

Automated support for systematic reviews: dream or reality ?

Workshop contributors:

- Jeremy Wyatt (Wessex Institute, Southampton): Workshop aims & scope; overview of the potential role of automated tools to support the SR process
- James Thomas (EPPI Centre, UCL): How well do current and emerging tools perform ?
- Elaine Williams (NETSCC, Southampton): Can study publishers such as the NIHR Journals Library provide machine readable protocols and study results ?
- Geoff Frampton, (SHTAC Southampton): That's all very well, but how might these tools help me ?
- You: discussion on training needs, likely niche areas of use, user requirements, criteria for adoption etc.
- JW: Closing remarks & next steps

Workshop aims & Scope

Aims:

- To help reviewers understand the current and potential role of automation in supporting the SR process
- To help those working on automated tools to better understand the review process and reviewers' needs
- To explore the implications of automated support tools for reviewers

Scope: tools that go beyond simple data management

Outputs: report & recommendations for partners;
journal article / manifesto; other ?

Overview of SR automation

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Overview

- Do we have a problem with SRs ?
- Why is this happening ?
- Where *might* technology be able to help ?
- Insights from Rogers & Gartner
- Some key questions to ask

Crequit's question: Do SRs include relevant evidence?

Methods:

- Identified 29 SRs (13 since 2013) on 47 treatments for non-small cell lung cancer
- Compared with 6 cumulative network meta analyses 2009-2015 of 77 RCTs (pub 2000-Nov 2014) on same treatments (54 comparisons, 29000 pts)

Results:

- SRs in best year covered 55% of RCTs, 70% of patients, 60% of treatments, 62% of comparisons
- Persisted when they excluded RCTs on drugs that failed Ph2 studies, were pub. as abstracts or after the last SR
- Median interval from last SR search to publication: 9m (IQR 5-13m)
- Only 21% of SRs reported duplicate study selection & extraction, comprehensive search of lit + industry sources

Conclusions: *“SRs of a given condition provide a fragmented, out of date panorama of the evidence.... This waste of research might be reduced by cumulative network meta analysis”*. Crequit et al, BMC Medicine 2016

Crequit's live cumulative network meta-analysis

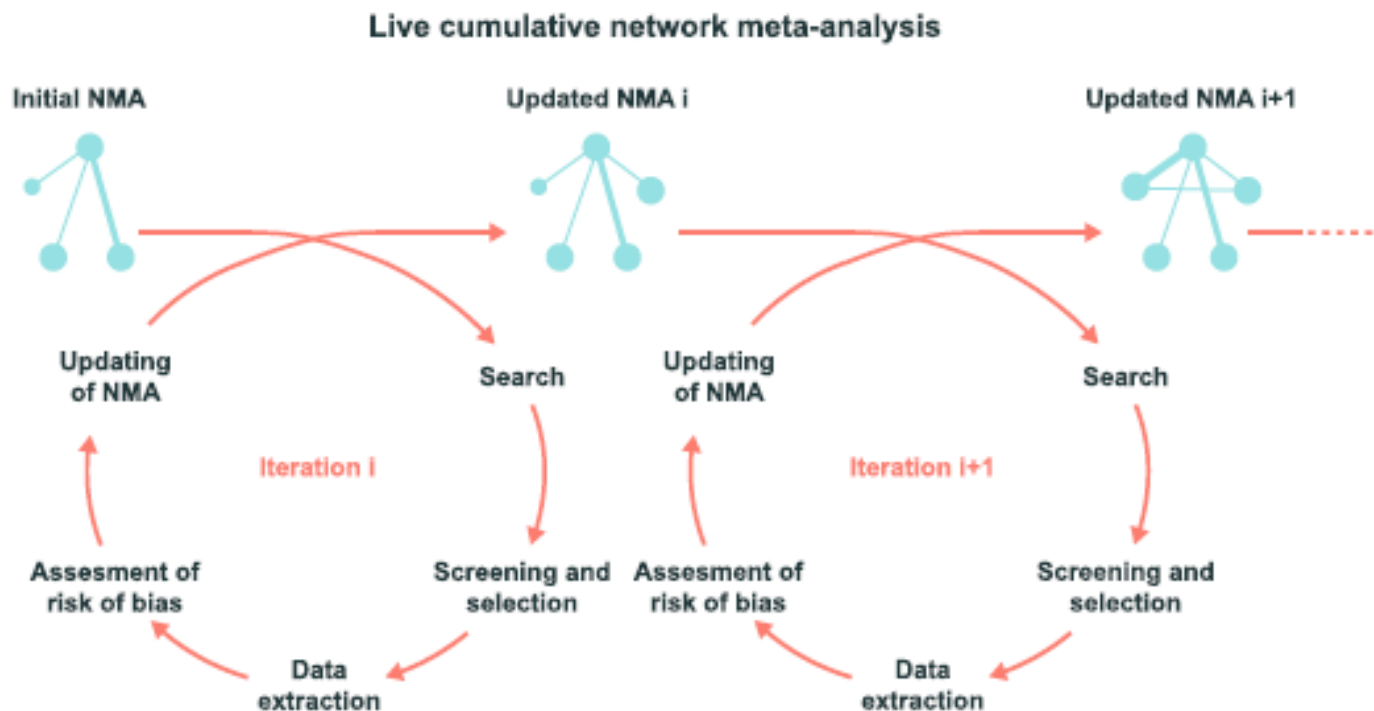


Fig. 5 A new approach to synthesize evidence: live cumulative network meta-analysis. Starting from an initial NMA, a research community would regularly (e.g., every 3 months), search for, screen, and select trials with new results and, if any, extract data, assess the risk of bias, and update the NMA. NMA: network meta-analysis

Some possible reasons for these problems

Supply side challenges:

- The tsunami of new trials: 40,000 pa. (ie. > 100 / day) [PT = clinical trial, publication year = 2014]
- Trials published only as abstracts: 20% in Crequit 2016
- Inadequate RCT reports eg. intervention descriptions (TIDIER checklist)
- Wider range of interventions & measures, inadequate lexicon & indexing processes

SR process issues:

- Increasingly complex review processes following growing evidence of SR biases and shortcomings
- Shortage of SR funding and skilled review staff
- Reluctance of some J to publish SR updates
- Insistence of some reviewers to use gold standard methods even when time & resources are short
- Failure to exploit new technology (Elliott 2014, Tsafnat 2014) – or new tech that doesn't tackle the real problems ?

