

RADPAD Mixed Model

Mixed Model

I used a log transform on the response to improve the model fit (by inspection of residual plots). The random effect is procedure ID.

```
m <- lmer(log(Dose + 1) ~ RADPAD*Occupation + (1 | ID), data = radpad)
```

ANOVA for Fixed Effects

```
anova(m)
```

```
## Type III Analysis of Variance Table with Satterthwaite's method
##              Sum Sq Mean Sq NumDF  DenDF F value    Pr(>F)
## RADPAD          34.34   34.340     1  203.49  55.213 2.932e-12 ***
## Occupation      403.91   80.783     5  867.39 129.886 < 2.2e-16 ***
## RADPAD:Occupation  50.45   10.090     5  867.39  16.224 2.565e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

LS Means for RADPAD by Occupation

LS means have been back-transformed from log scale.

```
emmeans(m, ~ RADPAD | Occupation, type = "response")
```

```
## Occupation = Anesthesia:
## RADPAD response      SE    df lower.CL upper.CL
## N          4.2981 0.3851  892   3.5937   5.110
## Y           0.1002 0.1391  884  -0.1416   0.410
##
## Occupation = Faculty:
## RADPAD response      SE    df lower.CL upper.CL
## N          1.9012 0.2096  887   1.5177   2.343
## Y           0.7126 0.2166  884   0.3362   1.195
##
## Occupation = Resident 1:
## RADPAD response      SE    df lower.CL upper.CL
## N          15.6726 1.2010  884  13.4744  18.205
## Y           5.6412 0.8398  884   4.1815   7.512
##
## Occupation = Resident 2:
## RADPAD response      SE    df lower.CL upper.CL
```

```
## N      1.8890 0.2234 938 1.4821 2.362
## Y      0.9189 0.2449 892 0.4937 1.465
##
## Occupation = Tech 1:
## RADPAD response      SE    df lower.CL upper.CL
## N      0.1181 0.0828 906 -0.0332 0.293
## Y      0.0589 0.1339 884 -0.1738 0.357
##
## Occupation = TEE:
## RADPAD response      SE    df lower.CL upper.CL
## N      2.5156 0.3708 1045 1.8583 3.324
## Y      1.3321 0.3684 1017 0.7105 2.180
##
## Degrees-of-freedom method: kenward-roger
## Confidence level used: 0.95
## Intervals are back-transformed from the log(mu + 1) scale
```

Pairwise contrasts for RADPAD by Occupation

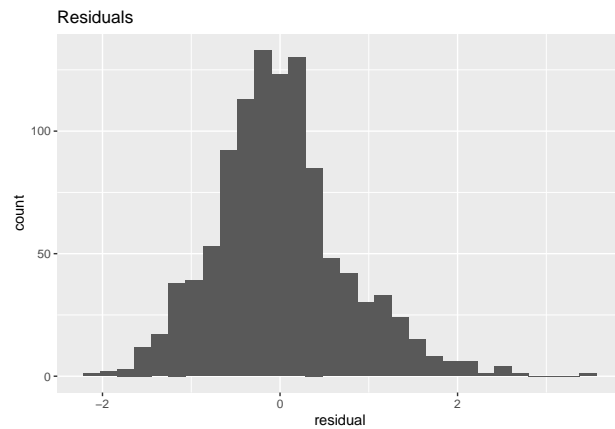
Contrasts have been back-transformed from log scale.

```
rg <- ref_grid(m)
em <- emmeans(regrid(rg, transform = "response"), ~ RADPAD | Occupation)
c <- contrast(em, interaction = "pairwise")
summary(c, infer = c(TRUE, TRUE))
```

```
## Occupation = Anesthesia:
## RADPAD_pairwise estimate      SE    df lower.CL upper.CL t.ratio p.value
## N - Y      4.1979 0.409 884 3.394 5.001 10.253 <.0001
##
## Occupation = Faculty:
## RADPAD_pairwise estimate      SE    df lower.CL upper.CL t.ratio p.value
## N - Y      1.1886 0.301 884 0.597 1.780 3.944 0.0001
##
## Occupation = Resident 1:
## RADPAD_pairwise estimate      SE    df lower.CL upper.CL t.ratio p.value
## N - Y     10.0314 1.466 884 7.155 12.908 6.845 <.0001
##
## Occupation = Resident 2:
## RADPAD_pairwise estimate      SE    df lower.CL upper.CL t.ratio p.value
## N - Y      0.9701 0.332 892 0.319 1.621 2.926 0.0035
##
## Occupation = Tech 1:
## RADPAD_pairwise estimate      SE    df lower.CL upper.CL t.ratio p.value
## N - Y      0.0592 0.157 884 -0.250 0.368 0.376 0.7072
##
## Occupation = TEE:
## RADPAD_pairwise estimate      SE    df lower.CL upper.CL t.ratio p.value
## N - Y      1.1834 0.523 1017 0.158 2.209 2.264 0.0238
##
## Degrees-of-freedom method: inherited from kenward-roger when re-gridding
## Confidence level used: 0.95
```

Residual Analysis

```
mdata <- data.frame(predicted = predict(m), residual = residuals(m))  
ggplot(mdata, aes(x = residual)) + geom_histogram() +  
  labs(title = "Residuals")
```



```
ggplot(mdata, aes(sample=residual)) + stat_qq() + stat_qq_line() +  
  labs(title = "QQ Plot")
```

