

Meta-Analysis using Odds Ratios

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1 Load required and new packages

```
if (!require("pacman")) install.packages("pacman")
```

```
## Loading required package: pacman
```

```
library(pacman)
pacman::p_load("here", "glue", "crayon", "readxl", "writexl", "dplyr", "tidyr", "rstatix")
pacman::p_load("metafor", "forestplot")

`%ni%` = Negate(`%in%`)
```

2 Set data paths and details

```
main.path = here::here()
data.path = file.path(main.path, "02 Data")
output.path = file.path(main.path, "04 Outputs")

file.name = "Data - For Analysis.xlsx"
sheet.name = "Final"
output.name = paste0("OUTPUT_", format(Sys.Date(), "%m%d%y"), ".xlsx")
```

3 Load dataset

```
df = readxl::read_excel(file.path(data.path, file.name),
                        sheet = sheet.name)
```

4 Process data

```

df.final = df

death.overall.df = df.final %>%
  dplyr::filter(Dependent == "Death") %>%
  dplyr::filter(Subset == "All")

outcome.overall.df = df.final %>%
  dplyr::filter(Dependent == "Outcome") %>%
  dplyr::filter(Subset == "All")

outcome.mri.df = df.final %>%
  dplyr::filter(Dependent == "Outcome") %>%
  dplyr::filter(Subset == "MRI")

outcome.time.1yr.df = df.final %>%
  dplyr::filter(Dependent == "Outcome") %>%
  dplyr::filter(Subset == "All") %>%
  dplyr::filter(Outcome_Time == "1 year")

outcome.time.3mo.df = df.final %>%
  dplyr::filter(Dependent == "Outcome") %>%
  dplyr::filter(Subset == "All") %>%
  dplyr::filter(Outcome_Time == "3 months")

```

5 Implement methodology

5.1 For overall death

```

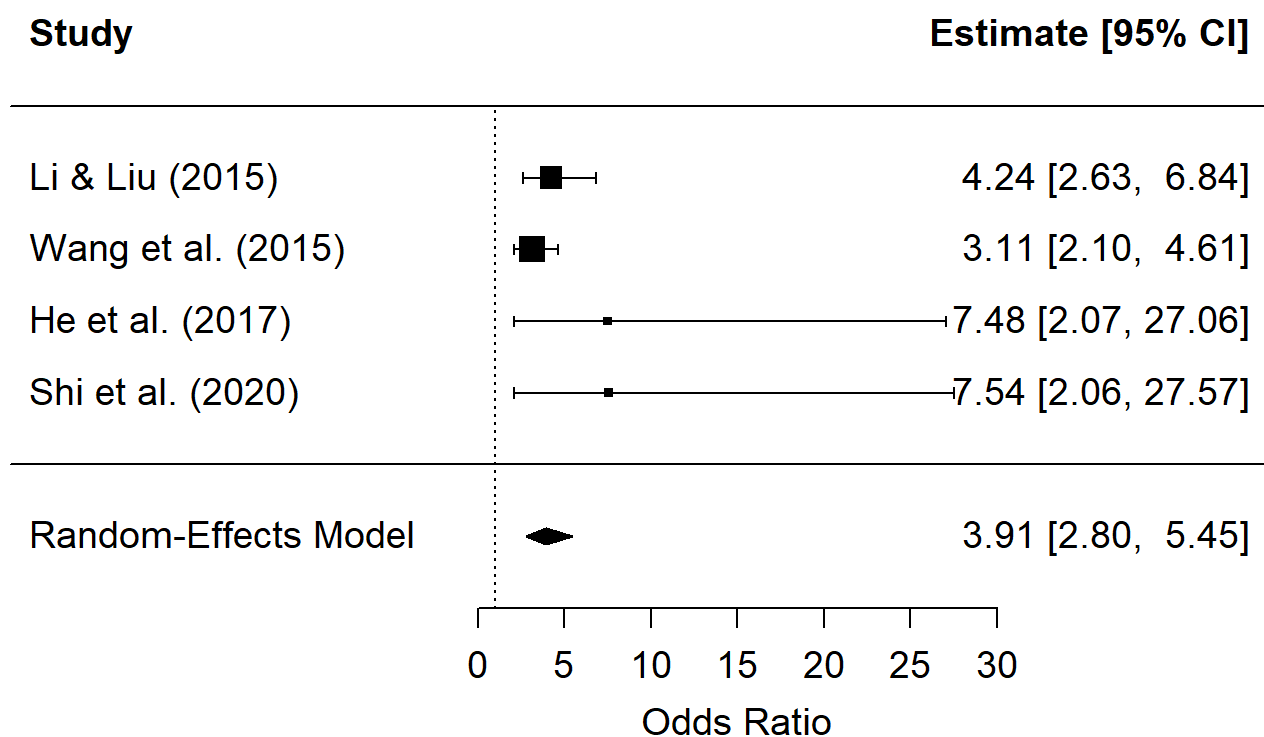
death.overall = metafor::rma.uni(yi = log(Ratio),
                                sei = (log(UL) - log(LL)) / (2 * 1.96),
                                data = death.overall.df)

summary(death.overall)