Some barriers to review excellence

Stage	Barrier	Potential solution
Searching	Too many studies	CRG Queries, PubMed “Studies in this” ?
	Missing studies	CRG study registers Full text searches ? Natural language understanding ? Machine translation ?
Critical appraisal	Missing, poor quality studies	Duplicate assessment Robot Reviewer ?
Data extraction	Incorrect data	Duplicate extraction XML structured study reports
Data synthesis	Ignoring heterogeneity	Check I ² , investigate via sensitivity analysis etc.
	Other ?	

We need studies – evidence – to inform this !

Emerging tools to consider

Search, screening & updating:

- Query expansion
- Machine translation
- NLU for full text searches
- ML to build RCT database

Critical appraisal:

- Robot Reviewer etc.

Data extraction:

- Machine translation
- XML-structured study reports (methods & data)
- Natural language understanding for automated data extraction

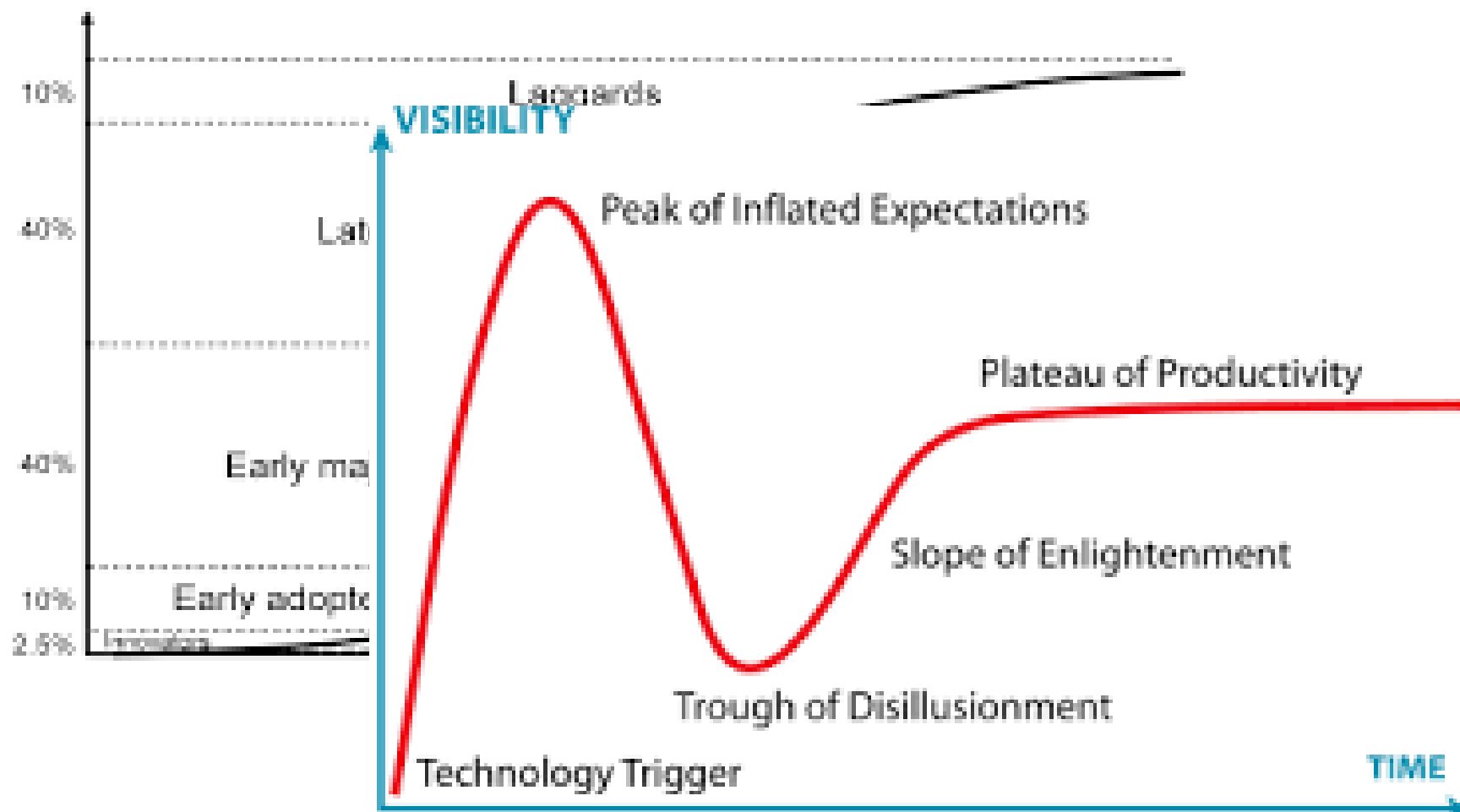
Synthesis and conclusions:

- Automated synthesis tools
- Automated summaries
- Graphical summaries / data graphics

All stages: support for crowd sourcing

Where are we on the Rogers curve and Gartner Hype cycle ?

Penetration of Target Market



Some questions

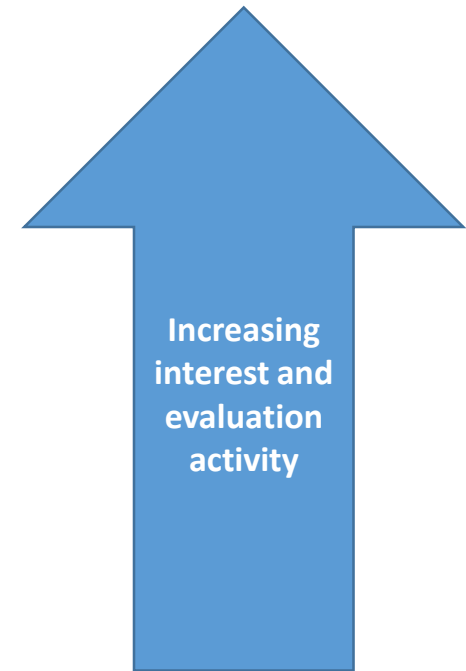
1. What are the **real** reviewing problems & challenges that reviewers need help with ?
2. How easy to use, fast and accurate **are** these automated tools now ?
3. How fast & accurate would these tools **need** to be to help us ?
4. How to link up tool developers with **typical** reviewers, to ensure that the resulting tools are usable and useful ?
5. What are the potential **implications** of these tools:
 - Will we need training in these tools ?
 - Will we see de-skilling of reviewers ?
 - Will they hasten moves towards structured methods & results sections in study reports (Ida Sim's Trial Bank) ?
6. Should we even start from here, or is now the time to re-engineer the whole knowledge chain

How well do current and emerging tools perform?

