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Innovate: Cochrane future ecosystem for evidence synthesis

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Cochrane Central Executive

Trusted evidence.
Informed decisions.
Better health.

Acknowledgements

Many thanks to Jo Anthony, Lorne Becker, Gordon Dooley, Julian Elliott, Ruth Foxlee, Ida Wedel-Heinen, Iain Marshall, Rasmus Moustgaard, Anna Noel-Storr, Charlotte Pestridge, Jacob Riis, Ida Sim, James Thomas, Tari Turner, Julie Wood, and probably others for their input into these slides

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This talk is about

How …

- finding evidence
- synthesising evidence
- disseminating evidence

… are changing?

What it means for you and our impact

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Outline

- Emerging new ecosystem
- Project Transform
- Linked data
- New authoring infrastructure
- The wider context
- Summary

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Background

- Current evidence processes very manual
- Machines and machine/human not optimally utilised
- Organising human effort not optimised
- Tools not yet fit for purpose and connected
- Data not "smart”
- Outputs not optimised for use and impact
- Solving “today's problems"
- Preparing for tomorrow's challenges

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Direction of travel

- Less manual work, more focus on data curation, synthesis, and “reflection”
- Structured, “PICO-fied”/computable data
- Audit trails, provenance, re-useable data
- Machine/crowd assistance
- New models of participation
- Tools fit for purpose and integrated
- We produce more evidence; Outputs have greater impact

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The emerging "ecosystem"

People + Process + Technology
optimized for the task

Future Evidence Ecosystem for Cochrane Review Production

BUSINESS PROCESS LAYER

Identifying studies → Working with studies → Managing data → Analysing data → Writing up → Publishing

APPLICATION LAYER


Centralized search | Evidence pipeline | CRS Web | Covidence/ EPPI-R | RevMan Web | GRADEPro/ GDT | Archie

DATA LAYER

APIs

- Annotation API
- Study API
- Review API
- Archie API

DATA REPOSITORIES

- Linked Data (PICO)
- Study Data
- Reviews Data
- 'Archie' Data

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New Cochrane Review Ecosystem

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Trusted evidence.
Informed decisions.
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New Cochrane Review Ecosystem

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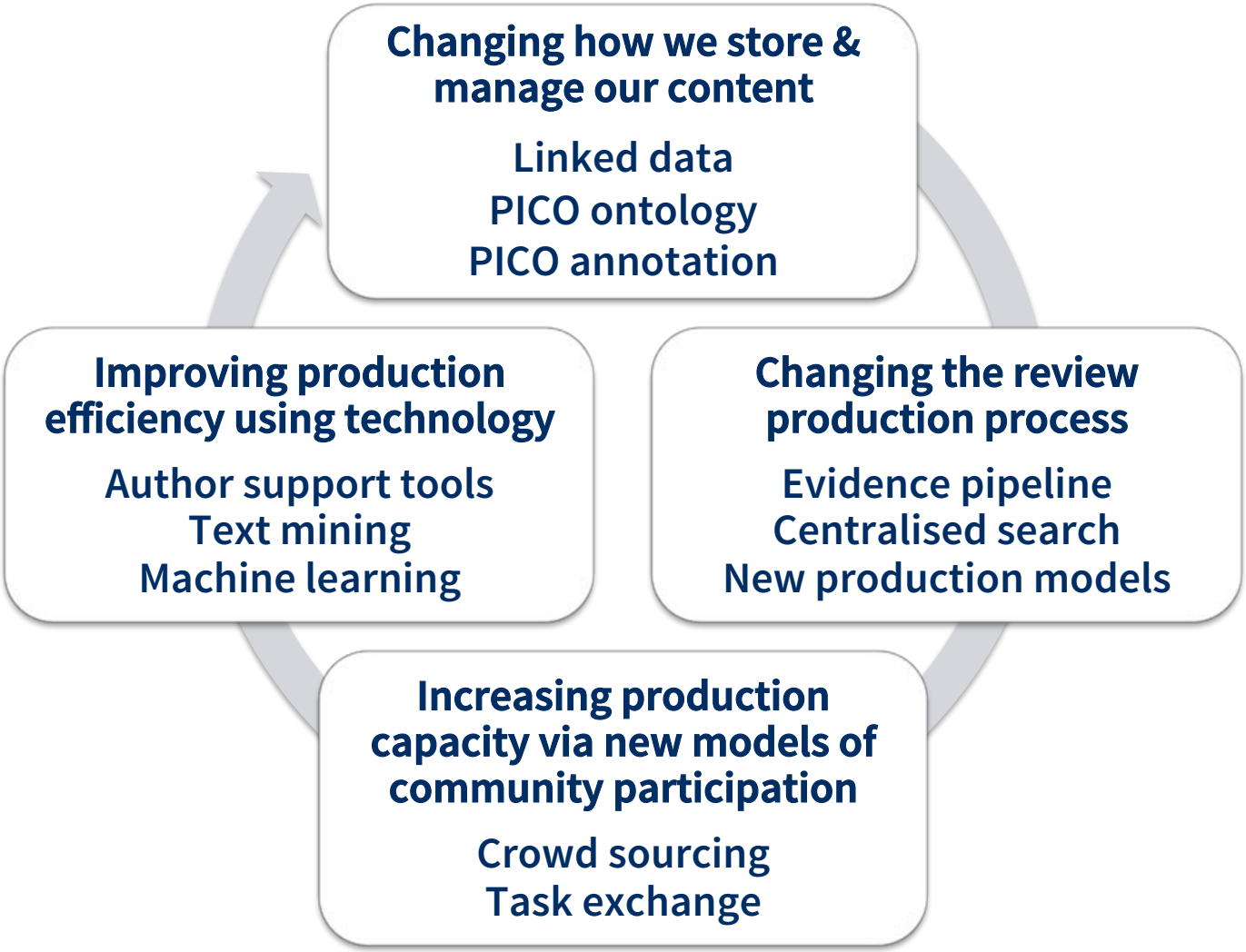
Cochrane operational projects



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Objectives

- Improve usability & utility of Cochrane data
- Production efficiency
- Quality & standardisation
- Revenue protection & generation
- Improve contributor engagement & experience

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Project Transform

People + Process + Technology converge

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Project Transform

4 components:

- **Evidence Pipeline**: uses machine learning and text mining to make study identification more efficient and semi-automated – **including Centralized Search Service**
- **Getting Involved**: uses crowdsourcing to get more people involved in tasks (**URL coming soon!)**
- **Task Exchange**: Platform for brokering tasks (**taskexchange.cochrane.org**)
- **Production Models**: New models of organising human effort in review production
- More info at **cochrane.org/transform**

Project Transform

Project Executive

Julian Elliott (Co-Lead), James Thomas (Co-Lead), Sally Green, Chris Mavergames, Steve McDonald, Anna Noel-Storr, David Tovey, Tari Turner

Project Team

Clive Adams, Lorne Becker, Linn Brandt, Rachel Churchill, Agustin Ciapponi, Gordon Dooley, Ruth Foxlee, Demian Glujovsky, Toby Lasserson, Geraldine Macdonald, Sue Marcus, Rupert McShane, Melissa Murano, Charlotte Pestridge, Daniel Perez Rada, Gabriel Rada, Jacob Riis, Ian Shemilt, Chris Watts, Karla Soares-Weiser, and IKMD developers

Project Component Co-Leads

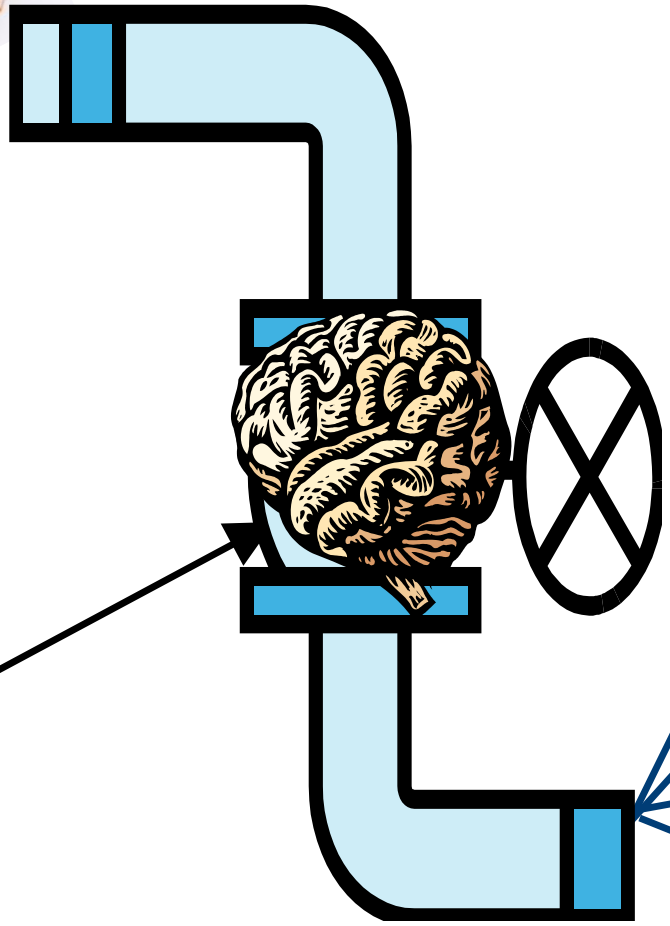
Evidence Pipeline: James Thomas, Steve McDonald

Getting Involved: Anna Noel-Storr, Chris Mavergames

Task Exchange: Anna Noel-Storr, Chris Mavergames, Julian Elliott, Tari Turner

Production Models: Julian Elliott, David Tovey

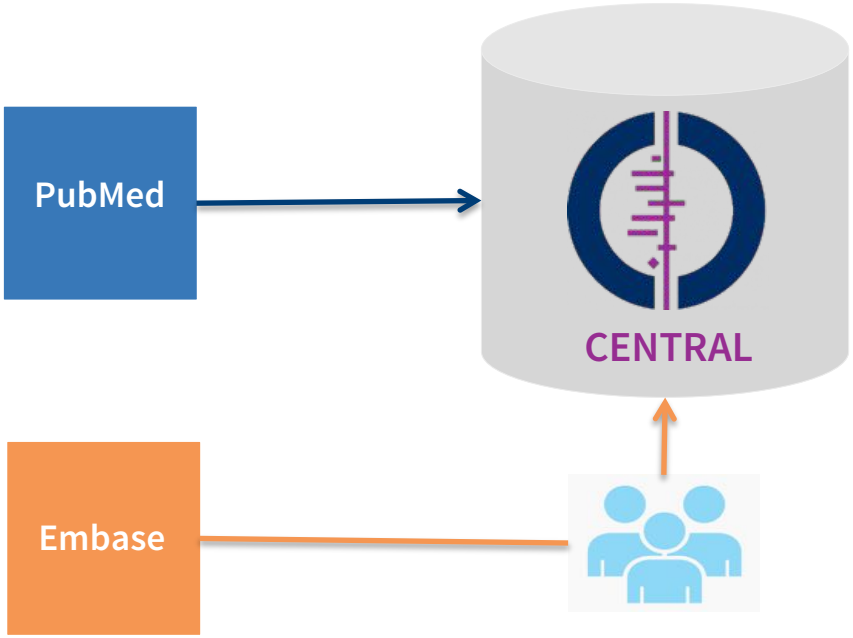
Evidence Pipeline



"Intelligence" from:

- Completed reviews
- CRG specialised registers
- Search strategies
- Citation networks…

Centralised Search Service (CSS): What we currently do

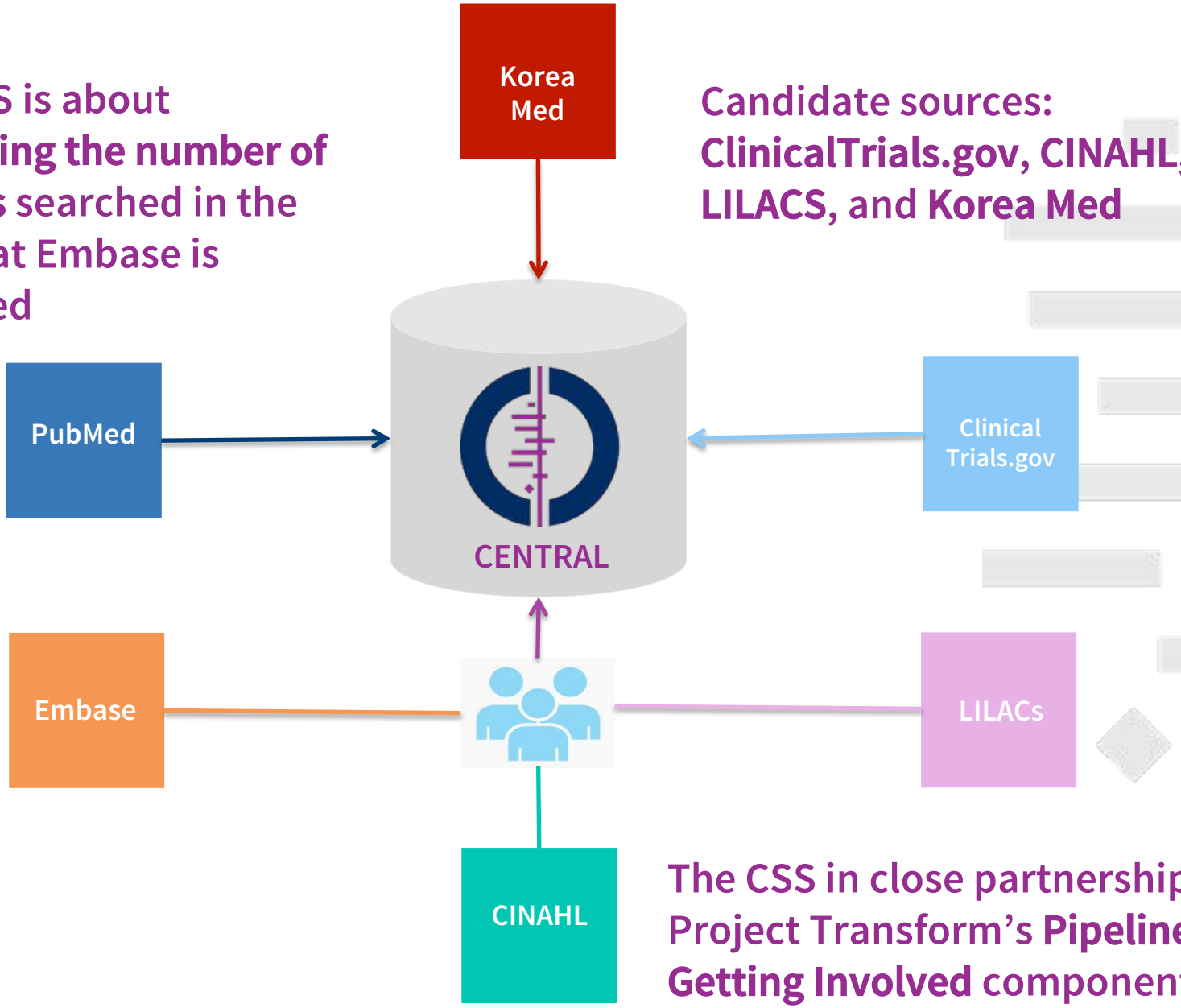


We currently have two centralised searches in place: the PubMed 'direct feed' and the Embase feed in some records are directly fed into CENTRAL, whilst others are screened for eligibility by a crowd

Future plans

The CSS is about **increasing the number of sources** searched in the way that Embase is searched

Candidate sources: **ClinicalTrials.gov, CINAHL, LILACS, and Korea Med**



The CSS in close partnership with Project Transform's **Pipeline** and **Getting Involved** components

