NA&E NURSE AUTHOR & EDITOR | WILEY

Statistical, practical and clinical significance and Doctor of Nursing Practice projects

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INTRODUCTION

Statistical significance is often a metric by which research results are measured. Yet, these results may have little relevance in the clinical setting. Many questions surround the recognition of clinical significance including the interpretation of these results, measures of association strength, kinds of studies that should employ this interpretation, and instruments used to detect small, yet meaningful changes.[1]

Statistical significance, which refers to the investigator's decision to reject a null hypothesis based on set benchmarks, can be quite beneficial in describing findings of a project or research study. However, it is often incorrectly used for evaluating the magnitude of a quantified effect.[2] Novice investigators should use caution when sharing such findings. Furthermore, clinical significance, which relates to the real-life value of findings, should not be overlooked as these measures may offer merit to nursing practice.[3]

Two recent studies of Doctor of Nursing Practice (DNP) projects found that many problems with data analysis exist.[4,5] The most common problem was the application of quantitative analysis on small samples sizes that were determined to be definite by the author. The use of inferential statistics, such as *t*-tests was seen often in these projects. Though *t*-tests may be appropriate with small samples, study designers must consider and assess the assumptions about data distribution as well as the limitation of such small samples. These descriptions are often not included in DNP projects.[4,5]

From a research view, it is not unusual that DNP projects are often under-powered.[4,5] In this situation, the result can be statistically non-significant, but clinically important. Therefore, there is the need to focus on clinical significance in project findings as they relate to real life value in the lives of patients.[3]

The purpose of this paper is to clarify types of significance that may be appropriate in DNP projects, and to offer considerations when planning and reporting results.

TYPES OF SIGNIFICANCE AND WHY IT MATTERS

Much has been written on the importance of and the differing views of the application of significance to the findings of research studies and clinical scholarly projects. The DNP project is an example of a clinical scholarly project. In the broadest sense, significance refers to the quality of being worthy of attention, of importance, and of having meaning. Three types of significance are reported in the literature: statistical, practical, and clinical. Each has a unique purpose, description, and method of evaluation. Statistical significance refers to the results being due to chance; specifically, that it is not likely that the differences occurred by chance alone. Practical significance quantifies the impact of a treatment and refers to the degree to which variables are associated with one another and estimates the magnitude of the effect. Clinical significance refers to the practical or applied importance of effect, and whether it makes a difference to patients in everyday life.

Practical and clinical significance are sometimes used interchangeably in the literature. In addition, the term "treatment effect" has been used synonymously when referencing practical and clinical significance, and different disciplines may use these terms uniquely. Nursing has not come to consensus on the use of these terms.[6] In the most general sense, both refer to the degree of change in an outcome. Practical significance is about the magnitude and direction of effects as judged by researchers or practitioners, and clinical significance is about the impact on the patient's life as perceived by the patient. Regardless of the terms used, it is important to acknowledge the relevance of the two different perspectives: one perspective is from the researcher's point of view and the other from the patient.[7]

Consensus does not exist in the literature about relationships among the types of significance. Some argue that statistical significance must be achieved prior to any evaluation of clinical significance,[8,9] while others argue that clinical significance can occur regardless of statistical significance.[5,10]

To differentiate between the different types of significance, it is helpful to understand the questions asked of the findings. Statistical significance asks: Were the results due to chance? Practical significance asks: How effective is the intervention/treatment? How much change does the intervention/treatment cause? And clinical significance asks: Was the intervention/treatment effective enough to have an impact on the patient's life? Was the intervention/treatment enough to cause the patient to feel an improvement? Table 1 highlights different types of significance, a brief description of each, and questions associated with each type.

CLINICAL SIGNIFICANCE AND DNP PROJECTS

Many nurses are seeking additional education on evidence-based practice at all levels. Those who earn the DNP degree have attained the highest level of educational preparation for advanced practice which means that in addition to evidence-based care, focus is placed on translating and implementing evidence into practice.[11] Evidence-based practice is a deliberate problem-solving approach to clinical practice that integrates the best scientific evidence, clinician expertise and opinion, and patient perspectives in making decisions about patient care.[12] A DNP project should aim to produce clinically significant outcomes that contribute to evidence-based practice. Clinical significance is an indicator of patient change and is from the perspective of the patient, with patient self-assessment being a central indicator of clinical significance.[6] Clinical significance supports evidence-based practice. When looking at the triadic definition of evidence-based practice, connections can be made between best scientific evidence and statistical significance, clinician expertise and practical significance, and perspectives of patients and clinical significance. The important point is that DNP projects that emphasize clinical significance can contribute to evidence-based practice.