James Thomas, EPPI Centre, UCL

Tools can perform different functions

- Search screening and updating
 - Screening of citations
 - 'Mapping' research activity
 - Database creation / curation
- Critical appraisal
- Data extraction
- Synthesis and conclusions



Citation screening

- Has received most r&d attention
- Diverse evidence base; difficult to compare evaluations
- ‘semi-automated’ approaches are the most common
- Possible reductions in workload in excess of 30%
- Automation can help in three areas, with increasing ‘risk’ to obtaining 100% recall:

Using text mining for study identification in systematic reviews: a systematic review of current approaches

Alison O'Mara-Eves¹, James Thomas^{1*}, John McNaught², Makoto Miwa³ and Sophia Ananiadou²

Abstract

Background: The large and growing number of published studies, and their increasing rate of publication, makes the task of identifying relevant studies in an unbiased way for inclusion in systematic reviews both complex and time consuming. Text mining has been offered as a potential solution: through automating some of the screening process, reviewer time can be saved. The evidence base around the use of text mining for screening has not yet been pulled together systematically; this systematic review fills that research gap. Focusing mainly on non-technical issues, the review aims to increase awareness of the potential of these technologies and promote further collaborative research between the computer science and systematic review communities.

Methods: Five research questions led our review: what is the state of the evidence base; how has workload reduction been evaluated; what are the purposes of semi-automation and how effective are they; how have key contextual problems of applying text mining to the systematic review field been addressed; and what challenges to

- Screening prioritisation
 - ‘safe to use’
- Machine as a ‘second screener’
 - Use with care
- Automatic study exclusion
 - Highly promising in many areas, but performance varies significantly depending on the domain of literature being screened

Mapping research activity

- It is possible to apply ‘keywords’ to text automatically, without needing to ‘teach’ the machine beforehand
- This relies on ‘clustering’ technology – which groups studies which use similar combinations of words
- Very few evaluations
 - Can be promising, especially when time is short
 - But users have no control on the terms actually used

Research
Synthesis Methods

Original Article

Received 23 November 2012, Revised 21 March 2013, Accepted 21 April 2013 Published online in Wiley Online Library

(wileyonlinelibrary.com) DOI: 10.1002/jrsm.1082

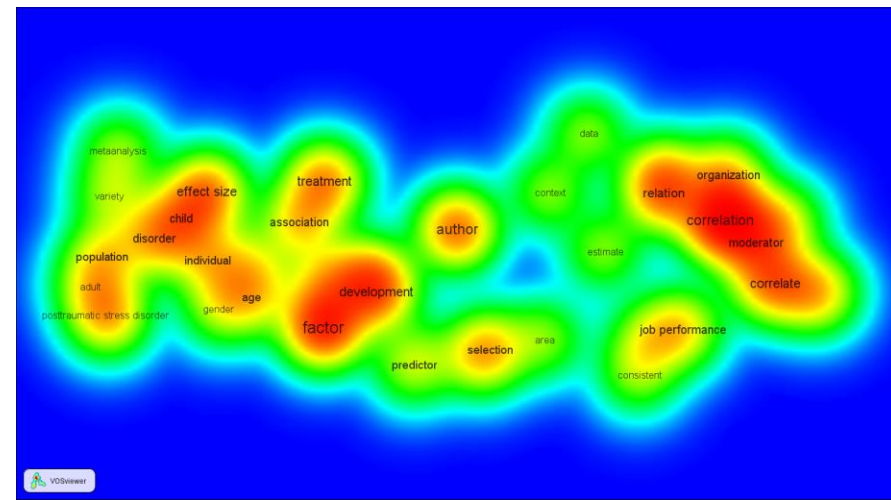
‘Clustering’ documents automatically to support scoping reviews of research: a case study

Claire Stansfield,^{*†} James Thomas[†] and Josephine Kavanagh[†]

Background: Scoping reviews of research help determine the feasibility and the resource requirements of conducting a systematic review, and the potential to generate a description of the literature quickly is attractive.

Aims: To test the utility and applicability of an automated clustering tool to describe and group research studies to improve the efficiency of scoping reviews.

