Semi-automation in evidence production

Introducing Screen4Me

David Moher Cochrane Methods Symposium:
Bias and Beyond
Saturday 15 September 2018

Trusted evidence.
Informed decisions.
Better health.
Semi-automation

First coined in manufacturing with the development of robotics in assembly lines.
Semi-automation

We are also using semi-automation in our review production line
Challenges

In Cochrane we are under pressure to produce high quality evidence quickly
Challenges

Information overload
Global scientific output doubling every 9 years. 4000+ articles published every day
Challenges

Processes not working: too siloed leading to inefficiency and duplication of effort
New approaches like crowdsourcing and machine learning could help us make better use of data (metadata) and better use of people.
Crowdsourcing

“Crowdsourcing is the process of obtaining needed services, ideas, or content by soliciting contributions from a large group of people, especially an online community, rather than from employees or suppliers.”
Crowdsourcing

There are different types of crowdsourcing and various names have been given to the different types.

Crowd Creation
Crowd Wisdom
Crowd Funding
Crowd Voting
Cochrane Crowd

You can make a difference!

Become a Cochrane citizen scientist. Anyone can join our collaborative volunteer effort to help categorise and summarise healthcare evidence so that we can make better healthcare decisions.

Give it a try

Cochrane Crowd: crowd,cochrane.org
Classification tasks about identifying and describing health research
It breaks tasks down to a micro form
Microwave ablation: an effective treatment for mild-to-moderate secondary hyperparathyroidism in patients undergoing haemodialysis

Background: Microwave ablation (MWA) is an effective treatment for severe secondary hyperparathyroidism (SHPT), but it can also be used for mild-to-moderate secondary hyperparathyroidism (SHPT). In this randomised, controlled study, the efficacy of MWA in the treatment of mild-to-moderate hyperparathyroidism is investigated. Materials and methods. We assessed outcomes 12 months after the randomisation of 28 patients with mild-to-moderate SHPT. The subjects received either MWA plus calcitriol or calcitriol alone. The primary end-points were the rate of achieving target levels of intact parathyroid hormone (iPTH), changes in iPTH levels and the rate of patients developing severe SHPT. Results: Primary end points: the overall rates of achieving target levels of iPTH were comparable between the MWA and calcitriol alone groups (24% vs. 22%, p=0.85). However, the rate of iPTH <150pg/mL (lower limit of the target range) in the MWA group was higher than that in the calcitriol alone group (23% vs. 8%, p=0.02). The mean iPTH level in the MWA group after MWA was lower than that in the calcitriol alone group (373.69 +/- 322.31 vs. 552.28 +/- 361.87 pg/mL, p=0.001). There was a significant difference in the change in iPTH levels over time within the MWA group (p=0.001) but not in the calcitriol alone group. Only one patient developed severe SHPT in the MWA group, while six patients in the calcitriol alone group developed severe SHPT (p=0.04). Conclusions: Compared with calcitriol alone, MWA plus calcitriol decreases iPTH levels and prevents the progression of mild-to-moderate SHPT.

Breaking a task down to one single question: is it an RCT?
Cochrane Crowd

Brief, interactive training

Individual accuracy is achieved through training

Collective accuracy is achieved through the agreement algorithm
Agreement algorithm

The agreement algorithm for RCT ID

Unsure → RCT → Reject → Reject → Reject → Central → Bin → Resolver

The agreement algorithm for RCT ID
Cochrane Crowd

6 mainstream micro-tasks  10,000+ crowd  150+ countries
Cochrane Crowd: RCTs

The Crowd have identified 42,706 RCTs for CENTRAL
Cochrane Crowd: Rejects

464,294 records have been identified as NOT describing RCTs by the crowd.

The Crowd have identified 464,294 REJECTs.
Cochrane Crowd

With the Crowd dataset we were able to train the machine
Machine learning gives “computers the ability to learn without being explicitly programmed”. In the context of Cochrane, this is about building classifiers that provide likelihood scores.
Machine learning

The RCT classifier built, calibrated and validated
Perfect partnership

The classifier has been used in CSS processes.

Every month, the classifier reduces the amount of records that need to go to Cochrane Crowd by **around 75%**.

Crowd and machine working together
Machine-Crowd in centralised searches

Crowd-machine system as part of the centralised search service has enabled significant scale up.

Bar chart showing:
- Previous model: 50K records
- Crowd 2016: 100K records
- Crowd & Machine 2017: 300K records
Introducing Screen4Me

Brining **three components together** and enabling review teams to access them for their **specific reviews**
Known Assessments

To date, over 500,000 bibliographic records have been through Cochrane Crowd.
42,000 RCTs

465,000 Rejects

We reject the same records time and again

In S4M we will make use of the metadata we already have
In a month’s worth of updated reviews, the results identified in Embase searches for those updates had already been screened by the Crowd: 62%-98%
Screen4Me: how will it work?

- Searching
- Importing
- De-duping

Screen4Me is operated from within the CRS web.

These processes done just as they usually are.
Screen4Me: workflow

Start: conduct usual review searches

Import results into CRS web

Looking only for RCTs? No → Leave workflow

Yes
Screen4Me: workflow cont.

Known records?

- YES
  - [File]
- NO
  - Manual screen

Ok for RCT classifier?

- NO
  - Manual screen
Screen4Me: workflow cont.

1. RCT classifier: not RCT?
   - YES: 99%
   - NO: 
     - Cochrane Crowd: not RCT?
       - NO: Manual screen
       - YES: 99%
Estimated reduction in records for author teams to have to screen: 50-85%
In summary

- We have successfully incorporated semi-automation in the form of Crowd and machine into CSS processes
- This has enriched our central repositories
- Screen4Me is a new workflow available to review teams via CRS web
Want more detail?

**Presentation: Cochrane Crowd**
Sunday 16th 16.20, Carrick 1

**Workshop: Cochrane Crowd**
Tuesday 18th 11.00, Harris 2

**Workshop: Screen4Me**
Monday 17th 11.00, Lammermuir 1
Log-in to Cochrane Crowd crowd.cochrane.org anytime during the Colloquium to join the challenge!
Thank you

Anna Noel-Storr
anna.noel-storr@rdm.ox.ac.uk

With huge acknowledgements to the Project Transform team and to the Crowd

Support for Project Transform was provided by Cochrane and the National Health and Medical Research Council of Australia (APP1114605). The contents of the published material are solely the responsibility of the Administering Institution, a Participating Institution or individual authors and do not reflect the views of the NHMRC.