Study Design – Five Golden Rules

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As study design is a fundamental aspect of any research project, investigators should consider having a study design consultation early in the development process.

In engineering, form follows function. In the context of clinical and translational research, the specific aims of a study are the "function." Study design is the "form."

With that in mind, here are five "golden rules" to live by.

1. Think like a skeptic, and have a thorough scientific review before starting a study.
This framework is the primary reason we hold peer-reviewed work in high regard. Without peer review, a very compelling – yet seriously flawed – story can be told about virtually anything. Science is reproducible and rigorous. The limitations of science are real, so it is best to think about these trade-offs at the design stage. If the limitation is significant enough and modifiable, then the study can be modified to prospectively address this concern.

2. Never let a secondary aim of a study compromise the primary aim.
A study that tries to answer too many questions is likely not capable of providing a comprehensive answer to any single question. When considering overall study logistics, if a secondary aim or hypothesis has great potential to compromise the primary aim of the study, the investigator should carefully consider whether or not the secondary aim should be included.

3. Use the correct tool for the job.
This seems straightforward, but it is more complicated in practice. For example, if you want to study the prevalence of a disease, you may automatically want to use a cross-sectional study design – that is, you take a random sample from the population of interest and count the number of cases of the disease. You estimate disease prevalence by determining the ratio of cases to the total number of participants.

But what if you want to study a rare disease – one that occurs in one in every 10,000 people? If you study only 100 people, there is a very low likelihood that you will see any cases. Even if you studied 10,000, you are still not guaranteed to see a single case. In this case, you need to consider using an alternative to a cross-sectional study design.

4. Randomization is a key – but it is not a master key.
A benefit of randomization is that it controls known (and unknown) confounding variables. Use of randomization, however, is not well-suited to every study. When randomization cannot be used, the design of the study is far more susceptible to limitations and study design attributes. While valid conclusions can be drawn from non-randomized designs, you need to be far more critical and methodological.

5. When in doubt, ask.
A scientifically flawed study design has little potential of producing a benefit, so its risks may outweigh the intended benefits. Realizing at the end of the study that you failed to account for an important design consideration may result in a tremendous waste of resources. For that reason – before you get too far into your study – be sure to carefully consider any questions or concerns you have with your study design.