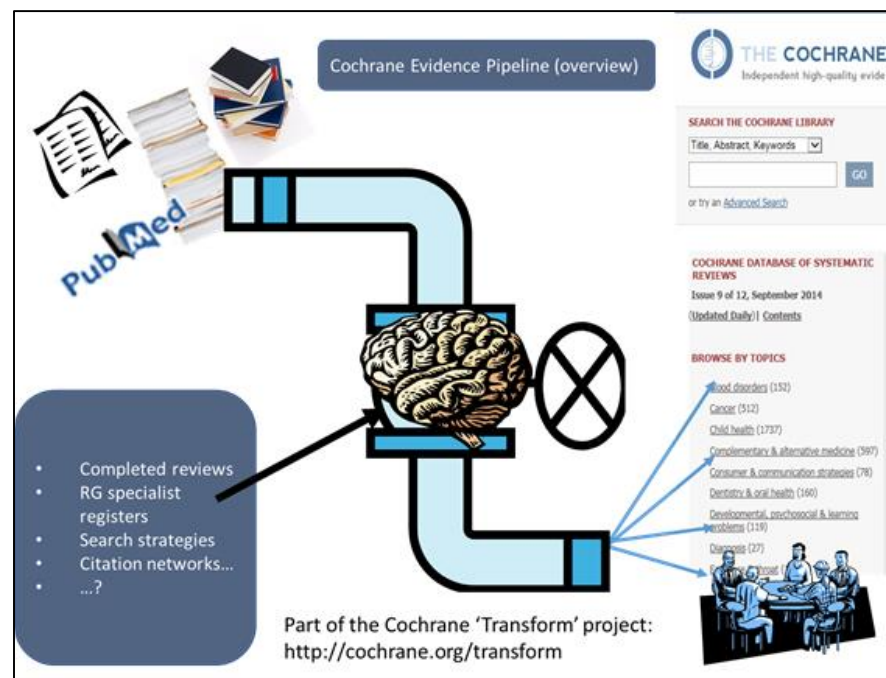
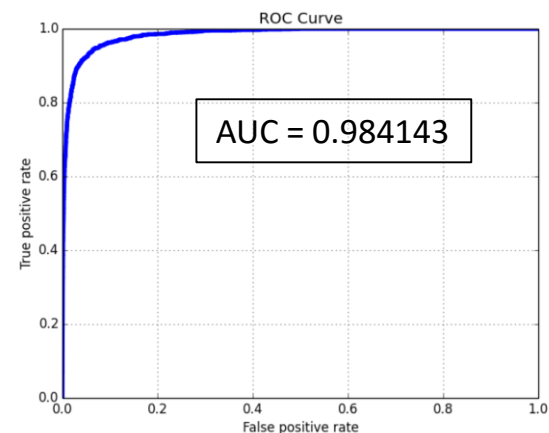
Methods: A retrospective study of two completed scoping reviews was conducted. This compared the



Database creation / curation

- If training data are available, it is possible to build a classification tool which can determine whether a given citation is within the scope of a database or not
- For simple categorisations – such as whether something is an RCT or not – performance is impressive
- The more data the better

Embase - RCT Evaluation ▶ Execute Python Script ▶ Python device



Risk of Bias assessment

- Emerging area; e.g.
 - RobotReviewer
 - Millard, Flach and Higgins
- Tools can accomplish two purposes:
 - Identify relevant text in the document
 - Automatically assess risk of bias
- Can perform very well on some dimensions of RoB

Int. J. Epidemiol. Advance Access published December 8, 2015

 International Journal of Epidemiology, 2015, 1–12
doi: 10.1093/ije/dyv306
Original article

Original article

Machine learning to assist risk-of-bias assessments in systematic reviews

Louise A.C. Millard,^{1,2,3*} Peter A. Flach^{1,3} and Julian P.T. Higgins^{1,2}

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Accepted 23 October 2015

Abstract
Background: Risk-of-bias assessments are now a standard component of systematic





Data extraction

TECHNICAL ADVANCE

Open Access

ExaCT: automatic extraction of clinical trial characteristics from journal publications

Svetlana Kiritchenko^{1*}, Berry de Bruijn¹, Simona Carini², Joel Martin¹, Ida Sim²

- RobotReviewer can identify phrases relating to study PICO characteristics
- ExaCT extracts trial characteristics (e.g. eligibility criteria)
- Systematic review found that no unified framework yet exists
- More evaluative work is needed on larger datasets

Abstract

Background: Clinical trials are one of the most important sources of evidence for guiding evidence-based practice and the design of new trials. However, most of this information is available only in free text - e.g., in journal

Jonnalagadda et al. *Systematic Reviews* (2015) 4:78
DOI 10.1186/s13643-015-0066-7



RESEARCH

Open Access



Automating data extraction in systematic reviews: a systematic review

Siddhartha R. Jonnalagadda^{1*}, Pawan Goyal² and Mark D. Huffman³

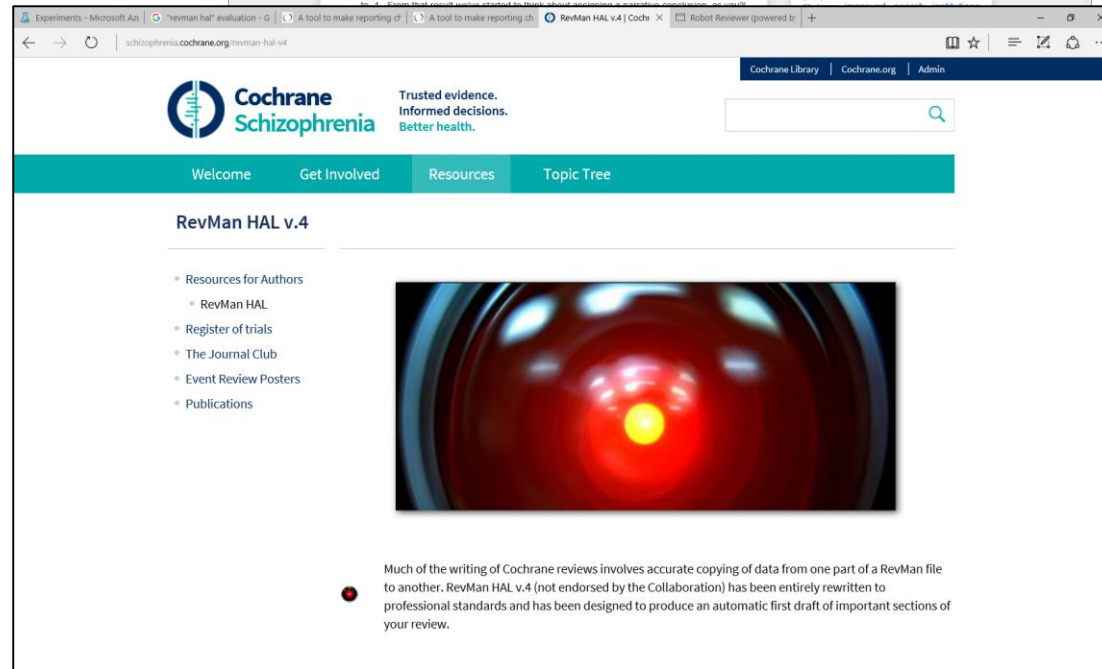
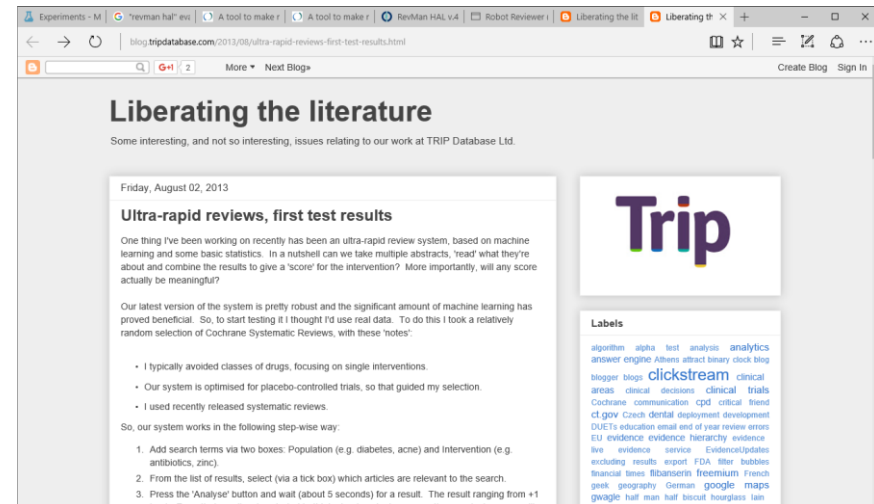
Abstract

