

Case Study 3: Dressings for February 10, 2012

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1) Introduction

The client is recruiting participants for a study of the efficacy of a new dressing for minor wounds. Each participant will have two simulated wounds, one of which is dressed in the new dressing and the other is dressed in the current standard dressing. At 7, 14, and 42 days several outcomes will be assessed on a five-point scale with lower scores indicating worse outcomes.

2) Questions for the Client.

- Will all responses be self-reported by the study participants (i.e. rate your pain from 1-5) or are there any objective measurements?
- What does the target population look like? What is the size of the group we can select subjects from?
- What does it mean that wounds will be "simulated"? Do we expect difficulty enrolling subjects in the trial if a potentially painful procedure is required?
- Will the analysis be used as part of a formal submission for approval to use the new dressing?
- Are we looking to show that the two dressings are equivalent or that one is better than the other?
- Do we need to combine all the responses into a single measure to compare the two dressings or do we want to compare each response?

3) Methods and Statistical Analysis. The group considered two statistical methods for the evaluation of the experimental results.

i). We could suggest a looking at a split-split plot designs (based on just the description given in the case study). There will likely be person-to-person variation we want to model. Dressings are nested within person, and then time is nested within dressing. Analysis should likely be done using MANOVA as there's likely a covariance structure for the outcomes that will need to be taken into account.

If we pursue this method, then as sampling goes, the number of participants will depend upon the desired power of the test. One thing to cover with the client is what level of Type I and Type II errors are acceptable from their perspective. Given this we can make an estimate at the sample size necessary. Of course, other considerations (like the client's budget and available man power) will also need to be taken into account.

ii). We could use a linear mixed model to analyze the experimental data. This is a repeated measures design so we will need to account for the dependency of observations on the same subject over a given length of time. Thus, subjects are the clusters and measurements at time 7, 14 and 42 days are the observations within the clusters. We include the several responses, i.e. pain, level of infection, speed on healing as covariates in the model. Since we are comparing treatments (new vs. standard) we are interested in between cluster differences, and not within cluster differences. The most appropriate model would then be a Generalized Estimating Equations (GEE) model, a marginal modeling approach where between cluster effects are of primary interest.

Since we only have 4 observations per cluster, determining the sample size would be restricted to the number of clusters (i.e subjects) that can be recruited to the study. In general we would want to recruit at least 30 subjects, with our estimates possibly improving with the increase in cluster size.