```

```
##
## Random-Effects Model (k = 4; tau^2 estimator: REML)
##
##   logLik  deviance      AIC      BIC      AICc
## -1.7752   3.5505   7.5505   5.7477  19.5505
##
## tau^2 (estimated amount of total heterogeneity): 0.0176 (SE = 0.0910)
## tau (square root of estimated tau^2 value):      0.1326
## I^2 (total heterogeneity / total variability):   13.48%
## H^2 (total variability / sampling variability):   1.16
##
## Test for Heterogeneity:
## Q(df = 3) = 3.3414, p-val = 0.3419
##
## Model Results:
##
## estimate      se    zval    pval   ci.lb   ci.ub
##   1.3628  0.1697  8.0306  <.0001  1.0302  1.6954  ***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

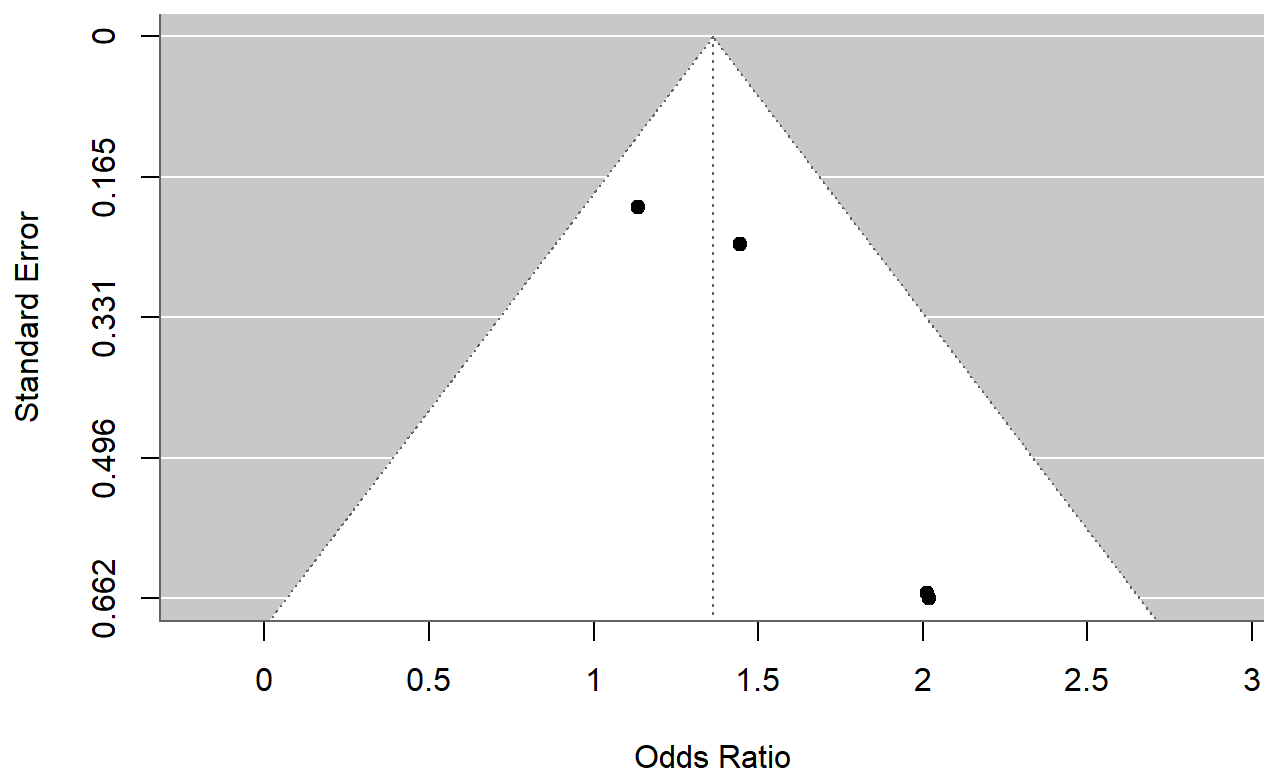
```
metafor::forest.rma(death.overall,
                    transf = exp,
                    cex = 1.2,
                    refline = 1,
                    xlab = "Odds Ratio",
                    slab = death.overall.df$Study)
```



```
metafor::regtest(death.overall)
```

```
##
## Regression Test for Funnel Plot Asymmetry
##
## Model:      mixed-effects meta-regression model
## Predictor: standard error
##
## Test for Funnel Plot Asymmetry: z = 1.6737, p = 0.0942
## Limit Estimate (as sei -> 0):  b = 0.8525 (CI: 0.2185, 1.4864)
```

