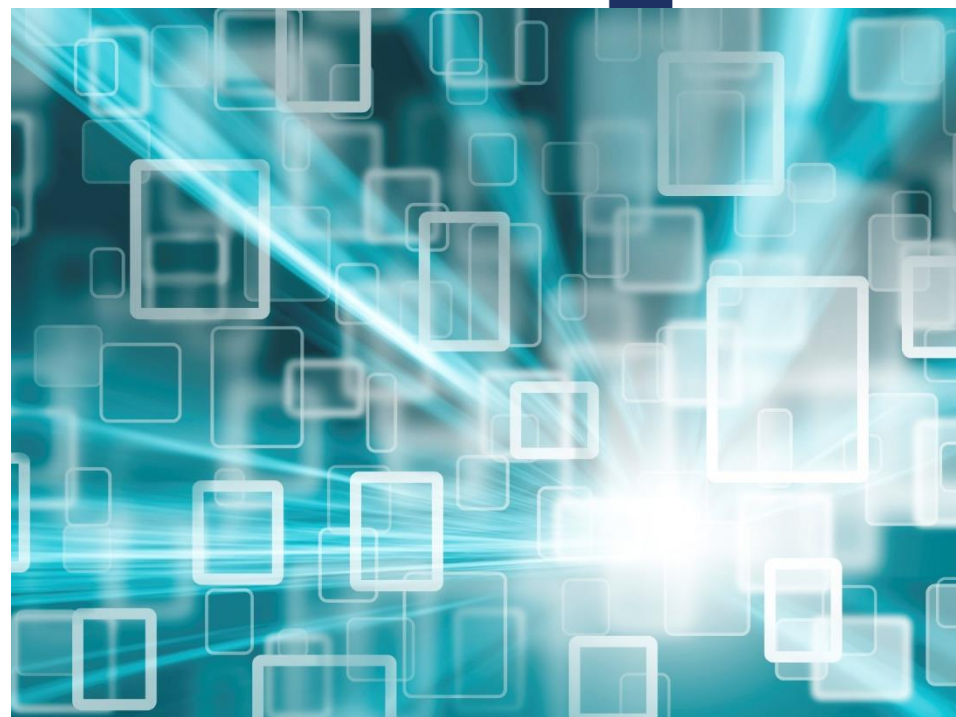


# Unlocking the Cochrane Data Vault

**Deirdre Beecher** Senior Metadata Specialist  
**Chris Mavergames** Head of Informatics and Technology  
(IT) Services/Chief Information Officer

**Trusted evidence.  
Informed decisions.  
Better health.**



# Conflicts of interest

Chris Mavergames and Deirdre Beecher are salaried employees of Cochrane.



## Workshop goals

- Understand how Cochrane is developing PICO (Patient-Intervention-Comparison-Outcomes) metadata to describe and enhance access to Cochrane systematic reviews and their included studies
- Explore approaches and scenarios to utilize PICO metadata in literature searching



# Summary

- Presentation (15 mins)
  - Background to Cochrane Linked Data Project
  - PICO annotation
  - Ongoing development of the search tool
- Exercise - using PICOfinder search tool (prototype) (30 Mins)
- Discussion (25 mins)
- Close (5 mins)



## Linked Data

- 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 (for example, NICE guidelines)
- Improve production and dissemination of evidence





Making existing research data “FAIR”

**F**indable

**A**ccessible

**I**nteroperable

**R**eusable



# How do we prepare the data?

## ▼ Digoxin for preventing or treating neonatal respiratory distress syndrome [CD001080](#)

Population	Interventions	Comparisons	Outcomes
<ul style="list-style-type: none"> <li>⚡ Preterm Infant (Less than 37 weeks)</li> <li>⚡ Neonatal Respiratory Distress Syndrome</li> <li>🕒 Birth to 1 mo</li> <li>👤 Male and Female</li> </ul>	<ul style="list-style-type: none"> <li>⚙ Pharmacological</li> <li>💧 Digoxin</li> </ul>	<ul style="list-style-type: none"> <li>⚙ No active treatment</li> <li>💧 Placebo</li> </ul>	<ul style="list-style-type: none"> <li>♥ Mortality</li> <li>♥ Physiological or clinical</li> <li>⚡ Death</li> <li>⚡ Respiratory Distress</li> <li>⚡ Bronchopulmonary Dysplasia</li> <li>⚡ Chronic Lung Disease</li> <li>⚡ Intraventricular Hemorrhage</li> </ul>

