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Statistic Methods Used in Scholarly Projects of Doctor of Nursing Practice Graduates

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Abstract

Background: Most of the DNP programs provide only one Biostatistics course for the students, which means instructors have limited time to prepare DNP students in mastering the statistics skills they need to complete their scholarly project.

Methods: Quantitative content analysis was conducted on 100 DNP projects to retrieve information regarding the subjects, sample size, sampling strategies, and statistics methods used. These projects were selected from two online DNP projects repositories, where DNP graduates uploaded their projects voluntarily.

Results: Almost half of the projects had a sample size less than 50, majority of the studies adopted convenience sampling strategy, and the most often used statistics methods discovered were descriptive analysis, t Test, and Chi square analysis.

Conclusion: Small sample size is an intrinsic problem of most DNP projects. The results of this study give DNP students and faculty a more clear teaching map that focuses on skills used most often.

Background

Doctor of nursing practice (DNP) students' scholarly projects focus on practical application of existing knowledge [1,2]. DNP students are required to complete a scholarly project upon completion of their program, which is equivalent to a dissertation requirement for students of doctors of philosophy (PhD). This project is considered as the synthesis of their DNP education outcome [3].

Throughout the years, the American Association of Colleges of Nursing (AACN) has published various documents to guide the development of DNP programs [4,1,5,2,6]. Based on these documents, a DNP graduate is prepared to provide leadership for evidence-based practice in their specialty area [6]. In order to play this role, he/she should be competent in "translating research in practice, evaluating evidence, applying research in decision-making, and implementing viable clinical innovations to change practice" [6]. Among the above four competencies, biostatistics skills are foundational. Without appropriate training in biostatistics, with limited literacy and reasoning ability in quantitative study, one will not be able to consume current research critically, which will then affect the accurate interpretation and application of the knowledge.

Most of the DNP programs only offer one semester of three credits biostatistics course [7]. With a limited time, faculty members face a substantial challenge of covering vast topics on biostatistics. At the same time, the depth and width of the teaching is also needed to be balanced carefully within a one course time frame.

Currently, to the author's knowledge, there is no study done to explore statistics methods used commonly in DNP projects. However, a study with similar objective was conducted to describe statistics used in general nursing research [8]. In their study, [8] revealed the top 10 statistics used in the journal articles reviewed: mean, frequency distribution, standard deviation, range, percentages (percentiles, and quartiles), t Test, analysis of variance, correlation, Cronbach's alpha, and Chi square. Among these top 10 statistics, the majority were used for descriptive analysis. Based on their study, [8] emphasized the importance of incorporating statistical skills in nursing education. Scotch, Duggal, Brandt, Lin, & Shiffman [9]

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surveyed articles in biomedical informatics journals and found that descriptive statistics were used most often. They also concluded that "a minimum, proficiency in descriptive and elementary statistics" was critical for biomedical informatics scientists to acquire [9]. Due to the fundamental difference in training goals of DNP and PhD education, research outcome based on reviewing journal articles written by nursing and biomedical informatics scientists might not apply directly to teaching statistics to DNP students. A study that surveys DNP projects to find out the most often used statistical methods will deliver the most relevant information to both DNP faculty and students in terms of accomplishing the goal of teaching and learning statistical skills within a short allowable time.

Methods

This study utilized the method of quantitative content analysis to review DNP projects completed recently. Projects submitted voluntarily to two main scholarly outcome repositories were selected. These two repositories were Doctor of Nursing Practice Inc. website and Digital Commons by Bepress. Doctor of Nursing Practice Inc. is a not for profit organization and it maintains a list of DNP projects submitted since 2007. This list of scholarly projects served as one sampling frame of the study. However, due to only a small amount of projects submitted, 50 projects with sufficient information on statistics methods used were selectively included in this study. Most of these projects were submitted from 2009 to 2013.

Digital Commons by Bepress has a much larger list of projects than the one maintained by the Doctor of Nursing Practice Inc. Fifty projects submitted in 2016 were randomly selected to be included in

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this study by using a random number generator. Projects from Digital Commons were more recent than the projects selected from Doctor of Nursing Practice Inc. Although this is not a longitudinal study, the differences in the time frame of the two groups of projects selected can provide insights into whether there are changes over time.

With a total of 100 projects from two repositories, content analysis was conducted to retrieve information regarding the subjects of the study, sample size, sampling strategies, and statistics methods used.

After the completion of data collection, Statistics Package for Social Study version 23.0 software (IBM Corp. Released 2015, Armonk, NY) was used to analyze the data.

Current study was approved by the author's Institutional Review Board.

Results

This study found 46.2% of studies' sample size was less than 50. The mean of the sample size was 49. There were 90% of the projects from both repositories were quantitative in nature. The rest of the 10% of the projects were either literature review or using qualitative in nature. In terms of study setting, 90% of the projects were conducted either in a hospital or at a clinic. In addition, 7.5% of the projects were conducted online. Among the projects examined, very few studies used random sample selection and the majority of the studies used convenience or purposive sampling strategies. About 30% of the projects studied patients directly. And more than two fifths of the projects from both samples focused on the behavior of either nurses or providers (including medical doctors, physician's assistants, and nurse practitioners).

Among these projects, the most often used statistic method was descriptive analysis, 67% of the projects utilized this method. *t* Tests and Chi square analysis were also used often. Other methods used but not included were Fisher exact test, Mann-Whitney test, McNemar test, logistic regression, and odds ratio.

Discussion

Among the projects examined, most of them had small sample size. DNP students had a very limited time and financial resources to conduct larger studies. Small sample size and low statistical power will continue to be an issue of most DNP projects. However, the problem of small sample size does not limited to DNP projects; many translational researches and new clinical trials have the same issue. Bacchetti, Deeks, & McCune [10] proposed a new perspective on the limitation of small sample size and argued about the flaws in the conventional requirement of Cohen's theory [11,12] of using 80% power for sample size calculation. With reasonable argument, the value of the DNP projects should not be negated by their smaller sample size. Broome, Riner & Allam [13] recommended to DNP programs to use multiple sites and involve multiple students to increase sample size, which could also be an innovative way to explore and overcome the intrinsic issue of small sample size that most DNP projects face.

Across two time frames, the subjects of DNP projects were comparable. Although relatively higher percentages of projects focused directly on patients, a similar amount of attention was paid to the other parts of the health care team, which included nurses and health care providers (medical doctors, nurse practitioners, and

physician's assistant). This diverse focus should be encouraged. At the same time, DNP students should also venture out to conduct projects on informatics interventions, which was lacking among the projects reviewed.

A panel of statistics experts suggested using descriptive statistics to summarize DNP project results [14], which was verified in the DNP projects explored in this study. Descriptive method was used most often in the 100 DNP projects examined. This study focused on the statistics methods used in DNP projects, which are the methods the DNP students not only need to understand how to interpret but also how to use proficiently. The final list of the top statistics methods provided here should not be considered as the only methods to be taught in a biostatistics course for DNP students. Instead, it gives the instructor some thoughts in terms of how to spend the time wisely with the students: give more hands on assignments for students to practice to fully master the methods included in the list, and give a broader review of other less frequently used methods.

Competing Interests

The author declare no competing interests

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