

Quantitative Research Designs

NURS 485 – The Discipline and Profession of Nursing III

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CALGARY

Lecture Outline

- Quantitative and qualitative research compared
- Experimental research designs
- Quasi-experimental research designs
- Descriptive research designs
- Correlational research designs
- Questions and issues for consideration when critically appraising quantitative research

Quantitative & Qualitative Research Compared

Qualitative

- Broad questions
- Understanding
- Exploratory
- Interview/observation
- Discover frameworks
- Textual (words)
- Theory generating
- Quality of informant > sample size
- Subjective

Quantitative

- Specific Prediction
- Survey/questionnaires
- Existing frameworks
- Numerical
- Theory testing
- Intervention testing (RCTs)
- Sample size core issue in reliability of data
- Objective

Should I do a quantitative study?



What is the problem?

Identifying the problem is the first step of any research process

For any project, the problem drives the methodology

Purposes of quantitative research

Quantitative research is used to examine:

- testing interventions and treatments
- differences between groups
- relationships between two or more variables
- descriptions of populations and phenomena
- change over time

Types of Variables

- **Independent variable:** manipulated by the researcher to influence the dependent variable; may be called predictor variable
- **Dependent variable:** This is the variable of primary interest to the researcher; may be called outcome variable.
- **Confounding variable:** Extraneous third variable that influences the relationship between the independent and dependent variables
- **Propose a hypothesis about the relationship among the variables, and test it by controlling the context of the study**

Types of Measurement

- Nominal
- Ordinal
- Ratio



Brief intro to statistical tests

- Tests are based on what variables and what level of measurement
- Descriptive and inferential statistics

Assessing the statistical tests

- Need to see all the variables represented in the analysis
- Need tables that report ALL these data, not just some (“cherry picking”)
- If there is an analysis reported (i.e., regression), you expect to see a regression table with all the variables included
- P values

Samples Quantitative Research

- Larger numbers
- Randomly selected
- Reflective of the population



Designs in Quantitative Research

- A systematic plan to study a scientific problem
- Seek to answer explanatory questions
- It describes the basic strategies that will be employed to address the research question or hypotheses



Quantitative Study Designs

Non- Experimental

Correlational

Descriptive

Experimental

Experimental

- RCT (Double blind)
- RCT (Not Blinded)

**Quasi-
Experimental**

Non-Experimental Designs: Descriptive Designs

- Research that observes, describes, and documents areas of interest as they occur naturally
- Describes variables, rather than testing a predicted relationship between them
- Numeric data numeric collected through surveys, interviews, or observation

Typical Descriptive Studies

Retrospective

Prospective



Typical Descriptive Studies

- Cross-sectional
- Compares different groups within a population of interest, data collected a single point in time.

Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Dissatisfaction

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Sean P. Clarke, PhD, RN

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Julie Sochalski, PhD, RN

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THE PAST DECADE HAS BEEN A TURBULENT time for US hospitals and practicing nurses. News media have trumpeted urgent concerns about hospital understaffing and a growing hospital nurse shortage.¹⁻³ Nurses nationwide consistently report that hospital nurse staffing levels are inadequate to provide safe and effective care.⁴⁻⁶ Physicians agree, citing inadequate nurse staffing as a major impediment to the provision of high-quality hospital care.⁷ The shortage of hospital nurses may be linked to unrealistic nurse workloads.⁸ Forty percent of hospital nurses have burnout levels that exceed the norms for health care workers.⁴ Job dissatisfaction among hospital nurses is 4 times greater than the average for all US workers, and 1 in 5 hospital nurses

Context The worsening hospital nurse shortage and recent California legislation mandating minimum hospital patient-to-nurse ratios demand an understanding of how nurse staffing levels affect patient outcomes and nurse retention in hospital practice.

Objective To determine the association between the patient-to-nurse ratio and patient mortality, failure-to-rescue (deaths following complications) among surgical patients, and factors related to nurse retention.

Design, Setting, and Participants Cross-sectional analyses of linked data from 10184 staff nurses surveyed, 232342 general, orthopedic, and vascular surgery patients discharged from the hospital between April 1, 1998, and November 30, 1999, and administrative data from 168 nonfederal adult general hospitals in Pennsylvania.