Background: Automation of the parts of systematic review process, specifically the data extraction step, may be an important strategy to reduce the time necessary to complete a systematic review. However, the state of the science

The screenshot shows the RobotReviewer web interface. On the left, there is a list of authors and their affiliations. The main content area displays a systematic review article titled "Physical activity for smoking cessation in pregnancy: randomised controlled trial". The article includes an abstract, objectives, design, setting, participants, interventions, main outcome measures, and conclusions. On the right side of the interface, there is a checklist of items to be extracted from the article, such as "Allocation Concealment", "Blinding Of Participants And Personnel", "Blinding Of Outcome Assessment", "Incomplete Outcome Data", "Selective Reporting", "PICO", "Population", and "Intervention". The "Intervention" item is currently selected and expanded, showing a list of specific details to be extracted, such as "Participants were randomised to six weekly sessions of behav...", "On the other occasion the women received behavioural sup...", "Participants attended a median of four treatment sessions in...", "All enrolled participants six weekly sessions of 20 minutes...", "Part C1 P ants 789 pregnant smokers, aged 16-50 years and...", "For the physical activity group compared with the control grou...", "Inclusion criteria were wanting to stop smoking, wanting beh...", and "At enrollment we randomised participants to behavioural cess...".

Synthesis and conclusions

- Summarisation and synthesis of text is an active area for development in computer science
- Many hurdles to overcome before this technology can be used routinely
- Some systems automate parts of the process



Automated support for systematic reviewers: dream or reality?

Can publishers provide machine readable protocols and study results?

Cochrane UK & Ireland Symposium 2016

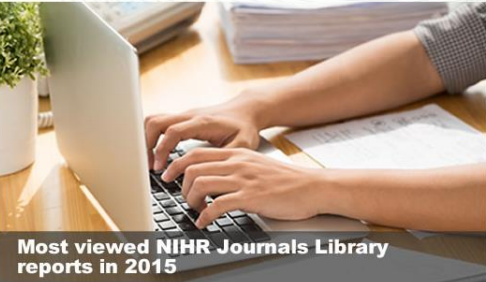
Elaine Williams, Director of Research Delivery and Impact,
NIHR Evaluation, Trials and Studies Coordinating Centre

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Community pharmacy interventions for public health priorities: a systematic review of community pharmacy-delivered smoking, alcohol and weight management interventions

Authors: Brown TJ, Todd A, O'Malley CL, Moore HJ, Husband AK,

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HEALTH TECHNOLOGY ASSESSMENT

VOLUME 17 ISSUE 10 MARCH 2013
ISSN 1366-5278

ASH-2 trial: a randomised controlled evaluation of the effects of tranexamic acid on death, vascular occlusive events and transfusion in bleeding trauma patients

H Shakur, T Coats, B Hunt, E Balogun, L Barnetson, P Perel, D Prieto-Merino, M Ramos, J Cairns and others

HTA17100

Articles

Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

CRASH-2 trial collaborators*

Summary

Background Tranexamic acid can reduce bleeding in patients undergoing elective surgery. We assessed the effects of early administration of a short course of tranexamic acid on death, vascular occlusive events, and the receipt of blood transfusion in trauma patients.

Methods This randomised controlled trial was undertaken in 274 hospitals in 40 countries. 20 211 adult trauma patients with, or at risk of, significant bleeding were randomly assigned within 8 h of injury to either tranexamic acid (loading dose 1 g over 10 min then infusion of 1 g over 8 h) or matching placebo. Randomisation was balanced by centre, with an allocation sequence based on a block size of eight, generated with a computer random number generator. Both participants and study staff (site investigators and trial coordinating centre staff) were masked to treatment allocation. The primary outcome was death in hospital within 4 weeks of injury, and was described with the following categories: bleeding, vascular occlusion (myocardial infarction, stroke and pulmonary embolism), multiorgan failure, head injury, and other. All analyses were by intention to treat. This study is registered as ISRCTN87559102, ClinicalTrials.gov NCT008375258, and South African Clinical Trial Register DOI11-27-0607-1919.

Findings 10 096 patients were allocated to tranexamic acid and 10 115 to placebo, of whom 10 060 and 10 067, respectively, were analysed. All-cause mortality was significantly reduced with tranexamic acid [4463 (44.5%)] tranexamic acid group to 10 113 (46.0%) placebo group; relative risk 0.91, 95% CI 0.82-0.97, *p* = 0.0032. The risk of death due to bleeding was significantly reduced (489 [4.9%] in 574 [5.7%]; relative risk 0.85, 95% CI 0.76-0.96, *p* = 0.0077).

Interpretation Tranexamic acid safely reduced the risk of death in bleeding trauma patients in this study. On the basis of these results, tranexamic acid should be considered for use in bleeding trauma patients.