**We PICO annotate!**

# What is PICO annotation?

- Patient, Population or Problem
  - What are the characteristics of the patient or population?
  - What is the condition or disease of interest?
- Intervention
  - Drug therapy, surgery, education etc
- Comparison
  - Usual care, placebo, different drug etc
- Outcome
  - Quality of life, change in clinical status, morbidity, adverse events



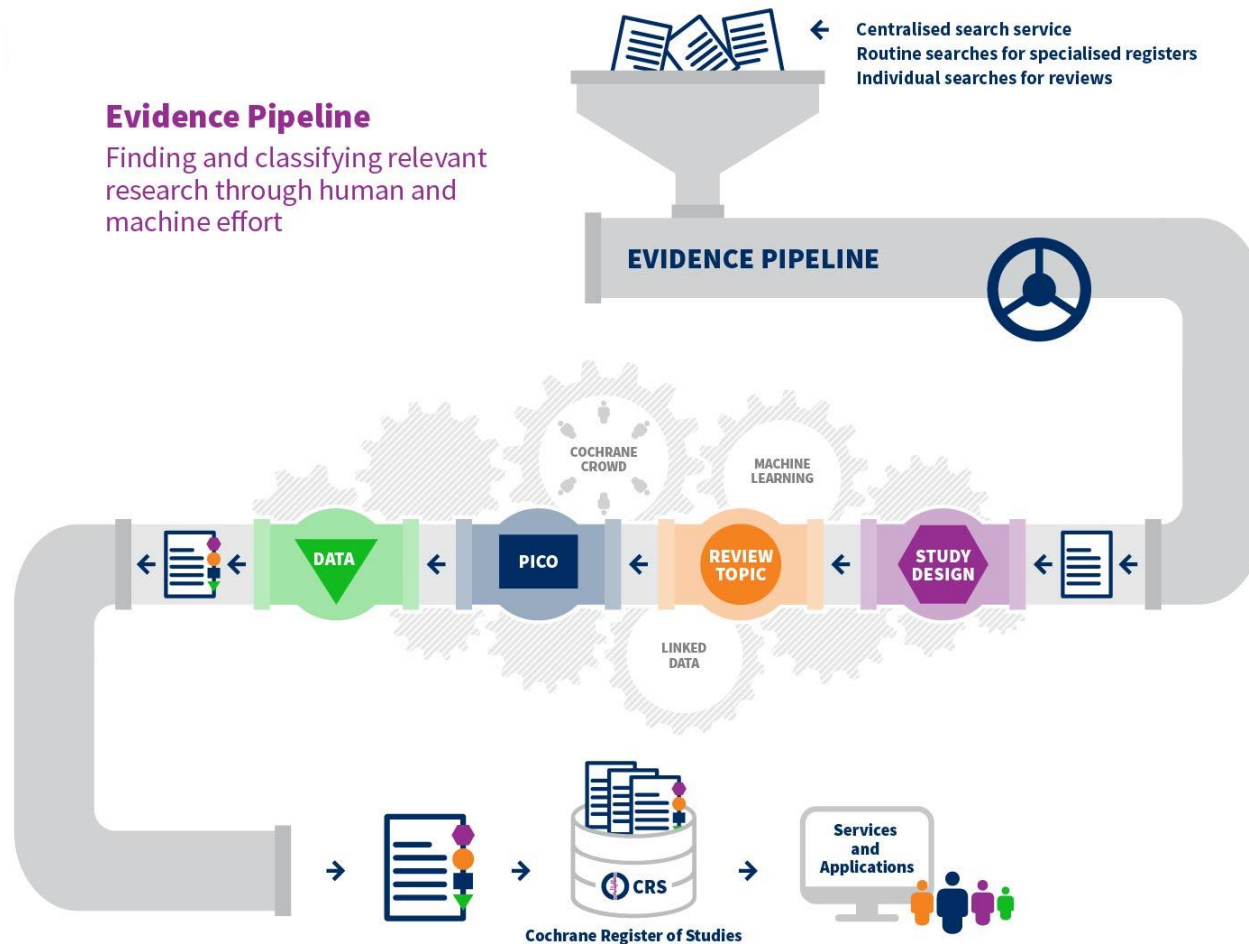


## What data are we annotating?

- Present
  - Cochrane systematic reviews (inclusion criteria) published from 2015
  - Included studies – only done for some topics
- Future
  - Meta-analyses – automation/design change to annotation widget in progress

# Dynamic study discovery via Evidence Pipeline

Goal: to create a dynamic discovery system for the upfront identification and description of human studies.