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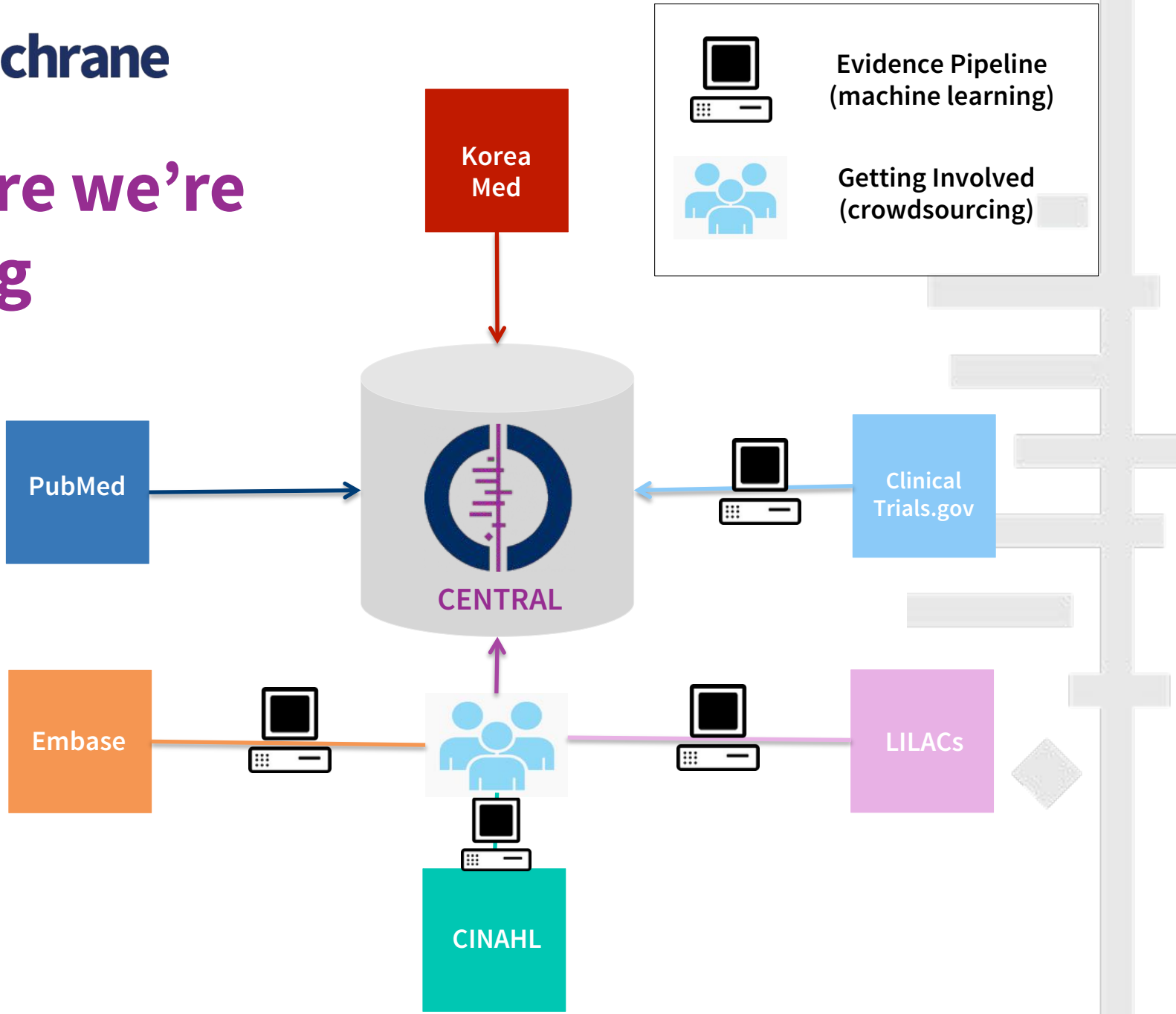
Where we're going



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Why?

Multi-source searching per review/per review group to identify reports of randomised trials

Time spent searching
Time spent screening
Duplication of effort

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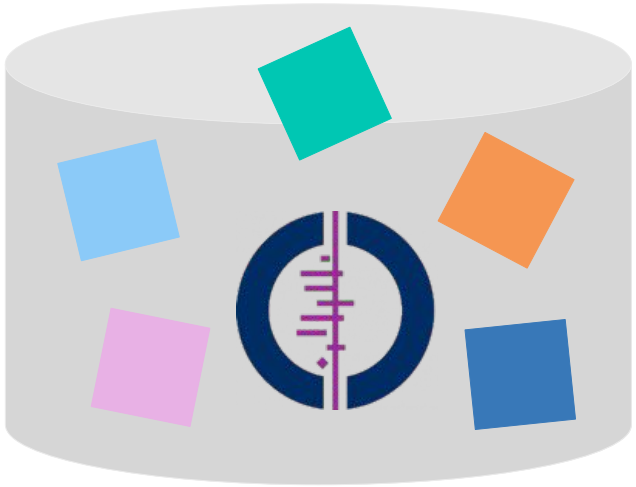
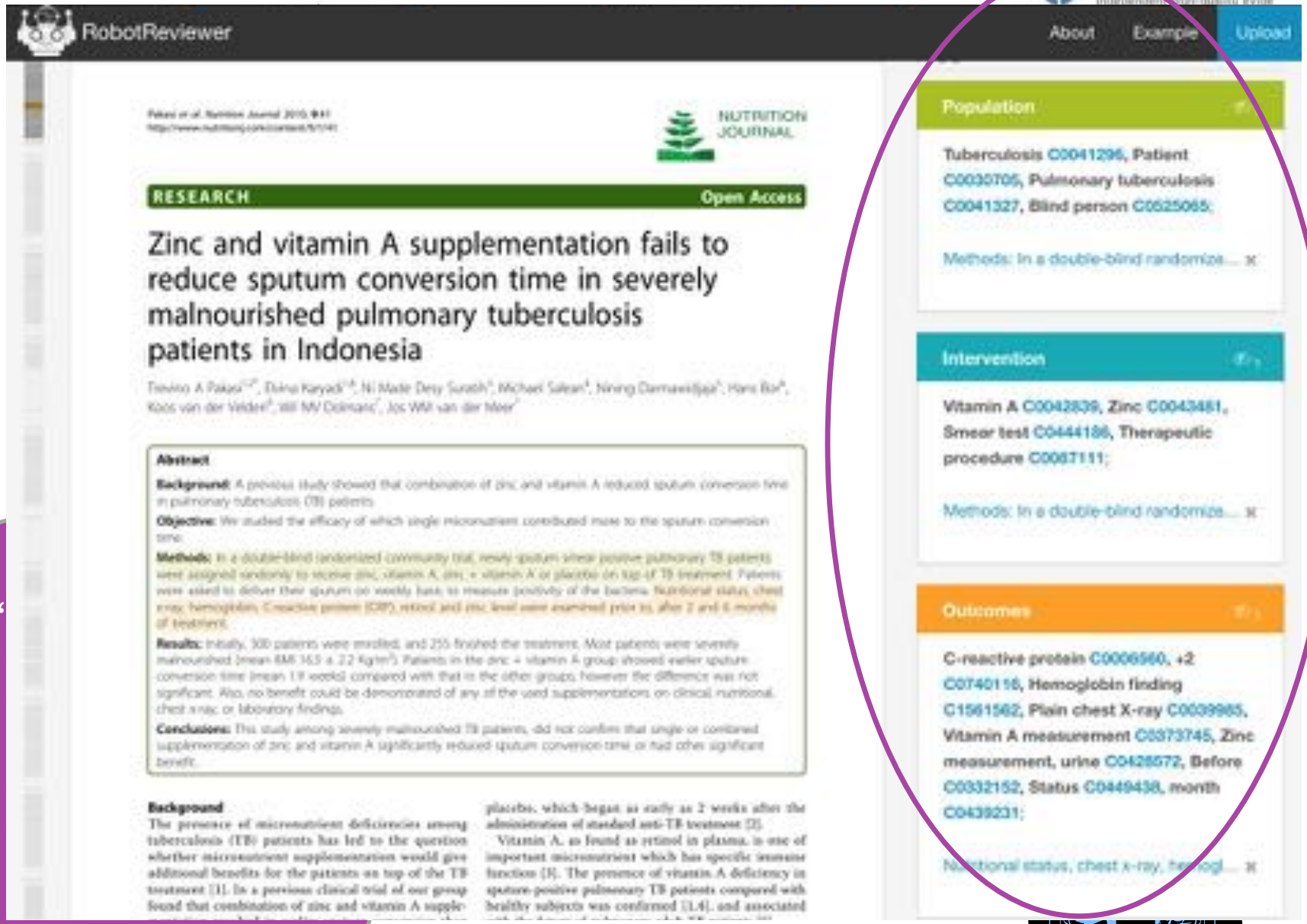
Why?



Endgame: Just search CENTRAL

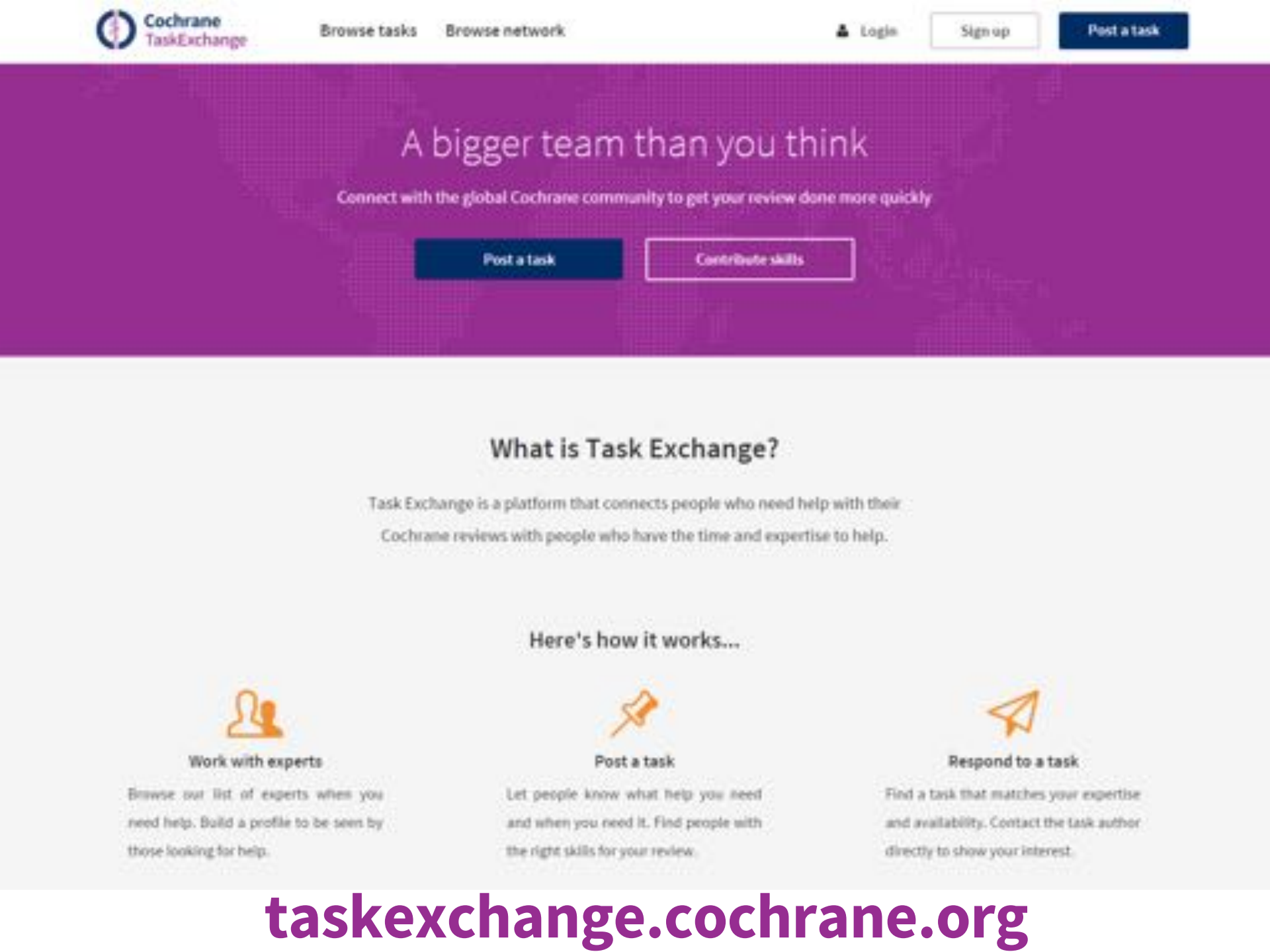
Time **saved** searching
Time **saved** screening
Reduction in duplication of effort

Evidence Pipeline

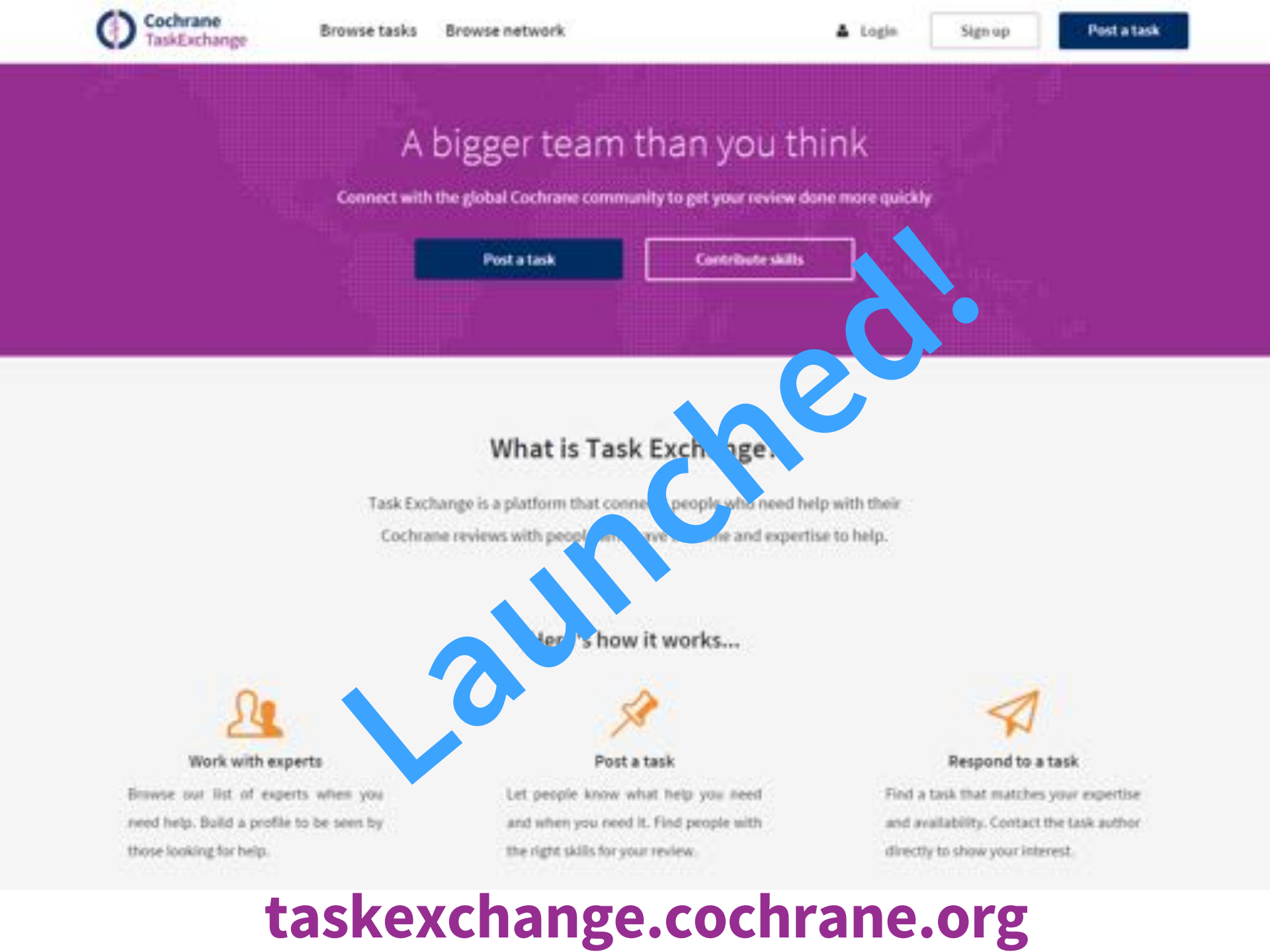



Cochrane Crowd
You can make a difference
2125
31
725784
Just 60 seconds a day can make a difference


Cochrane Crowd
You can make a difference
2125
725784
launching
‘Soft



taskexchange.cochrane.org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TaskExchange
Browse tasks
Browse network
Login
Sign up
Post a task
A bigger team than you think
Connect with the global Cochrane community to get your review done more quickly
Post a task
Contribute skills
What is Task Exchange?
Task Exchange is a platform that connects people who need help with their Cochrane reviews with people who have the time and expertise to help.
Here's how it works...
Work with experts
Browse our list of experts when you need help. Build a profile to be seen by those looking for help.
Post a task
Let people know what help you need and when you need it. Find people with the right skills for your review.
Respond to a task
Find a task that matches your expertise and availability. Contact the task author directly to show your interest.
Launched!
taskexchange.cochrane.org

Production Models

Exploratory phase complete (26 interviews and >100 survey responses) & report drafted; identified opportunities to improve production models in a range of ways including 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 review production steps;
- break reviews into smaller ‘chunks’;
- improve approaches to capacity building and information sharing around review production

Now working on developing pilot projects to implement some of these ideas.