Funding UK NIHR Health Technology Assessment programme, Pfizer, BUPA Foundation, and J P Moulton Charitable Foundation.

Introduction

Injuries are major causes of death worldwide.¹ Every year, more than a million people die as a result of road traffic injuries around the world. Road traffic injuries are the ninth leading cause of death globally, and such injuries are predicted to become the third leading cause of death and disability by 2020. About 1.6 million people die as a result of intentional acts of interpersonal, collective, or self-directed violence every year. More than 90% of trauma deaths occur in low-income and middle-income countries.² Haemorrhage is responsible for about a third of in-hospital trauma deaths and can also contribute to deaths from multiorgan failure.³

The haemostatic system helps to maintain circulation after severe vascular injury, whether traumatic or surgical in origin.⁴ Major surgery and trauma trigger similar haemostatic responses, and in both situations severe blood loss presents an extreme challenge to the coagulation system. Part of the response to surgery and trauma is stimulation of clot breakdown (fibrinolysis), which might become pathological (hyper-fibrinolysis) in some cases.⁵ Antifibrinolytic agents reduce blood loss in patients with both normal and exaggerated fibrinolytic responses to surgery, and do so without apparently increasing the risk of postoperative complications.⁶

Tranexamic acid is a synthetic derivative of the amino acid lysine that inhibits fibrinolysis by blocking the lysine binding sites on plasminogen.⁷ A systematic review of the randomised trials of tranexamic acid in patients undergoing elective surgery identified 53 studies including 3836 participants.⁸ Tranexamic acid reduced the need for blood transfusion by a third (relative risk [RR] 0.61, 95% CI 0.54-0.70), with no significant reduction in mortality (0.61, 0.32-1.12).⁸ Because the haemostatic responses to surgery and trauma are similar,⁹ tranexamic acid might reduce mortality due to bleeding in trauma patients. However, up until now there have been no randomised trials of this drug in such patients.⁹ We assessed the effects of the early administration of a short course of tranexamic acid on death, vascular occlusive events, and the receipt of blood transfusion in trauma patients with or at risk of significant haemorrhage.

*Members listed at end of paper

Correspondence to: Clinical Trials Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK (m.ewington@lshtm.ac.uk)

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DOI:10.1016/S0140-6736(13)60565-5
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See Comment page 3

www.thelancet.com Vol 381 July 3, 2013 23

NIHR Journals Library

- 5 open access journals – only health research funder with own journal series
- Builds on *Health Technology Assessment* journal
- Full reporting and permanent archive of research and other project information, **after project completion**
- Over 1,000 issues published - **£309m** research funding
(November 2015)
- Academic primary audience
- HTA widely referenced in NICE Clinical Guidelines¹

¹Turner S, Bhurke S, Cook A. *Impact of NIHR HTA Programme funded research on NICE clinical guidelines: a retrospective cohort*. Health Research Policy and Systems (2015) 13:37.

<http://www.health-policy-systems.com/content/13/1/37>

Features of NIHR journals

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Reporting of patient and public involvement	✓
Published in an online open access journal	✓

Table of contents	Abstract	Plain English summary	Scientific summary	Chapters	
Important information	References	Appendices	Glossary	List of abbreviations	
<p>Abstract [-]</p> <ul style="list-style-type: none"> ▶ Background ▶ Objective ▶ Design ▶ Setting ▶ Participants ▶ Interventions ▶ Main outcome measure ▶ Results ▶ Conclusions ▶ Trial registration ▶ Funding <p>Plain English summary</p> <p>Scientific summary [-]</p> <ul style="list-style-type: none"> ▶ Background ▶ Objectives ▶ Randomised controlled trial: o ▶ Cost-effectiveness ▶ Generalisability and cost imp ▶ Conclusions ▶ Trial registration ▶ Funding <p>Headline</p> <p>Chapter 1. Introduction [-]</p> <ul style="list-style-type: none"> ▶ Use in practice ▶ Rationale ▶ Risks and benefits ▶ Overview of aims and research 	<p>Chapter 2. Clinical effectiveness: methods [-]</p> <ul style="list-style-type: none"> ▶ Trial design ▶ Setting and participants ▶ Interventions ▶ Randomisation and consent ▶ Blinding ▶ Comparisons and outcomes ▶ Sample size ▶ Statistical methods ▶ Study oversight and role of funders <p>Chapter 3. Clinical effectiveness: results [-]</p> <ul style="list-style-type: none"> ▶ Study population ▶ Comparison of interventions <p>Chapter 4. Cost-effectiveness analysis [-]</p> <ul style="list-style-type: none"> ▶ Introduction ▶ Aim ▶ Methods ▶ Results <p>Chapter 5. Generalisability study [-]</p> <ul style="list-style-type: none"> ▶ Introduction ▶ Methods ▶ Results <p>Chapter 6. Discussion [-]</p> <ul style="list-style-type: none"> ▶ Introduction ▶ Clinical effectiveness ▶ Cost-effectiveness ▶ Generalisability and cost impact 	<p>Acknowledgements & Disclaimers [-]</p> <ul style="list-style-type: none"> ▶ Trial oversight committees ▶ Ethics ▶ Funding ▶ Contributions of authors ▶ Publications ▶ Data sharing statement ▶ Disclaimers <p>Permissions [-]</p> <ul style="list-style-type: none"> ▶ Copyright statement <p>Notes [-]</p> <ul style="list-style-type: none"> ▶ Article history ▶ Declared competing interests of authors <p>References</p> <p>Appendix 1. Statistical analysis plan</p> <p>Appendix 2. Clinical effectiveness study additional data</p> <p>Appendix 3. Cost-effectiveness study additional data</p> <p>Appendix 4. Generalisability study additional data</p> <p>Appendix 5. Statistical analysis report</p> <p>Glossary</p> <p>List of abbreviations</p>			

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HEALTH TECHNOLOGY ASSESSMENT
VOLUME 17 ISSUE 10 MARCH 2013
ISSN 1366-5728