# Machine Curation (PICO)

Using machine learning to identify and filter evidence prospectively

```
In [7]: r = requests.post("http://104.41.231.151:5000/annotate", json=json.dumps({'source': 'cochrane-review', 'task': 'pico', 'data': {'cdno': 'CD006064', 'characteristics': {'participants': ' All pregnant women attending antenatal care at least once. ', 'outcomes': ' The primary outcome measure is the rate of breastfeeding initiation in all pregnant women after birth (as defined by trial authors). Secondary outcomes include: \n', 'interventions': " Breast examination, for any purpose, conducted at least once during an antenatal care visit, compared with 'usual' care (that is, that which does not include antenatal breast examination). "}, 'annotator-id': 'unique annotator ID'}}))
```

```
In [8]: r.text
```

```
Out[8]: u'{"participants": [{"http://data.cochrane.org/concepts/r4hp3qdtjr4x", "Prenatal Care"}], "interventions": [{"http://data.cochrane.org/concepts/r4hp5z0zhmh1", "Examination Of Breast"}, {"http://data.cochrane.org/concepts/r4hp5z8lnrpd", "Prenatal Examination And Care Of Mother"}, {"http://data.cochrane.org/concepts/r4hp3qdtjr4x", "Prenatal Care"}, {"http://data.cochrane.org/concepts/r4hp39zj0grt", "Behavior Finding"}], "outcomes": [{"http://data.cochrane.org/concepts/r4hp5z5yxj6b", "Initiation Of Breastfeeding"}, {"http://data.cochrane.org/concepts/r4hp3p7h6l5y", "Metastasis"}, {"http://data.cochrane.org/concepts/r4hp39r5xxsx", "Birth"}]}'
```

```
In [9]: █
```

# Crowd-Based Annotation

Using crowdsourcing to perform complex annotations as a series of micro-tasks

## Early inhaled steroid use in extremely low birthweight infants: A randomised controlled trial. [201631]


**Objective** We hypothesised that a prophylactic inhaled steroid would prevent the progression of bronchopulmonary dysplasia (BPD) in extremely low birthweight infants (ELBWIs). **Design** This study was a multicentre, randomised, double-blinded, placebo-controlled trial. **Setting** This investigation was conducted in 12 level III neonatal intensive care units (NICUs). **Patients** A total of 211 ELBWIs requiring ventilator support were enrolled. **Intervention** Starting within 24 h of birth and continuing until 6 weeks of age or extubation, two doses of 50 mug fluticasone propionate (FP) or placebo were administered every 24 h. **Main outcome measurement** The primary outcome measure used to indicate the morbidity of severe BPD incidence was death or oxygen dependence at discharge from the NICU. The secondary measures were neurodevelopmental impairments (NDIs) at 18 months of postmenstrual age and 3 years of age. We performed subgroup analyses based on gestational week (GW) and the presence of chorioamnionitis (CAM). **Results** Infants were randomised into the FP (n=107) or placebo (n=104) groups. No significant differences were detected between the FP and placebo groups with respect to either the frequency of death or the oxygen dependence at discharge or NDIs. In subgroup analyses, the frequencies of death and oxygen dependence at discharge were significantly decreased in the FP group for infants born at 24-26 GWs and for infants with CAM, regardless of the GW at birth. **Conclusions** Inhaled steroids have no effect on the prevention of severe BPD or long-term NDI but might decrease the severity of BPD for ELBWIs with a risk factor. **Trial registration number** UMIN-CTR C000000405. Copyright © 2016 BMJ Publishing Group Ltd & Royal College of Paediatrics and Child Health.



What type of outcome is measured in this study?

Please select a value



**Physiological or clinical**   
*progression of bronchopulmonary dysplasia (BPD)*

- Not answered
- Not reported
- No available term
- Answered above

Back

Done

[Add a note](#)

# PICO Annotation Tools

## Condition - Seasonal Asthma

<http://data.cochrane.org/concepts/r4hp37xsddcx>

RDF Type: <http://data.cochrane.org/ontologies/core/Condition>

SNOMED: 445427006

Synonyms:

### ↑ Broader Terms

#### Recurrent Disease

<http://data.cochrane.org/concepts/r4hp38d90px8> SNOMED: 58184002

#### Asthma

<http://data.cochrane.org/concepts/r4hp3p4kcrph> SNOMED: 195967001 MedDRA: 10003565,10003553,10003555,10066091 MeSH: D001249,D016535

#### Chronic Disease Of Respiratory System

<http://data.cochrane.org/concepts/r4hp38s9fkms> SNOMED: 17097001

## Systematic Reviews [1-1 of 1]

CD012393 Interventions for autumn exacerbations of asthma in children

Male and Female
  Child, Preschool 2-5 years
  Child 6-12 years
  Adolescent 13-18 years
  Asthma

