MetaInsight: The Complex Review Support Unit (CRSU) network meta-analysis (NMA) web-based app

Webpage for App: http://www.nihrcrsu.org/guidance/apps/

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Structure of the Webinar

- Background and introduction to MetaInsight (10 mins)
  - Opportunity for questions

- Demonstration of the app (20 mins)
  - Opportunity for questions

- Final thoughts & plans for the future (10+ mins)
  - Opportunity for questions / suggestions

Poll 1: What is Your Background?

- Systematic reviewer / researcher
- Editor
- Clinician
- Statistician / health economist
- Other

Poll 2: What is your experience with Network Meta-analysis (NMA)?

- None whatsoever
- I have an understanding of the principles of (NMA) but no practical analysis experience
- I have an understanding of NMA and conducted NMA analysis with MetaInsight
- I have an understanding of NMA and conducted NMA analysis with software other than MetaInsight

Why was MetaInsight Created?

- Complex Review Support Unit was set up to support National Institute for Health Research (UK) reviews
  - Add value through making reviews appropriately sophisticated and more clinically relevant
  - Cochrane focus

- Since many reviews conducted without support of an expert statistician, software expertise was identified as an issue
  - Desire to increase capacity in more advanced synthesis analyses formats
  - Lack of Cochrane support for Network Meta-Analysis seemed a pressing issue
    - E.g. Not possible in RevMan
  - Wanted to present results of analyses in more user-friendly formats
    - Emphasis on visualisation
  - Real time interrogation of robustness of results to studies included and model fit3
  - Software has evolved to the point where statisticians are (also) using it for its convenience and efficiency

CRSU Software Suite (http://www.nihrcrsu.org/guidance/apps/#d.en.581059)

- MetaInsight : https://crsu.shinyapps.io/metainsightc/

Apps for carrying out network meta-analysis

Owen, RK, Bradbury, N, Xin, Y, Cooper, N, Sutton, A. MetaInsight: An interactive web-based tool for analyzing, interrogating, and visualizing network meta-analyses using R-shiny and netmeta. *Res Syn Meth*. 2019; 1- 13. https://doi.org/10.1002/jrsm.1373

- MetaDTA : https://crsu.shinyapps.io/dta_ma/

App for carrying out diagnostic test accuracy meta-analysis

Freeman SC, Kerby CR, Patel A, Cooper NJ, Quinn T, Sutton AJ. Development of an interactive web-based tool to conduct and interrogate meta-analysis of diagnostic test accuracy studies: MetaDTA. *BMC Medical Research Methodology* 2019; 19: 81 https://doi.org/10.1186/s12874-019-0724-x

- Primers on diagnostic test evaluation methods: https://crsu.shinyapps.io/diagprimer/

& https://vigorous-hawking-f95f83.netlify.com/

How does MetaInsight work?