```
metafor::funnel.rma(death.overall, xlab = "Odds Ratio")
```

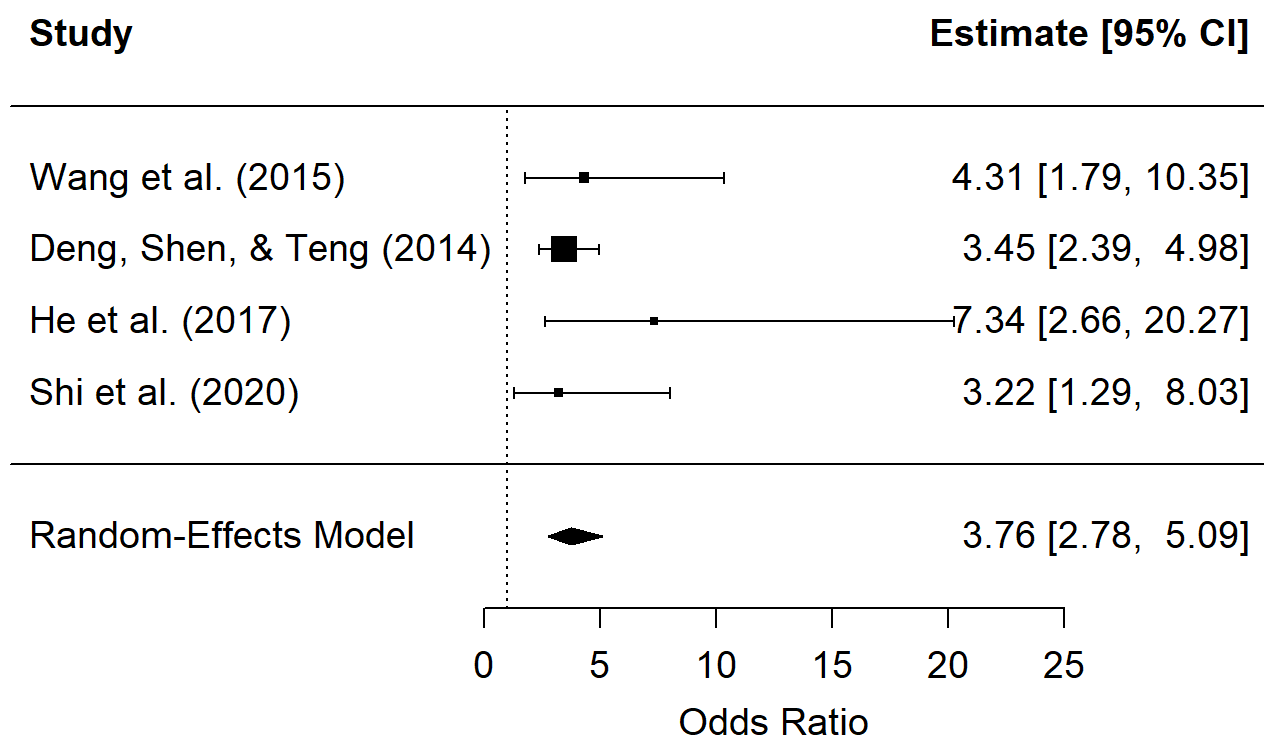


5.2 For overall outcome

```
outcome.overall = metafor::rma.uni(yi = log(Ratio),  
                                   sei = (log(UL) - log(LL)) / (2 * 1.96),  
                                   data = outcome.overall.df)  
  
summary(outcome.overall)
```

```
##
## Random-Effects Model (k = 4; tau^2 estimator: REML)
##
##   logLik  deviance      AIC      BIC      AICc
## -1.0711   2.1422   6.1422   4.3394   18.1422
##
## tau^2 (estimated amount of total heterogeneity): 0 (SE = 0.1033)
## tau (square root of estimated tau^2 value):      0
## I^2 (total heterogeneity / total variability):   0.00%
## H^2 (total variability / sampling variability):   1.00
##
## Test for Heterogeneity:
## Q(df = 3) = 2.0825, p-val = 0.5555
##
## Model Results:
##
## estimate      se      zval      pval      ci.lb      ci.ub
##   1.3246   0.1546   8.5702   <.0001   1.0216   1.6275   ***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