Seasonal Asthma
  Preventive
  Behavioral
  Educational
  Pharmacological
  Adverse events

Physiological or clinical
  Adverse Event
  Exacerbation Of Asthma
  Seasonal Asthma

## Studies [1-5 of 5]

STD-Julious-2016 PLEASANT: Preventing and Lessening Exacerbations of Asthma in School-age children Associated with a New Term - a cluster randomised controlled trial and economic evaluation

Male and Female
  Child, Preschool 2-5 years
  Child 6-12 years
  Adolescent 13-18 years

Asthma
  Seasonal Asthma
  Letter Encounter To Patient
  Preventive
  General Practitioner

Educational
  Resource use

STD-Johnston-2007 Attenuation of the September epidemic of asthma exacerbations in children: a randomized, controlled trial of montelukast added to usual therapy

Male and Female
  Child, Preschool 2-5 years
  Child 6-12 years
  Adolescent 13-18 years

Asthma
  Seasonal Asthma
  Montelukast
  Usual Care
  Preventive
  Pharmacological

Resource use
  Physiological or clinical
  Asthma Exacerbation

MedDRA 10000443 **Pelvic Peritonitis**

MedDRA 10049608

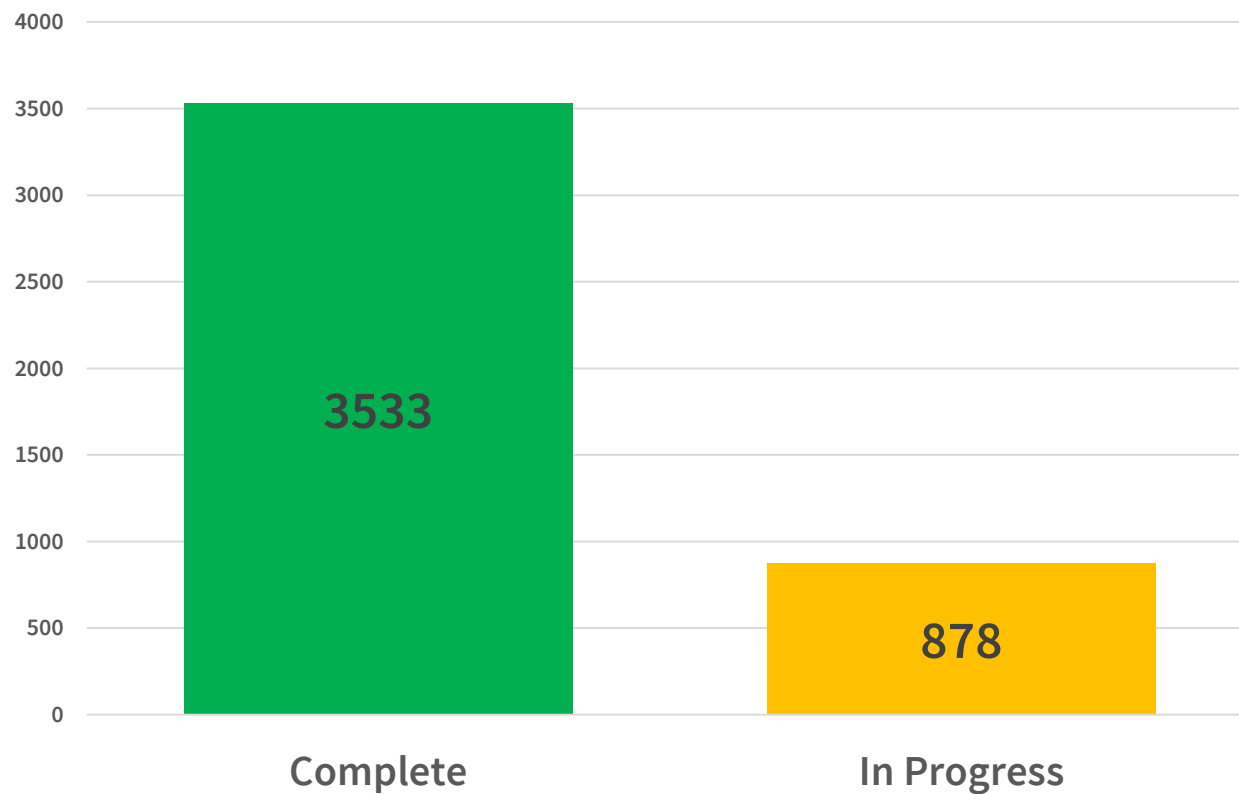
MedDRA 10016658 **Fibrosis Pelvic**

MedDRA 10016658

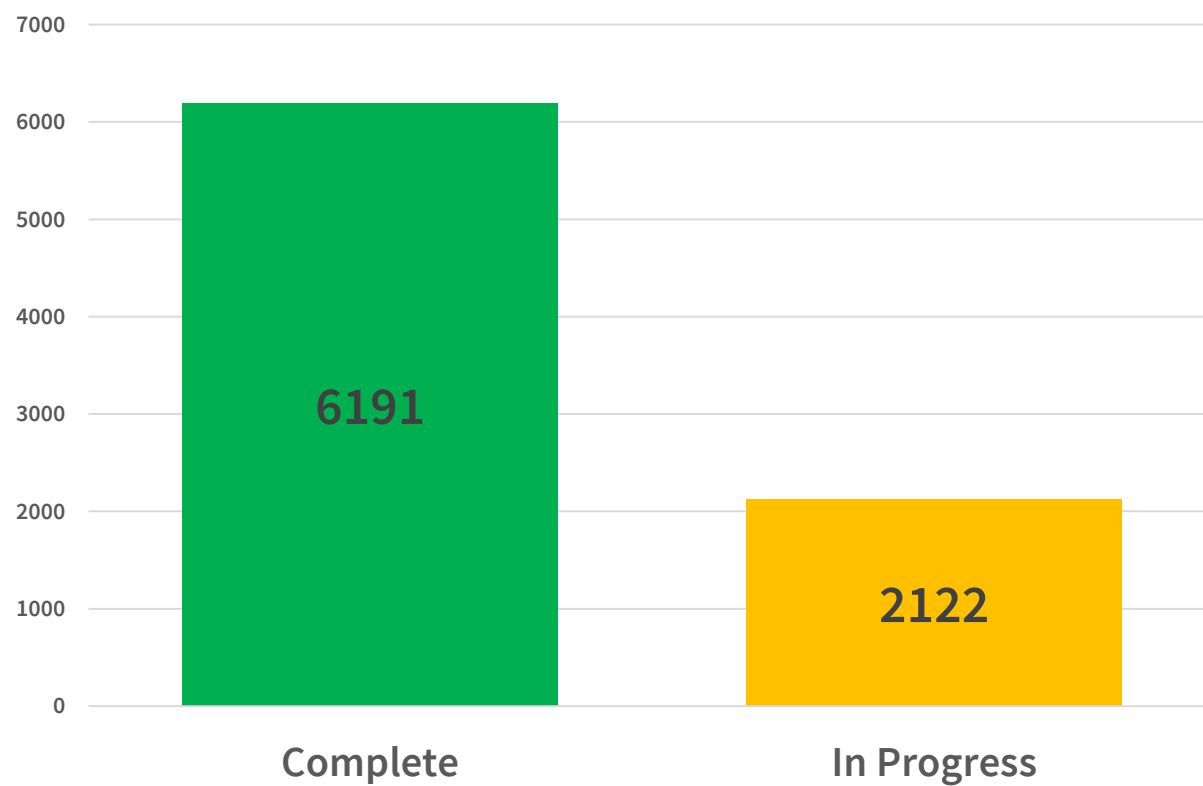
## Who is doing the work?

- **Cochrane Review Group Staff**
- **Cochrane Information Specialists**
- **Health Sciences Information Specialists**
- **Healthcare Professionals**
- **PICO annotation Central Support Team**

# Progress to date – review annotations



# Progress to date – study annotations





# The Cochrane Vocabulary

- Using already developed ontologies
- Creating terms where not available in these ontologies
- Relabelling some terms but keeping the hierarchy imported from the ontology
- Mapping/Merging terms to make it easier to select a term



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Unified Medical Language System® (UMLS®)

Home > Biomedical Research & Informatics > UMLS

RxNorm

RxNorm provides normalized names for drugs including those of First Databank, Micromedex, and others between systems not using the same software.

