WinBUGS Hierarchical Model for MI Agent

```
model
{
#  nj = 1357; #  total number of cases
#     n = 1165, # cases with no missing values -low volume hospitals<10 cases combined
#     nn = 26; # number of hospitals

for (i in 1:nn) {

#  For each hospital, all log reg parms follow normal distributions

b.intercept[i]~dnorm(b0.intercept[i], tau.intercept);
b.age65[i]~dnorm(b0.age65[i], tau.age65);
b.sex[i]~dnorm(b0.sex[i], tau.sex);
b.site[i]~dnorm(b0.site[i],tau.site);
b.stat6[i]~dnorm(b0.stat6[i], tau.stat6);
b.oldmi[i]~dnorm(b0.oldmi[i], tau.oldmi);
b.md[i]~dnorm(b0.md[i],tau.md);
b.bp[i]~dnorm(b0.bp[i], tau.bp);

#  Each of these parameters follow linear reg models

b0.intercept[i]<-b0.intercept.new+b0.statut.intercept*statut[i];
b0.age65[i]<- b0.age65.new+b0.vol.age65*nvolume[i];
b0.site[i]<-b0.site.new+b0.urban.site*nurban[i];
b0.oldmi[i]<-b0.oldmi.new+b0.urban.oldmi*nurban[i];
b0.md[i]<-b0.md.new+b0.vol.md*nvolume[i];
b0.bp[i]<-b0.bp.new+b0.vol.bp*nvolume[i];
b0.sex[i]<-b0.sex.new+b0.vol.sex*nvolume[i];
b0.stat6[i]<- b0.stat6.new+b0.vol.stat6*nvolume[i];

########################################
#  Main Logistic Regression Statement  #
########################################

for (j in (1+N[i]) :N[i+1])  {

logit(p[j])<-b.intercept[i]
```

```
+b.age65[i]*(age65[j]-age65.bar)+b.sex[i]*(sex[j]-sex.bar)
+b.site[i]*(site[j]-site.bar)+b.stat6[i]*(stat6[j]-stat6.bar)+b.oldmi[i]*(oldmi[j]-oldm
+b.md[i]*(md[j]-md.bar)+b.bp[i]*(bp[j]-bp.bar);
      agent[j]~dbern(p[j]);
    }
     }

#  Priors for all hierarchical regression model parms

    b0.statut.intercept   ~ dnorm(0,1.0E-1);
    b0.statut.age65~ dnorm(0,1.0E-1);
    b0.urban.age65~ dnorm(0,1.0E-1);
    b0.vol.age65~ dnorm(0,1.0E-1);
    b0.statut.site~ dnorm(0,1.0E-1);
    b0.urban.site~ dnorm(0,1.0E-1);
    b0.vol.site~ dnorm(0,1.0E-1);
    b0.statut.oldmi~ dnorm(0,1.0E-1);
    b0.urban.oldmi~ dnorm(0,1.0E-1);
    b0.vol.oldmi~ dnorm(0,1.0E-1);
    b0.statut.md~ dnorm(0,1.0E-1);
    b0.urban.md~ dnorm(0,1.0E-1);
    b0.vol.md~ dnorm(0,1.0E-1);
    b0.statut.bp~ dnorm(0,1.0E-1);
    b0.urban.bp~ dnorm(0,1.0E-1);
    b0.vol.bp~ dnorm(0,1.0E-1);
    b0.statut.sex~ dnorm(0,1.0E-1);
    b0.urban.sex~ dnorm(0,1.0E-1);
    b0.vol.sex~ dnorm(0,1.0E-1);
    b0.statut.stat6~ dnorm(0,1.0E-1);
    b0.urban.stat6~ dnorm(0,1.0E-1);
    b0.vol.stat6~ dnorm(0,1.0E-1);
    b0.intercept.new~ dnorm(0,1.0E-1);
    b0.age65.new~ dnorm(0,1.0E-1);
    b0.site.new~ dnorm(0,1.0E-1);
    b0.oldmi.new~ dnorm(0,1.0E-1);
    b0.md.new~ dnorm(0,1.0E-1);
    b0.bp.new~ dnorm(0,1.0E-1);
    b0.sex.new~ dnorm(0,1.0E-1);
    b0.stat6.new~ dnorm(0,1.0E-1);

#  Priors on Variances (precisions)
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```