A major goal for a DNP project is for the student to demonstrate the ability to lead and practice at the highest level, using research and evidence to improve patient care, either directly or indirectly. The focus is on improved patient outcomes rather than to the contribution to generalizable knowledge.[13] These points are supported by the American Association of Colleges of Nursing (AACN)[11]: "Clinical significance is as important in guiding practice as statistical significance is in evaluating research."

PRACTICE EXAMPLE

The following is a simplified example of the common use of statistics in a DNP project. The aim of the project was to increase appropriate prescribing of a certain drug class based on national guidelines. The intervention was provider education. The outcome measure was documentation by the prescriber in the electronic medical record. These data were extracted using a pre-post audit. Although the evaluation period was 6 months (3 months prior to the intervention and 3 months after), there were only a small number of patient visits for the medical indication that would require a prescription. There were 28 records in the before and 30 in the after group. Results revealed that before the educational intervention 22 of 28 patients were prescribed the recommended medication class. After the change in practice, 30 of 30 patients received appropriate prescriptions.

What is often seen in reports of projects like this example is a statistical analysis that includes not only descriptive statistics such as percent absolute change or improvement (i.e., from 78.6% before to 100% or an increase in 22.4%) but also the calculation of statistical significance of the change based on a standard error and resulting in a not statistically significant probability (p) value. Then the author will go on to discuss in detail why this "study" did not reach statistical significance and not discuss the clinical significance of the practice change.

In this example, the implementation of practice guideline recommended prescribing resulted in the best medication class for this indicated medical condition being prescribed 100% of

TABLE 1 Brief descriptions of types of significance

Significance type	Description	Questions asked of the findings
Statistical	Results due to chance	• Were the results of the intervention due to chance? • What is the probability that these results occurred by chance alone?
Practical	Quantifies the impact of a treatment. Estimates the magnitude of effect	• How effective was the intervention/treatment? • How much change does the intervention/treatment cause?
Clinical	The practical or applied importance of effect, and does it make a difference to clients/subjects/patients in everyday life	• Was the intervention/treatment effective enough to improve the patient's experience (e.g., of their health or provision of care)? • Was the intervention/treatment enough to improve or eliminate a diagnostic criterion for a condition?

the time. Every patient at this clinic who presented with the indication received it. From the patient point of view, they received the highest quality of care based on the highest level of evidence.

DNP projects should have as a major focus the clinical significance of findings. Emphasizing clinical significance can make valuable contributions to evidence-based practice. With limited research determining clinically significant values, clinical significance is one of most ambiguous domains of the types of significance that advance knowledge and practice. Clinical practice change projects have the opportunity to add clarity and strengthen the contribution of clinical significance to evidence-based practice.

RECOMMENDATIONS

A DNP project uses evidence (results of research studies using research methodologies such as randomized controlled trials or cohort studies) and applies it to all indicated patients or systems. The results are derived from the outcomes (what measures improved) for the patients or systems after the change in practice was implemented. A focus on the aim of the DNP project and what question is being asked should make it clear which type of significance to choose.

Authors do not need to spend a lot of time on discussing why the results are not statistically significant in a DNP project in a local setting where there were not a lot of patients or providers impacted by the change. Instead discuss why the results may be considered clinically significant and what other improvements would allow for more confidence in the results and how this intervention could be transferrable to other similar clinical settings. Educators should be clear in their own knowledge of the different types of significance. While it is important for all nurses to understand the statistical analyses used in research so that they can appraise the evidence, being able to perform advanced statistical analysis is usually not necessary in most clinical practice change projects.

CONCLUSION

Translating knowledge into practice requires planning and interactions between researchers and practitioners. Considerations about how findings can influence practice change future research, practice, education, and policy is a shared responsibility.[14] Teaching students what they need to know to match the appropriate statistic to the questions being asked or the aim of the project is how nursing will move the discipline forward in both research and evidence based practice. Improving the health of patients and healthcare system depends on both.

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