MedDRA Medical Dictionary for Regulatory Activities

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World Health Organization

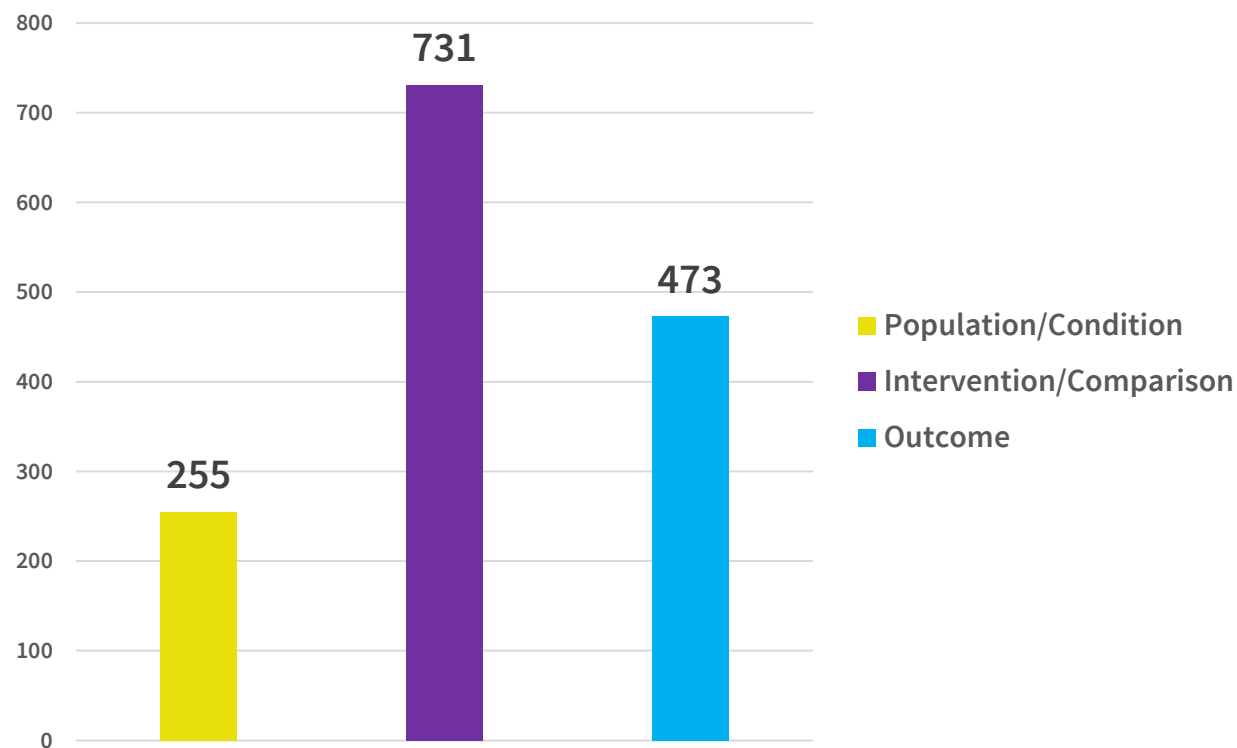


Home Publications Countries Programmes Governance About WHO

Classifications

The Anatomical Therapeutic Chemical Classification System with Defined Daily Doses (ATC/DDD)

# Terms added to our vocabulary since 2017



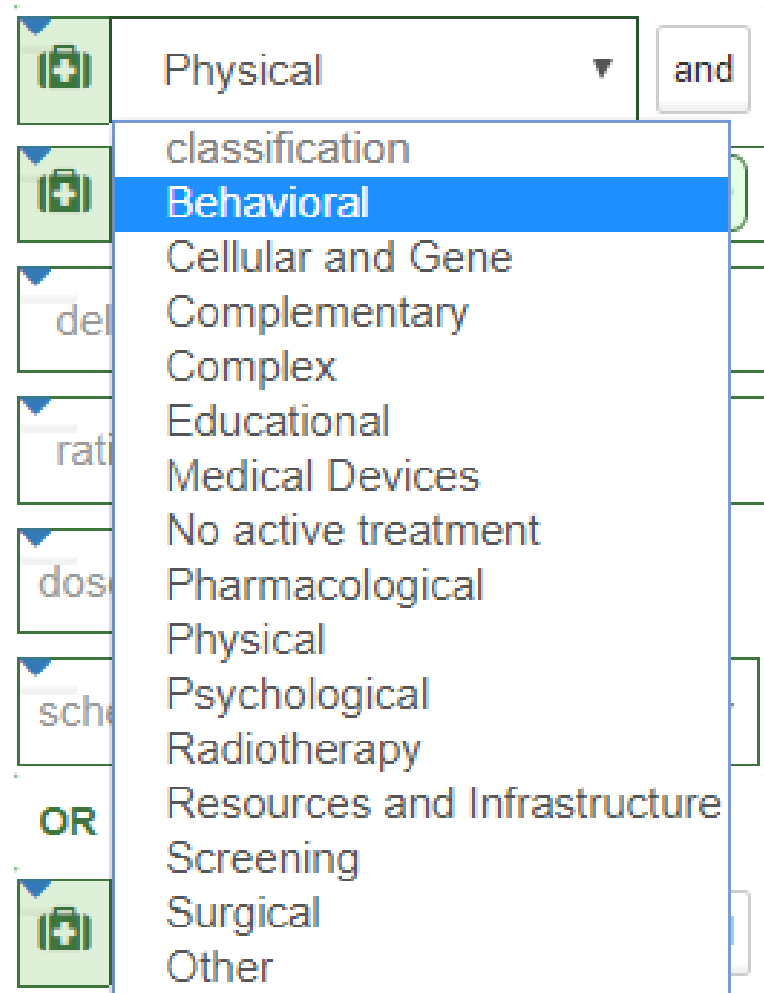
# Intervention classification

- **15 item classification of interventions from Davey et al (2011)**
- **No active treatment used for Comparisons (sham, placebo, etc.)**

Davey J, Turner RM, Clarke MJ, Higgins JP.

