Effectiveness Comparisons of Drug Therapies for Postoperative Aneurysmal Subarachnoid Hemorrhage Patients: Network Meta-analysis and systematic review

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# Binomial likelihood, logit link

# Random effects model for multi-arm trials

model{
  # *** PROGRAM STARTS

  for(i in 1:ns) { # LOOP THROUGH STUDIES
    w[i,1] <- 0 # adjustment for multi-arm trials is zero for control arm
    delta[i,1] <- 0 # treatment effect is zero for control arm
    mu[i] ~ dnorm(0,.0001) # vague priors for all trial baselines

    for (k in 1:na[i]) { # LOOP THROUGH ARMS
      r[i,k] ~ dbin(p[i,k],n[i,k]) # binomial likelihood
      logit(p[i,k]) <- mu[i] + delta[i,k] # model for linear predictor
      rhat[i,k] <- p[i,k] * n[i,k] # expected value of the numerators
      dev[i,k] <- 2 * (r[i,k] * (log(r[i,k])-log(rhat[i,k]))) #Deviance contribution
      + (n[i,k]-r[i,k]) * (log(n[i,k]-r[i,k]) - log(n[i,k]-rhat[i,k])))
    }
    resdev[i] <- sum(dev[i,1:na[i]]) # summed residual deviance contribution for this trial

    for (k in 2:na[i]) { # LOOP THROUGH ARMS
      delta[i,k] ~ dnorm(md[i,k],taud[i,k]) # trial-specific LOR distributions
      md[i,k] <- d[t[i,k]] - d[t[i,1]] + sw[i,k] # mean of LOR distributions (with multi-arm trial correction)
      taud[i,k] <- tau *2*(k-1)/k # precision of LOR distributions (with multi-arm trial correction)
      w[i,k] <- (delta[i,k] - d[t[i,k]] + d[t[i,1]]) # adjustment for multi-arm RCTs
      sw[i,k] <- sum(w[i,1:k-1])/(k-1) # cumulative adjustment for multi-arm trials
    }
  }

  totresdev <- sum(resdev[]) #Total Residual Deviance
  d[1] <- 0 # treatment effect is zero for reference treatment

  for (k in 2:nt){ d[k] ~ dnorm(0,.0001) } # vague priors for treatment effects
  sd ~ dunif(0,5) # vague prior for between-trial SD.
  tau ~ pow(sd,-2) # between-trial precision = (1/between-trial variance)

  # pairwise ORs and LORs for all possible pair-wise comparisons, if nt>2
for (c in 1:(nt-1)) {
    for (k in (c+1):nt) {
        or[c,k] <- exp(d[k] - d[c])
        lor[c,k] <- (d[k]-d[c])
    }
}

# Ranking and probabilities for treatment
for(k in 1:nt) {
    order[k]<- nt+1-rank(d[,k])  #events are good
    most.effective[k]<-equals(order[k],1)
    for(j in 1:nt) {
        effectiveness[k,j]<- equals(order[k],j)
        cumefectiveness[k,j]<- sum(effectiveness[k,1:j])
    }
}

#SUCRA
for(k in 1:nt) {
    SUCRA[k]<- sum(cumeffectiveness[k,1:(nt-1)])/ (nt-1)
}

list(ns=44, nt=14)  # tolerability

1 2 28 82 28 72 2
2 3 31 51 34 53 2
1 2 185 276 223 278 2
1 2 26 54 49 73 2
2 6 48 60 49 55 2
1 2 26 39 28 31 2
#chain 1
list(d=c(NA,0,0,0,0,0,0,0,0,0,0,0,0,0,0),
     sd=1,
     mu=c(0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0))
#chain 2
list(d=c(NA,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1,-1),
     sd=2,
     mu=c(-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3,-3))
#chain 3
list(d=c(NA,2,2,2,2,2,2,2,2,2,2,2,2,2),
     sd=4,
     mu=c(5,3,2,4,-5,-4,-1,5,5,-4,4,-2,-6,2,4,1,7,5,2,-1,-5,-3,-1,-7,-7,-7,-2,0,7,7,5,5,9,8,7,5,6,7,1,2,0,-1,5,-5))