Target 6, Goal 1 – 2016 Strategy Targets

community.cochrane.org

Contact us | Task Exchange | Training | Cochrane Library | Cochrane.org

Cochrane Community

Trusted evidence.
Informed decisions.
Better health.

Search...

Review production | Organizational info | Tools | News and events

Welcome

Quick links

- Archie
- [redacted]
- Community Newsletter
- Editorial and Publishing Policy Resource
- FAQs
- Jobs
- Handbook for Systematic Review
- MECIR

Latest News and Events

New webinar series -

cochrane.org/organizational-info/resources/strategy-to-2020


…breathe…

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Linked Data Project: Update

PICO Annotation and PICOfinder

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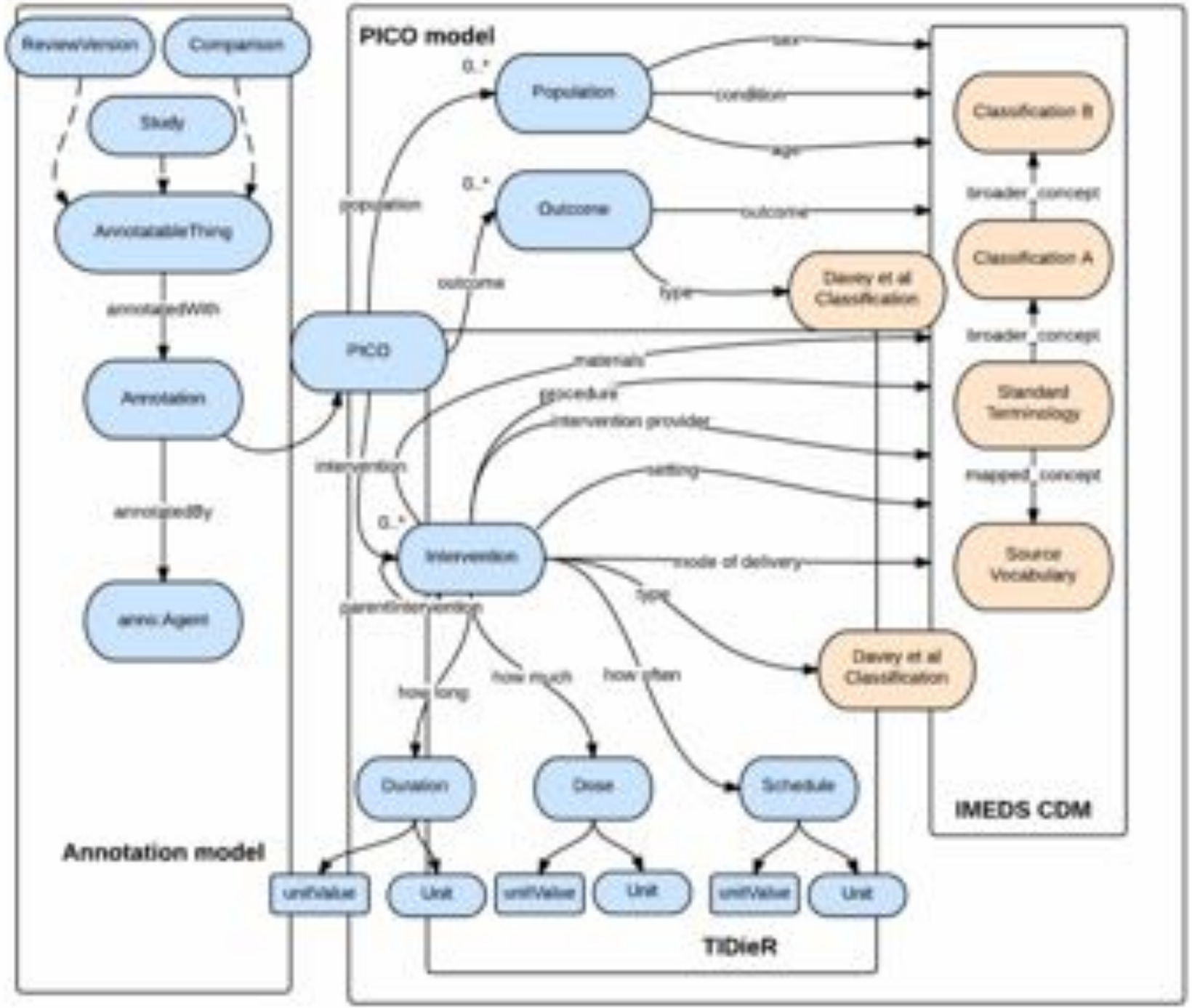
Linked Data: Overarching goals

- Enrich our content and data with metadata using controlled vocabularies (SNOMED CT, etc.)
- Construct knowledge models and structures (ontologies) that will allow re-use of this metadata (annotations) for both downstream (dissemination) and upstream (production) use
- Become more interoperable with other projects, products, datasets, and systems
- Improve production (“smarter data”) and dissemination of evidence (“unlocking the evidence”)
- http://linkeddata.cochrane.org


PICO model
Review/Version
Comparison
Study
AnnotatableThing
annotatedWith
Annotation
annotatedBy
anno:Agent
Annotation model
PICO
0..*
Population
Outcome
intervention
0..*
Intervention
parentIntervention
sex
condition
age
outcome
type
materials
procedure
intervention provider
setting
mode of delivery
type
how long
how much
how often
Duration
Dose
Schedule
unit/value
Unit
unit/value
Unit
unit/value
Unit
TIDieR
Davey et al Classification
Classification B
broader_concept
Classification A
broader_concept
Standard Terminology
mapped_concept
Source Vocabulary
Davey et al Classification
IMEDS CDM

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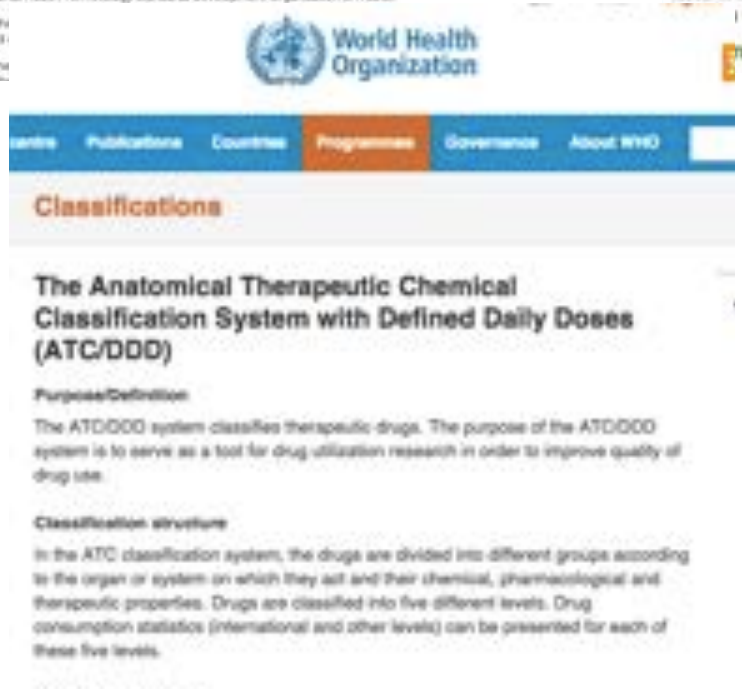
Controlled terminology sets (vocabularies)



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Existing Cochrane databases

Archie

CRS

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A new Cochrane *PICO database*

Archie

Linked data Store

CRS

User Interfaces…

PICO annotations:
- Reviews (question, studies, analyses)
- CRS/CENTRAL
- Data sets (Covidence, EPPI-R)

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PICO Annotator

Annotating Cochrane Review content

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PICO Annotator
Derivative Products
C0000343
Home
Methods
Criteria for considering studies for this review
Types of studies
Types of participants
PICO Annotator
Step 1: Participants
asthma
Asthma
Asthma
Asthma Without Status Asthmaticus
Asthma With Status Asthmaticus

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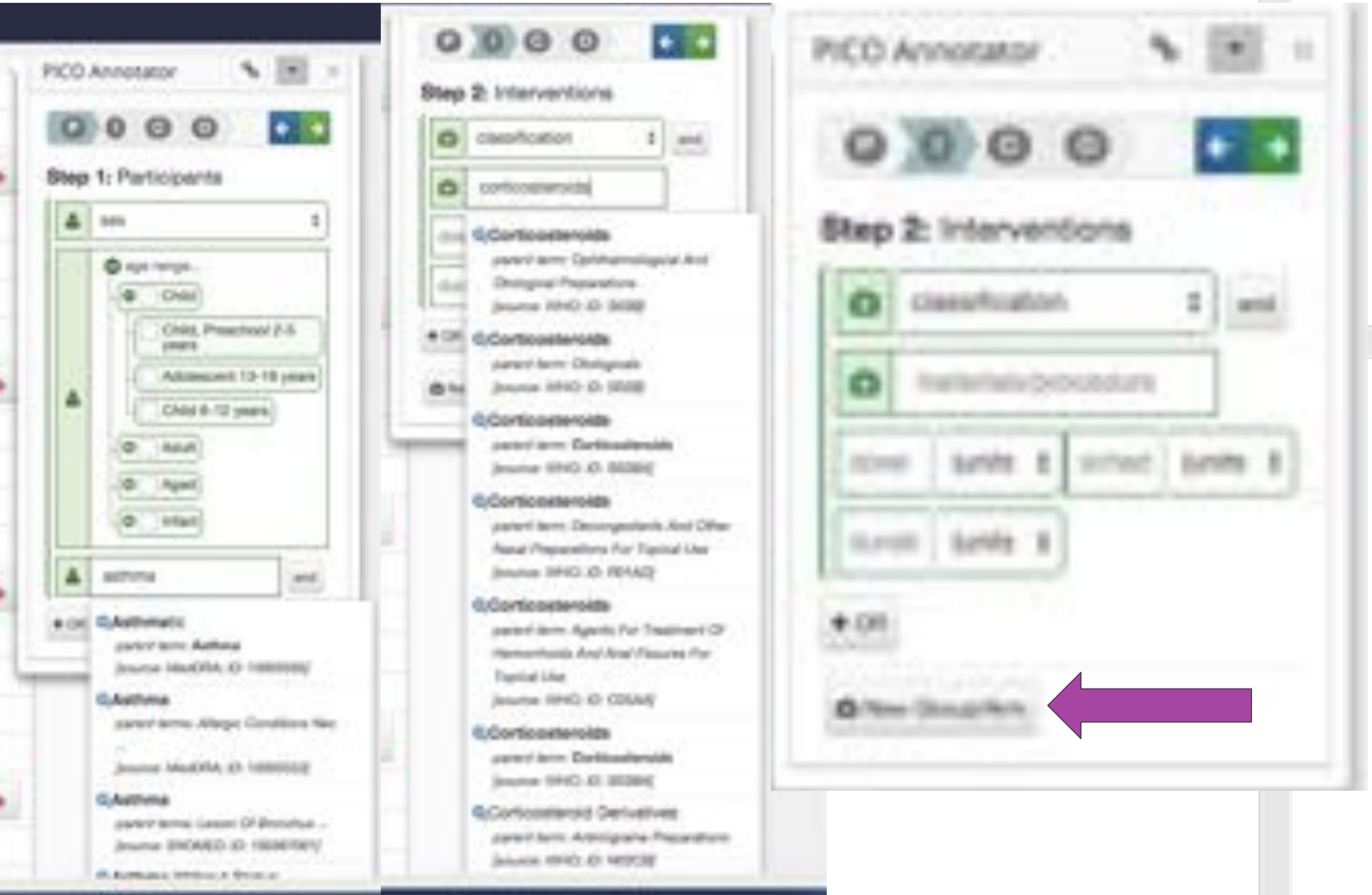
PICO Annotator
Step 1: Participants
Step 2: Interventions
PICO Annotator
Step 2: Interventions

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PICO Annotator
Step 4: Outcomes
Pain
Quality of Life
Resource use
Mental health
Infection
Compliance with treatment
Function
Adverse events
Mortality