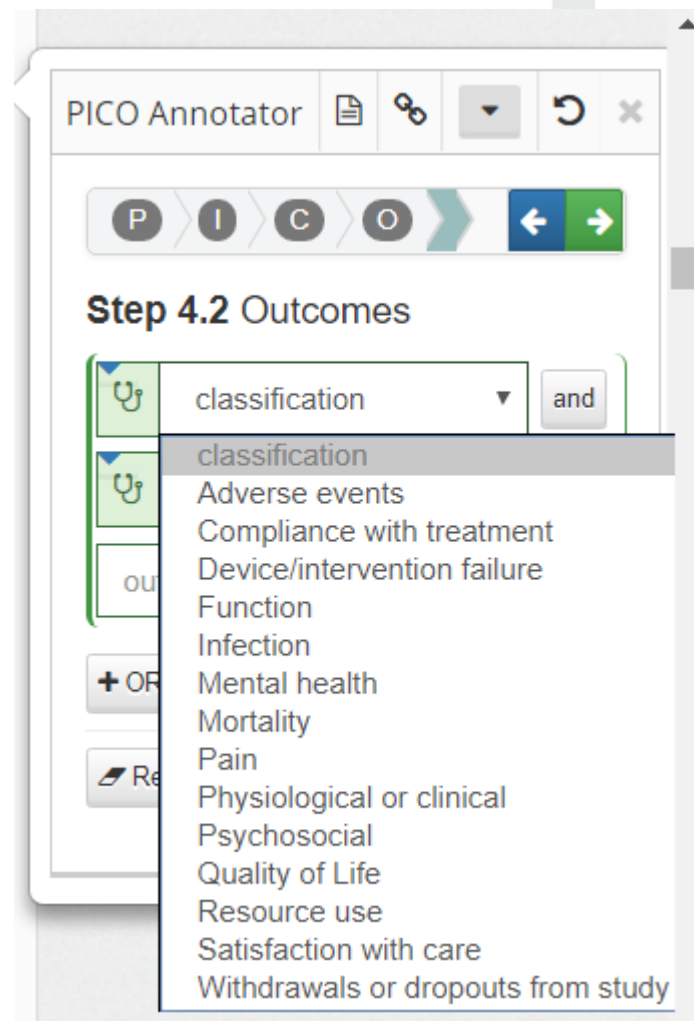
Characteristics of meta-analyses and their component studies in the Cochrane Database of Systematic Reviews: a cross-sectional, descriptive analysis.

BMC Med Res Methodol. 2011 Nov 24;11:160. doi: 10.1186/1471-2288-11-160.



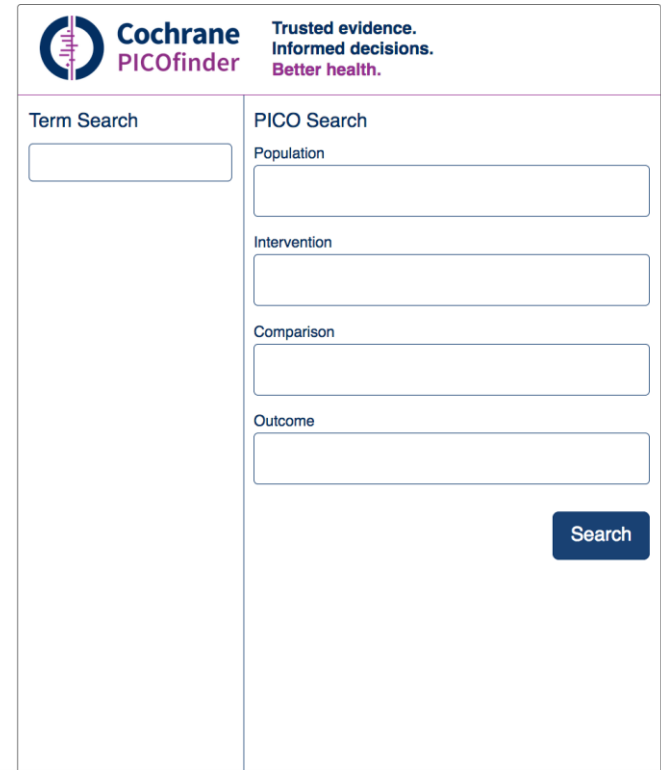
# Outcome classification

‘The COMET (Core Outcome Measures in Effectiveness Trials) Initiative brings together people interested in the development and application of agreed standardised sets of outcomes, known as ‘core outcome sets’ (COS)’



