EVIDENCE-BASED PRACTICE

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Reading a Research Article
# Part II: Parametric and Nonparametric Statistics

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This is the second in a series of articles to help nurses use and understand statistics. The purpose of the series is to assist nurses in critically reviewing published studies and implementing the findings of research into clinical practice. The first article addressed basic statistical considerations and types of variables (Oliver & Mahon, 2005). This article will describe appropriate statistical methods to use when summarizing data collected from a research project.

Additionally, this article will introduce the infamous p value. A p value is a probability that determines whether a difference between two or more treatment types or interventions is big enough, or statistically significant, to change the current standard of care. However, interpretation of a p value requires that subjects were assigned randomly into the two or more groups being compared. Therefore, a variety of randomization techniques will be described to illustrate the influence that sampling choices might have on the interpretation of p values. Finally, this article will discuss the interpretation of statistical significance in terms of clinical significance.

How to Choose the Appropriate Statistical Method

Two categories of statistical analysis will be discussed in this article: parametric and nonparametric (see Figure 1). Researchers have a number of nonparametric alternatives to consider in place of the traditionally used parametric methods (see Table 1). Nonparametric methods play two primary roles in statistical analysis: They are used to summarize categorical data (i.e., nominal and ordinal level data) and in place of the commonly used parametric methods for continuous level data. Figure 1 provides a guide for statistical method selection. It illustrates four of the characteristics that must be taken into account for statistical test deci-
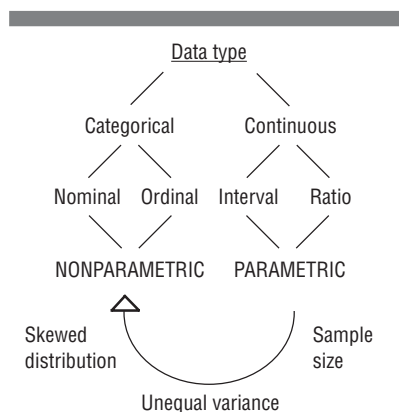
This figure provides an overview of how understanding the data type (categorical or continuous) ultimately guides the process of selecting the appropriate statistical test.

FIGURE 1. ALGORITHM FOR STATISTICAL TEST DECISION MAKING

sion making. The rules or assumptions for use of parametric methods must be met to ensure that reliable conclusions are drawn. The primary rules include identification of data type, appropriate sample size, variability of the results of the data, and shape of the distribution of the data. The additive effect of these four characteristics contributes to the power of the analysis.

Table 1 provides a list of the more commonly used parametric and nonparametric statistical methods for the assessment of research data. The nonparametric methods can be referred to as distribution-free methods (Pett, 1997). Distribution-free refers to the lack of a normal or bell-shaped curve, which frequently is the case with clinical data (see Figure 2). In many clinical situations, the "normal" distribution of the data is not bell-shaped, as frequently is the case in other situations (e.g., age of females enrolled in a study

for breast cancer). Distributions that deviate from normal are referred to as skewed distributions. Skewed distributions can be positive or negative (see Figure 2). Clinically, a person would not expect to encounter a bell-shaped distribution of a pathologic tumor size. (The distribution is skewed because a tumor must be large enough to be found.)

Because alternatives exist for the choice of a statistical test, why don't researchers simply use the nonparametric statistical methods that have less stringent requirements? One reason is because parametric methods are more effective in providing reliable results as long as the rules or assumptions are not grossly violated. Another reason is because the nonparametric equivalent methods are thought to be less powerful than the parametric methods. (Recall that loss of power decreases the probability of detecting a difference when a difference truly exists.) However, statisticians now believe that nonparametric tests are almost as efficient as their corresponding parametric tests (see Table 1).

Assessment of the Similarity or Difference Between Two Groups Using a p Value

The first table presented in most clinical research articles describes the subjects who participated in the clinical trial. Descriptive variables usually include age, race, diagnosis, and treatment type. In many studies, two or more groups are compared. For example,

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