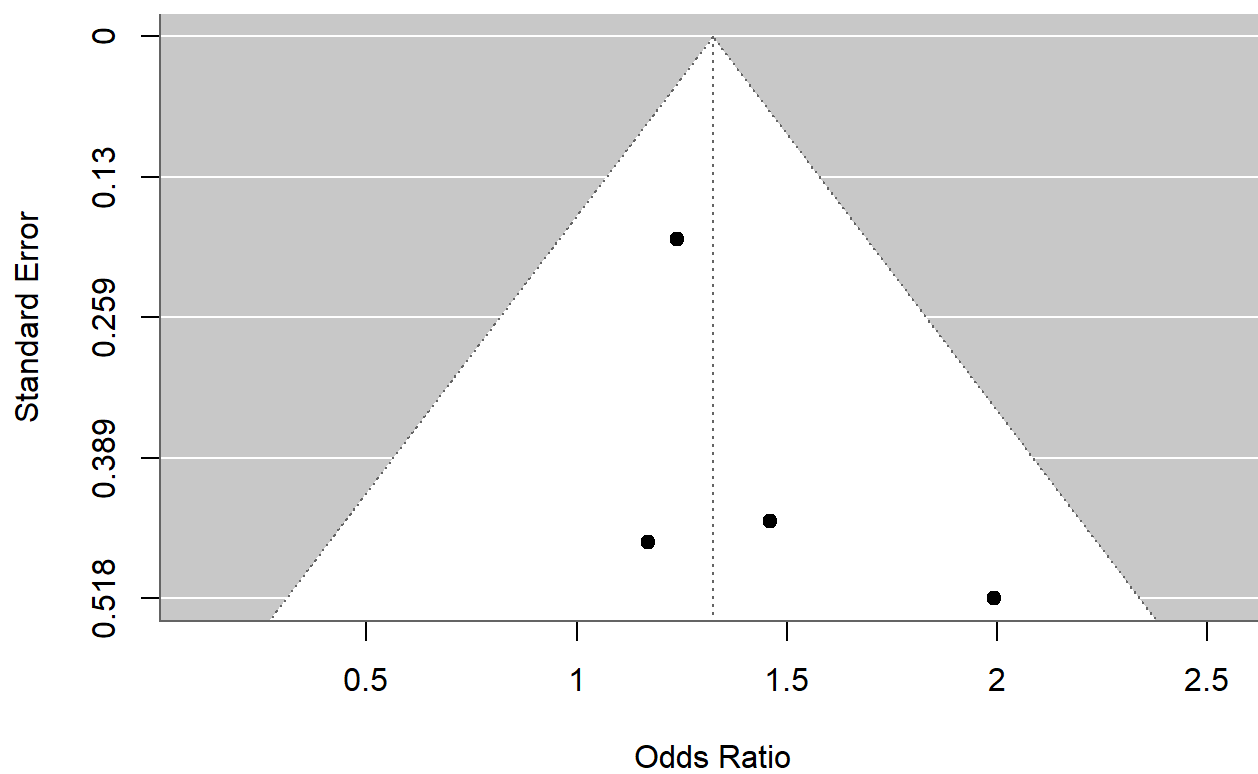
```
metafor::forest.rma(outcome.overall,
                    transf = exp,
                    cex = 1.2,
                    refline = 1,
                    xlab = "Odds Ratio",
                    slab = outcome.overall.df$Study)
```



```
metafor::regtest(outcome.overall)
```

```
##
## Regression Test for Funnel Plot Asymmetry
##
## Model:      mixed-effects meta-regression model
## Predictor: standard error
##
## Test for Funnel Plot Asymmetry: z = 0.9230, p = 0.3560
## Limit Estimate (as sei -> 0):  b = 1.0291 (CI: 0.3324, 1.7258)
```

```
metafor::funnel.rma(outcome.overall, xlab = "Odds Ratio")
```



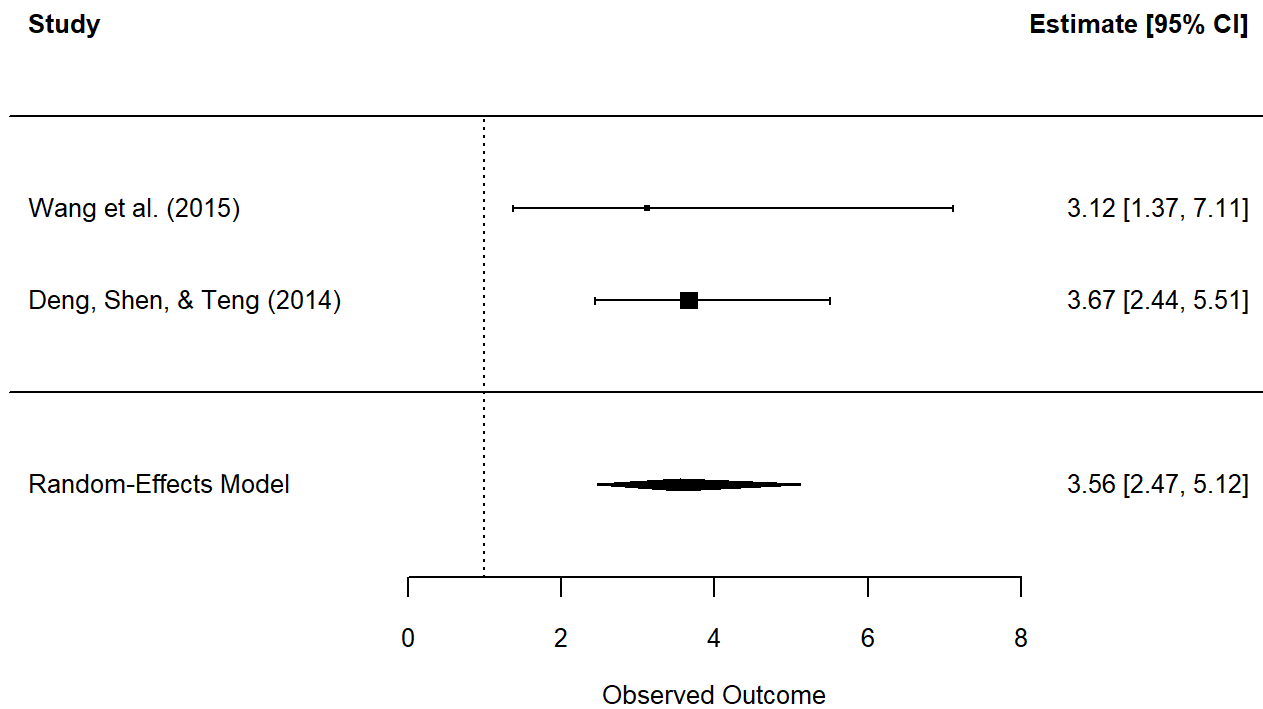
5.3 MRI Outcome

```
outcome.mri = metafor::rma.uni(yi = log(Ratio),  
                               sei = (log(UL) - log(LL)) / (2 * 1.96),  
                               data = outcome.mri.df)  
  
summary(outcome.mri)
```