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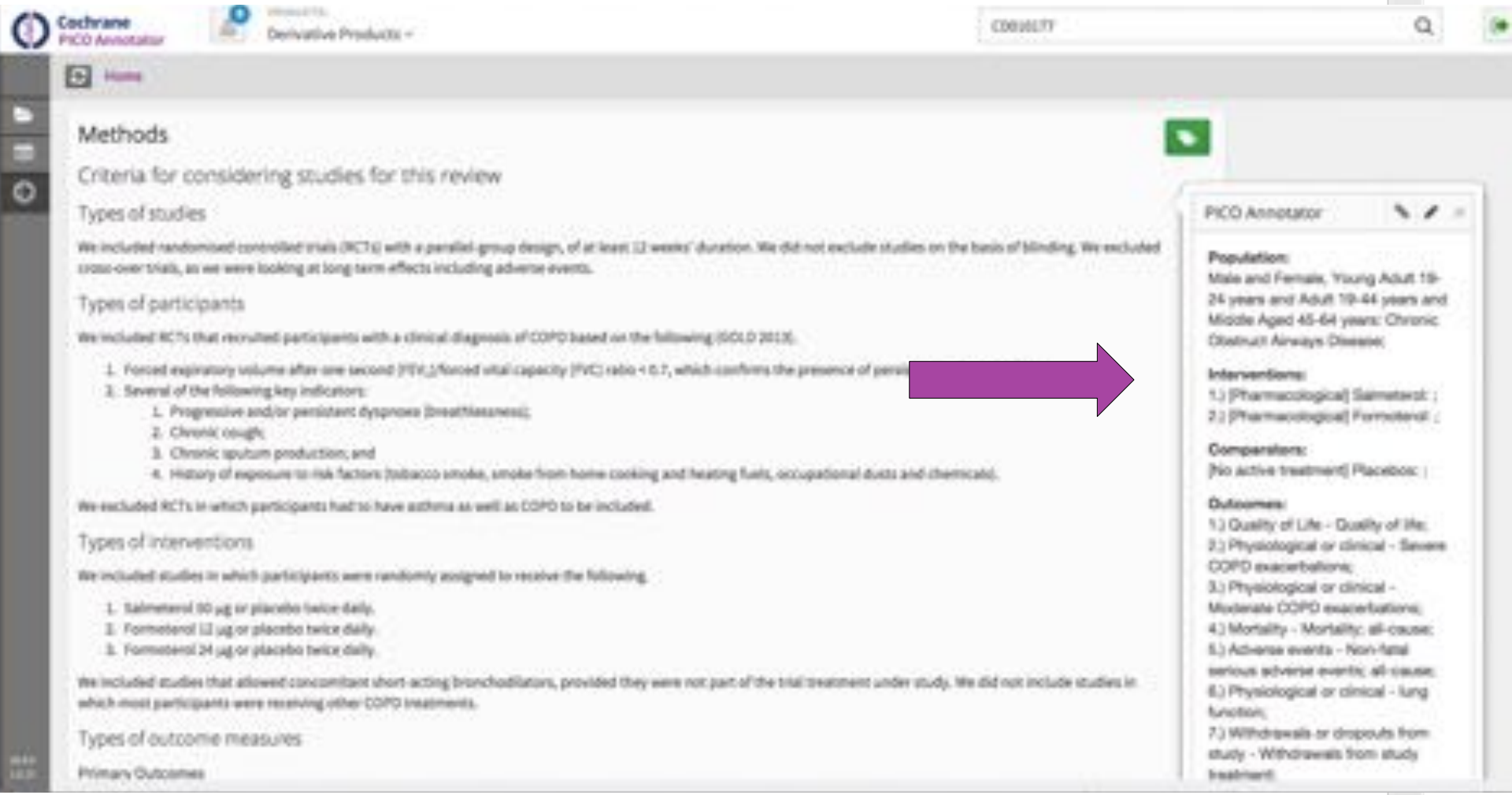
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PICO Annotator
Derivative Products
CD010177
Home
Methods
Criteria for considering studies for this review
Types of studies
We included randomised controlled trials (RCTs) with a parallel-group design, of at least 12 weeks' duration. We did not exclude studies on the basis of blinding. We excluded cross-over trials, as we were looking at long term effects including adverse events.
Types of participants
We included RCTs that recruited participants with a clinical diagnosis of COPD based on the following (GOLD 2013):
1. Forced expiratory volume after one second (FEV1)/forced vital capacity (FVC) ratio < 0.7, which confirms the presence of persi
2. Several of the following key indicators:
1. Progressive and/or persistent dyspnoea (breathlessness);
2. Chronic cough;
3. Chronic sputum production; and
4. History of exposure to risk factors (tobacco smoke, smoke from home cooking and heating fuels, occupational dusts and chemicals).
We excluded RCTs in which participants had to have asthma as well as COPD to be included.
Types of interventions
We included studies in which participants were randomly assigned to receive the following.
1. Salmeterol 50 µg or placebo twice daily.
2. Formoterol 12 µg or placebo twice daily.
3. Formoterol 24 µg or placebo twice daily.
We included studies that allowed concomitant short acting bronchodilators, provided they were not part of the trial treatment under study. We did not include studies in which most participants were receiving other COPD treatments.
Types of outcome measures
Primary Outcomes
PICO Annotator
Population:
Male and Female, Young Adult 19-24 years and Adult 19-44 years and Middle Aged 45-64 years: Chronic Obstruct Airways Disease;
Interventions:
1.) [Pharmacological] Salmeterol; ;
2.) [Pharmacological] Formoterol; ;
Comparisons:
[No active treatment] Placebos; ;
Outcomes:
1.) Quality of Life - Quality of life;
2.) Physiological or clinical - Severe COPD exacerbations;
3.) Physiological or clinical - Moderate COPD exacerbations;
4.) Mortality - Mortality: all-cause;
5.) Adverse events - Non-fatal serious adverse events; all-cause;
6.) Physiological or clinical - lung function;
7.) Withdrawals or dropouts from study - Withdrawals from study treatment;

Goal 2, Target 7 – 2016 Strategy Targets

Goal 2 Targets in 2016:

7. **USER-CENTRED DESIGN AND DELIVERY** -Cochrane Reviews (PICO annotation
We will make the content and data behind our reviews more useful and discoverable by completing the linked data annotation of reviews and protocols at question, included study, and analysis levels.

Outcomes	Indicators of success delivered by the Central Executive Team	Indicators of success delivered by Cochrane Groups	Delivery deadlines
Cochrane PICOs are short summaries of a clinical question addressed by one or more Cochrane Reviews. Target audiences for Cochrane PICOs are healthcare practitioners and policy makers, and other informed users of health care (e.g. decision makers). This target will complete the background work required to enable PICO views of Cochrane evidence in the Cochrane Library and elsewhere. For users:	For all reviews and protocols, a complete set of PICO annotations have been developed at question, included study, and analysis levels.	CRGs are familiar with linked data tools and annotation work.	Dec 2016
	An annotation tool has been added to the workflow in Archie, RevMan, and the CMS.	TSCs are trained in annotation and there is engagement with the CET on governance of metadata	Dec 2016
	Scoping of uses APIs is in place for external business cases and data feeds	TSCs begin annotating all new reviews in their Group and, in combination with machine-led, PICO annotating studies in the CMS.	Dec 2016

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Goal 2, Target 7 – 2016 Strategy Targets

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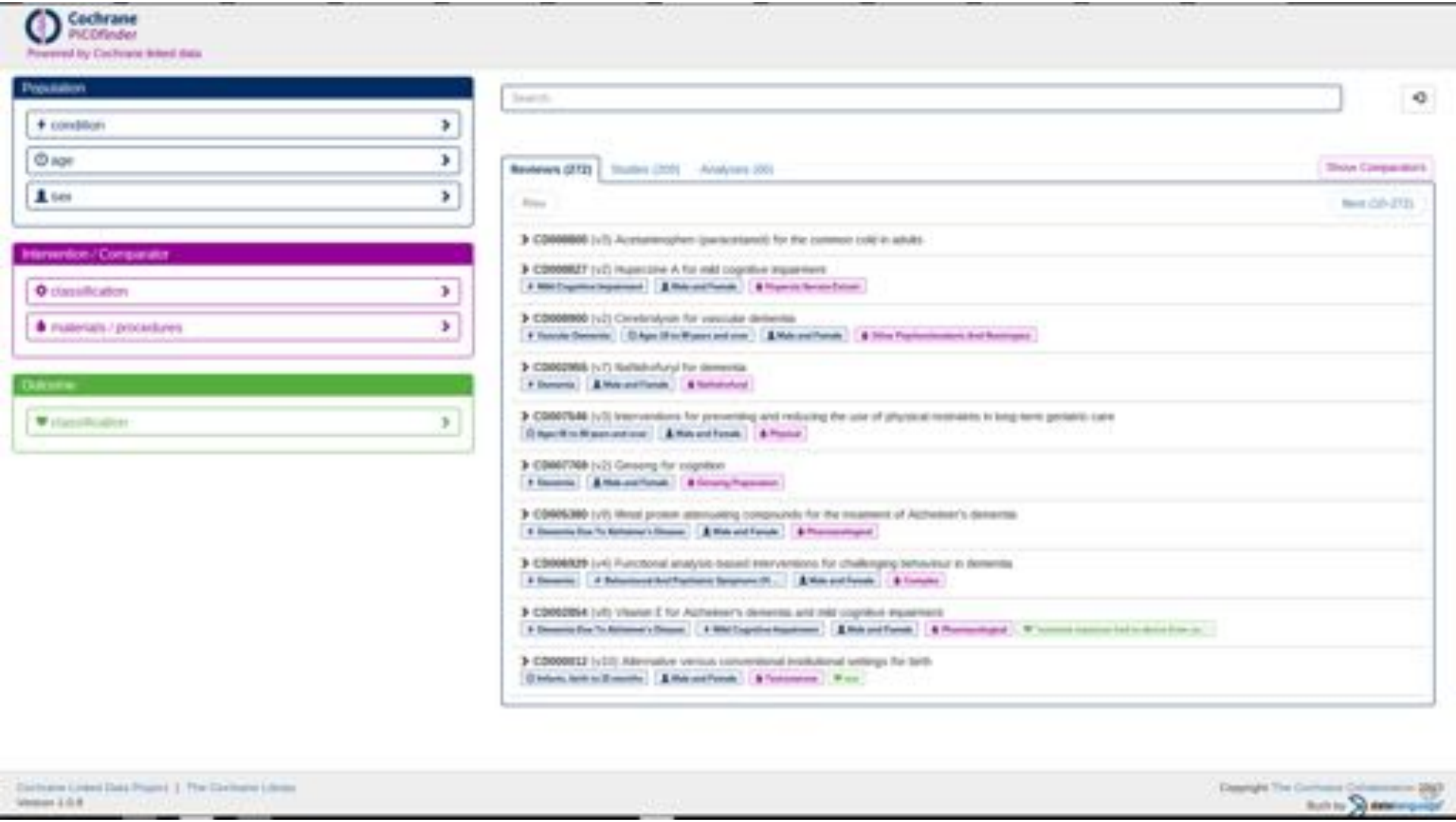
PICOfinder demo interface

Exploring, filtering, and visualizing Cochrane evidence using PICO

https://data.cochrane.org/pico-finder



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Cochrane
PICOfinder
Powered by Cochrane linked data
Population
condition
age
sex
Intervention / Comparator
classification
materials / procedures
Outcome
classification

Cochrane


Cochrane
PICOfinder
Powered by Cochrane linked data
Population
condition
Asthma
Dementia
Dementia Due To Alzheimer's Disease
Acute Asthma
Mild Cognitive Impairment
Asthma
Vascular Dementia
Chronic Obstructive Pulmonary Disease
Elderly
Mixed Dementia

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Vasc
Vascular Dementia
Operation On Vascular Graft
Vascular Surgery Procedure
Peripheral Vasodilators
Peripheral Vasodilators
Selective Calcium Channel Blockers With Mainly Vascular Effects
Valproate
Other Peripheral Vasodilators
Vaccines
Various
Vaccines
Viral Vaccines
Pneumococcal Vaccines
Bacterial Vaccines
Validation Therapy
CD007769 (v2) Ginseng for cognition

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“Enabling” technology

- New interfaces and products for Cochrane evidence such as:
  - Dynamically-generated topic portals and interfaces ☺
  - Improved discoverability ☺
  - Comparator tools ☺
  - APIs for third-party systems and data feeds 
- Facilitating:
  - Data re-use and repurposing ☺
  - Review production efficiency and intelligence ☺
  - Living sys reviews into living guidelines ☺
  - Creation of standards (PICO) for interoperability 

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Hypothesis announces a coalition of over 40 scholarly organizations bringing annotation to all knowledge. Learn more

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Annotate!

CONTENTMINE

Open Science Prize: ContentMine and Hypothes.is teaming up for proposal

We are pleased to announce that we're teaming up with Hypothes.is to put forward a proposal to the Open Science Prize to mine and annotate the biomedical literature - using and producing loads of open data along the way.

A growing number of open data resources are either directly cited in the biomedical literature or have an indirect link to the content of articles or other research outputs. Unfortunately these links are often not visible to readers and if the article is behind a paywall they could be invisible to the vast majority of the population, including many researchers.

We plan to automatically mine and openly annotate the biomedical literature with intelligent identifiers for data such as genes, species and many dataset citations. ContentMine will extract the facts and Hypothes.is will display them on the online document. Through this, we'll create an index of facts as open data that can be combined with manual annotations from the community of Hypothes.is and ContentMine users. This development and linking of two existing early-stage services will lead to a powerful and rich user opportunity to examine facts in context and look for connections and correlations centred around identifiers.

In the spirit of openness, we're discussing the proposal on discuss.contentmine.org and collaboratively drafting via Google Docs. We're appreciative of any volunteers who would like to help!

You can get involved by:

- joining the discussion thread here
- Contributing to the proposal draft
- joining the ContentMine github community

Hypothesis announ… …otation to all knowledge. Learn more


…refresh…

New authoring infrastructure

CRS Web, RevMan Web , Covidence, EPPI-R

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Overarching goals

- Browser-based tools
- Connected by APIs
- Using common data exchange formats
- Connected by ”the glue” (PICO metadata)
- Facilitating:
  - Data provenance, audit trails, and re-use/ reproducibility
  - Increasing efficiency
  - Better Ux

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CRS Web

The CRS is software for managing reports of trials. CRS Web is the browser-based version of the CRS desktop app. Key features are:

- Leverages the power of the CRS-D, the backend database of trials which links together all reports of trials and associated metadata.
- Provides a rich interface to allow easy discovery of all trials found by all review groups, making study identification for Cochrane review easier and faster and reducing duplication of effort.
- Automatically updates and alerts users when a trial's status changes.
- Integrated with RevMan Web, Covidence, EPPI, Cochrane Crowd, and other Cochrane projects.

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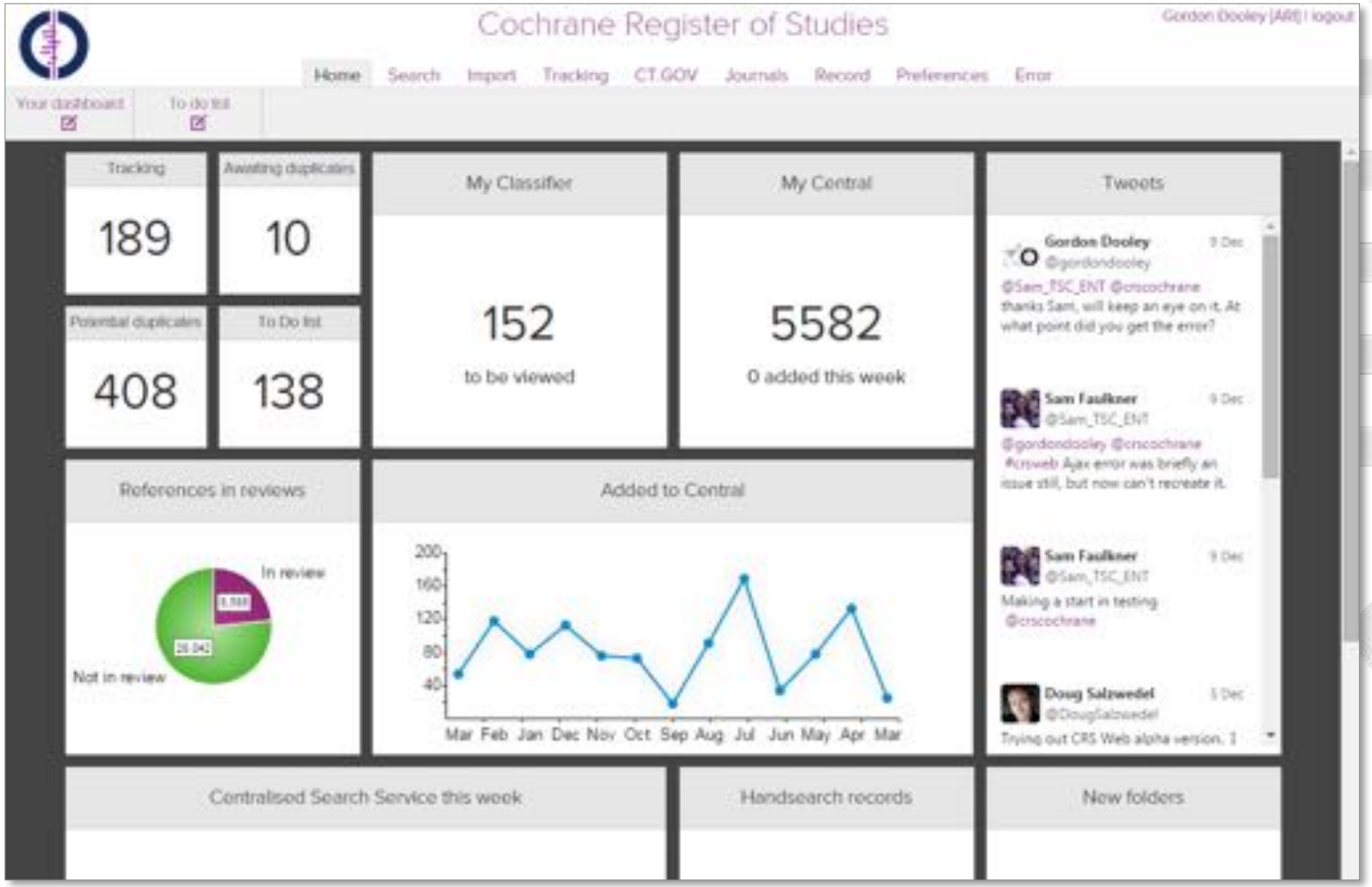
CRS Web dashboard page



