for improving the speed with which screening can be done. It does this by using hotkeys to move references to groups, for instance the exclude and include groups. It also improves the speed with which the full texts of references can be found. It does this by using hotkeys to search in predetermined locations, such as the University Library, PubMed and Google Scholar for the full text. Versions have now been developed for Monash University and Queensland Health, roll out to other, interested, institutions could be done quickly and easily.

## System for Automatically Requesting Articles (SARA)

Developed to enable the bulk ordering of the full-texts of articles required for the conduct of a systematic review. Up to 100 full texts can be ordered at a time, replacing the need for full texts to be ordered individually. Now operational, SARA is part of the systematic review workflow at CREBP. Over 300 requests have been successfully submitted to the Bond Library. The system was presented at a National library conference and at the 2018 Queensland Health Librarians professional development day.

## RevMan Replicant

Designed to identify the forest plots in a systematic review written in RevMan, then extract the numbers from it and write a draft of a results section. It was adapted from the RevMan Hal project developed by the Cochrane Schizophrenia group. It aids with the issue of internal consistency in the reporting of data, a commonly identified problem in Cochrane reviews. The continual checking and rechecking of numbers throughout the review life cycle is a costly burden on all those involved, especially as Cochrane reviews can be done over a long period of time meaning authors may make changes to documents. Additional sentences have now been made available to improve the variability of the writing. RevMan Replicant was demonstrated at the Cochrane mid-year meeting in Lisbon, feedback was positive and comments suggested it would be beneficial as a tool, especially for translation teams wanting to make reviews available in other languages.



**Learning by doing: Six ways to boost your knowledge with Cochrane Crowd**

**Living systematic reviews are going live**

**Project Transform – Making high-quality evidence synthesis quicker and easier**

## Communications

**There was a strong focus on delivering frequent and targeted updates to the broader Cochrane community throughout the four years of Project Transform.**

Working closely with the (former) Communications and External Affairs Department (CEAD), over 100 news articles and blogs were published in the Cochrane Connect and Cochrane Community newsletters and pushed through to the Managing Editor, Review and Methods communities. Cochrane Crowd and TaskExchange also produced regular newsletters for their contributors and published blogs and articles on relevant evidence synthesis sites.

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 [View Project Transform video](#)

 [View Cochrane Crowd video](#)

 [View Classmate video](#)

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# Publications

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# Project Transform team

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**Cochrane Crowd:** Anna Noel-Storr, Chris Mavergames

**Task Exchange:** Chris Mavergames, Julian Elliott, Tari Turner

**Production Models:** Julian Elliott, David Tovey, Tari Turner

**Australian Guidelines:** Tari Turner, Steve McDonald

**Systematic Review Search and Writing Tools:** Paul Glasziou, Elaine Beller

## Project Team

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## With assistance from

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