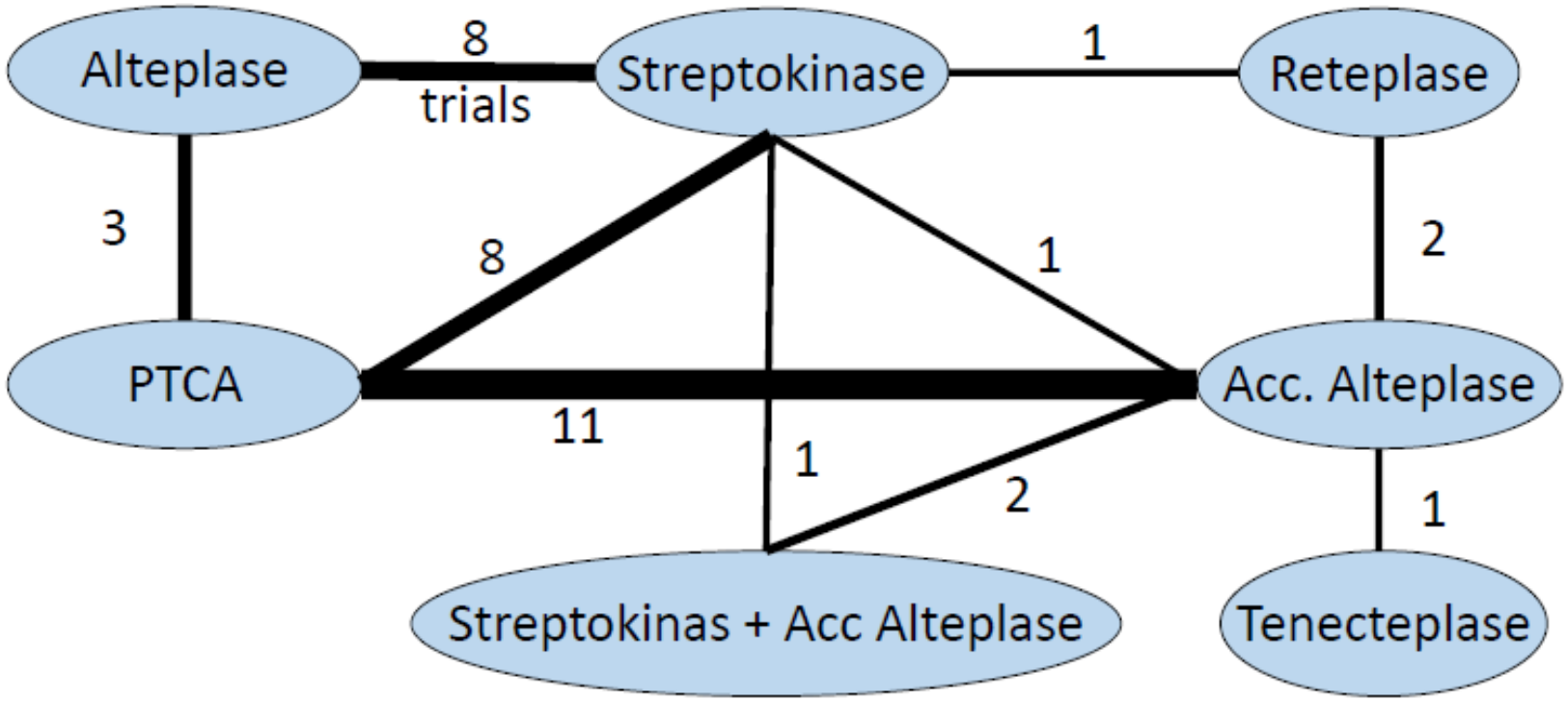
- A powerful package called Shiny for making web apps was developed for the statistical package R
  - https://shiny.rstudio.com/
  - Allows us as non software developers to create analysis apps

- R acts as a backbone for the tool, it is accessed "behind the scenes" on an internet cloud (together with "helper" software, e.g. JAGS – for Bayesian simulation)
  - User does not need to download any software other than a web-browser
  - Works on modern browsers including on tablets / phones etc

- Aim to utilise existing packages where possible
  - E.g. Uses `netmeta` for frequentist analysis and `gemtc` for Bayesian analysis
  - Write bespoke code for the interface and for features not covered in existing packages (e.g. certain plots)

What is Network Meta-analysis anyway?

The network of trial evidence is analysed as a 'whole'



What can MetaInsight do?

As of version 2.0 (available now - November 2019 -in beta via link in app)

- Network meta-analysis of binary or continuous (raw scale and standardised) outcomes
- Frequentist and Bayesian estimation routines
- Fixed and random effect models
- Many graphical outputs, all of which can be downloaded and saved
- Inconsistency / influential points diagnostics
- Treatment ranking (Bayes only)
- Flexible sensitivity analysis
- Operated via a point and click interface & updated in real time
- User guide available (for earlier version – downloadable from app)

Any questions so far?

MetaInsight Demonstration

Any Questions on the Software Demonstration?

What can MetaInsight **NOT** do?

As of version 2.0 (available now in beta via link in app) it cannot do:

- Network meta-analysis of hazard ratios & other outcomes
- Meta-regression (inclusion of study level covariates)
- Quality assessment
- Inconsistency models, treatment component models etc
- (Save analyses half way through (need to re-paste data))
- (Some other things that will no doubt be requested!)

- Seek expert advice if you require help with any of the above (possibly from the CRSU)

Will MetaInsight be Updated Further?

- The CRSU funding runs out in 2020, but we have a time extension to March 2021
- We intend to work on developing this and the other apps for at least until the end of the grant
- Looking to secure funding for hosting the apps for the next decade (currently approx. 600 hours a month)

Can You Give us an *Exclusive* Scoop on what may be Included in the Future?

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Yes!