Main Outcome Measures Risk-adjusted patient mortality and failure-to-rescue within 30 days of admission, and nurse-reported job dissatisfaction and job-related burnout.

Results After adjusting for patient and hospital characteristics (size, teaching status, and technology), each additional patient per nurse was associated with a 7% (odds ratio [OR], 1.07; 95% confidence interval [CI], 1.03-1.12) increase in the likelihood of dying within 30 days of admission and a 7% (OR, 1.07; 95% CI, 1.02-1.11) increase in the odds of failure-to-rescue. After adjusting for nurse and hospital characteristics, each additional patient per nurse was associated with a 23% (OR, 1.23; 95% CI, 1.13-1.34) increase in the odds of burnout and a 15% (OR, 1.15; 95% CI, 1.07-1.25) increase in the odds of job dissatisfaction.

Conclusions In hospitals with high patient-to-nurse ratios, surgical patients experience higher risk-adjusted 30-day mortality and failure-to-rescue rates, and nurses are more likely to experience burnout and job dissatisfaction.

JAMA. 2002;288:1987-1993

www.jama.com

Typical Descriptive Studies

- Longitudinal
- Study the dynamics of a phenomenon over time
- Collect data from individuals/groups (a cohort) at more than one point in time over an extended period



The mental health impacts of health and human service work: Longitudinal evidence about differential exposure and susceptibility using 16 waves of cohort data

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ABSTRACT

The health and human care workforce comprise a substantial and increasing proportion of the employed population in high income countries. This diverse workforce is comprised of high skilled workers, such as doctors and nurses, as well as lower skilled workers such as carers and support workers. This paper assessed psychosocial working conditions among health and human care workers compared to other workers. We also examined the effects of psychosocial working conditions on mental health. The data source was 16 waves of the Household Income Labour Dynamics in Australia survey. The exposure was a multidimensional, previously validated psychosocial job quality index. The outcome was changes in the Mental Health Inventory-5 (MHI-5). The effect modifier was a multicategory health and human care occupational variable. Random and fixed effects linear regression models were used to unpack between- versus within- person differences. Time varying confounders were controlled for. We found evidence of effect modification. Carers and support workers experienced a 4.90-point decline (95% CI -6.23 to 3.57) on the MHI-5 when reporting 3 or more job stressors compared to no stressors. These workers also reported lower levels of mental health than other occupational groups and had greater exposure to poor psychosocial working environments. Health workers also reported substantial declines on the MHI-5 when exposed to 3 or more job stressors (-3.50, 95% CI -5.05 to -1.94). Understanding the quality of employment in this workforce, and consequent impacts of this employment on mental health is critical to ensuring sustainable individual, organizational and client-related outcomes.



Non-Experimental Designs: Correlational Designs

- Research that explores the inter-relationships among variables (without researcher intervention):
 - How close to the front of class you sit and your grade?
 - Cigarettes smoked per day and health costs?
 - Symptoms of depression and social support?
 - Does owning a dog impact on quality of life and well-being for people with chronic pain?



Correlational Research
Research Methodology

Typical Correlational Studies



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Comparability of nurse staffing measures in examining the relationship between RN staffing and unit-acquired pressure ulcers: A unit-level descriptive, correlational study

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Experimental Designs: RCT

- Considered the ‘highest level of evidence’ because you can establish causation
- Management of context
- May be blinded or unblinded

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Parachute use to prevent death and major trauma when jumping from aircraft: randomized controlled trial

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Additional material is published online only. To view please visit the journal online.

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ABSTRACT

OBJECTIVE

To determine if using a parachute prevents death or major traumatic injury when jumping from an aircraft.

DESIGN

Randomized controlled trial.

SETTING

Private or commercial aircraft between September 2017 and August 2018.

PARTICIPANTS

92 aircraft passengers aged 18 and over were screened for participation. 23 agreed to be enrolled and were randomized.

INTERVENTION

Jumping from an aircraft (airplane or helicopter) with a parachute versus an empty backpack (unblinded).