    tau.intercept   ~ dgamma(1.0E-3,1.0E-3);
    tau.age65 ~ dgamma(1.0E-3,1.0E-3);
    tau.stat6 ~ dgamma(1.0E-3,1.0E-3);
    tau.sex ~ dgamma(1.0E-3,1.0E-3);
    tau.site ~ dgamma(1.0E-3,1.0E-3);
    tau.oldmi ~ dgamma(1.0E-3,1.0E-3);
    tau.md~ dgamma(1.0E-3,1.0E-3);
    tau.bp~ dgamma(1.0E-3,1.0E-3);

#  Creation of SD's from tau's

    sigma.intercept   <- 1/sqrt(tau.intercept);
    sigma.age65 <- 1/sqrt(tau.age65);
    sigma.stat6 <- 1/sqrt(tau.stat6);
    sigma.sex <- 1/sqrt(tau.sex);
    sigma.site <- 1/sqrt(tau.site);
    sigma.oldmi <- 1/sqrt(tau.oldmi);
    sigma.md<- 1/sqrt(tau.md);
    sigma.bp<- 1/sqrt(tau.bp);

#  Predictions for various groupings

age65.low<-b0.age65.new+15*b0.vol.age65;
age65.mid<-b0.age65.new+40*b0.vol.age65;
age65.high<-b0.age65.new+65*b0.vol.age65;
age65.xhigh<-b0.age65.new+90*b0.vol.age65;

b0.age65.low.pred~dnorm(age65.low, tau.age65);
b0.age65.mid.pred~dnorm(age65.mid, tau.age65);
b0.age65.high.pred~dnorm(age65.high, tau.age65);
b0.age65.xhigh.pred~dnorm(age65.xhigh, tau.age65);

sex.low<-b0.sex.new+15*b0.vol.sex;
sex.mid<-b0.sex.new+40*b0.vol.sex;
sex.high<-b0.sex.new+65*b0.vol.sex;
sex.xhigh<-b0.sex.new+90*b0.vol.sex;

b0.sex.low.pred~dnorm(sex.low, tau.sex);
b0.sex.mid.pred~dnorm(sex.mid, tau.sex);
b0.sex.high.pred~dnorm(sex.high, tau.sex);
b0.sex.xhigh.pred~dnorm(sex.xhigh, tau.sex);
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```
site.low<-b0.site.new+0*b0.urban.site;
site.mid<-b0.site.new+1*b0.urban.site;

b0.site.low.pred~dnorm(site.low, tau.site);
b0.site.mid.pred~dnorm(site.mid, tau.site);

oldmi.low<-b0.oldmi.new+0*b0.urban.oldmi;
oldmi.mid<-b0.oldmi.new+1*b0.urban.oldmi;

b0.oldmi.low.pred~dnorm(oldmi.low, tau.oldmi);
b0.oldmi.mid.pred~dnorm(oldmi.mid, tau.oldmi);

md.low<-b0.md.new+15*b0.vol.md;
md.mid<-b0.md.new+40*b0.vol.md;
md.high<-b0.md.new+65*b0.vol.md;
md.xhigh<-b0.md.new+90*b0.vol.md;
b0.md.low.pred~dnorm(md.low, tau.md);
b0.md.mid.pred~dnorm(md.mid,tau.md);
b0.md.high.pred~dnorm(md.high, tau.md);
b0.md.xhigh.pred~dnorm(md.xhigh, tau.md);

bp.low<-b0.bp.new+15*b0.vol.bp;
bp.mid<-b0.bp.new+40*b0.vol.bp;
bp.high<-b0.bp.new+65*b0.vol.bp;
bp.xhigh<-b0.bp.new+90*b0.vol.bp;
b0.bp.low.pred~dnorm(bp.low, tau.bp);
b0.bp.mid.pred~dnorm(bp.mid,tau.bp);
b0.bp.high.pred~dnorm(bp.high, tau.bp);
b0.bp.xhigh.pred~dnorm(bp.xhigh, tau.bp);

stat6.low<-b0.stat6.new+15*b0.vol.stat6;
stat6.mid<-b0.stat6.new+40*b0.vol.stat6;
stat6.high<-b0.stat6.new+65*b0.vol.stat6;
stat6.xhigh<-b0.stat6.new+90*b0.vol.stat6;

b0.stat6.low.pred~dnorm(stat6.low, tau.stat6);
b0.stat6.mid.pred~dnorm(stat6.mid, tau.stat6);
b0.stat6.high.pred~dnorm(stat6.high, tau.stat6);
b0.stat6.xhigh.pred~dnorm(stat6.xhigh, tau.stat6);
}
```