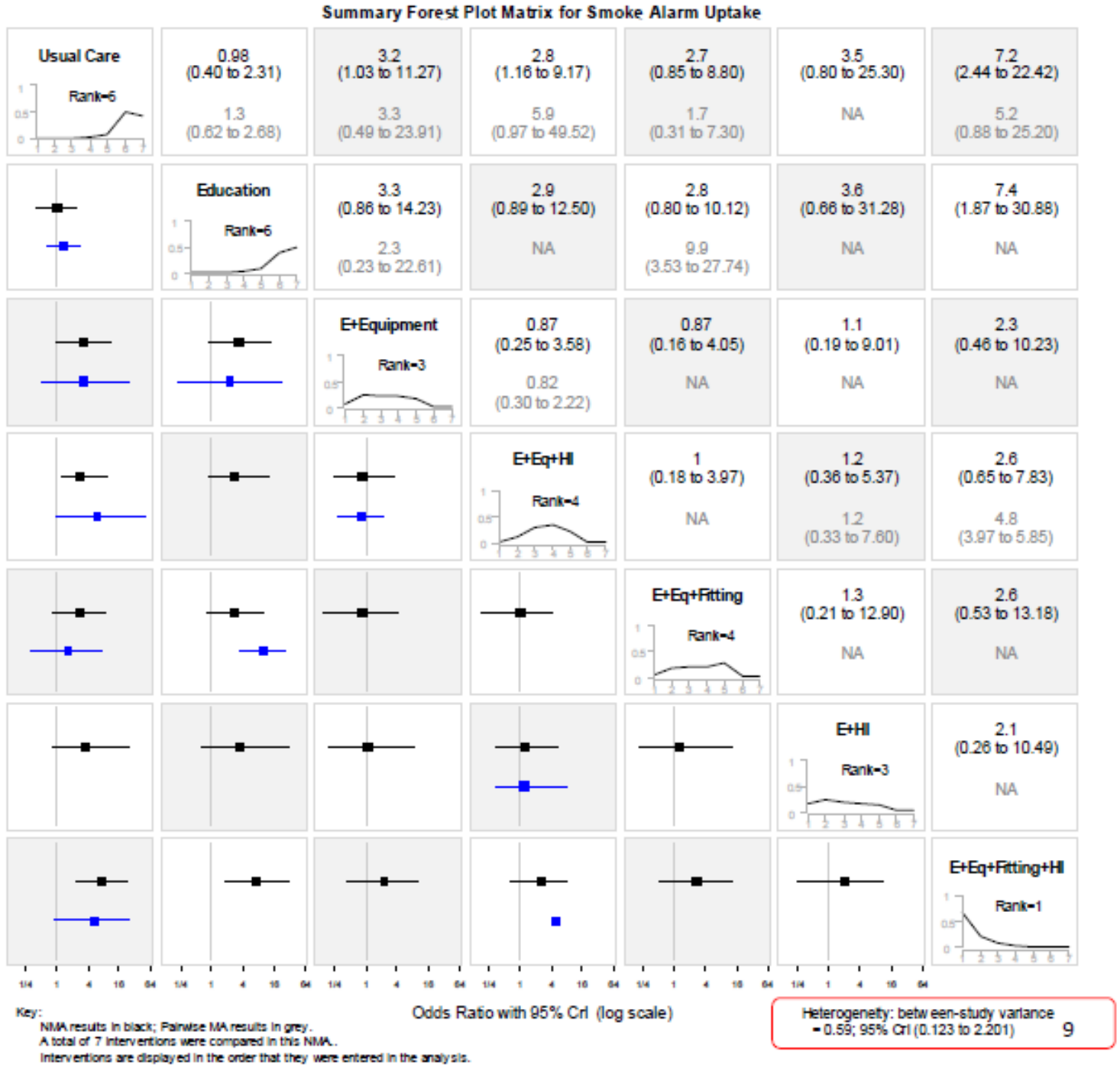
Improved Summary of Analysis Figures

- Based on:

Tan, Sze Huey et al. Novel presentational approaches were developed for reporting network meta-analysis. Journal of Clinical Epidemiology, Volume 67, Issue 6, 672 – 680. (2014)