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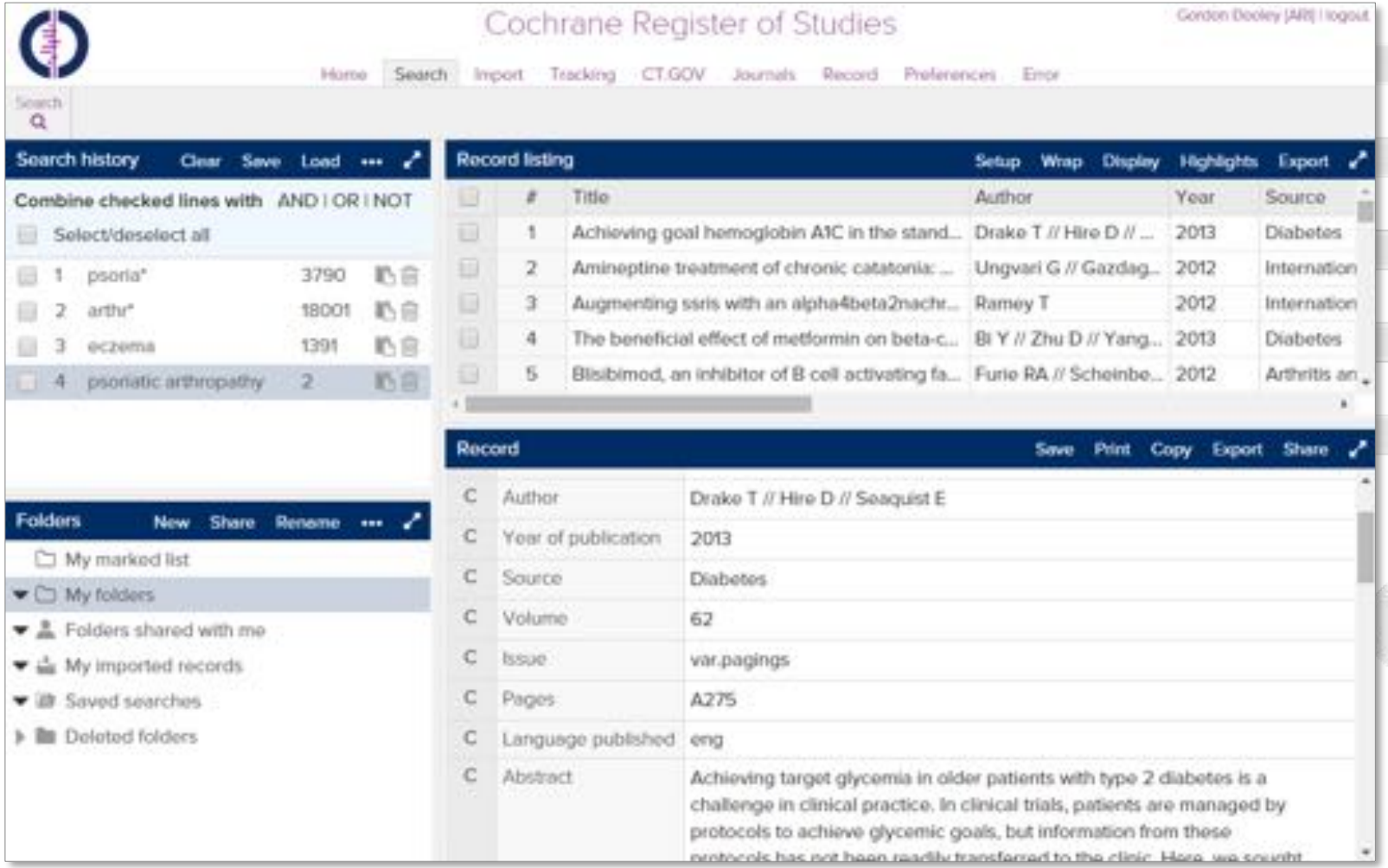
CRS Web search results page



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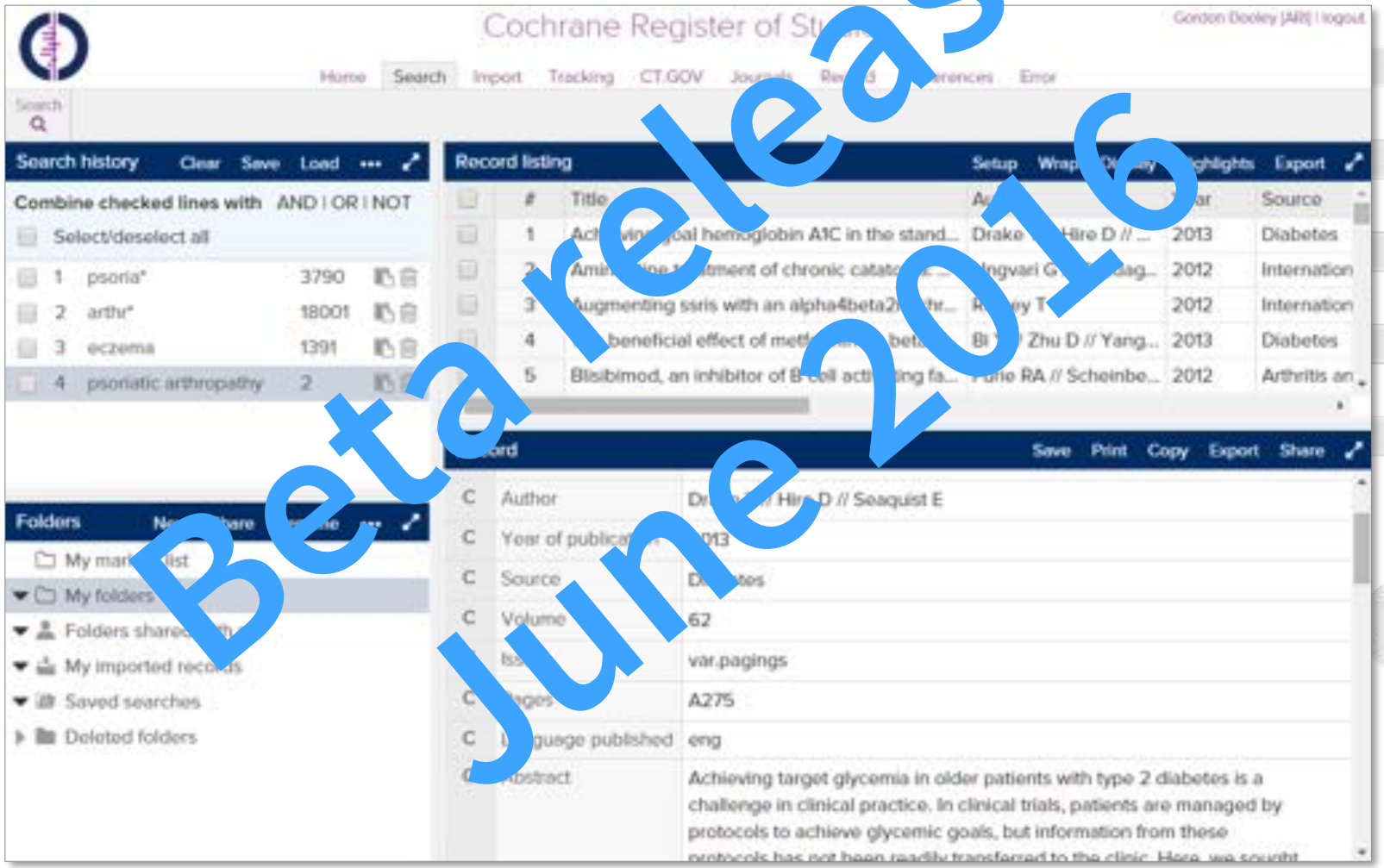
CRS Web search results page



Beta release:
June 2016

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RevMan Web

RevMan Web is a browser-based version of RevMan.

The primary objectives are to:

- Eliminate local installation by users.
- Link and integrate with other tools: Covidence and CRS Web.
- Improve and modernise the user interface.
- Enable Cochrane to quickly adapt review methods and new content.
- Faciliate better audit trails and provenance.

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Requirements for RevMan Web

- Installation free
- Works offline
- Mobile/Tablet friendly
- Multi-user
- Tracks provenance
- Secure
- Modular
- Facilitates data consistency
- Fast/performant
- Supports internationalisation

RevMan Web will co-exist with RevMan 5 during the rollout of the beta and 1st generation versions.

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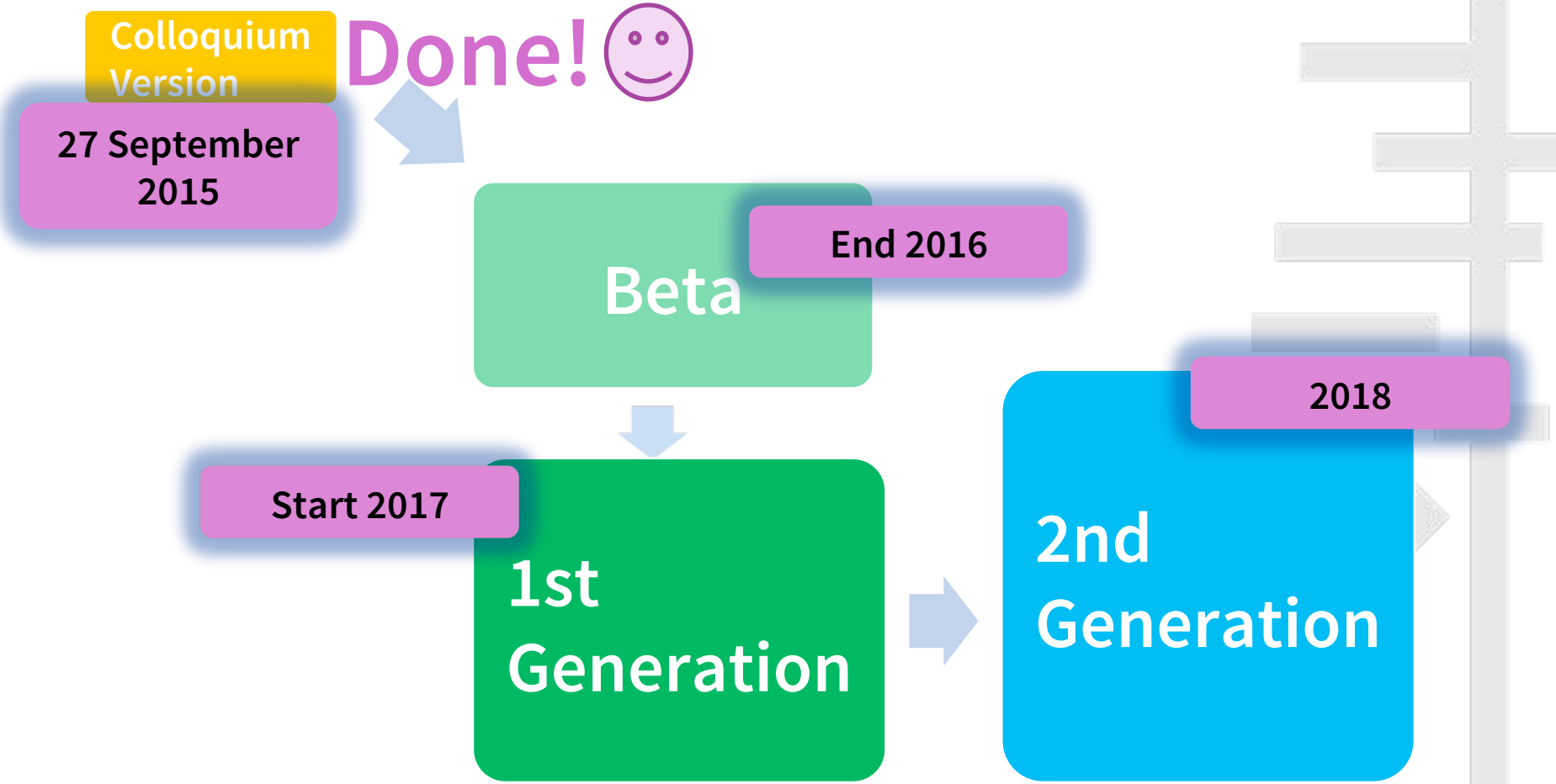
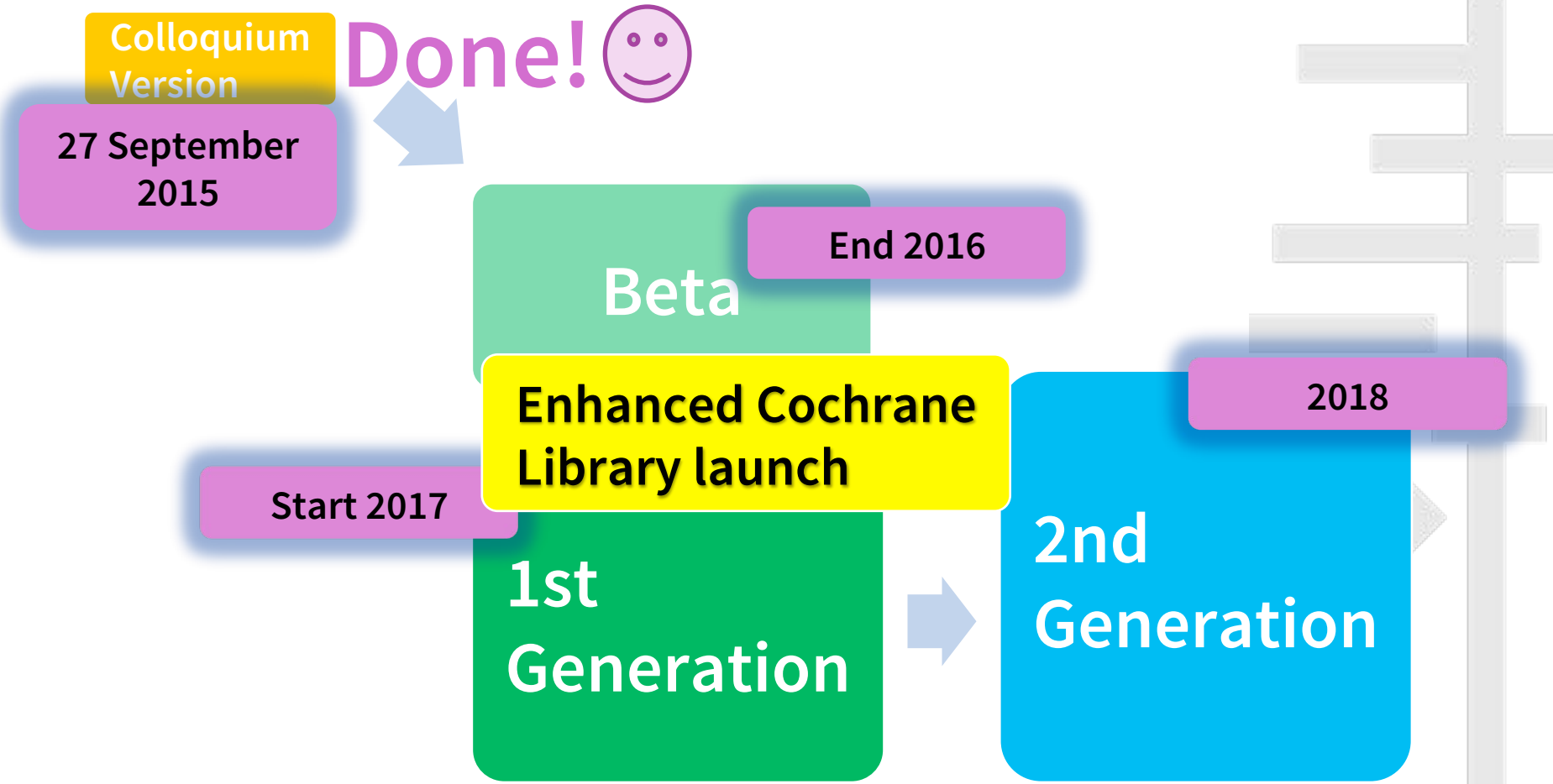
Expected Release Dates