The CRASH-2 trial: a randomised controlled trial and economic evaluation of the effects of tranexamic acid on death, vascular occlusive events and transfusion requirement in bleeding trauma patients

I Roberts, H Shakur, T Coats, B Hunt, E Balogun, L Barnettson, L Cook, T Kawahara, P Perel, D Prieto-Merino, M Ramos, J Cairns and C Guerriero

Final report

NHS
National Institute for Health Research

DOI: 10.3310/HTA17100

CRASH2
Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage

PROTOCOL UK

A large randomised placebo controlled trial among trauma patients with or at risk of significant haemorrhage, of the effects of antifibrinolytic treatment on death and transfusion requirement

Protocol

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CRASH-2: a trial of tranexamic acid in serious injury

Given within three hours of injury, tranexamic acid reduces deaths in people who are bleeding heavily

Why did we fund this research?
About three million people die every year worldwide as a result of a serious injury (trauma). About a third of people with trauma who die in hospital do so because of bleeding. A drug that could reduce blood loss could prevent thousands of deaths each year worldwide.

What did the researchers find?
By four weeks after their injury, tranexamic acid was used to reduce blood loss, after minor or major trauma, in 20,211 adults who were seriously injured in the past eight hours and were bleeding heavily or were likely to bleed heavily. These people were randomly assigned to have either a slow injection of tranexamic acid into their bloodstream, or to have an injection of an identical-looking solution which did not contain the drug and would not affect bleeding (called placebo). People were only included in the study if the doctors were not sure whether giving them tranexamic acid would be any better for them than giving them nothing (the placebo).

Neither the injured people nor the doctors knew which injection they had (the trial was 'double blind'). The researchers recorded how many people in the study died in hospital, up to four weeks after their injury. They also recorded why these people died. They did not assess deaths occurring after people were discharged from hospital or deaths occurring more than four weeks after the injury.

Summary for the public

Tranexamic acid is a drug which is already regularly used to reduce blood loss after minor or major trauma, in 20,211 adults who were seriously injured in the past eight hours and were bleeding heavily or were likely to bleed heavily. These people were randomly assigned to have either a slow injection of tranexamic acid into their bloodstream, or to have an injection of an identical-looking solution which did not contain the drug and would not affect bleeding (called placebo). People were only included in the study if the doctors were not sure whether giving them tranexamic acid would be any better for them than giving them nothing (the placebo).

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Get the evidence at www.ccrash2trial.org.uk

Articles

Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

RESEARCH

Journal articles

BMJ
0959-9961/13/306(6859):e008581 (Published 11 September 2013)

Effect of traumatic brain injury on the effect of tranexamic acid on death and vascular occlusive events in patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

Previous research

March 2012

freeBIRD
Bank of Injury and Emergency Research Data

"I suffered head injuries after a motorway road accident. I owe my life to the surgical team at Guy's and St Thomas' Hospital."

freeBIRD
Bank of Injury and Emergency Research Data

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Welcome to **freeBIRD**, a new website which allows the uploading and sharing of injury and emergency research data.

Making clinical trial data sets available to investigators beyond the original research team can improve patient care, advance medical knowledge and provide better value for money from health research.

Project data

injury and emergency research in a timely access to anonymised data on over 30,000 cases and that freeBIRD becomes a valued resource for those committed to improving injury and emergency care.

PLEASE CLICK ARROW TO RUN VIDEO

ELIJDH'S STORY BY HER SISTER KATE
(Eliidh and Kate inset below)

interview crash-2.mov

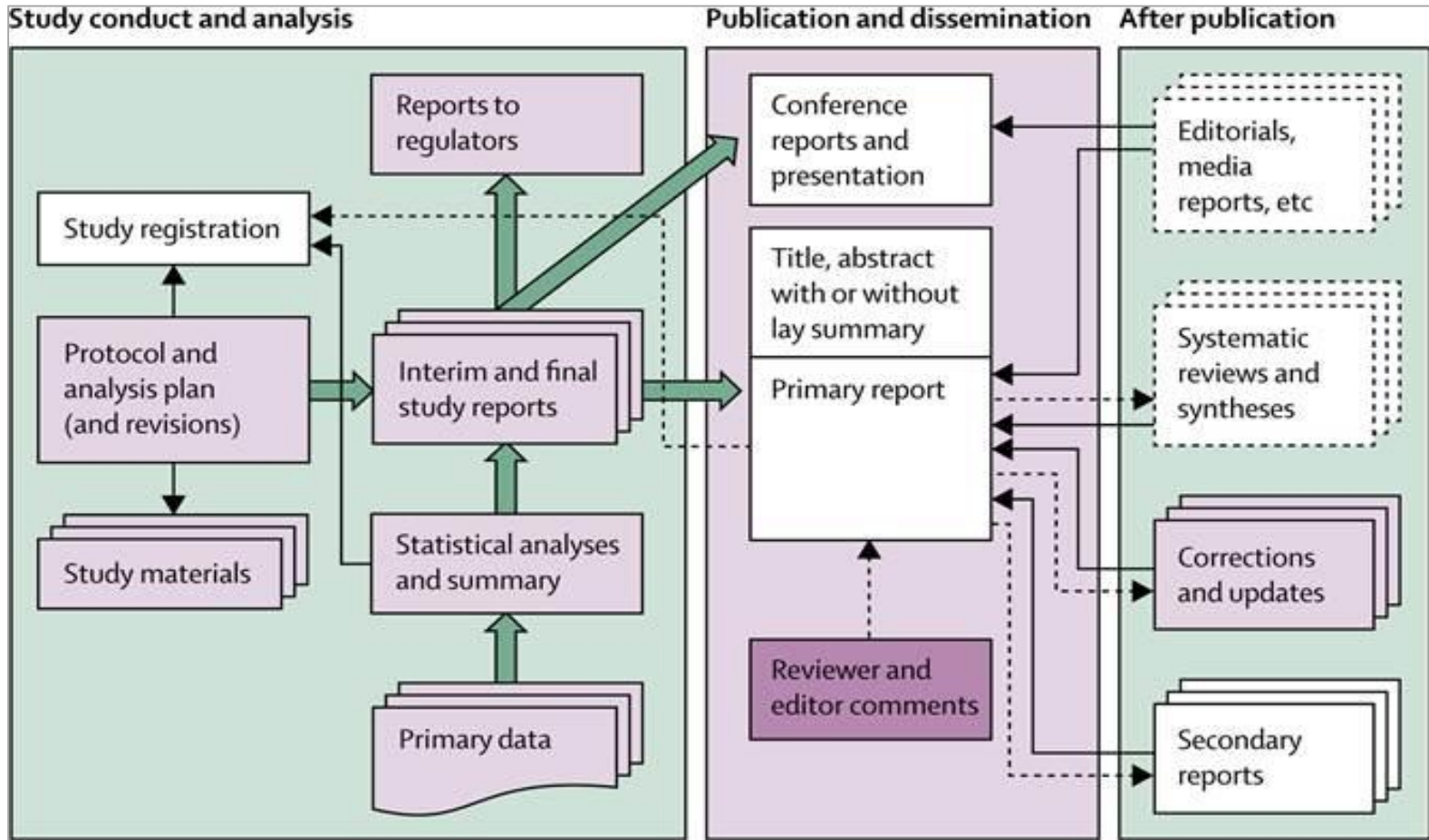
[Table of contents](#)[Abstract](#)[Plain English summary](#)[Scientific summary](#)[Chapters](#)[Important information](#)[References](#)[Appendices](#)[Glossary](#)[List of abbreviations](#)