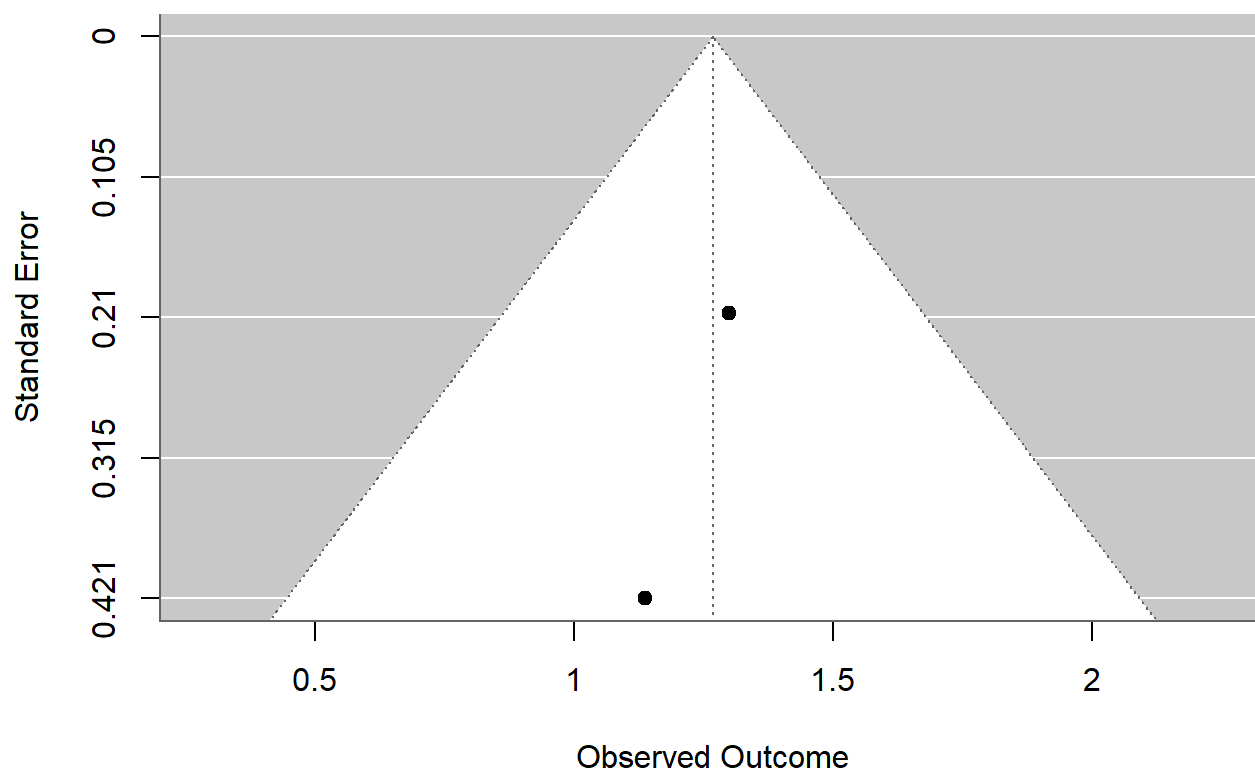


```
##
## Random-Effects Model (k = 2; tau^2 estimator: REML)
##
##   logLik  deviance      AIC      BIC      AICc
##   0.1251  -0.2502   3.7498  -0.2502   15.7498
##
## tau^2 (estimated amount of total heterogeneity): 0 (SE = 0.1555)
## tau (square root of estimated tau^2 value):      0
## I^2 (total heterogeneity / total variability):   0.00%
## H^2 (total variability / sampling variability):   1.00
##
## Test for Heterogeneity:
## Q(df = 1) = 0.1199, p-val = 0.7291
##
## Model Results:
##
## estimate      se    zval    pval   ci.lb   ci.ub
##   1.2685   0.1859  6.8229  <.0001  0.9041  1.6328  ***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
metafor::forest.rma(outcome.mri,
                    transf = exp,
                    cex = 0.8,
                    refline = 1,
                    slab = outcome.mri.df$Study)
```



```
metafor::funnel.rma(outcome.mri)
```