Expected Release Dates



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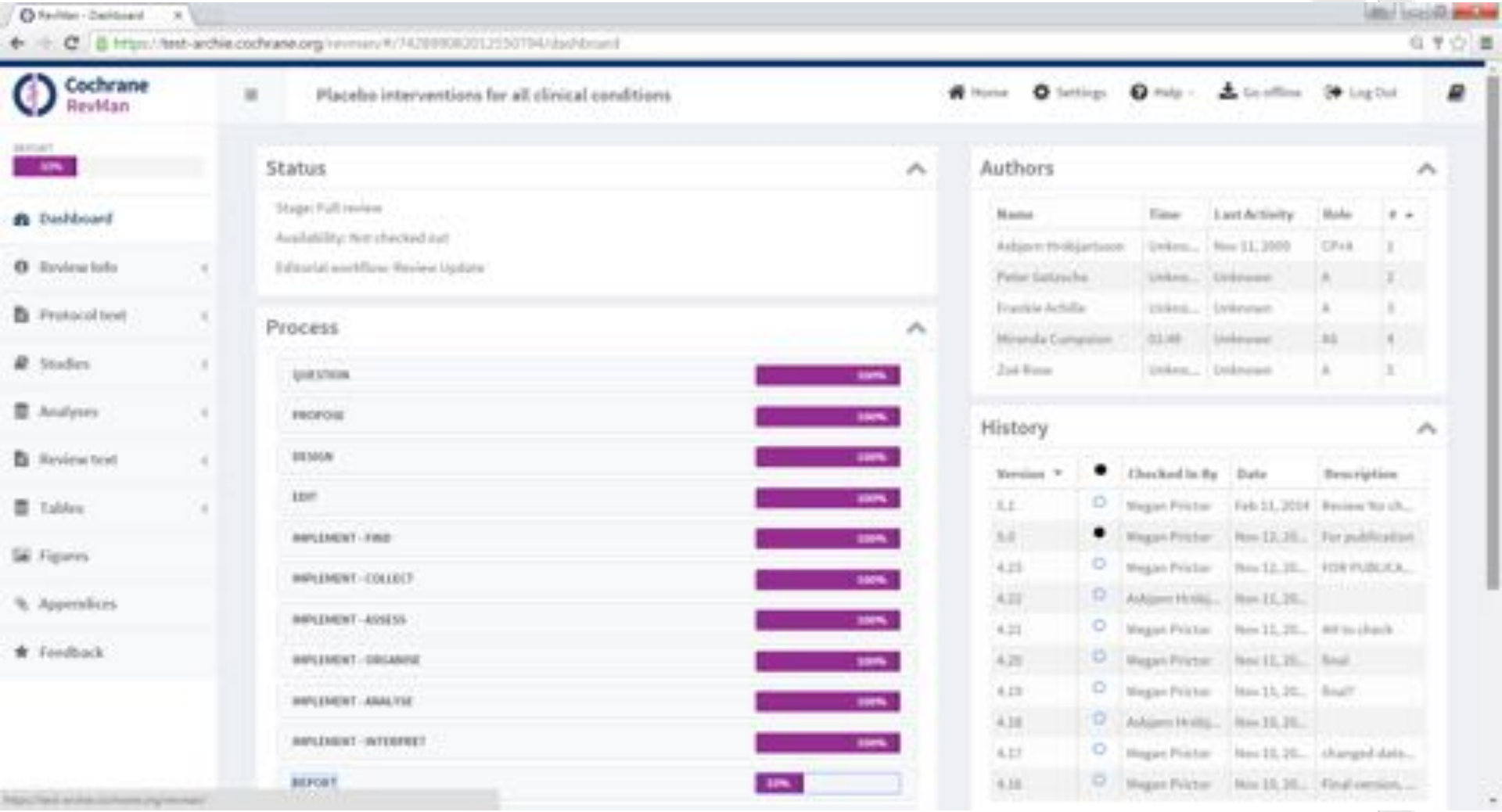
RevMan Web Review Dashboard



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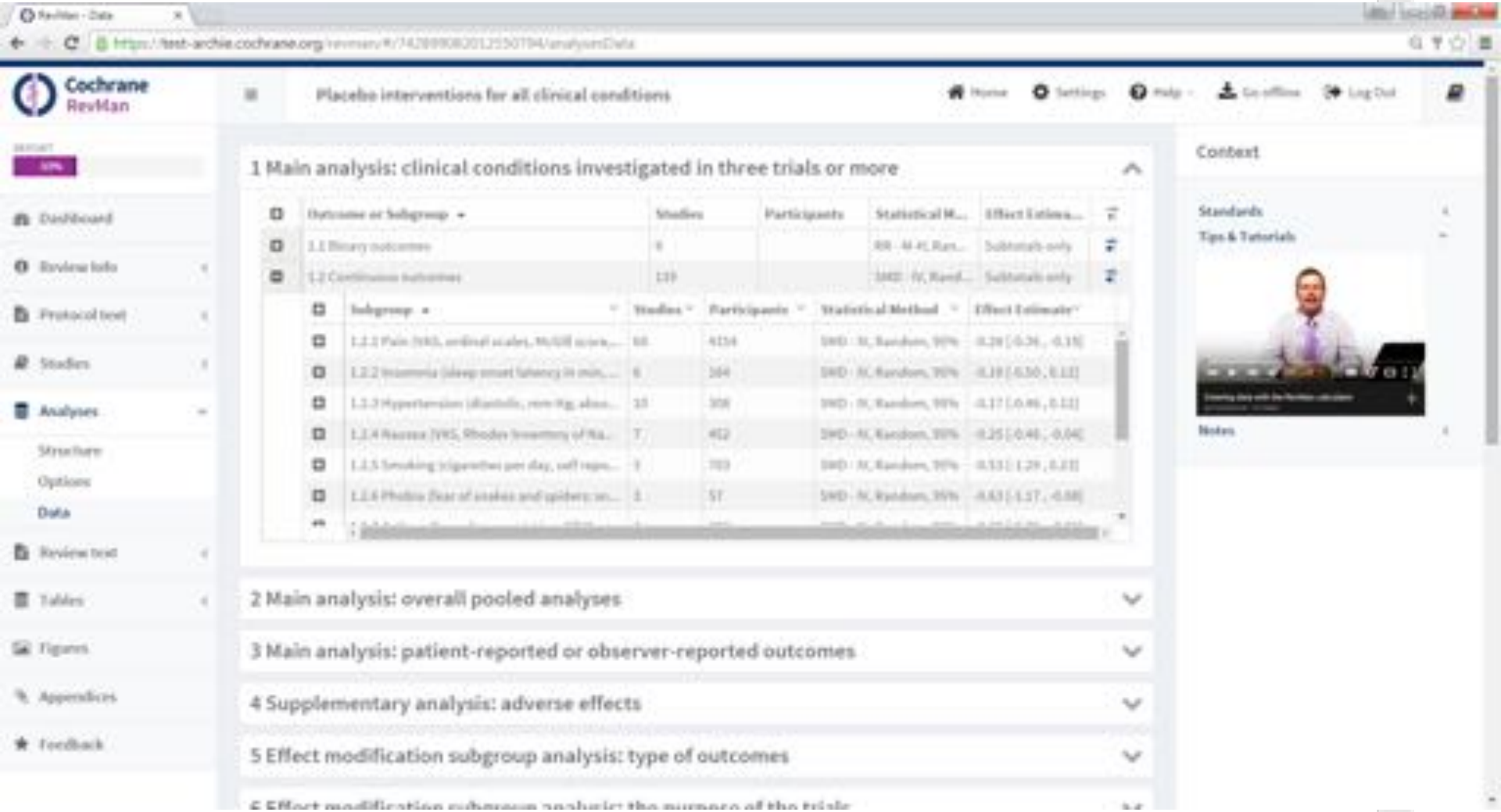
RevMan Web



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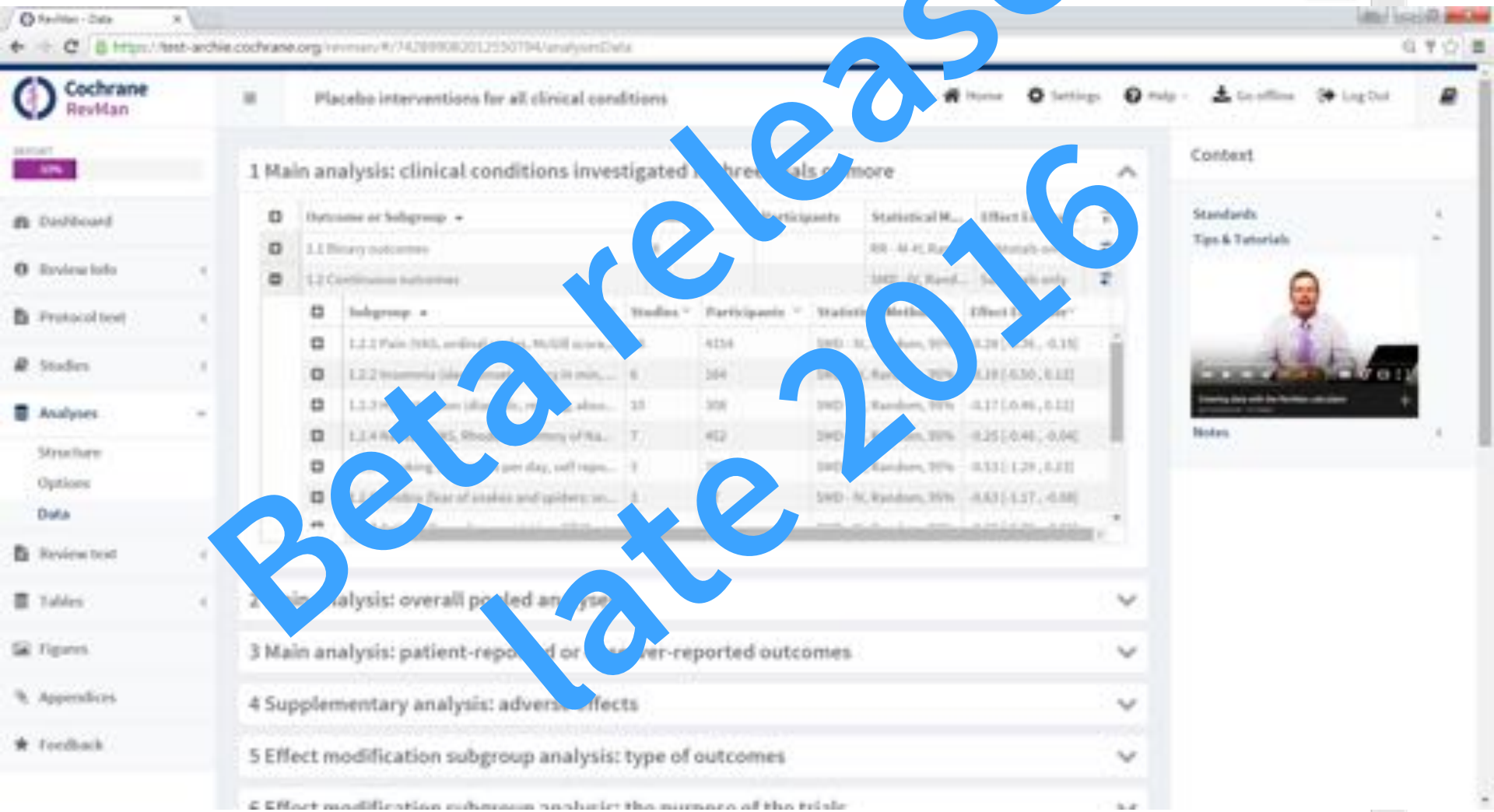
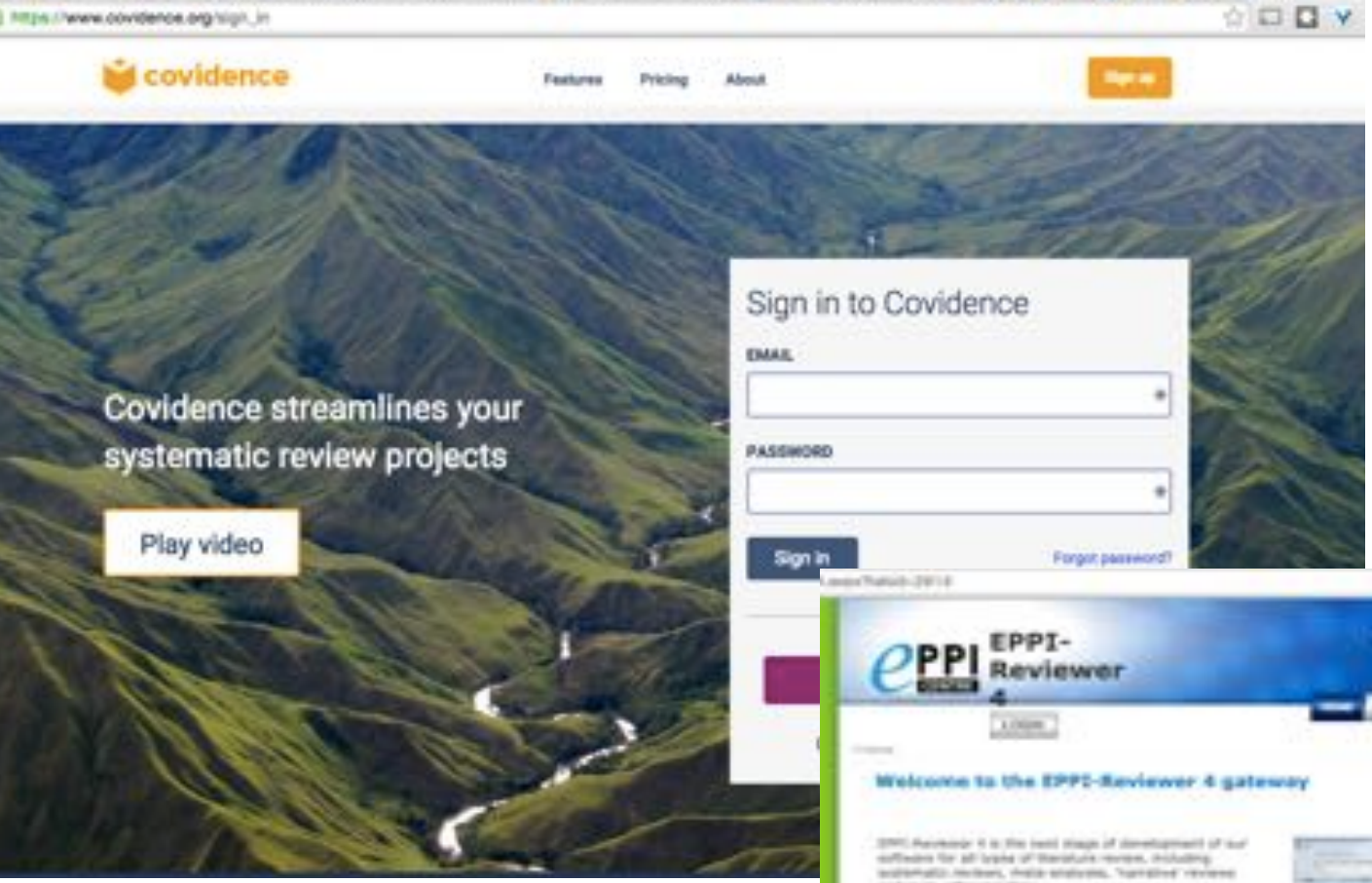
RevMan Web