- Not routinely used, but elegant and concise summary of NMA results

Summary Forest Plot Matrix



Summary Forest Plot Table

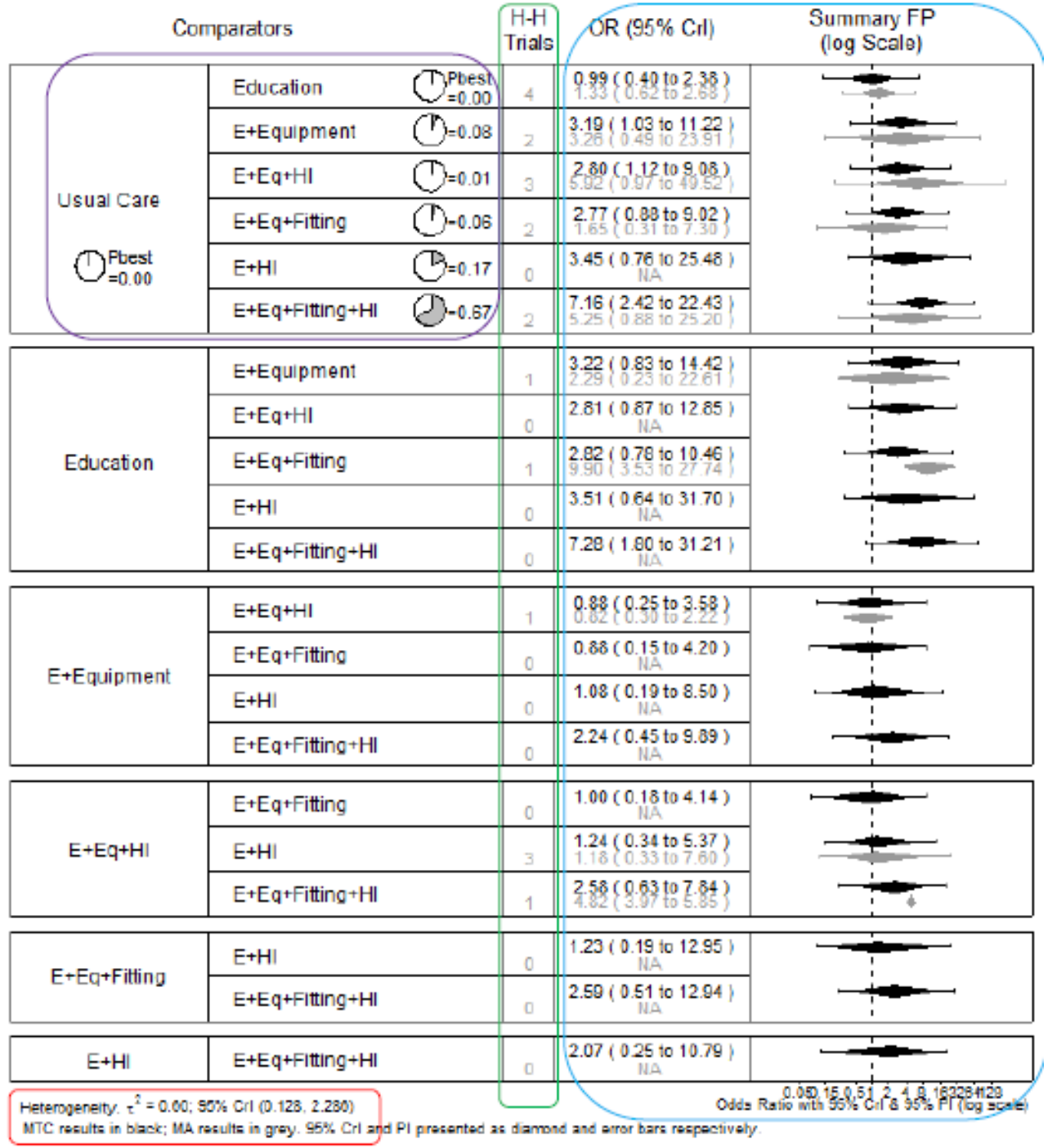
NMA & pairwise MA estimates and plots on the same graph

Probability best

Heterogeneity estimate presented

Column showing Head-to-Head Trial counts

Graph can extend easily to another page



Alex, Swap to HTML for the Grand Finale!

Poll 3: Which new features would you most want to see? (Please click up to 2)

- Quality assessment displays
- Ability to analyse hazard ratios or other outcomes not supported
- Meta-regression (inclusion of covariates)
- Show R code used “behind the scenes” (to improve reproducibility / use to teach R coding)
- More customisability of the Bayesian analysis
- Threshold analysis (as described in - Phillippo, D, Dias, S, Welton, N, Caldwell, D, Taske, N & Ades, T, 2019, ‘Threshold Analysis as an Alternative to GRADE for Assessing Confidence in Guideline Recommendations Based on Network Meta-analyses’. *Annals of Internal Medicine*, vol 170., pp. 538-546)

Poll 4: After this presentation, are you

- More likely to conduct a network meta-analysis
- Less likely to conduct a network meta-analysis

Poll 5: If you were planning on doing a network meta-analysis would you consider using MetaInsight?

- Yes
- No

Summary

Hope software (eventually) presents a complete solution to peoples needs for conducting and reporting network meta-analysis

- Already good functionality

Always grateful for feedback (good or bad) / suggestions

Any final questions, comments or suggestions?

Thank you for your time

MetaInsight:
https://crsu.shinyapps.io/metainsightc/

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