- [Scientific Summary \(PDF\) \(171.3 KB\)](#)
- [Plain English Summary \(PDF\) \(144.2 KB\)](#)
- [Full Report \(PDF\) \(19.9 MB\)](#)
- [References \(from this publication as a .ris file\) \(38.8 KB\)](#)
- [Citation \(for this publication as a .ris file\) \(595 Bytes\)](#)
- [Protocol \(PDF\) \(875.9 KB\)](#)

The landscape is developing

- Greater focus on 'avoidable waste'
- Open Access
- Dissemination and implementation
- Demonstrating impact
- Technology (eg XML)
- Data sharing

Move to enhanced linking



Supporting systematic reviewers

“Evidence-based medicine stipulates that all relevant evidence be used to make clinical decisions regardless of the implied resource demands”¹

- Quality in > Quality Out
- Reporting guidelines (*EQUATOR*) and associated tools (*eg Penelope*)
- Full text XML to support data mining
- Enhanced tagging
- References (.ris format)
- Access to data
- other?

¹Sackett DL, Straus S, Richardson WS, Rosenberg W, Haynes RB: Evidence based Medicine: How to Teach and Practice EBM. Edinburgh: Churchill Livingstone; 2000.

Automation of systematic reviews: the reviewer's viewpoint

(...that's all very well, but how do these tools help me?)

Geoff Frampton

Southampton Health Technology Assessments Centre (SHTAC)

<http://www.southampton.ac.uk/shtac>

SHTAC: Who are we and what do we do?

- **A team of systematic reviewers and health economists**
- **We conduct systematic reviews (and maps) on a wide variety of health and social sciences topics (e.g. for NIHR, Cochrane Collaboration, WHO)**
- **We also critically appraise systematic reviews and economic analyses conducted by other parties, e.g. companies submitting evidence to NICE**

Do we use automation for systematic reviews (SR) ?

- **Depends on how “automation” is defined**
- **Yes, in bibliographic searching**
 - running search strategies in databases or search engines
 - importing search results into reference management software
- **Yes, within reference management software**
 - identification of duplicate references
 - acquiring full-text documents
 - rule-based sorting (e.g. grouping) of references
- **Not (yet) for other steps of systematic reviews (or maps)**

Our experiences

- **Bibliographic searching**

✓ – Automation saves effort in searching and retrieving references

BUT...

✗ – Search functionality is not consistent across databases

✗ – Manual translation of search strategies is necessary for some databases

✗ – Reference import or download options are sometimes limited by quantity or completeness

Our experiences

- **Reference management software**

✓ – Automation saves effort in organising references

BUT...

✗ – A proportion of references is often incomplete or incorrect

✗ – Duplicates are often missed

✗ – Full text documents are not always available or accessible

Where else in SR could automation help us?

- Eligibility screening

- Especially if thousands of titles & abstracts require screening ✓

BUT...

- Might compromise recall (up to 5%?) ✗
- Which tool(s) should we use?
- Would automation replace one human reviewer?
- Suitable for full-text screening?
- Quality assurance process (reviewer agreement)?



Where else in SR could automation help us?

- **Guide for data extraction?**
 - Help reviewers to identify where relevant data are located in a report (but risk of over-reliance?)
- **Guide for planning/formatting?**
 - Auto-filling of relevant data fields in Protocol or Review report
 - Prompting for human input to ensure standardisation

Discussion points

- Automation unlikely to be applicable to all *steps* of SR
 - Some steps require human judgement
 - SR need human inputs (e.g. stakeholder advisors to guide clinical interpretation and problem-spotting)



Discussion points

- **Automation unlikely to be applicable to all *steps* of SR**
 - Some steps require human judgement
 - SR need human inputs (e.g. stakeholder advisors to guide clinical interpretation and problem-spotting)
- **Automation unlikely to be applicable to all *types* of SR**
 - For some SR (e.g. complex interventions) even human reviewers find it challenging to locate and select evidence



- ... automation could be valuable on a case-by-case basis
- ... may guide human reviewers on some SR steps

Wish list: what would we as reviewers like to see?

- **More efficient automation of searching and reference retrieval**
 - Improved capability to interrogate multiple databases and search engines with the same search strategy
 - Improved quantity and completeness of references that can be imported into reference management software
 - Improved compatibility of databases and search engines with reference management software

Wish list: what would we as reviewers like to see?

- **More efficient reference management**
 - A tool to validate and update all references in a library to ensure completeness and accuracy (to also improve de-duplication)
- **Guidance on tools for automated eligibility screening**
 - Which tools are available?
 - Where to find them?
 - How to use them?
 - ... training requirements for the operator?
 - ... time and resources for machine learning processes?
 - Critical evaluation of strengths and weaknesses