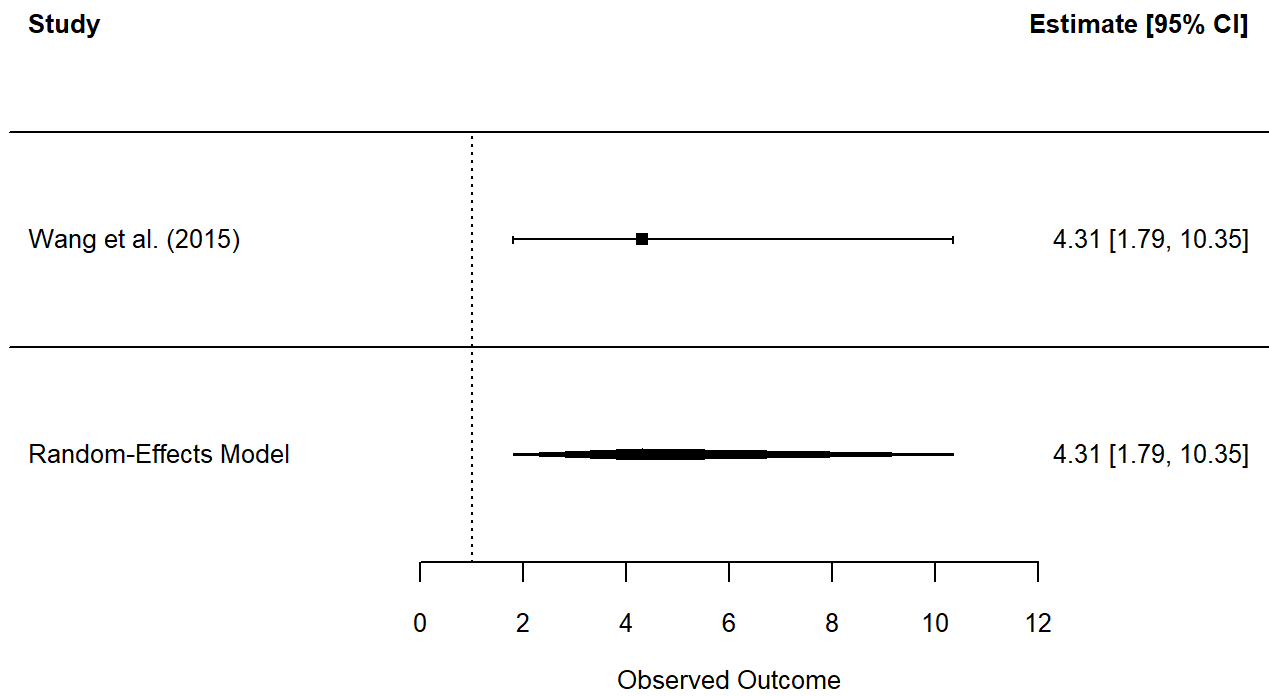


5.4 Outcome in 1 year

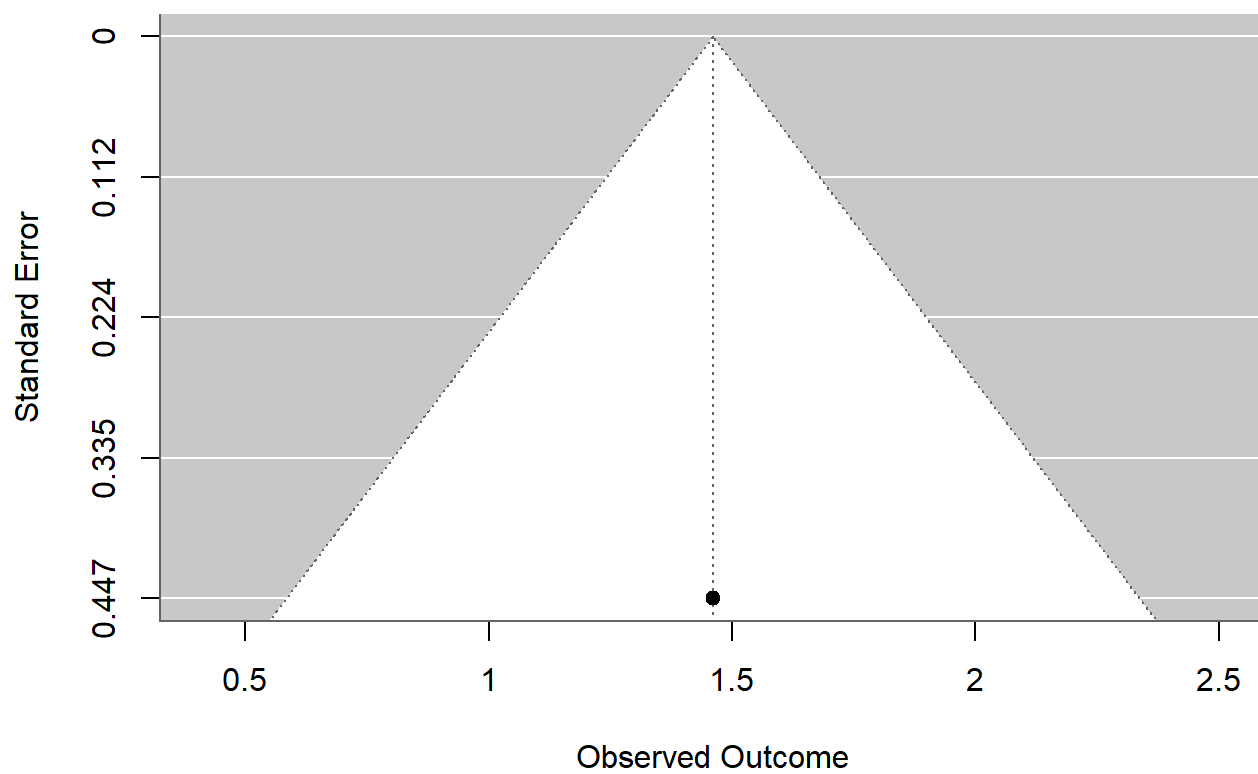
```
outcome.time.1yr = metafor::rma.uni(yi = log(Ratio),  
                                     sei = (log(UL) - log(LL)) / (2 * 1.96),  
                                     data = outcome.time.1yr.df)  
  
summary(outcome.time.1yr)
```

```
##
## Random-Effects Model (k = 1; tau^2 estimator: REML)
##
##      logLik  deviance      AIC      BIC      AICc
##      0.0000   -0.0000    4.0000    -Inf    16.0000
##
## tau^2 (estimated amount of total heterogeneity): 0
## tau (square root of estimated tau^2 value):      0
## I^2 (total heterogeneity / total variability):   0.00%
## H^2 (total variability / sampling variability):   1.00
##
## Test for Heterogeneity:
## Q(df = 0) = 0.0000, p-val = 1.0000
##
## Model Results:
##
## estimate      se      zval      pval      ci.lb      ci.ub
##      1.4609    0.4472    3.2668    0.0011    0.5844    2.3374    **
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
metafor::forest.rma(outcome.time.1yr,
                    transf = exp,
                    cex = 0.8,
                    refline = 1,
                    slab = outcome.time.1yr.df$Study)
```



```
metafor::funnel.rma(outcome.time.1yr)
```