# How do we access this data?

- For now we use the PICOfinder
- This is ONLY a prototype
- Proof of concept for the principle of PICO searching
- For retrieval testing metadata in progress



The screenshot shows the Cochrane PICOfinder search interface. At the top left is the Cochrane logo and the text "Cochrane PICOfinder". To the right of the logo is the tagline "Trusted evidence. Informed decisions. Better health." Below this, the interface is divided into two main sections: "Term Search" and "PICO Search". The "Term Search" section has a single text input field. The "PICO Search" section has four text input fields labeled "Population", "Intervention", "Comparison", and "Outcome". A dark blue "Search" button is located at the bottom right of the "PICO Search" section.

# How the PICOfinder prototype has helped to develop searching tools

- Usefulness of PICO search
- Functionality needed for possible future PICO search platform
- How PICO search might be used in conjunction with Cochrane Library search
- How PICO search might be used in conjunction with search on other platforms

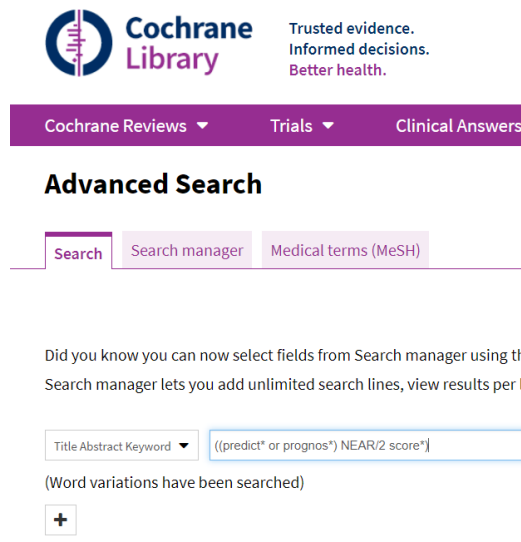


# PICO search – present & future development

- A PICO metadata search widget integrated into the Cochrane Library
- At the point of launch, search to be used with Cochrane reviews' metadata
- Suitable for search across different content type e.g. included studies
- Cochrane Colloquium
  - Presentation of metadata in Cochrane Library Search Results
  - Find reviews with similar PICOs
  - New PICO search tab within Advanced search



# So we would like to ...



The screenshot shows the Cochrane Library website's search interface. At the top left is the Cochrane Library logo with the tagline "Trusted evidence. Informed decisions. Better health." To the right are links for "English", "Cochrane.org", and "Sign In". Below this is a navigation bar with "Cochrane Reviews", "Trials", and "Clinical Answers". The main heading is "Advanced Search". There are three tabs: "Search", "Search manager", and "Medical terms (MeSH)". A text box contains the search query: "((predict\* or prognos\*) NEAR/2 score\*)". Below the text box is a plus sign icon. At the bottom right of the search area are three buttons: "Search limits", "Send to search manager", and "Run search".

- Search Cochrane Reviews (or included studies) with greater speed, precision, sensitivity
- And complement traditional searching on the Cochrane Library



# Acknowledgements

Anna Last – Medical Terminology Manager

Lorne Becker – Product Owner/Clinical Expert

Carol Friesen – Metadata Specialist, Cochrane

Robin Featherstone – Information Specialist, Editorial Methods Dept.  
Cochrane

Cochrane Review Group Staff

Cochrane Information Specialists

Volunteers who are annotating or doing quality assurance (QA)

# Exercise

PICOfinder prototype

<https://data.cochrane.org/pico-finder2>



## Questions – provided on handouts

- How did you construct your search?
- How many reviews did you find?
- Would you be confident that you have retrieved all reviews for this topic?
- In what situations would you use this tool? i.e. teaching, assisting other researchers, as a clinical librarian etc.
- How long did it take to construct your search?
- What did you like about PICOfinder?
- What didn't you like about PICOfinder?
- To whom would you recommend PICOfinder?
- How easy was it to search PICOfinder? (on a scale of 1-5, 1=very easy, 5=very hard)

## Discussion

- How could PICO metadata change the way you search for health evidence?
- What avenues would you like Cochrane to explore with PICO metadata?



## Contacts

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