MAIN OUTCOME MEASURES

Composite of death or major traumatic injury (defined by an Injury Severity Score over 15) upon impact with the ground measured immediately after landing.

RESULTS

Parachute use did not significantly reduce death or major injury (0% for parachute v 0% for control; P=0.9). This finding was consistent across multiple subgroups. Compared with individuals screened but not enrolled, participants included in the study were on aircraft at significantly lower altitude (mean of 0.6 m for participants v mean of 9146 m for non-participants; P<0.001) and lower velocity (mean of 0 km/h v mean of 800 km/h; P<0.001).

CONCLUSIONS

Parachute use did not reduce death or major traumatic injury when jumping from aircraft in the first randomized evaluation of this intervention. However, the trial was only able to enroll participants on small stationary aircraft on the ground, suggesting cautious extrapolation to high altitude jumps. When beliefs

regarding the effectiveness of an intervention exist in the community, randomized trials might selectively enroll individuals with a lower perceived likelihood of benefit, thus diminishing the applicability of the results to clinical practice.

Introduction

Parachutes are routinely used to prevent death or major traumatic injury among individuals jumping from aircraft. However, evidence supporting the efficacy of parachutes is weak and guideline recommendations for their use are principally based on biological plausibility and expert opinion.^{1,2} Despite this widely held yet unsubstantiated belief of efficacy, many studies of parachutes have suggested injuries related to their use in both military and recreational settings,^{3,4} and parachutist injuries are formally recognized in the World Health Organization's ICD-10 (international classification of diseases, 10th revision).⁵ This could raise concerns for supporters of evidence-based medicine, because numerous medical interventions believed to be useful have ultimately failed to show efficacy when subjected to properly executed randomized clinical trials.^{6,7}

Previous attempts to evaluate parachute use in a randomized setting have not been undertaken owing to both ethical and practical concerns. Lack of equipoise could inhibit recruitment of participants in such a trial. However, whether pre-existing beliefs about the efficacy of parachutes would, in fact, impair the enrolment of participants in a clinical trial has not been formally evaluated. To address these important gaps in evidence, we conducted the first randomized clinical trial of the efficacy of parachutes in reducing death and major injury when jumping from an aircraft.

Methods

Study protocol

Between September 2017 and August 2018, individuals were screened for inclusion in the PARACHUTE In Randomized trials Compromised by widely Held beliefs about Lack of Treatment Equipoise (PARACHUTE) trial. Prospective participants were approached and screened by study investigators on commercial or private aircraft.

For the commercial aircraft, travel was related to trips the investigators were scheduled to take for business or personal reasons unrelated to the present study. Typically, passengers seated close to the study investigator (typically not known acquaintances)

WHAT IS ALREADY KNOWN ON THIS TOPIC

Parachutes are routinely used to prevent death or major traumatic injury among individuals jumping from aircraft, but their efficacy is based primarily on biological plausibility and expert opinion
No randomized controlled trials of parachute use have yet been attempted, presumably owing to a lack of equipoise

WHAT THIS STUDY ADDS

This randomized trial of parachute use found no reduction in death or major injury compared with individuals jumping from aircraft with an empty backpack
Lack of enrolment of individuals at high risk could have influenced the results of

Typical RCTs






International Journal of Nursing Studies



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Mothers' voices and white noise on premature infants' physiological reactions in a neonatal intensive care unit: A multi-arm randomized controlled trial

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Experimental Designs: Quasi-experimental

- Occur when experimental research is unethical or impractical
- *No randomization*
- Control or comparison groups might be another site

Typical Quasi-Experimental Studies



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The effects of three consecutive 12-hour shifts on cognition, sleepiness, and domains of nursing performance in day and night shift nurses: A quasi-experimental study

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Critical Appraisal of Quantitative Research Designs

Appraisal Questions

- What design has been used for the study?
- Is a design clearly stated/readily apparent?
- Is it sensible? Can it be replicated?
- Is it appropriate to the question/hypothesis/purpose?
- Was the best possible design used to address the study purpose?
- Is the study design justified?
- Are the strengths & limitations debated?

Textbook: Lansley, Kane & Barker (Chapter 7) and Appendix 6