Beta release: late 2016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EPPI-Reviewer 4
Welcome to the EPPI-Reviewer 4 gateway
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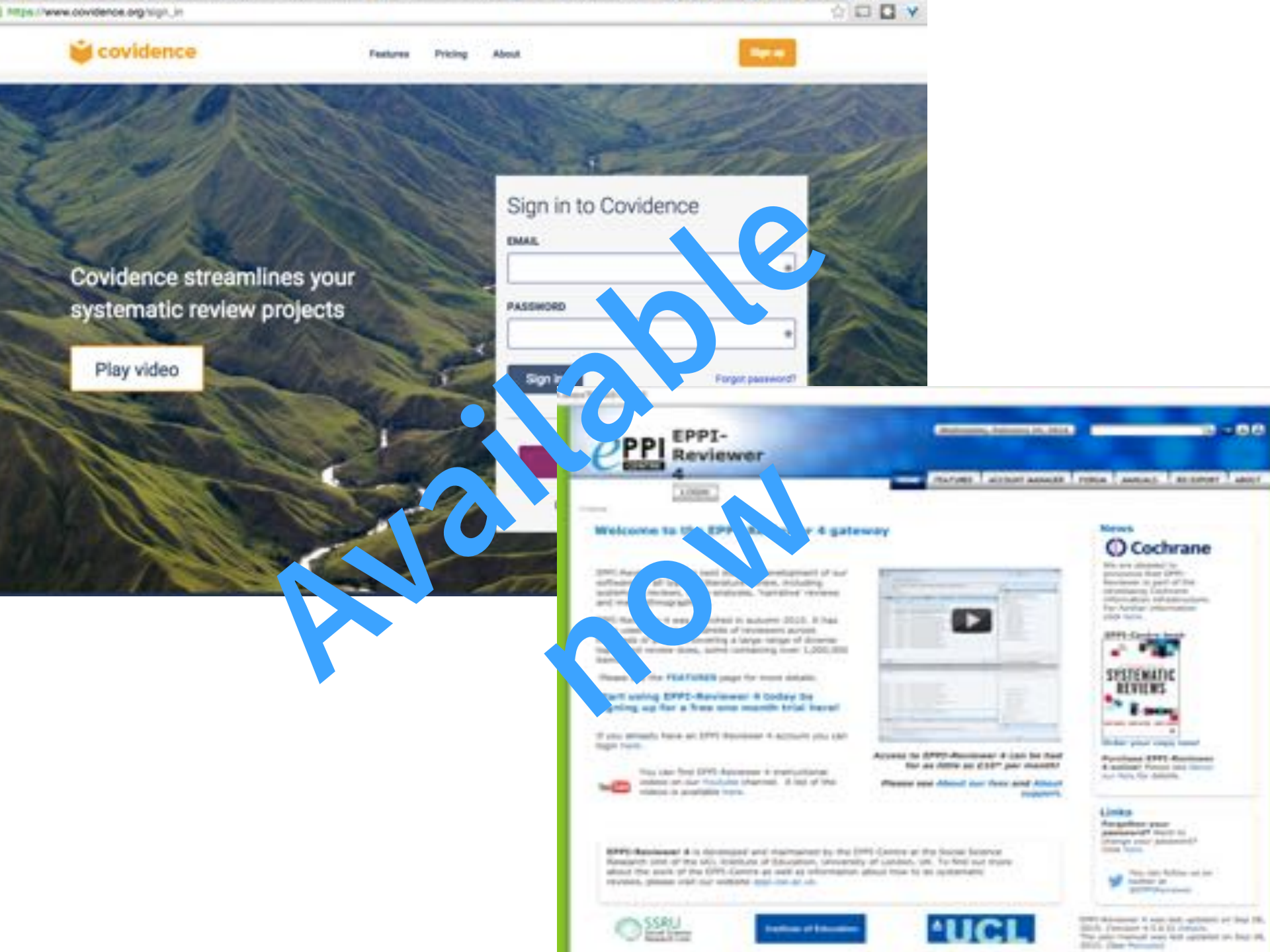
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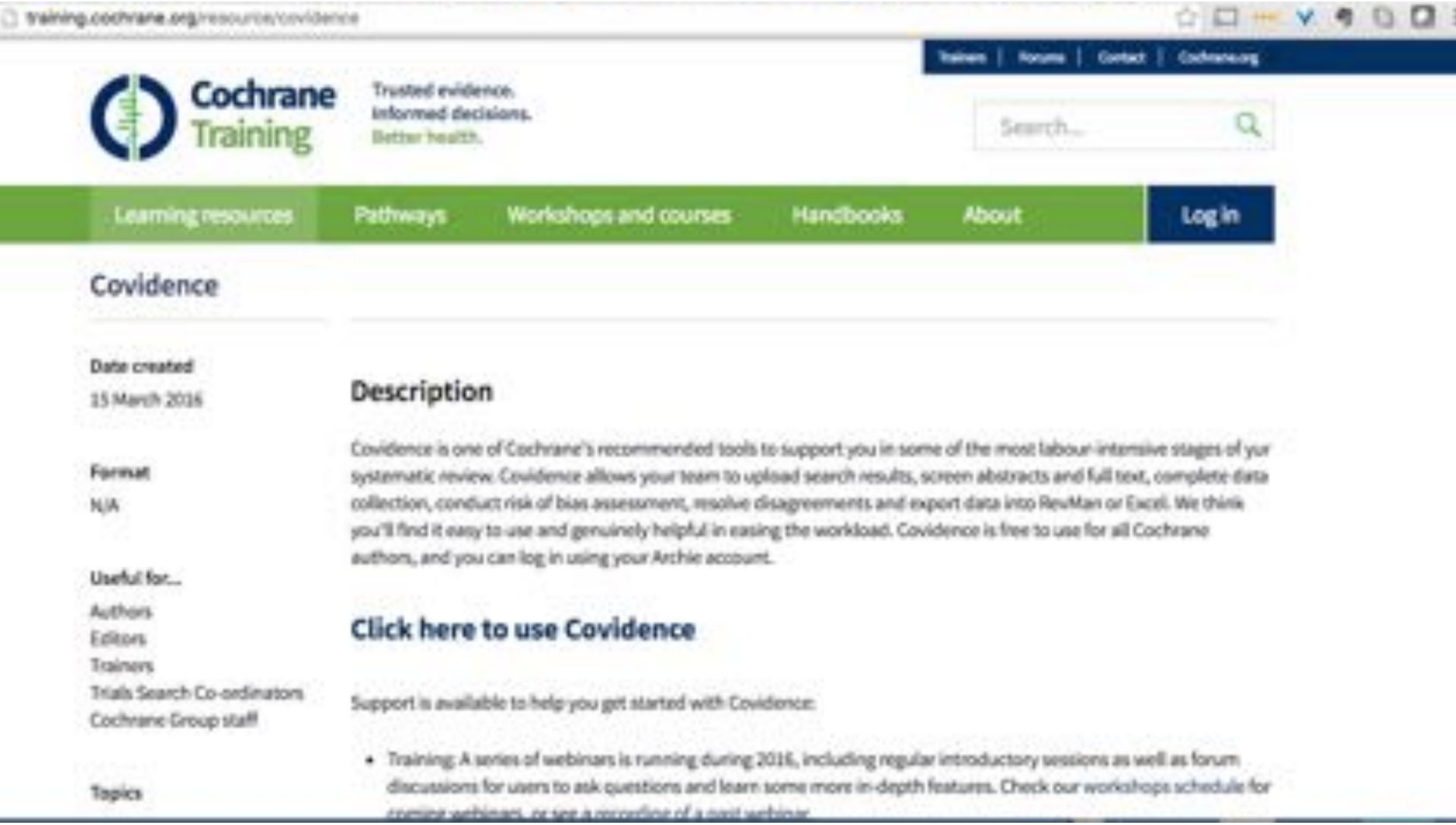
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Covidence is one of Cochrane's recommended tools to support you in some of the most labour-intensive stages of yur systematic review. Covidence allows your team to upload search results, screen abstracts and full text, complete data collection, conduct risk of bias assessment, resolve disagreements and export data into RevMan or Excel. We think you'll find it easy to use and genuinely helpful in easing the workload. Covidence is free to use for all Cochrane authors, and you can log in using your Archie account.
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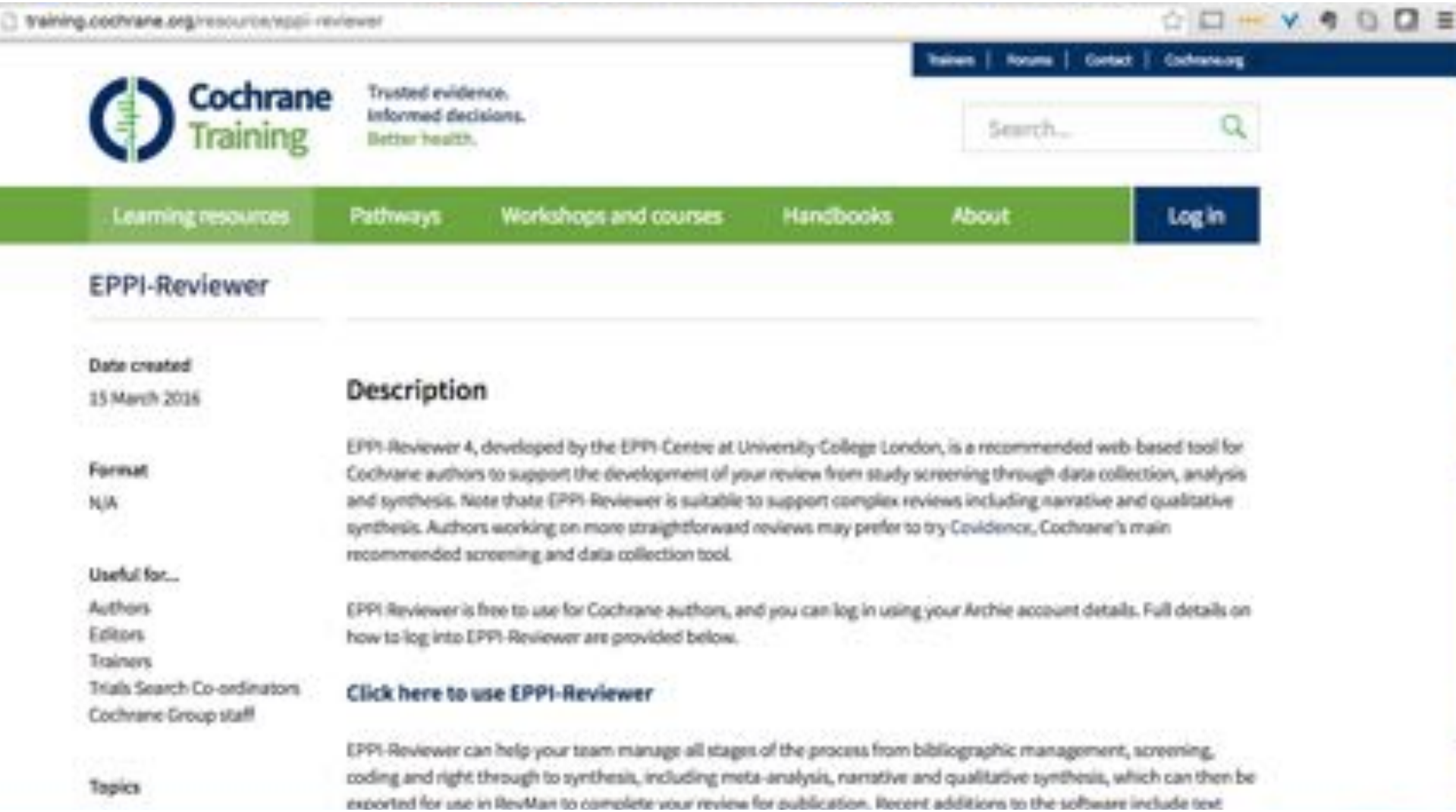
Training: A series of webinars is running during 2016, including regular introductory sessions as well as forum discussions for users to ask questions and learn some more in-depth features. Check our workshops schedule for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Description
EPPI-Reviewer 4, developed by the EPPI-Centre at University College London, is a recommended web-based tool for Cochrane authors to support the development of your review from study screening through data collection, analysis and synthesis. Note thate EPPI-Reviewer is suitable to support complex reviews including narrative and qualitative synthesis. Authors working on more straightforward reviews may prefer to try Covidence, Cochrane's main recommended screening and data collection tool.
EPPI-Reviewer is free to use for Cochrane authors, and you can log in using your Archie account details. Full details on how to log into EPPI-Reviewer are provided below.
Click here to use EPPI-Reviewer
EPPI-Reviewer can help your team manage all stages of the process from bibliographic management, screening, coding and right through to synthesis, including meta-analysis, narrative and qualitative synthesis, which can then be

Target 5, Goal 1 – 2016 Strategy Targets

...nearly there...

The wider context

Cochrane remaining competitive in an expanding marketplace of evidence

"Next generation" Cochrane?

- Big data
- “Diverse” data
  - IPD (Individual Patient Data)
  - ~omics
  - Device, systems
  - Data from different study designs
- Activity to date:
  - Meetings
  - Various conversations happening but nothing definitive yet
  - Discussions mainly what role Cochrane should play
  - Ida Sim Cochrane lecture in Vienna

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"Next generation" Cochrane

- How can we move towards…
  - "living" systematic reviews
  - and dynamic curation of evidence in real-time

  …that can incorporate methods and data from "diverse" sources?
- Wellcome/IoM/Harvard MRCT project
  - Project to build a clinical trial data sharing platform
  - Will include both aggregate/summary data and IPD
  - Analytical tools, mechanisms for de-identification, privacy
  - Meeting next week in London at Wellcome
- OpenTrials
- Cochrane has a role to play (lead, partner, other options?)