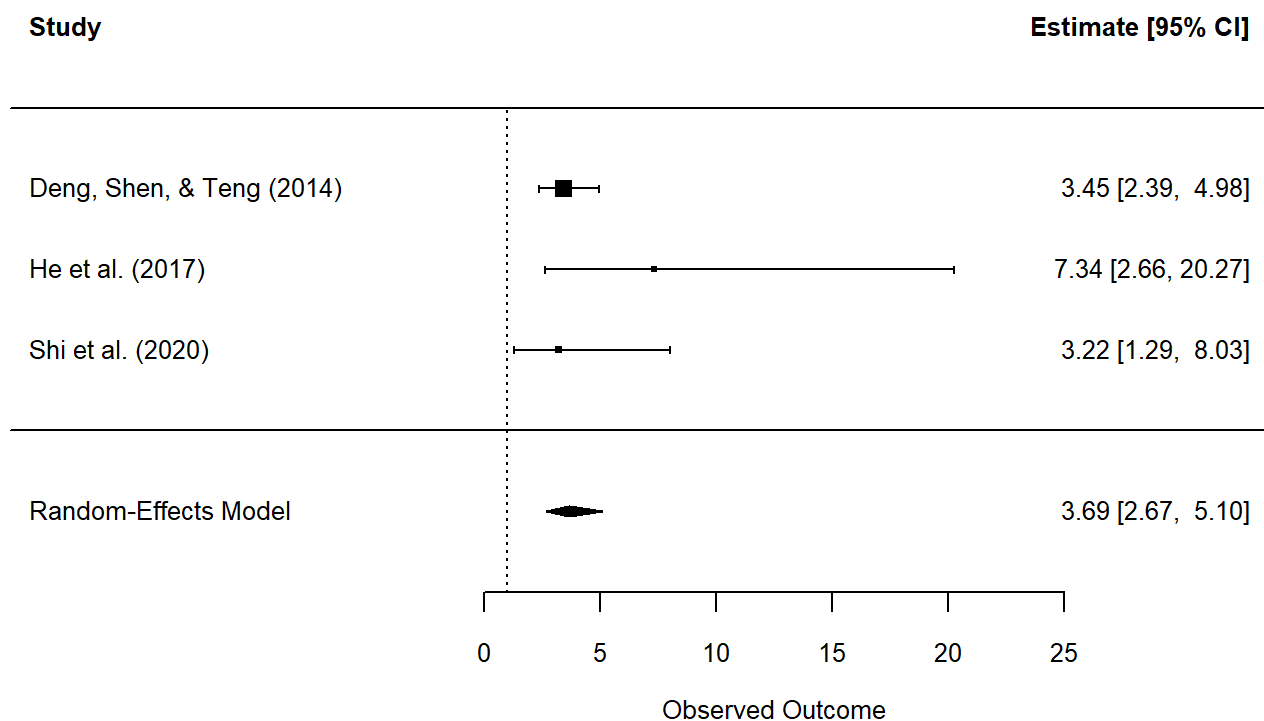


5.5 Outcome in 3 months

```
outcome.time.3mo = metafor::rma.uni(yi = log(Ratio),  
                                     sei = (log(UL) - log(LL)) / (2 * 1.96),  
                                     data = outcome.time.3mo.df)  
  
summary(outcome.time.3mo)
```

```
##
## Random-Effects Model (k = 3; tau^2 estimator: REML)
##
##   logLik  deviance      AIC      BIC      AICc
## -0.9843   1.9687   5.9687   3.3550  17.9687
##
## tau^2 (estimated amount of total heterogeneity): 0.0000 (SE = 0.1340)
## tau (square root of estimated tau^2 value):      0.0008
## I^2 (total heterogeneity / total variability):   0.00%
## H^2 (total variability / sampling variability):   1.00
##
## Test for Heterogeneity:
## Q(df = 2) = 1.9769, p-val = 0.3722
##
## Model Results:
##
## estimate      se    zval    pval   ci.lb   ci.ub
##   1.3061  0.1647  7.9298  <.0001  0.9833  1.6289  ***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

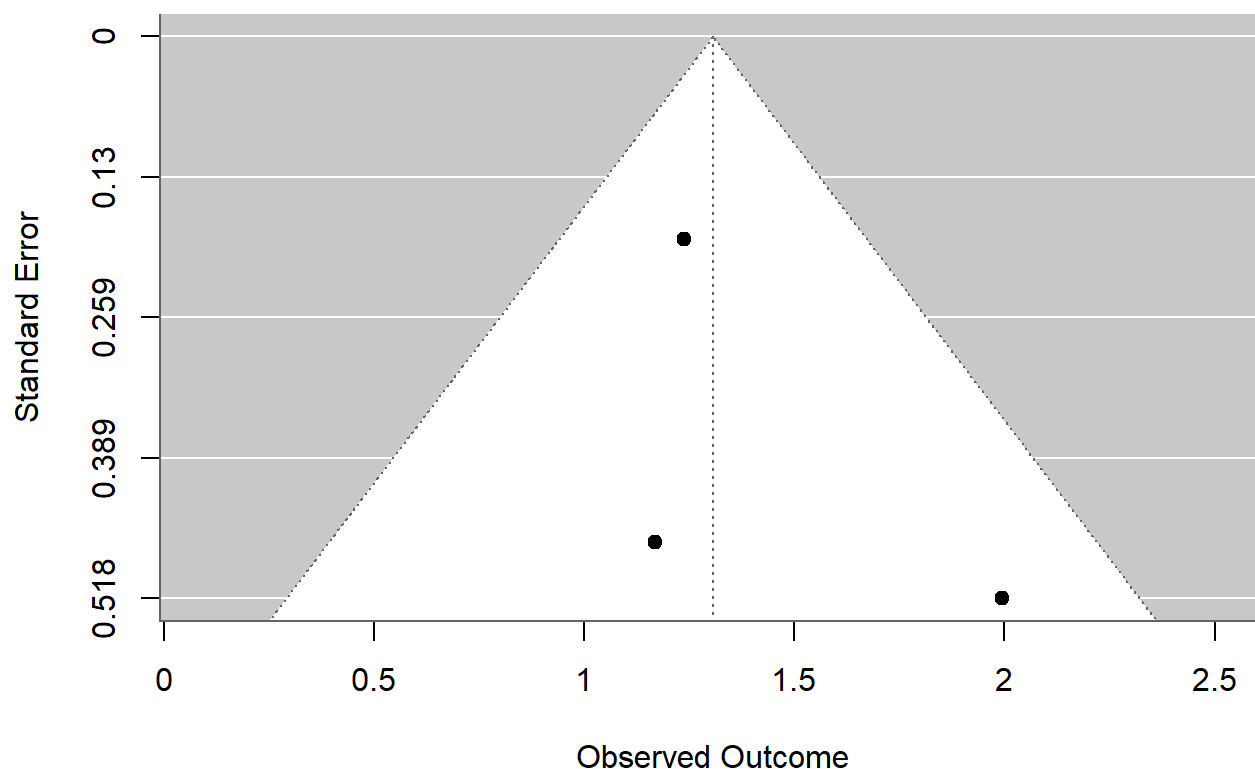
```
metafor::forest.rma(outcome.time.3mo,
                    transf = exp,
                    cex = 0.8,
                    refline = 1,
                    slab = outcome.time.3mo.df$Study)
```



```
metafor::regtest(outcome.time.3mo)
```

```
##
## Regression Test for Funnel Plot Asymmetry
##
## Model:      mixed-effects meta-regression model
## Predictor: standard error
##
## Test for Funnel Plot Asymmetry: z = 0.7491, p = 0.4538
## Limit Estimate (as sei -> 0):  b = 0.9973 (CI: -0.0381, 2.0326)
```

```
metafor::funnel.rma(outcome.time.3mo)
```

6 Export necessary data

```
export.list = list()

if(length(export.list) != 0){
  if (!file.exists(file.path(output.path, output.name))) {
    writexl::write_xlsx(export.list, file.path(output.path, output.name))
    cat(crayon::green("File successfully written. "))
  } else {
    cat(crayon::red(glue::glue("Filename already used: {output.name}")))
    overwrite = readline(prompt = "Overwrite (1 for Yes, 0 for No): ")
    if (overwrite == "1") {
      writexl::write_xlsx(export.list, file.path(output.path, output.name))
      cat(crayon::green("File successfully overwritten"))
    } else {
      cat(crayon::red("File not overwritten"))
    }
  }
}
```