IBM Watson Health Cloud
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Data
Solutions


What's around the corner
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Prescription: Watson
How healthcare can benefit from Watson's unique capabilities
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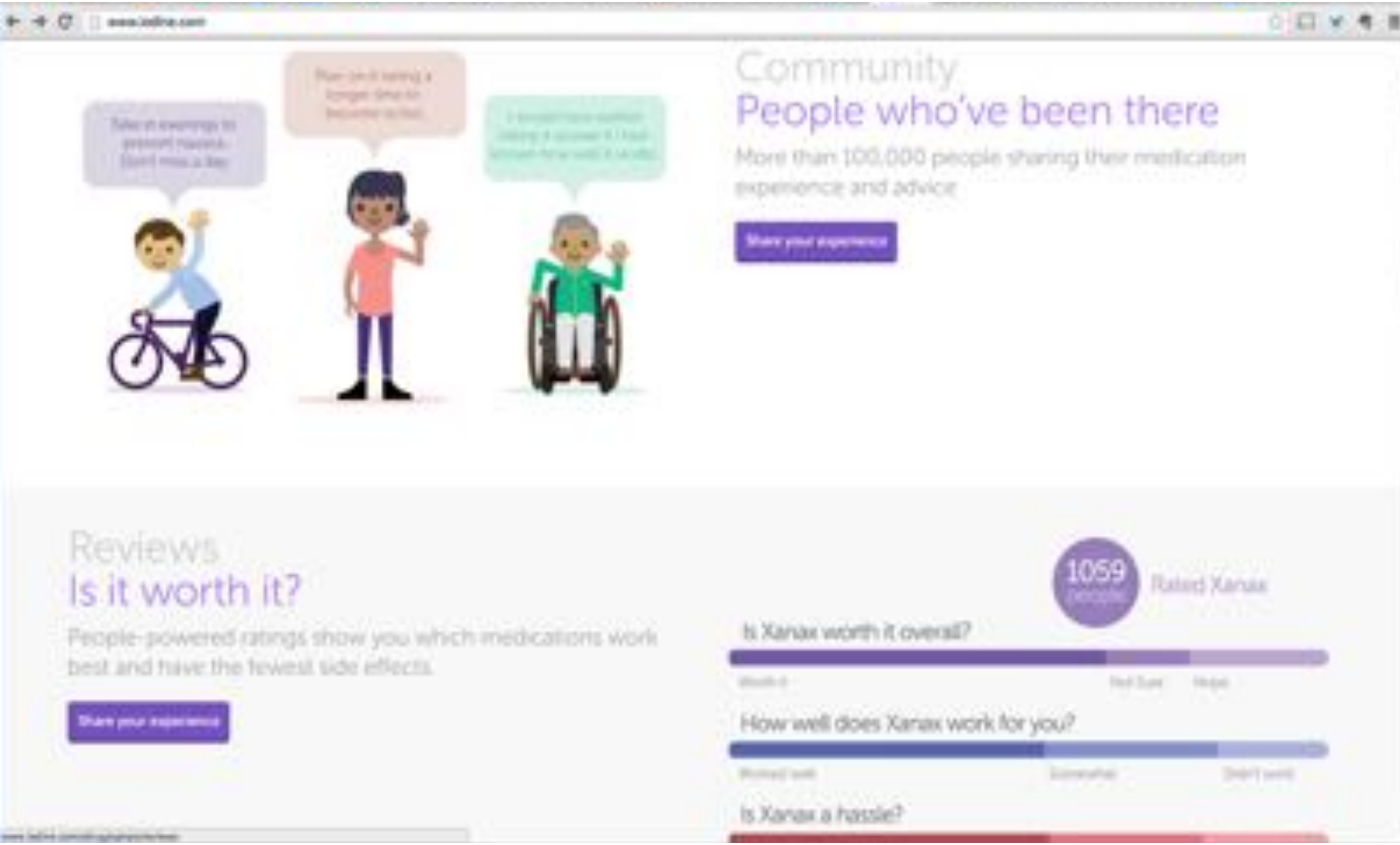
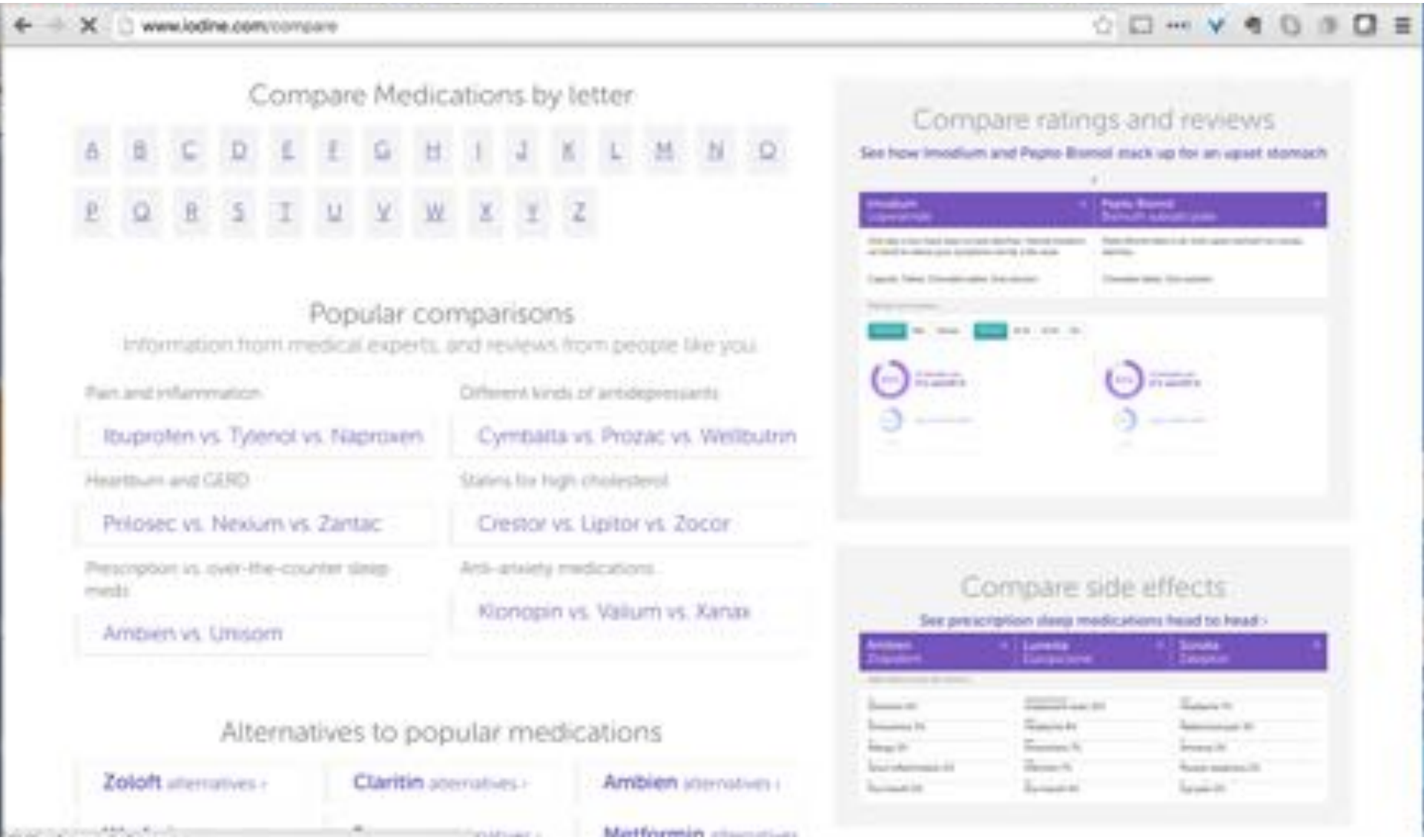
"The Yelp of medicine is here" : /

"The Yelp of medicine is here" : /



"The Yelp of medicine is here" : /



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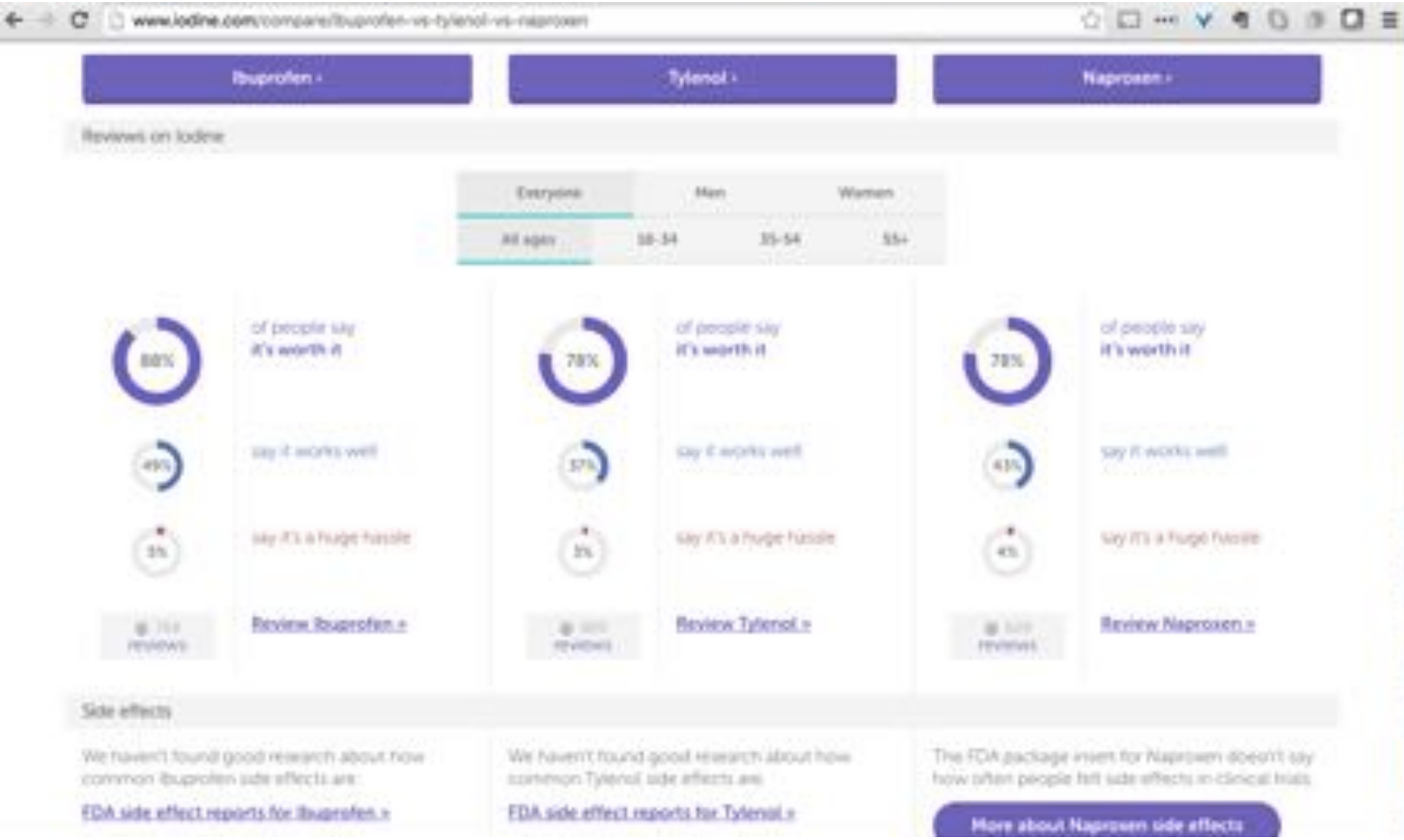

Postscript
Impact: Cochrane and NICE
Engagement and collaboration

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Cochrane and NICE

- Talk at NICE's Joint Information Day last week
- Several meetings to date on collaboration between NICE's linked data work and Cochrane's
- *HENCE Forward* EU bid
- Ongoing discussions via groups like #GINTech and #CochraneTech

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HENCE Forward (EU bid)

Main concepts are:

- We need ALL research to be described using standard schema in order for it to be useful for decision-making (e.g. The PICO ontology)
- The task of doing this at scale exceeds human (there‘s too much work) and machine (too much judgement needed) capacity
- We therefore create an infrastructure which automates as much as possible, but utilises human input where needed

Partners cover evidence production, evidence utilisation, and technology R&D and implementation

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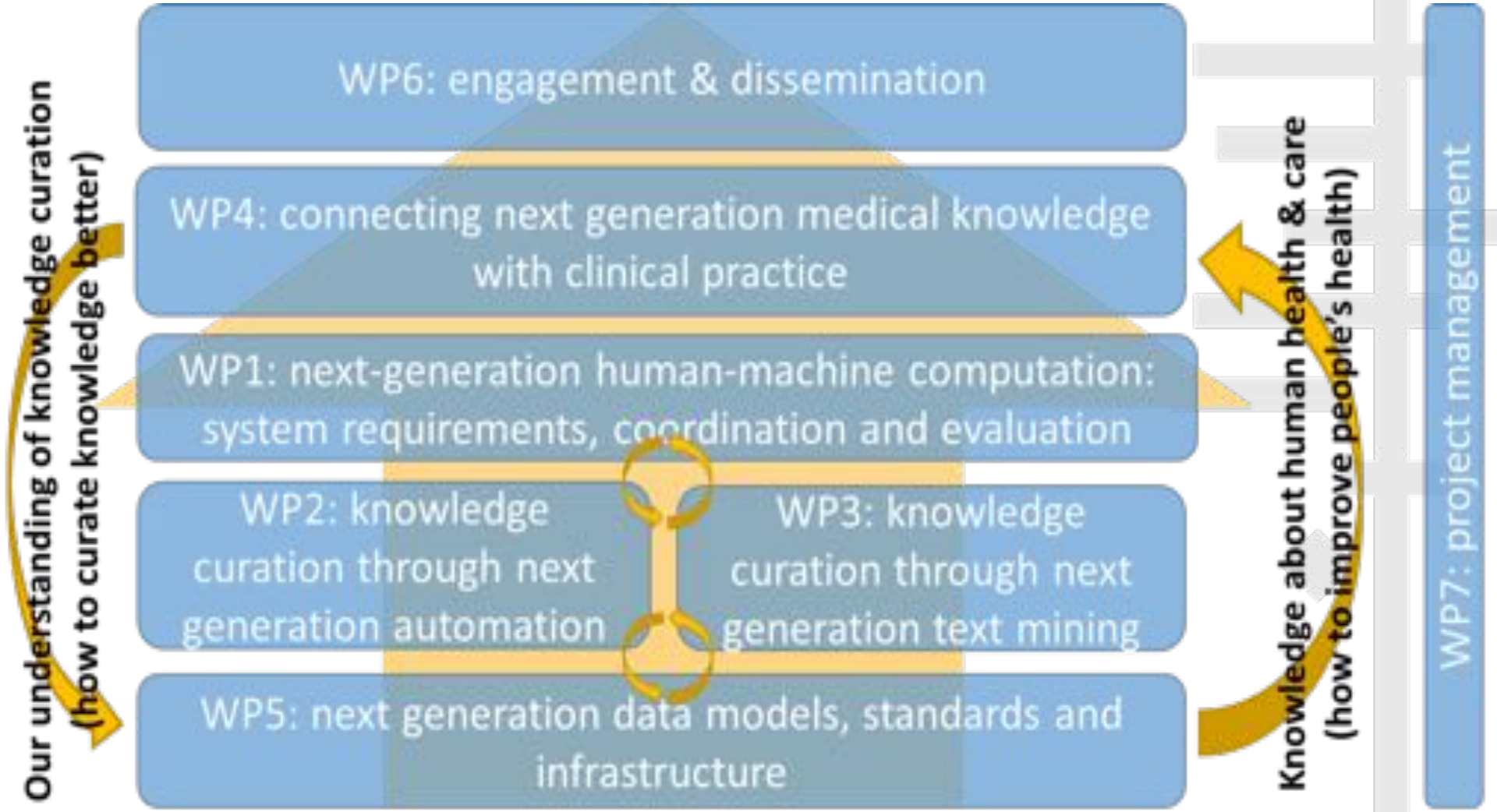
HENCE Forward EU bid




Health Practice
Learning healthcare systems
Health 'big data'
Linked data repositories
Living systematic review
Living evidence services
Living guidance
Decision support systems
Hypotheses Prioritisation
Primary research
Publication
Systematic review
Publication
Guidance
Knowledge translation

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Summary

- People + Process + Technology are converging in new and innovative ways to help us further our mission
- We are ramping up the machines, platforms, and structured, linked data (tech)
- Change management: we are asking for you all (people) to adapt (process)
- Helps Cochrane to scale
- We can produce more high-quality evidence for health care decision making
- Tackle tomorrow’s challenges so we remain competitive and relevant

Thank you